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Original Article

Economic Impacts of Climate Change in India: Implications for Central Banking and Financial Stability

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Abstract: *Climate change poses severe challenges to the Indian economy. Changing temperatures, unpredictable weather, and extreme events have already disrupted various sectors of the economy. This paper synthesizes the existing literature on the economic impact of climate change on India. It will focus on the various channels through which the economy and various sectors will be affected. This paper further delves into the impact of climate change on central banks and financial stability. Further, emphasis is placed on the initiatives taken by the Reserve Bank of India (RBI) to address climate- related risks.*

Keywords: *Central Banking, Climate Change, Monetary Policy, Green Central Banking.*

I. INTRODUCTION

The Earth is facing significant climate change that is manifesting itself through extreme weather conditions and increased frequency of disasters. India is also under threat of climate change and its multifaceted impact. In India, the effects of climate change are becoming increasingly severe. There is an increase in extreme weather events along with heatwaves, irregular monsoons, catastrophic storms, and rising sea levels. According to the Indian Meteorological Department, 2024 was the warmest year on record for India, with an annual mean temperature of 25.75°C, exceeding the average between 1991 and 2020.

The economic impact of climate change manifests itself as supply shocks that reduce output, increase prices, which in turn dampens long-term growth. This shock operates through multiple channels, including damage to infrastructure and reduced labour productivity due to extreme weather events (IPCC, 2022). There is a growing body of empirical and model-based research that indicates economic losses for economies if emissions remain high. Climate change alters inflation dynamics, output volatility, and asset values, thereby affecting core macroeconomic variables, making it harder for monetary authorities to maintain price stability and safeguard financial stability (European Central Bank, 2021; Reserve Bank of India,2022a)

The objective of this paper is to bring together the literature on the economic impact of climate change with reference to India. It will focus on the various channels through which the economy and various sectors will be affected and their implications for central banking and financial stability. This paper will trace the development of initiatives taken by the Reserve Bank of India (RBI) in promoting green and sustainable finance.

II. ECONOMIC IMPACT OF CLIMATE CHANGE IN INDIA

According to a report, 'The costs of climate change', India could lose 3 percent to 10 percent of GDP by 2100 (ODI 2021). Unchecked climate change could reduce India's GDP by around 3 percent by 2050 compared to a no-climate-change baseline, primarily via impacts on agriculture, labour, and infrastructure (OECD, 2015; World Bank, 2022). Few other studies report that if global average temperatures rise by about 2°C above pre-industrial levels, India's economy could lose roughly 2.5 percent to 3 percent of GDP by mid-century, while higher warming of 3 °C could lead to output losses of 10 percent annually by 2100 (IPCC, 2022; Burke et al., 2015).

A changing climate is a major threat to labour productivity especially for workers in agriculture, construction, and informal urban work (IPCC, 2022). The International Labour Organization (ILO) estimates that heat-related productivity loss could lead to over 80 million full-time job losses across the world by 2030. India would account for 34 million of these units of lost work equivalents due to its massive, climate-vulnerable workforce (International Labour Organization, 2019). These productivity losses translate into lower output, reduced incomes for vulnerable workers, and diminished tax revenues, compounding the macroeconomic costs of climate change (ILO, 2019; World Bank, 2022).

Climate change has a direct effect on the agricultural sector. Agriculture is a sector that is exposed directly to climate variability. Increasing temperatures, greater intensity of heat waves, erratic monsoon rainfall, and increased incidence of extreme weather events such as droughts and floods all contribute to decreased agricultural yields with grave consequences for farm incomes and rural livelihoods (IPCC, 2022; World Bank, 2022). As per the Economic Survey 2017-18, farm incomes, especially

in unirrigated districts that are dependent on rainfall, are likely to decline by about 20-25 percent over a medium and long-term period under existing climate trends (Government of India, 2018).

Climate-related extreme events, such as floods, cyclones, and storms that destroy physical capital and disrupt economic activity (World Bank, 2023), already inflict economic damage on India. Both of these are magnified by the projected impacts of climate change on cyclone intensity (World Bank 2021). For example, Cyclone Amphan in 2020 inflicted damage and economic losses valued at over 13 billion US dollars across India and Bangladesh, primarily due to destroyed housing, power infrastructure, transport networks, and agricultural land (World Bank 2021). India's major coastal cities, including Mumbai, Kolkata and Chennai, are increasingly at risk from sea-level rise, storm surges and extreme rainfall, with studies suggesting billions of dollars in annual losses without large-scale investments in coastal protection and climate-resilient infrastructure (IPCC 2022; World Bank 2022). These impacts generate not only direct reconstruction costs, but also indirect losses from business interruption, while affecting the fiscal position of governments that will have to finance relief and rebuilding as well as adaptation (World Bank, 2022).

Climate change tends to worsen existing social and regional inequalities as poorer regions and households are more exposed and have less capacity to adapt. Studies show that a 1°C rise in temperature can reduce per capita consumption growth and agricultural yields, with severe effects in poorer districts and rain-fed farming regions (Government of India, 2018; Burke et al., 2015). The World Bank has warned that climate change may push up to 50 million additional Indians into poverty by around 2040 if current trends continue.The frequency and severity of climate-related disasters are putting increasing pressure on the insurance sector globally and also in India. In India, government-backed crop insurance schemes and disaster-risk financing instruments are critical, but the scale of losses in some recent years—tens of billions of dollars is such that more comprehensive risk-sharing arrangements and wider adaptation measures will be needed to ensure continued stability in the insurance sector while expanding coverage (World Bank 2021; 2022).

The economic costs of climate-related disasters are on the rise. Data from disaster databases and worldwide climate risk indices reveal that India consistently ranks as the country or G20 economy with the highest absolute economic damage due to extreme weather events (like floods, cyclones, and heat waves) between the late 1990s until late 2010s (Eckstein, et. al.,2019; World Bank, 2021). For example, one recent assessment of climate-related events found that India incurred economic losses on the order of tens of billions of US dollars in 2019 alone (reflecting both insured and uninsured damages to infrastructure, agriculture and housing) (Eckstein et al., 2019; World Bank, 2021). These events underscore that climate change is not just a macroeconomic risk of the future, but also an ongoing source of large, recurrent financial losses that remain a drain on public finances, insurance systems and household budgets (World Bank 2022).

III. EFFECTS ON CENTRAL BANKS AND FINANCIAL STABILITY

Climate shocks such as major droughts, floods, or heatwaves are considered to be adverse supply shocks. They have the potential to reduce output while pushing up prices, especially for food and energy (ECB, 2021; RBI, 2022b). Studies done on India find that natural disasters affect short-term growth by damaging crops, infrastructure and capital. On the other hand, this causes rising inflation through disruptions to supply chains and spikes in food prices (RBI, 2022b; World Bank, 2022).

Food inflation in particular is highly dependent on weather patterns. The South-West monsoon plays a key role in determining harvests of major crops such as rice and pulses (Government of India, 2018; RBI, 2022b). Food prices are a major component of India's Consumer Price Index and a delayed or deficient rainfall can push up prices. Studies indicate that there is a non-linear and state dependent relationship between weather shocks and inflation. Large or repeated shocks result in persistent inflation. This can complicate monetary policy forecasting and response (ECB, 2021; RBI, 2022b).

Climate change and its impact has become a source of financial risk that can alter the credit, market and liquidity risk profiles of institutions as well as the stability of the entire financial system (Reserve Bank of India, 2022a). Public sector banks, which frequently have greater exposure to carbon-intensive and climate-vulnerable sectors, may be more vulnerable to climate-related credit risks than some private banks, according to preliminary climate stress-testing exercises and pilot analyses. This highlights the need for improved risk assessment and governance (Reserve Bank of India, 2022a, 2023).

IV. RBI'S INITIATIVES

Through its initiatives, The Reserve Bank of India (RBI) has addressed climate change related risks. In order to provide loans for non-conventional energy public utilities and renewable energy, the RBI integrated the renewable energy sector into its priority sector lending scheme in 2015. A major step taken by the RBI was to join the Central Banks and Supervisors Network for Greening the Financial system (NGFS) in 2021. This showcased RBI's interest to exchange experiences, learn and promote environmentally sustainable practices with the financial sector. The RBI has undertaken three major pathways in its efforts to address climate related risks, namely using climate scenario exercises to find vulnerabilities in the balance sheets of supervised

entities, incorporating climate related risks into financial stability monitoring and education financial institutions about climate related risks and mitigation strategies (Reserve Bank of India, 2023).

The RBI conducted a Survey on Climate Risk and Sustainable Finance in January 2022 to assess the state of climate risk management among top scheduled banks. The RBI's Report on Currency and Finance also analysed the medium and long term macro financial effects of climate change and stressed on the importance of climate goals as a policy priority.In order to support investments in green infrastructure, the RBI issued sovereign green bonds worth US$2.2 billion (₹16,000 crore) in January and February of 2023. In April of the same year, it unveiled a "Framework for Acceptance of Green Deposits" to direct funds toward sustainable projects while addressing concerns about greenwashing.These initiatives signify the RBI's evolving commitment to integrating environmental considerations into financial policy and promoting sustainable development

V. CONCLUSION

Climate change has profound impact on many sectors of the economy thereby being a threat to the financial stability of the nation. India's financial system has made progress in incorporating climate factors, yet substantial challenges are there. India will require 2.5 trillion US dollars in cumulative investment by 2030 to meet its climate and energy-transition targets, including large expansions in renewable energy, resilient infrastructure, and adaptation measures. Mobilizing finance at this scale requires both domestic reforms and international support through climate finance and technology transfer (Climate Policy Initiative,2022). The lack of a unified green finance taxonomy, limited board-level climate-risk expertise in banks, and inadequate data/methodologies for assessing physical and transition risks impede effective risk management and capital allocation (RBI, 2022a; United Nations Environment Programme Finance Initiative [UNEP FI], 2021). Embedding climate resilience into central banking mandates will help mitigate systemic threats and promote sustainable growth amid intensifying environmental challenges.

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