CLIMATE RISK & CENTRAL BANKING: THE RBI'S ROLE IN INCENTIVISING GREEN FINANCE

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ABSTRACT

Climate change has evolved from a distant ecological concern into a defining macroeconomic challenge, forcing a historic paradigm shift in global central banking. This paper examines the evolving regulatory posture of the Reserve Bank of India (RBI) as it navigates the "Tragedy of the Horizon" and the emergence of "Green Swan" events, systemic financial risks that traditional, backward-looking risk models are unequipped to price. India faces a unique dual-front challenge: extreme vulnerability to physical climate shocks and a massive $10 trillion capital requirement to achieve its 2070 net-zero transition. Utilizing a doctrinal method of study, this paper analyzes the RBI's transition from "moral suasion" to a structured, enforceable regulatory framework. Key interventions discussed include:

1. The inclusion of renewable energy under Priority Sector Lending (PSL).
2. The 2023 Green Deposits Framework designed to mitigate greenwashing.
3. The landmark 2025 Master Directions on Climate Finance, which integrated climate risk into core banking strategy and governance.

The study further explores the 'climate-risk paradox', where the need for rapid decarbonization must be balanced against the risks of greenflation, data deficits in Scope 3 emissions, and the socio-economic necessity of a just transition for a fossil-fuel-dependent economy. The paper concludes by recommending the formalization of a National Climate Taxonomy and a dedicated Transition Finance framework to ensure that the brown economy has the financial runway to adopt cleaner technologies without triggering systemic instability.

Keywords: RBI, Green Finance, Climate Risk, Green Swan, Transition Finance, Priority Sector Lending (PSL), Net-Zero 2070.

Introduction

Climate change is no longer a distant ecological threat; it has rapidly crystallised into the defining macroeconomic and financial challenge of the 21st century. As the anthropogenic acceleration of global warming crosses critical thresholds, the traditional boundaries of economic policymaking are being forcibly redrawn. At the centre of this structural transformation are global central banks, institutions that are currently undergoing a historic paradigm shift. They are recognising that ecological degradation and the sweeping economic transitions required to halt it are not merely environmental crises, but profound, systemic financial risks.

India, as a developing economy, is disproportionately vulnerable to physical climate shocks, yet, bound by a massive capital requirement for its 2070 net-zero transition, the Reserve Bank of India (RBI) occupies a highly complex and critical nexus. This paper comprehensively examines the evolving regulatory posture of the RBI in identifying, measuring, and mitigating climate-related financial risks while proactively incentivising green finance.

The Era of Market Neutrality and the "Tragedy of the Horizon"

Historically, central banks operated under a strict doctrine of "market neutrality". Grounded in macroeconomic orthodoxies such as Tinbergen's Rule, which posits that policymakers must have at least one distinct policy tool for every policy target, central banks steered clear of sectoral credit allocation. Their legal mandates were intentionally narrow: maintain price stability (inflation targeting) and ensure broader macroeconomic stability. Intervening in environmental policy or actively directing capital away from fossil fuels was viewed as the exclusive, politically accountable domain of fiscal authorities and elected governments.

The turning point in this orthodoxy occurred in 2015, marked by former Bank of England Governor Mark Carney's seminal speech, "Breaking the Tragedy of the Horizon"[1]. Carney articulated a fundamental market failure: the catastrophic impacts of climate change will be felt beyond the traditional horizons of most financial actors—beyond the credit cycle, the political cycle, and the business cycle. By the time climate change becomes a definitive

[1] Mark Carney, 'Breaking the tragedy of the horizon – climate change and financial stability' (Speech at Lloyd's of London, 29 September 2015).

threat to financial stability, it will be too late for central banks to intervene. This realisation shattered the illusion that central banks could afford to remain passive observers of the climate crisis.

The Emergence of the "Green Swan"

The theoretical foundation for central bank intervention was further solidified in 2020 when the Bank for International Settlements (BIS) introduced the concept of the 'Green Swan'[2]. Adapting Nassim Nicholas Taleb's "Black Swan" theory, which describes highly improbable, unpredictable outlier events with massive consequences. The BIS defined climate-related financial risks as "Green Swans".

The Green Swan Distinction: Unlike traditional financial crises (Black Swans), Green Swans are characterised by a high degree of certainty that they will occur, driven by atmospheric physics. However, there is radical uncertainty regarding their exact timing, spatial manifestation, and the cascading non-linear impacts they will have on global supply chains and financial markets.

Traditional risk models, which rely heavily on historical data to predict future probabilities (Value-at-Risk models), are entirely unequipped to price in Green Swan events. Because climate change represents a structural break from historical data, central banks globally realised that retro-looking models would inevitably lead to the systemic mispricing of assets, threatening global financial stability.

The Global Context and the NGFS

Driven by the threat of Green Swans, the global financial architecture mobilised. The establishment of the Network for Greening the Financial System (NGFS) in 2017 marked the formal institutionalisation of climate risk within central banking. Starting with just eight founding members, the NGFS has grown into a coalition of over 130 central banks and financial supervisors, including the RBI, which joined in April 2021. The NGFS pioneered the consensus that managing climate risk falls squarely within the core mandates of modern central banks, providing standardised climate scenarios (e.g., "Orderly Transition",

[2] Patrick Bolton and others, *The Green Swan: Central banking and financial stability in the age of climate change* (Bank for International Settlements 2020).

"Disorderly Transition", "Hot House World") for regulators to stress-test their domestic banking systems[3].

The Indian Imperative: Vulnerability meets Ambition

For India, the stakes of this paradigm shift are uniquely existential, presenting a dual-front challenge.

First, India is extraordinarily exposed to the physical impacts of climate change. Ranked consistently high on the Global Climate Risk Index, the Indian economy is heavily reliant on sectors highly sensitive to climate shocks. Agriculture, which employs nearly half the national workforce, is intimately tied to the unpredictability of the monsoon. Furthermore, India's rapidly urbanising coastal megacities and extensive industrial infrastructure face severe threats from rising sea levels, chronic heat stress, and cyclonic disruptions. These physical risks translate directly into credit risks for the Indian banking sector, threatening the stability of rural lending portfolios and infrastructure financing[4].

Second, India has committed to ambitious climate action. At the COP26 summit in Glasgow, India announced its Panchamrit (five-fold) strategy, which includes reaching 500 GW of non-fossil energy capacity by 2030 and achieving a Net-Zero economy by 2070[5].

The financial friction lies in the execution. Recent estimates by bodies such as NITI Aayog and international financial institutions suggest that achieving India's climate goals will require an estimated $10 trillion in cumulative investments over the next half-century. The state exchequer alone cannot bear this burden; massive mobilisation of private and institutional capital is required[6].

The RBI's Dual Challenge

Consequently, the RBI's role has forcibly expanded. Under the Reserve Bank of India Act, 1934, the RBI is tasked with securing monetary stability and operating the credit system to

[3] Network for Greening the Financial System, *Guide for Supervisors: Integrating climate-related and environmental risks into prudential supervision* (NGFS 2024).
[4] David Eckstein, Vera Künzel and Laura Schäfer, Global Climate Risk Index 2021 (Germanwatch 2021) 7.
[5] Press Information Bureau, 'National Statement by Prime Minister Shri Narendra Modi at COP26' (Ministry of External Affairs, 1 November 2021)
[6] Vaibhav Pratap Singh and Gagan Sidhu, 'Investment Sizing India's 2070 Net-Zero Target' (CEEW Centre for Energy Finance, November 2021).

the country's advantage. In the 21st century, fulfilling this legal mandate is impossible without addressing climate change[7].

However, the RBI must navigate a treacherous macroeconomic tightrope. It must design regulatory frameworks that aggressively incentivise green finance and penalise carbon-heavy risks, while simultaneously avoiding "greenflation"—the inflationary pressures caused by the rapid, commodity-intensive transition to green energy. Furthermore, in a developing economy where fossil fuels still power baseline economic growth and support millions of livelihoods, the RBI must ensure that the transition is 'just'. A sudden, uncalibrated withdrawal of credit from the "brown" economy could trigger widespread corporate defaults and a systemic banking crisis.

Literature Review

1. ***Mark Carney, Breaking the Tragedy of the Horizon (2015)[8].***

   Carney's foundational speech established the 'Tragedy of the Horizon', arguing that the catastrophic effects of climate change will be felt beyond the traditional horizons of most actors, imposing costs on future generations that the current financial system has no incentive to address. He identifies three channels of risk—physical, liability, and transition- that have since become the standard taxonomy used by the RBI and other central banks to assess financial stability.

2. ***Patrick Bolton et al., The Green Swan: Central Banking and Financial Stability in the Age of Climate Change (2020)[9].***

   Published by the BIS, this work introduces the concept of "Green Swans", profoundly disruptive events that lie outside the realm of normal statistical expectations. Bolton and his colleagues argue that traditional black-swan risk management is insufficient, necessitating a "new coordination" where central banks like the RBI must move beyond market neutrality to facilitate a structural shift toward a low-carbon economy actively.

[7] Reserve Bank of India Act 1934, s 3.
[8] Mark Carney, 'Breaking the Tragedy of the Horizon - Climate Change and Financial Stability' (Lloyd's of London, 29 September 2015).
[9] Patrick Bolton and others, *The Green Swan: Central Banking and Financial Stability in the Age of Climate Change* (Bank for International Settlements 2020).

3. ***Reserve Bank of India, Report on Currency and Finance (RCF): Towards a Cleaner, Greener India (2022-23)[10].***

   This seminal report serves as the RBI's internal manifesto for green finance. It explicitly acknowledges that climate change is a *systemic risk* to the Indian economy and provides the first comprehensive roadmap for the RBI's intervention. The report discusses the macro-criticality of climate change and justifies the use of non-traditional tools—like Green Deposits and Sovereign Green Bonds—as necessary instruments for an emerging market.

4. ***NGFS (Network for Greening the Financial System), Guide for Supervisors: Integrating Climate-related and Environmental Risks into Prudential Supervision (Updated 2024)[11].***

   The NGFS provides the global standard for how central banks should supervise financial institutions. This work critiques the 'silent observer' approach, arguing instead for mandatory climate-risk stress testing. It highlights the importance of 'financed emissions' and provides the technical basis for the RBI's 2024 Disclosure Framework, ensuring that Indian banks align their internal governance with global best practices.

5. ***Gireesh Shrimali, The Role of the RBI in Greening the Indian Financial System (2021/Updated 2025)[12].***

   Shrimali analyses the specific levers available to the Indian regulator, with a heavy focus on Priority Sector Lending (PSL)[13]. He argues that while the RBI has pioneered directed lending, the current caps on renewable energy are insufficient. His work suggests that for the RBI to truly "incentivise" green finance, it must move toward "Green Risk-Weighted Assets", where banks are required to hold less capital against

[10] Reserve Bank of India, *Report on Currency and Finance (RCF) 2022-23: Towards a Cleaner, Greener India* (RBI May 2023)
[11] Network for Greening the Financial System, *Guide for Supervisors: Integrating Climate-related and Environmental Risks into Prudential Supervision* (2nd edn, NGFS January 2025)
[12] Gireesh Shrimali, 'The Role of the RBI in Greening the Indian Financial System' (2021) Observer Research Foundation Issue Brief https://www.orfonline.org/ accessed 2 April 2026; updated as Gireesh Shrimali, 'Regulatory Levers for Green Finance' (2025) Oxford Sustainable Finance Group.
[13] Reserve Bank of India, 'Master Direction – Priority Sector Lending (PSL) – Targets and Classification' (Updated 5 December 2024) RBI/FIDD/2020-21/72.

green loans compared to carbon-heavy ones.

Statement of Problem

India's banking sector faces a "climate-risk paradox", while the nation requires over $10 trillion to reach its Net-Zero 2070 goal, financial institutions remain heavily exposed to both physical climate shocks and the transition risk of stranded "brown" assets. Despite the RBI's 2024 mandates, a significant financing gap persists due to the lack of a standardised green taxonomy and the high perceived credit risk of sustainable technologies.

Hypothesis

The study hypothesises that the RBI's proactive regulatory shift, specifically through mandatory climate-risk disclosures and the strategic expansion of Priority Sector Lending (PSL), significantly reduces the "climate-risk premium" for sustainable projects, thereby accelerating the flow of private capital into green finance. It posits that these interventions are the primary catalysts for de-risking the Indian banking sector's transition to a low-carbon economy.

Research Questions

1. How effectively does the RBI's current regulatory framework integrate Physical and Transition risks into the traditional Basel III capital adequacy requirements?

2. To what extent has the inclusion of renewable energy under Priority Sector Lending (PSL) actually increased the net credit flow to the sector?

3. What role do Sovereign Green Bonds (SGrBs) play in setting a benchmark yield for private green bond issuances in India?

4. Is the lack of a formal Green Taxonomy in India leading to "greenwashing" within the banking sector?

Research Objectives and Methodology

The main objectives of this study are:

i. To analyse the effectiveness of the RBI's 2024 Disclosure Framework in improving

climate-risk transparency among Scheduled Commercial Banks (SCBs).

ii. To evaluate the impact of the Green Deposit Framework on the mobilisation of sustainable funds.

iii. To identify the regulatory and structural barriers that prevent Indian banks from scaling up green credit.

iv. To compare the RBI's "interventionist" approach (using PSL) with the "market-neutral" approaches of Western central banks (like the ECB).

The method of study employed in this work is the *doctrinal method of study*.

Scope of Study

The scope is limited to the Reserve Bank of India's (RBI) regulatory framework and its direct impact on Scheduled Commercial Banks (SCBs). Geographically focused on India, the study analyses the efficacy of the Green Deposit Framework and the 2024 Disclosure Norms between 2021 and 2026. It specifically examines how these policies address Physical and Transition risks, excluding non-banking financial entities unless they fall under the RBI's core climate-reporting mandates.

Transmission Channels of Climate Risks

To comprehend the necessity of the Reserve Bank of India's (RBI) regulatory interventions, it is imperative to move beyond the abstract understanding of climate change as an environmental issue and map the exact theoretical mechanisms through which it threatens financial stability. The foundational framework adopted by the NGFS, and subsequently the RBI, categorises climate-related financial risks into two primary transmission channels: Physical Risks and Transition Risks. These channels act as the conduits through which climate shocks translate into traditional microprudential banking risks—specifically credit, market, liquidity, and operational risks.

Physical Risks: The Cost of Climate Shocks

Physical risks refer to the direct economic costs and financial losses resulting from the increasing severity and frequency of climate-related natural hazards. In the Indian context,

where a significant portion of the GDP and employment is inextricably linked to climate-sensitive sectors like agriculture and coastal trade, physical risks represent a severe and immediate threat to banking stability.

Physical risks are bifurcated into two temporal categories:

I. Acute Risks (Event-Driven Shocks): These are sudden, extreme weather events such as cyclones, flash floods, and severe heatwaves.

The Indian Context: India's eastern coastline is perpetually vulnerable to cyclonic disruptions, while its agrarian heartland is at the mercy of erratic monsoon patterns. When an acute shock occurs, such as widespread flooding in a major agricultural belt, crop yields are decimated. For commercial banks and Regional Rural Banks (RRBs), this immediately impairs the debt-servicing capacity of farmers, leading to a direct spike in Non-Performing Assets (NPAs) within Priority Sector Lending (PSL) portfolios. Furthermore, extreme weather destroys physical collateral (such as machinery, inventory, and real estate), severely increasing the Loss Given Default (LGD) for financial institutions.

II. Chronic Risks (Long-Term Shifts): These represent gradual, progressive shifts in climate patterns, such as rising mean temperatures, shifting precipitation patterns, chronic water stress, and sea-level rise.

The Indian Context: Chronic risks lead to the gradual but permanent depreciation of capital. For instance, rising sea levels threaten critical port infrastructure and coastal real estate in megacities like Mumbai and Chennai. Similarly, chronic heat stress significantly reduces labour productivity in India's massive, informal, outdoor workforce (such as construction and agriculture). Over time, this depresses corporate revenues and household incomes, slowly deteriorating the credit quality of loan books exposed to these regions and sectors.

Transition Risks: The Friction of Decarbonisation

While physical risks arise from the failure to mitigate climate change, transition risks emerge from the very process of attempting to solve it. As India moves toward its Net-Zero 2070 target, the economy will undergo a massive structural transformation. The speed, timing, and policy design of this transition will dictate the severity of these risks, which manifest through three primary sub-channels:

I. Policy and Regulatory Changes: Governments globally are increasingly implementing carbon-pricing mechanisms, emission caps, and outright bans on highly polluting activities. In India, policy shifts such as the phased-down of unabated coal or the introduction of stringent energy efficiency mandates for the cement and steel industries can abruptly inflate operating costs for carbon-intensive firms, eroding their profitability and triggering credit downgrades.

II. Technological Shifts: The rapid scaling and decreasing costs of green technologies (such as solar photovoltaics, green hydrogen, and electric vehicles) fundamentally disrupt legacy industries. For Indian banks heavily exposed to internal combustion engine (ICE) auto-ancillary manufacturers or thermal power plants, the technological leapfrogging can render the underlying assets obsolete long before their debt is repaid. These loans risk becoming "stranded assets"—investments that suffer from unanticipated or premature write-downs.

Market and Consumer Dynamics: Changing consumer preferences toward sustainable products and the increasing pressure from global supply chains (e.g., the European Union's Carbon Border Adjustment Mechanism, or CBAM) can drastically reduce the market share of Indian exporters who fail to decarbonise, directly impacting their revenue streams and debt-servicing capabilities.

Translation into Traditional Financial Risks

The physical and transition channels do not exist in a vacuum; they act as amplifiers of the traditional financial risks that the RBI traditionally monitors.

I. Credit Risk: This is the most direct impact. Whether due to a flood destroying a factory (physical risk) or a carbon tax bankrupting a coal supplier (transition risk), the Probability of Default (PD) of borrowers increases. Simultaneously, the collateral backing these loans (e.g., coastal property or thermal power plants) loses value, elevating the Loss Given Default (LGD).

II. Market Risk: As financial markets wake up to the realities of climate change, a sudden, systemic repricing of assets can occur. If institutional investors abruptly dump carbon-intensive equities or bonds—a phenomenon often referred to as a "climate Minsky moment"—banks holding these securities in their trading books will suffer massive mark-to-market losses.

III. Liquidity Risk: In the aftermath of severe natural disasters, banks often experience sudden, large-scale deposit withdrawals as affected populations demand cash for rebuilding.

Conversely, banks heavily concentrated in "brown" (carbon-intensive) sectors may find themselves locked out of wholesale funding markets as global investors increasingly apply ESG (Environmental, Social, and Governance) negative screening to their portfolios.

IV. Operational Risk: Extreme weather events directly threaten the physical infrastructure of the banking system itself. Floods or cyclones can destroy bank branches, damage ATMs, and sever power to critical data centres, disrupting the clearing and settlement systems essential for financial stability.

Macroeconomic Feedbacks and the Sovereign Nexus

Ultimately, these microprudential risks aggregate into macroeconomic instability. Climate shocks are inherently stagflationary: extreme weather destroys supply chains (driving up prices) while simultaneously destroying capital (depressing growth).

Furthermore, a dangerous sovereign-bank nexus exists. As the government increases fiscal spending to provide disaster relief or subsidise the green transition, the fiscal deficit widens. If the sovereign rating is downgraded as a result, the value of government securities (G-Secs) held by banks falls, weakening bank balance sheets and constricting credit flow to the broader economy. Thus, the RBI's theoretical framework must account for climate risk not just as a micro-level banking issue, but as a macro-financial feedback loop that threatens the very core of India's economic resilience.

The RBI’s Evolving Regulatory Posture (2022–2026)

The regulatory architecture governing climate finance in India has undergone a profound transformation over the last half-decade. Initially, the Reserve Bank of India (RBI) relied on “moral suasion”—encouraging banks to voluntarily integrate Environmental, Social, and Governance (ESG) principles into their lending practices. However, as the systemic nature of climate risk became undeniable, the RBI’s posture systematically evolved from issuing advisory discussion papers to implementing structured, enforceable regulatory frameworks. This evolution reflects a calculated, phased approach to scaling up climate finance without destabilising the traditional banking system.

Foundational Interventions: Priority Sector Lending and Sovereign Green Bonds

The RBI’s earliest direct interventions in green finance were designed to seed the market and

build initial capacity.

I. Priority Sector Lending (PSL) Inclusion: The foundational step was the inclusion of the renewable energy sector under the RBI's Priority Sector Lending (PSL) guidelines. By mandating that commercial banks direct a specific quota of their adjusted net bank credit toward solar, wind, biomass, and micro-hydel projects (subject to specific loan limits), the RBI actively utilised its most potent credit allocation tool. This not only provided crucial early-stage liquidity to green infrastructure but also forced commercial banks to develop internal competencies in underwriting renewable energy projects.

II. The Sovereign Green Bond (SGrB) Catalyst: A major structural milestone was achieved in early 2023 when the RBI acted as the debt manager for the Government of India's inaugural issuance of Sovereign Green Bonds (SGrBs)[14]. These issuances were critical for market development for two reasons. First, they established a domestic sovereign yield curve for green assets, providing a vital, risk-free pricing benchmark for private corporations seeking to issue their own green bonds. Second, they demonstrated the existence of a "greenium" (green premium) in the Indian market, whereby investors were willing to accept a slightly lower yield in exchange for the environmental impact of the bond, thereby lowering the cost of capital for green projects.

Mobilising Domestic Capital: The 2023 Green Deposits Framework

As the capital requirements for India's 2070 Net-Zero target became clearer, the RBI recognised that wholesale funding alone would be insufficient; domestic retail and institutional savings needed to be mobilised. In April 2023, the RBI issued the Framework for Acceptance of Green Deposits[15]. Before this, banks offering "green deposits" operated in a regulatory grey area, raising significant concerns about "greenwashing"—the deceptive practice of marketing financial products as environmentally friendly when the underlying funds are deployed in conventional, or even carbon-intensive, assets.

The 2023 framework introduced strict guardrails:

Ring-fencing of Funds: Funds raised through green deposits had to be allocated exclusively to

[14] Ministry of Finance, 'Framework for Sovereign Green Bonds' (Government of India, 9 November 2022).
[15] Reserve Bank of India, 'Framework for Acceptance of Green Deposits' (Notification RBI/2023-24/14, 11 April 2023).

eligible green activities (e.g., renewable energy, clean transportation, climate change adaptation) and could not be used to fund fossil fuels, nuclear power, or tobacco.

Board Oversight: Banks were required to establish a comprehensive Board-approved policy detailing the allocation, monitoring, and reporting of these funds.

Third-Party Verification: To ensure integrity, the framework mandated independent, third-party impact assessments and assurance, ensuring that the environmental outcomes claimed by the banks were scientifically valid.

The Compliance Milestone: The 2025 Master Directions on Climate Finance

The transition from voluntary frameworks to strict prudential compliance culminated on November 28, 2025, when the RBI issued the landmark Reserve Bank of India (Commercial Banks - Climate Finance and Management of Climate Change Risks) Directions, 2025[16].

Building upon the July 2022 Discussion Paper on Climate Risk, these Master Directions forced a fundamental rewiring of banking operations. Key mandates included:

Governance and Strategy Integration: Climate risk could no longer be siloed within Corporate Social Responsibility (CSR) departments. Bank Boards were made explicitly accountable for integrating climate risk into the institution's core business strategy and risk appetite frameworks.

Risk Management Architecture: Banks were mandated to develop advanced methodologies to identify, measure, and monitor both physical and transition risks. This included the mandatory integration of physical vulnerability assessments into mortgage and real estate lending and transition risk assessments into corporate loan underwriting.

Capacity Building: Recognising the severe skill deficit in the banking sector regarding climate science, the Directions mandated ongoing, formalised training for senior management and risk officers to interpret complex climate models and translate them into financial risk metrics.

[16] Reserve Bank of India, 'Reserve Bank of India (Commercial Banks - Climate Finance and Management of Climate Change Risks) Directions, 2025' (28 November 2025).

Pragmatism in Policy: The 2026 Deferment of Mandatory Disclosures

Perhaps the most nuanced display of the RBI's regulatory posture occurred in early 2026. In February 2024, the RBI released a highly anticipated draft Disclosure Framework on Climate-related Financial Risks, proposing mandatory, Basel-aligned climate disclosures for Tier IV banks starting in FY2026-27. This framework required banks to disclose their governance, strategy, and critical metrics, including financed emissions (the greenhouse gas emissions associated with their lending portfolios).

However, in January 2026, the RBI demonstrated pragmatic regulatory flexibility by temporarily deferring this mandate. This strategic pause highlights a critical central banking challenge in an emerging market: avoiding regulatory asymmetry.

The Data Deficit and Scope 3 Emissions: To accurately calculate financed emissions, banks require granular data from their corporate borrowers, particularly regarding Scope 3 (supply chain) emissions. However, domestic corporates were not yet fully bound by the Securities and Exchange Board of India (SEBI)—through the Business Responsibility and Sustainability Reporting (BRSR) framework—to provide this level of exhaustive data.

Preventing Systemic Shocks: Imposing disclosure rules on banks prematurely would have forced them to rely on industry proxies and estimated data. This could have triggered arbitrary capital reallocation, where banks preemptively dumped carbon-intensive assets or drastically increased borrowing costs for core industrial sectors (like steel and cement) simply to improve their disclosure metrics.

By deferring the mandate, the RBI signalled that while it is committed to international climate standards (such as the ISSB and TCFD), it will not blindly import global timelines if they threaten domestic economic stability. The RBI chose to align its banking regulations with the real-economy disclosure capabilities, ensuring that the transition to transparency is orderly and grounded in accurate data.

Policy Tools for Incentivising Green Finance

Having established the theoretical transmission channels of climate risk and tracing the evolving regulatory posture of the Reserve Bank of India (RBI), it is crucial to examine the specific operational instruments available to the central bank. To effectively steer the financial

system toward India's 2070 Net-Zero target without compromising the stability of the banking sector, the RBI must deploy a calibrated mix of microprudential, macroprudential, and monetary policy tools.

These tools are designed to correct the market failure of unpriced climate externalities, internalise the cost of carbon into the cost of capital, and systematically redirect credit flows from "brown" (carbon-intensive) to "green" (sustainable) sectors.

Microprudential Regulation and Supervision (Basel Pillar 2)

Microprudential tools focus on the resilience of individual financial institutions against climate-induced shocks. Under Pillar 2 of the Basel framework, the RBI has the authority to mandate how banks identify, assess, and manage these idiosyncratic risks.

Climate Stress Testing and Scenario Analysis: Traditional stress testing evaluates bank resilience over a short-term horizon (typically 1 to 3 years) using historical data. Climate stress testing, however, requires banks to project over decades using forward-looking, highly uncertain data. The RBI can mandate commercial banks to map their loan portfolios against the standardised scenarios developed by the Network for Greening the Financial System (NGFS)—such as "Orderly Transition," "Disorderly Transition," and "Hot House World." By conducting these exercises, banks are forced to quantify potential credit losses if, for instance, a carbon tax of $50/ton is introduced by 2030, or if average temperatures rise by 2°C, destroying coastal collateral.

Supervisory Review and Evaluation Process (SREP): The RBI is increasingly integrating climate risk into its annual supervisory inspections. Under a modernised SREP, RBI inspectors evaluate whether a bank's Board of Directors has adequate oversight of climate risks, whether loan origination standards account for physical vulnerability (e.g., checking if a new factory is in a high-risk flood zone), and whether internal capital adequacy assessment processes (ICAAP) hold sufficient buffers against modelled climate shocks.

Macroprudential Tools (Basel Pillar 1)

While microprudential tools protect individual banks, macroprudential tools are designed to mitigate systemic, system-wide risks. These tools operate primarily by altering the capital requirements (Risk-Weighted Assets, or RWA) for specific types of lending, thereby directly

influencing the cost and direction of credit.

The debate over macroprudential tools centres on two distinct approaches:

The Green Supporting Factor (GSF): A GSF would artificially lower the capital requirements (risk weights) applied to green loans, such as financing for solar parks or electric vehicle (EV) manufacturing. The objective is to make green lending cheaper and more profitable for banks.

Critique: While politically attractive, a GSF is highly contested among central bankers. Capital requirements are meant to reflect actual financial risk (probability of default), not social utility. Lowering capital requirements for green assets—which still face standard project, operational, and technological risks—could compromise the fundamental safety of the banking system and inadvertently fuel a "green asset bubble."

The Brown Penalising Factor (BPF): A BPF takes the inverse approach by systematically increasing the risk weights on loans extended to highly polluting sectors (e.g., unabated thermal power, high-emission steel, and cement).

Justification: From a strictly prudential standpoint, a BPF is theoretically superior to a GSF. It accurately reflects the elevated transition risk associated with carbon-intensive assets, which are highly susceptible to becoming stranded. By making brown lending more expensive, it naturally disincentivises capital allocation to these sectors.

Systemic Risk Buffers (SyRB): The RBI could implement a sectoral Systemic Risk Buffer, requiring banks with heavily concentrated exposures to climate-vulnerable geographies or industries to hold additional Common Equity Tier 1 (CET1) capital. This ensures that the banking system has the collective shock-absorbing capacity to withstand a severe, localised climate event.

Monetary Policy and Credit Allocation Operations

Beyond prudential regulation, the RBI can leverage its balance sheet and monetary operations to structurally favour green finance.

Collateral Framework Adjustments: To access short-term liquidity from the RBI through the Liquidity Adjustment Facility (LAF) or Marginal Standing Facility (MSF), commercial banks

pledge collateral (primarily Government Securities). The RBI could adjust its "haircuts" (the discount applied to the value of the collateral) based on the climate profile of the asset. For example, the RBI could apply favourable, lower haircuts to Sovereign Green Bonds (SGrBs) or highly rated corporate green bonds, thereby increasing their liquidity and attractiveness to institutional investors. Conversely, bonds from high-emission corporations could be subjected to higher haircuts, reflecting their inherent transition risks.

Targeted Refinancing Operations: Drawing inspiration from the European Central Bank's Targeted Longer-Term Refinancing Operations (TLTROs), the RBI could introduce a "Green Targeted Repo Operation." Under this mechanism, the RBI would provide long-term, concessional liquidity to commercial banks at rates below the standard repo rate, strictly conditional upon the banks utilising those funds to originate loans in highly impactful green sectors (e.g., green hydrogen electrolyser manufacturing or grid-scale battery storage).

Calibration of Priority Sector Lending (PSL): The RBI could further refine the existing PSL guidelines. Currently, renewable energy has a relatively low lending cap within the PSL framework. The RBI could substantially increase these caps, introduce specific sub-targets for climate adaptation financing (e.g., drought-resistant agricultural tech), and weight the PSL certificates to heavily favour sustainable infrastructure.

The Foundational Requirement: A National Climate Taxonomy

The efficacy of all the aforementioned microprudential, macroprudential, and monetary tools hinges entirely upon one foundational prerequisite: a standardised, legally binding Climate Finance Taxonomy.

Without a precise, scientific definition of what constitutes a "green" or "transition" economic activity, regulatory tools are rendered ineffective and susceptible to massive greenwashing. For example, if the RBI were to introduce a Green Supporting Factor, banks could exploit vague definitions to classify marginal efficiency improvements in fossil-fuel plants as "green," thereby claiming capital relief without actually aiding decarbonization.

The RBI must work in strict lockstep with the Ministry of Finance to finalise a localised taxonomy that is interoperable with global standards (like the EU Taxonomy or the ASEAN Taxonomy) but acutely tailored to India's developmental stage. This taxonomy must not only

define "dark green" activities (like wind power) but, critically for India, must define legitimate "transition" activities (the progressive decarbonization pathways for hard-to-abate sectors like aviation, shipping, and heavy industry). Only with a robust taxonomy can the RBI's policy tools accurately transmit incentives through the financial system.

Challenges and Institutional Constraints

While the theoretical tools available to the Reserve Bank of India (RBI) are extensive, deploying them in the context of an emerging market presents profound complexities. The RBI cannot blindly import the climate regulatory playbooks of advanced economies, such as those formulated by the European Central Bank (ECB) or the Bank of England. India's unique developmental stage dictates that the central bank's climate mandate must be carefully balanced against overarching imperatives of poverty alleviation, industrialisation, and financial inclusion.

Consequently, the RBI's efforts to incentivise green finance are bound by severe macroeconomic, socio-economic, and methodological constraints.

The "Just Transition" Imperative and the Fossil Fuel Nexus

The most formidable structural constraint facing the RBI is India's deep, multifaceted reliance on fossil fuels. Currently, coal accounts for approximately 70% of India's electricity generation and remains the bedrock of the country's baseline energy security. However, coal is not merely a source of power; it is deeply embedded in the socio-economic and fiscal architecture of the nation.

Socio-Economic Entanglement: The coal economy sustains millions of direct and indirect livelihoods, particularly in the eastern states of Jharkhand, Odisha, Chhattisgarh, and West Bengal.

The Risk of a "Disorderly Transition": If the RBI were to aggressively deploy macroprudential tools—such as a steep Brown Penalising Factor (BPF)—to immediately starve carbon-intensive sectors of capital, the consequences would be catastrophic. An abrupt withdrawal of credit from the "brown" economy would trigger a wave of corporate defaults in the power, cement, and steel sectors. This would precipitate a massive surge in Non-Performing Assets (NPAs) on bank balance sheets, effectively replacing a long-term climate crisis with an

immediate, systemic banking crisis.

The "Just" Mandate: Therefore, the RBI is institutionally constrained to ensure an "orderly" and "just" transition. It must facilitate a phased decarbonization that allows traditional industries the financial runway to adopt cleaner technologies, rather than engineering a sudden cliff-edge drop in credit availability that would lead to widespread economic disenfranchisement.

The Macroeconomic Trilemma and "Greenflation"

The second major constraint lies in the direct conflict between the structural economic shifts required for decarbonization and the RBI's primary statutory mandate: inflation targeting (maintaining CPI inflation at 4%, within a band of +/- 2%).

The transition to a Net-Zero economy is inherently commodity-intensive. The global shift toward renewable energy grids, electric vehicles (EVs), and battery storage requires exponential increases in the mining and processing of critical minerals—such as copper, lithium, cobalt, nickel, and rare earth elements.

The Mechanics of Greenflation: As global demand for these decarbonization materials outstrips supply, their prices inevitably surge. Simultaneously, as carbon taxes and stringent environmental regulations are applied to legacy industries, the cost of traditional energy spikes before green energy becomes sufficiently cheap and reliable at scale. This dual pressure creates "Greenflation"—a persistent, supply-side, structural inflation driven by the climate transition itself.

The Monetary Policy Trap: Greenflation places the RBI's Monetary Policy Committee (MPC) in a severe bind. If the RBI raises benchmark interest rates to combat this inflation, it simultaneously raises the cost of capital across the economy. Because green infrastructure projects are highly capital-intensive and front-loaded, higher interest rates disproportionately damage the financial viability of the very renewable energy projects needed to solve the climate crisis. Conversely, if the RBI tolerates higher inflation to keep green capital cheap, it violates its primary legislative mandate and risks destabilising the broader economy.

Methodological and Data Deficits

Effective central banking relies on precise, historical data to model risk. Climate risk, however,

fundamentally breaks this paradigm, presenting severe methodological constraints for the RBI and the banks it supervises.

The Horizon Tragedy in Modelling: Traditional financial risk models operate on a 1-to-3-year horizon. Climate models, however, project physical and transition risks over 30 to 50 years. Translating these long-term, highly uncertain meteorological pathways (e.g., the specific regional impact of a 1.5°C vs. 2°C warming scenario) into short-term financial metrics (like a 12-month Probability of Default) requires complex, untested financial engineering.

The Scope 3 Data Vacuum: To accurately assess transition risk, banks must calculate their "financed emissions," which requires granular data on their borrowers' Scope 1, Scope 2, and, crucially, Scope 3 (supply chain) greenhouse gas emissions. In India, verifiable Scope 3 data is virtually non-existent outside of the top 100 listed conglomerates.

SME Vulnerability: This data deficit is most acute in the Micro, Small, and Medium Enterprises (MSME) sector, which contributes roughly 30% to India's GDP and employs over 110 million people. MSMEs lack the financial and technical capacity to conduct carbon accounting or climate vulnerability assessments. If the RBI strictly enforces climate disclosure and risk-weighting rules, commercial banks may simply halt lending to MSMEs due to the inability to price their climate risk, leading to devastating financial exclusion.

Fiscal-Monetary Asymmetry and Sovereign Limits

Finally, the RBI cannot unilaterally engineer the green transition; it requires massive, coordinated fiscal support from the Government of India. The development of experimental, early-stage green technologies (like green hydrogen or offshore wind) carries technological risks that commercial banks are not equipped to underwrite, even with RBI incentives.

The Need for Blended Finance: These sectors require "catalytic capital"—sovereign guarantees, tax subsidies, and first-loss default covers provided by the fiscal authority.

Fiscal Headroom: However, unlike the governments of advanced economies, the Indian government operates with limited fiscal headroom and a relatively high debt-to-GDP ratio. The state exchequer cannot afford to heavily subsidise the entire $10 trillion transition.

Consequently, an excessive burden falls on the RBI to use monetary and regulatory tools to force private capital into spaces where it would normally wait for fiscal derisking, stretching the limits of central banking efficacy.

Policy Recommendations

The Reserve Bank of India (RBI) has made commendable strides in recognising and codifying climate risk, moving decisively from a posture of passive observation to active regulatory intervention. However, as demonstrated by the institutional constraints and the macroeconomic realities of India's fossil-fuel reliance, blunt regulatory instruments are insufficient. To effectively mobilise the estimated $10 trillion required for India's Net-Zero 2070 pathway without triggering systemic financial instability, the RBI must adopt a highly calibrated, multi-pronged approach.

The following recommendations outline strategic pathways for the RBI to optimise its role as a catalyst for sustainable economic growth while safeguarding the financial system.

Formulate a Comprehensive "Transition Finance" Framework

The current global and domestic discourse heavily biases "pure green" activities (e.g., solar parks, wind farms). However, India's decarbonization cannot be achieved merely by funding green infrastructure; it fundamentally requires the decarbonization of the "brown" economy.

Beyond Binary Classifications: The RBI must introduce a dedicated regulatory framework for Transition Finance. This framework should provide clear guidelines for commercial banks to finance the technological upgrading and emission-reduction strategies of hard-to-abate sectors (such as steel, cement, aviation, and heavy manufacturing).

Transition Trajectories: Banks should be incentivised to lend to carbon-intensive corporates, provided these entities have legally binding, science-based transition pathways (e.g., targets aligned with the Science Based Targets initiative, SBTi). If the RBI focuses only on pure green finance, it risks starving core industries of the capital they desperately need to adopt cleaner technologies, paradoxically delaying the net-zero transition.

Institutionalise Inter-Regulatory Coordination

The temporary deferment of the mandatory climate disclosure framework in early 2026

exposed a critical vulnerability: regulatory fragmentation. The RBI cannot mandate banks to disclose financed emissions if the Securities and Exchange Board of India (SEBI) and the Ministry of Corporate Affairs (MCA) do not simultaneously mandate granular Scope 3 disclosures from the real economy.

Establish a Joint Climate Risk Council: The Government of India should establish a formalised, statutory inter-regulatory committee comprising the RBI, SEBI, the Insurance Regulatory and Development Authority of India (IRDAI), and the Ministry of Finance.

Centralised Data Repository: This council's primary objective must be to eliminate data asymmetry by creating a centralised, national ESG and climate-risk data repository. By harmonising corporate reporting standards (like SEBI's BRSR) with banking disclosure requirements, the RBI can ensure that financial institutions have access to the empirical data required to price risk accurately, rather than relying on arbitrary industry proxies.

Implement Tiered and Proportionate Regulation for MSMEs

The Micro, Small, and Medium Enterprises (MSME) sector is the backbone of the Indian economy, but represents a massive blind spot in climate finance. Subjecting MSME lending to stringent climate risk-weighting or mandatory emissions disclosures would result in immediate financial exclusion.

Proportionality in Application: The RBI must apply a principle of proportionality. Tier 1 and Tier 2 banks should be required to conduct granular risk assessments for large corporate exposures, but the RBI should develop simplified, proxy-based climate risk matrices for MSME portfolios.

Capacity Building Grants: Working with the Small Industries Development Bank of India (SIDBI), the RBI should advocate for state-backed capacity-building grants. These grants would subsidise the cost of energy audits and carbon accounting for MSMEs, gradually bringing them into the formal climate-data ecosystem without imposing punitive compliance costs.

Foster Innovative Market Mechanisms and Blended Finance

Because the RBI cannot artificially lower capital requirements for green loans without

compromising financial stability (the flaw of the Green Supporting Factor), it must instead promote financial engineering that naturally lowers the risk profile of sustainable investments.

Promote Green Securitisation: The RBI should issue targeted guidelines to stimulate a market for green securitisation. By allowing banks to bundle smaller green loans (e.g., rooftop solar installations, EV retail loans) into tradable securities, banks can offload climate assets from their balance sheets, freeing up capital to originate new green loans.

Facilitate Blended Finance Vehicles: The RBI should work closely with the government and Multilateral Development Banks (MDBs)—such as the World Bank and the Asian Development Bank—to create blended finance structures. In these structures, sovereign or MDB capital absorbs the initial, high-risk tranches (first-loss guarantees) of experimental green projects (like green hydrogen hubs), allowing domestic commercial banks to safely finance the senior, lower-risk tranches.

Aggressive Supervisory Upskilling and the Creation of a Climate Observatory

The analytical techniques required to assess climate risk—such as interpreting complex meteorological models and translating atmospheric physics into financial probabilities—are currently absent in traditional banking supervision.

Establish an RBI Climate Risk Observatory: The RBI should establish a specialised "Climate Risk Observatory" within its Department of Regulation. This unit should be staffed not just by traditional macroeconomists, but by climate scientists, environmental engineers, and spatial data analysts.

Mandatory Board-Level Competency: The RBI must mandate that the Boards of Directors of all commercial banks include at least one independent director with demonstrable, specialised expertise in climate science or environmental economics. Furthermore, the RBI's supervisory college must undergo rigorous, continuous upskilling to critically evaluate the internal climate models designed by commercial banks, ensuring these models are scientifically sound and not merely algorithmic greenwashing.

Conclusion & Suggestions

The global consensus on climate change has fundamentally rewritten the orthodoxies of

macroeconomic policy. For central banks, the era of absolute market neutrality and environmental passivity is over. As this paper has demonstrated, the Reserve Bank of India (RBI) has decisively moved beyond the academic debate of whether climate change constitutes a systemic financial risk to grappling with the complex operational mechanics of how to manage it within the contours of a rapidly developing economy.

The RBI's institutional journey over the past half-decade represents a monumental paradigm shift. Recognising that physical and transition risks act as direct transmission channels for credit, market, and operational instability, the central bank has proactively rewired its regulatory architecture. From the foundational inclusion of renewable energy in Priority Sector Lending (PSL) and the facilitation of Sovereign Green Bonds, to the landmark 2023 Green Deposits Framework and the sweeping 2025 Master Directions on Climate Finance, the RBI has systematically laid the tracks for a resilient, sustainable financial ecosystem. It has mandated that commercial banks elevate climate risk from a peripheral Corporate Social Responsibility (CSR) concern to a core, Board-level strategic imperative.

However, the RBI's mandate is uniquely burdened by the structural realities of an emerging market. Unlike the central banks of advanced economies, the RBI cannot aggressively deploy macroprudential tools, such as a steep Brown Penalising Factor, without precipitating severe socio-economic consequences. India's energy matrix and millions of livelihoods remain deeply tethered to the fossil-fuel economy. Consequently, the RBI must navigate a treacherous macroeconomic tightrope: it must violently incentivise the mobilisation of the estimated $10 trillion required for India's 2070 Net-Zero target, while simultaneously managing the inflationary pressures of "greenflation" and averting the systemic shocks of a disorderly transition.

This delicate balancing act was perfectly illustrated by the RBI's pragmatic deferment of mandatory climate disclosures in early 2026. By pausing the mandate to align banking regulations with real-economy data capabilities (specifically regarding Scope 3 emissions), the RBI demonstrated a mature, localised approach to climate regulation. It signalled that while India is fully committed to global climate standards, it will not blindly import timelines that threaten domestic economic stability or trigger the financial exclusion of vulnerable sectors like MSMEs.

Looking forward, the efficacy of the RBI's climate mandate will hinge on its ability to evolve

beyond binary definitions of "green" versus "brown". The successful greening of the Indian economy requires the central bank to champion a robust Transition Finance framework, one that provides traditional, carbon-intensive industries the capital runway needed to decarbonise. Furthermore, the RBI cannot operate in a silo; eliminating data asymmetry and scaling up blended finance will require unprecedented, formalised coordination with the Securities and Exchange Board of India (SEBI), the Ministry of Finance, and multilateral development institutions.

Ultimately, the Reserve Bank of India's role in the 21st century is defined by a dual, deeply intertwined mandate. Price stability and financial resilience are no longer achievable without environmental stability. By carefully calibrating its microprudential and macroprudential tools, heavily investing in supervisory capacity, and remaining anchored to the principles of a 'Just Transition', the RBI is not merely protecting the banking system from the climate crisis; it is actively positioning the Indian financial sector as the primary engine for the nation's sustainable future

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