



# BUILDING RESILIENCE IN CLIMATE FINANCE: AN INDIAN FRAMEWORK FOR ADAPTATION

Dr. Debadatta Das<sup>1\*</sup>, Dr. Krishnamurthy S<sup>2</sup>

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## Abstract

This paper explores the concept of resilience measures and adaptation in climate finance within the context of India, which has a large geographic footprint and a rapidly growing economy that is particularly susceptible to climate change impacts in South Asia. Developing countries often encounter difficulties when attempting to measure and invest in adaptation finance. In order to promote increased knowledge and investment in adaptation, it is critical that both the national government and stakeholders play an active role. The mobilization of climate finance is essential in building resilience and adapting to the impacts of climate change, in line with the global requirement of limiting the increase in global average temperature to 1.5 degrees Celsius above pre-industrial levels.

Further, I investigate various approaches proposed and implemented to address resilience and adaptation in specific areas. My analysis focuses on the drivers of climate finance flows in the development sector and the improvement of the nation's public policy. Through this examination, I aim to provide a comprehensive framework for understanding climate finance flows, with a view to enhancing resilience and adaptation in the face of climate change, while also promoting sustainable development.

**Keywords:** Climate Finance; Green Finance; Climate Change; Public Policy

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<sup>1\*</sup>Assistant Professor, K L University and can be accessed: [debadattadas@kluniversity.in](mailto:debadattadas@kluniversity.in)

<sup>2</sup>Researcher at Tumkur University and can be accessed: [krishnamurthy8989@gmail.com](mailto:krishnamurthy8989@gmail.com)

**\*Corresponding Author:** Dr. Debadatta Das

\*Assistant Professor, K L University and can be accessed: [debadattadas@kluniversity.in](mailto:debadattadas@kluniversity.in)

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## Introduction

India has committed to meeting its pledges under the 2015 Paris climate change agreement, which includes reducing the greenhouse gas emissions intensity of its gross domestic product by 33% to 35% by 2030, increasing non-fossil fuel power capacity to 40%, and substantially increasing forest cover to reduce carbon dioxide. The rise in temperature by approximately 0.7°C during the last century, primarily due to climate change, is a significant challenge for India. This trend is expected to continue, with temperatures projected to increase between 2.4°C to 4.7°C by the end of the twenty-first century<sup>1</sup>. Climate finance plays an important role in India's long-term economic prosperity, as it aids in the implementation of climate action measures and adaptation strategies to mitigate the adverse effects of climate change, including flooding, cyclones, coastal erosion, droughts, and increased precipitation variability.

To successfully mitigate and adapt to climate change, there must be a clear understanding of climate finance responsibilities. Pledges made at COP 22 included quadrupling adaptation finance from 2014 to 2020. The Green Climate Fund (GCF), the Global Environmental Facility's (GEF)-administered Least Developed Countries Fund (LDCF), the Pilot Program for Climate Resilience (PPCR) of the World Bank's Climate Investment Funds (CIFs), and the Adaptation Fund are currently the largest sources of approved funding for adaptation projects (Hattle, 2021). However, contributions to these funds from wealthy countries remain modest compared to those supporting mitigation, and adaptation is underfunded on a global scale. To address this, the GCF plans to focus half of its resource mobilization on SIDS, LDCs, and African governments. In 2020, the GCF approved the most amount of adaptation money, providing USD 313 million for 11 adaptation projects, and it is estimated that the total amount of money granted for adaptation from main climate funds will reach USD 5.8 billion by 2020.

India's commitment to tackling climate change includes five Amrit Tatva or pledges, announced at COP26<sup>2</sup>. These pledges include reaching a non-fossil capacity of 500 gigawatts by 2030, fulfilling 50% of its energy requirements with renewable energy by 2030, reducing one billion tonnes of the total projected carbon emission between now and

2030, reducing its economy's carbon intensity to less than 45%, and achieving the target of net-zero emissions by 2070. The Prime Minister emphasized that developed nations must fulfill their promised \$1 trillion in climate finance, and this should be monitored similarly to climate mitigation. He called for putting pressure on countries that have not fulfilled their climate finance commitments, stating that justice would be served by doing so.

## Overview of Climate Finance in India

### Green Finance

Green financing refers to financial arrangements tailored to the usage of ecologically sustainable or climate-change-aware projects. Environmentally sustainable projects include energy generation from renewable sources such as solar, wind, and biogas; clean transportation that reduces greenhouse gas emissions; energy efficient projects such as green building; and waste management that includes recycling, efficient disposal, and energy conversion, among others. Independent private firms pollute less than public firms (Sophie A. Shive, 2020). Various financial instruments and institutions are being developed to meet the financial demands and fill knowledge gaps (Morgan Richmond, 2020) for climate change adaptation, sustainable waste and water management, sustainable land use, and biodiversity protection. These include green bonds, weather-indexed insurance (Rishikesh Ram Bhandary K. S., 2021), carbon market instruments such as carbon tax, and new financial institutions like green banks and green funds. Together, these form the domain of green finance.

As early as 2007, India began putting a focus on green finance. The Reserve Bank of India released a regulation in December 2007 titled "Corporate Social Responsibility, Sustainable Development, and Non-Financial Reporting - Role of Banks." In the context of sustainable development, this emphasizes the importance of global warming and climate change. In 2008, the National Action Plan on Climate Change (NAPCC) was established to provide a comprehensive policy framework for addressing the impacts of climate change (Jain, 2020). Subsequently, in 2011, the Climate Change Finance Unit (CCFU) was created as a coordinating body for India's diverse green finance institutions under the Ministry of Finance. The adoption of

<sup>1</sup> Assessment of climate change over the Indian region: A report of the Ministry of Earth Sciences (MoES), Government of India

<sup>2</sup> 'Net-zero carbon emissions by 2070': PM Modi announces India's 5 commitments at COP26 climate summit | India News - Times of India (indiatimes.com)

sustainability disclosure requirements has been a significant strategic change since 2012. Since 2012, the Securities and Exchange Board of India (SEBI) has made annual business responsibility reports necessary for the top 100 listed businesses on the BSE and NSE based on market capitalization, and it has been updated from time to time. SEBI released rules for green bond issuance in May 2017, laying out the standards for transparency. In addition, the Companies Act of 2013 required the Ministry of Corporate Affairs to report on progress on Corporate Social Responsibilities (CSR). The Board of Directors should meet at least once a year to discuss strategy, budgeting, board evaluation, risk management, ESG, and succession planning (SEBI, 2017).

In India, there have been a number of fiscal and financial incentives at work. The offered incentives align with India's objectives as stated in the 2015 Paris Agreement, which aims to reduce greenhouse gas emissions by 33 to 35 percent below 2005 levels by 2030 and to produce 40 percent of the installed electric power capacity from non-fossil sources. In most states, the Government of India (GoI) provides a subsidy of 30% of the cost of installing rooftop solar panels to the institutional, residential, and social sectors<sup>11</sup>. The subsidy might be up to 70% of the installation cost in some of the special category states<sup>12</sup>. In addition, recipients are eligible for a generation-based reward of \$2 per unit of generation. Additionally, excess power can be sold at a government-determined rate. In addition, from 2015 to 2019, the Indian government introduced two stages of the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) initiative aimed at enhancing credit accessibility, reducing the upfront costs of purchasing electric vehicles, and establishing infrastructure. The State Bank of India has established a 'green car loans' program for electric vehicles, which offers a 20 basis point lower interest rate and a more extended repayment period than traditional vehicle loans, to counterbalance the high initial expense of such vehicles (Jain, 2020). Furthermore, the government has implemented a Production Linked Incentive (PLI) Scheme.

Green finance activities have also been promoted and supported by the Reserve Bank through aggressive policy measures. In 2015, it expanded its Priority Sector Lending (PSL) programme to include the small renewable energy sector. Renewable energy firms can access loans of up to ₹ 30 crores (increased from ₹ 15 crores since September 4, 2020), while households can access

loans of up to ₹ 10 lakhs for renewable energy investments. In September 2019, India declared its target of producing 450 GW of renewable energy by 2030. The Reserve Bank engages in public awareness campaigns, investor education, and bank guidance on the significance, prospects, and difficulties of green finance through regular reports and other channels. The Reserve Bank's Annual Report (2015-16) highlights the G20 Green Finance Study Group (GFSG14) report's conclusions, including the necessity to establish local green bond markets, ease cross-border green bond investments, promote knowledge sharing on environmental risks, and strengthen overall green finance endeavors. In addition, the annual report discusses the broader concerns surrounding green financing that should be addressed in the future. Various examples include defining green activities, outlining intellectual property rights in technology transfer and development from developed countries, and assessing environmental risk by banks. The Reserve Bank of India's Report on the Trend and Progress of Banking in India (2018-19) acknowledges the risk climate change poses to financial assets and the necessity to expedite green finance for environmentally sustainable development. The report recognizes the challenges that hinder the growth of green finance, such as false claims of environmental compliance (i.e., "greenwashing"), a range of definitions, and mismatches in the maturity of long-term green investments and investors' short-term objectives. Furthermore, it highlights the significance of regulatory intervention in establishing a framework that promotes knowledge of the green finance ecosystem in India through coordinated initiatives.

The Indian Renewable Energy Development Agency (IREDA), a government-supported entity that fosters renewable energy investment, expressed its desire to become India's initial green bank in May 2016. Additionally, the India Infrastructure Finance Corporation Limited (IIFCL) introduced a specific credit enhancement scheme aimed at financing qualified infrastructure projects with bond tenors exceeding five years (Jain, 2020). In the subsequent section, we will assess the advancement of green finance in India, considering these initiatives, as well as general awareness of environmental sustainability.

In 2008, India developed the National Action Plan on Climate Change (NAPCC), and in 2011, it established the Climate Change Finance Unit (CCFU) with the goal of laying out a wide policy framework for mitigating the effects of climate change. Furthermore, various new initiatives in this

area have been launched, including the International Solar Alliance, decreasing emissions in trains, the LED bulb campaign, and expanding the geographical coverage of BS IV (See Section III). In the future, industries, cars, and fossil-fuel energy-producing units may face more challenges in adhering to pollution standards. As the primary source of financing for these industries in India, the banking sector is expected to face some transitional costs. The rating class of models employs probability of defaults (PD) in many industries to measure the effects of such changes. Transitional shocks are considered supply-side shocks in another class of general equilibrium models, whereas physical shocks are considered demand-side shocks.

The banking sector's exposure to fossil-fuel-dependent industrial operations in India, in order to assess the banking sector's vulnerability if the industry's input usage and/or production processes change dramatically as a result of the shift away from fossil fuels. Apart from businesses that directly expose workers to fossil fuels, there are a variety of different industries that rely on fossil fuel-based energy to varying degrees.

## India's Exposure

### Fossil Fuel

The ASI data offers insights into the financials and production processes of individual establishments. To determine the fossil fuel intensity of a particular industry, we need data on input utilization. Our calculation involves determining the proportion of

electricity, gasoline/diesel, and coal used in an industry as a percentage of total inputs, which is determined by taking a weighted sum of all establishments in that industry. Additionally, we adjust the electricity component to account for the fact that non-fossil fuel sources account for 37.8% of total electricity generation, as reported by the Central Electricity Authority.

### Bank credit

India is an emerging market economy in which a substantial percentage of businesses rely on bank money to meet their working capital and capital expenditure needs. Despite signs of corporate deleveraging in recent years (Herwadkar, 2017), the banking sector has remained the primary source of funding for most businesses. In light of the foregoing, we plot the fuel and credit intensity of Indian industries to highlight the most significant exposures. This analysis is based on ASI data for fossil fuel usage intensity and BSR data for loans outstanding (as of March 2019) for each sector. In the below figure, the y-axis depicts sectoral shares of outstanding loans, while the x-axis depicts the sectors' fossil fuel intensity. Electricity and basic metals absorb a large amount of overall credit disbursed by the banking sector, although they have only minor exposure to fossil fuels. Cement manufacturing, for example, has significant fossil fuel exposure, but its credit share is low (Figure 1). As a result, substantial vulnerabilities in the banking sector are unlikely to emerge as a result of any disruptions in the fossil-fuel-dependent sectors.

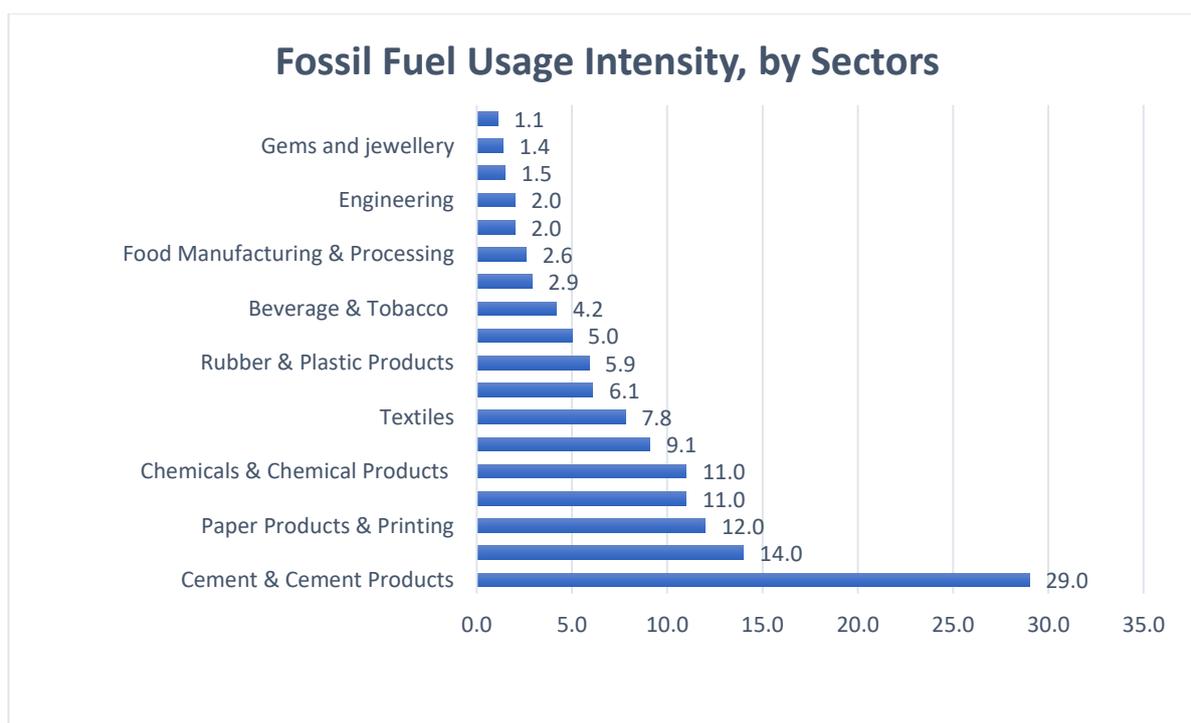


Figure 1: Sector wise fossil fuel usage

## Progress and Challenges of Green Finance in India

### Improvements in general awareness

Data from conventional sources to measure the public's comprehension of green financing and sustainable development is limited. However, Google Trends can serve as a valuable resource in this regard by tracking the frequency and patterns of Google searches in different regions and timeframes. By analyzing the number of searches on a specific subject, it can help determine the degree of interest in that topic. Google Trends normalizes the number of searches for a specific topic by calculating it as a percentage of the total searches in a particular region during the chosen period.

### Green Bonds

Green bonds were introduced in India in 2015, and as of February 12, 2020, the outstanding value of green bonds in the country was ₹ 1,22,250 crores. Since January 1, 2018, India has issued green bonds worth approximately US\$8 billion, accounting for approximately 0.7 percent of all bonds issued in the Indian financial market. Despite the fact that the value of green bonds issued in India since 2018 (Table 1) constituted a relatively small proportion of the total bond issuance, India performed favorably when compared to many developed and developing economies.

**Table 1:** Green Bonds Issuance Since January 1, 2018

| Country                      | Amount issued (₹ in crores) | Number of bonds issued | Amount issued as a percent of all bond issuance (percent) | Number of bonds issued as a percent of all bond issuance (percent) |
|------------------------------|-----------------------------|------------------------|---|--|
| Euro Area                    | 1476405                     | 594                    | 1.7   | 0.4  |
| China                        | 472672.5                    | 183                    | 0.3   | 0.2  |
| USA                          | 265657.5                    | 71                     | 0.2   | 0.2  |
| Japan                        | 88,613                      | 88                     | 0.1   | 1.1  |
| South Korea                  | 88,358                      | 44                     | 1   | 0.4  |
| Central and Southern America | 66517.5                     | 53                     | 0.5   | 1  |
| India                        | 59940                       | 22                     | 0.7   | 0.3  |
| South east Asia              | 54060                       | 86                     | 0.6   | 1.4  |
| Australia and New Zealand    | 44085                       | 15                     | 1.1   | 0.8  |
| UK                           | 39832.5                     | 17                     | 0.4   | 0.5  |
| Hong Kong                    | 35857.5                     | 19                     | 0.5   | 1  |
| Singapore                    | 3720                        | 9                      | 0.05  | 1.2  |

Most of the green bonds issued since 2015 had maturities of five years or above, but less than 10 years. However, some issuers such as Yes Bank Ltd. (2015), Indian Renewable Energy Development Agency Ltd. (2017, 2019), Rural Electrification Corporation Limited or REC Ltd. (2017), Power Finance Corporation Ltd. (2017), Indian Railway Finance Corporation Ltd. (2017), Adani Renewable Energy Ltd. (2019) have issued green bonds with the maturity of 10 or more years. ReNew Power Pvt. Ltd. issued green bonds with a maturity period of less than 5 years in 2019. Around 76 percent of the green bonds issued in India since 2015 were denominated in US\$. In addition to corporates and governments, the World Bank has issued green bonds for several projects in India from time to time (Appendix 1)<sup>3</sup>. Based on the Green Bond Impact report (2019) by the World Bank, it is estimated that the outstanding amount of Green Bond proceeds allocated to support the

financing of such projects in India is US\$640mn, as on June 30, 2019.

In sum, green finance in India is still at the nascent stage. Green bonds constituted only 0.7 percent of all the bonds issued in India since 2018, and bank lending to non-conventional energy constituted about 7.9 percent of outstanding bank credit to the power sector, as on March 2020. In the next section, we will highlight some of the major challenges faced by the green bond market in India.

### Challenges and Way Forward

Based on existing research and global experience, an integrated policy approach to green finance appears to be gaining traction. While public awareness and financing options have improved in India, high borrowing costs, false claims of environmental compliance, a plethora of green loan definitions, and maturity mismatches between long-term green investments and investors'

<sup>3</sup> Green Finance in India: Progress and Challenges – RBI bulletin January 2021

relatively short-term interests could pose significant challenges. We'll go through some of these issues in more detail in this part, as well as a few policy options.

Finance flows and processes from private, governmental, and development finance institutions (DFIs), as well as insurance and risk-pooling mechanisms, are all part of the adaptation finance architecture.

Much of the climate finance literature has focused on estimating financing needs (Buchner B, 2019) or tracking progress on addressing this issue in international climate negotiations. There is substantial existing scholarly work on climate finance at the firm level or international organization level. The academic literature on climate finance policies is limited, however, and, where it exists, the focus is on policies to address the North–South climate finance gap or policy analysis based on economic modelling.

In order to evaluate the possible threats to financial stability caused by climate change and various policy measures, this article examines the direct and indirect exposure of Indian banks to fossil fuels. It is noted that the public and private sector banks have a low combined proportion of outstanding bank credit in the three sectors directly exposed to fossil fuels, which are electricity, chemicals, and automobiles. However, a significant portion of bank credit is allocated to various other industries that rely indirectly on fossil fuels. Some of these sectors currently have a low-interest coverage ratio (ICR) and a high gross non-performing assets (GNPA) ratio, and therefore, require careful monitoring during the transition to green energy<sup>4</sup>.

#### **Climate Mitigation Finance in India**

In 2007, at the 13th Conference of Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), also known as the Bali conference, developing countries agreed to develop Nationally Appropriate Mitigation Action (NAMA), and subsequently, India released the National Action Plan on Climate Change (NAPCC) in June 2008. The financial estimates and descriptions of NAPCC's missions are presented in the following table (Annexure 2).

Between 1901 and 2018, India experienced a surface air temperature increase of roughly 0.7 °C, which coincided with a rise in atmospheric moisture. Additionally, sea surface temperatures in the tropical Indian Ocean grew by approximately 1 °C between 1951 and 2015. Anthropogenic GHG and aerosol forcing, as well as changes in land use and land cover, have contributed to clear evidence of human-caused climate shifts in the Indian region. These shifts have led to a rise in climatic extremes, including localized heavy rainfall, drought, and flood events, and more severe tropical cyclones. Future projections of the region's climate, conducted under various climate change scenarios, show substantial changes in key climatic parameters for the Indian subcontinent and neighboring areas. These parameters include land temperature and precipitation, monsoons, Indian Ocean temperature and sea level, tropical cyclones, and the Himalayan cryosphere. The warming environment and regional anthropogenic factors have created intricate interactions between components of the Earth system.<sup>5</sup>

#### **Methodology and data collection**

The methodology focuses on identifying the allocation of funds for different climate change action plans to achieve the climate goal. The evaluation is used by analyzing secondary sources of data and information. The primary tools were Document Review and Data Analysis of transcripts.

#### **Policy and Institutional Framework**

India's present energy balance clearly demonstrates the country's policy goal of boosting renewable energy's proportion of the overall energy mix. Coal and gas contribute 199 GW and 25 GW, respectively, of India's total installed capacity of 370 GW<sup>3</sup>. Renewable energy capacity has increased to 87 GW from 36.5 GW in March 2014. With around 23% of the country's total electricity capacity coming from renewable energy, India has reached a new milestone. The government plans to boost renewable energy's proportion of total installed capacity to more than one-third by 2022, with an ambitious target of 175 GW. Biomass, micro-hydro, and waste-to-energy are the remaining options. Solar and wind power have respective installed capacities of 37 and 32 gigawatts. Coal continues to be a major source of electricity in the country, accounting for 53% of

<sup>4</sup> Green Transition Risks to Indian Banks - RBI Bulletin March 2022

<sup>5</sup> Assessment of Climate Change over Indian

Region, Ministry of Earth Science, Posted On: 23 MAR 2021 4:28 PM by PIB Delhi

total capacity; however, the amount of renewable capacity has steadily increased over time, reaching 23% in March 2020. Renewable energy appears to be taking up a growing and larger portion of the country's energy basket.

Policies on climate financing are rarely adopted in isolation. Because of the numerous financial and non-financial constraints that prevent private finance from being mobilized to address climate change, they frequently accompany other climate measures (Ghosh, 2019). When it comes to maximizing fund mobilization, a larger range of policies can be superior to a single policy if there are no conflicts among them. In order to encourage private investment, most of the nations studied in this study have implemented both supply- and demand-side policies. For example, to encourage renewable energy funding, the United States employs PTCs, ITCs, loan guarantees, accelerated depreciation, Renewable Portfolio Standards (RPS) in some states, and carbon trading in others. These policies complement or partially overlap with one another, making it more difficult to determine the value added by each. However, such policy density may be sub-optimal in terms of economic efficiency. How much policy overlap is there between these policies that are already in place? Isn't that redundancy a waste of time? Because of the conflict between financial mobilization effectiveness and economic efficiency, a careful balance is required.

### Conclusions and policy implications

India has made significant efforts to promote green finance since 2007, with a focus on environmentally sustainable and climate change-aware projects. The implementation of sustainability disclosure requirements and the establishment of various green finance institutions, such as green banks and green funds, has enabled the development of new financial instruments such as green bonds and carbon market instruments. The

government of India has also introduced fiscal and financial incentives, including subsidies for installing rooftop solar panels and schemes to promote the adoption of electric vehicles. The Reserve Bank of India has taken a proactive approach to support green finance activities through policy measures, including expanding its Priority Sector Lending program to include the small renewable energy sector. Despite the challenges in the growth of green finance, India has recognized the need for regulatory action to foster a framework that promotes environmentally friendly sustainable development.

Policy measures such as widening the corporate bond market, standardization of green investment language, consistent corporate reporting, and minimizing information asymmetry between investors and receivers, according to the RBI, can help alleviate some of the green financing sector's weaknesses. The Securities and Exchange Board of India (SEBI) enforced corporate responsibility reporting for the top 100 publicly traded companies in 2012. The reporting requirements were enhanced in 2021 to include greenhouse gas emissions specifically, and the number of companies required to declare grew to 1,000. More quantitative criteria that are easier to measure and compare across firms, industries, and time periods are required for reporting. In April 2021, the RBI became a member of the NGFS (Network for Greening the Financial System). The goal of the NGFS is to increase the global response needed to accomplish the Paris Agreement's goals, as well as to expand the financial system's role in risk management (Stefano Giglio, 2020) and capital mobilization for green and low-carbon investments. These objectives are quite like the work India needs to do not only to make its financial system more robust to climate change concerns, but also to balance mitigation, adaptation, and economic development throughout the country.

### Annexure - 1

#### World Bank Green Bond Commitment Towards India

(₹ in Crores)

| Sector                               | Project Name                                  | Status | Approval Date      | Closing Date      | Total Project Cost | Allocated Amount |
|--------------------------------------|---|--------|--------------------|-------------------|--------------------|------------------|
| Renewable Energy & Energy Efficiency | Power System Development Project IV           | Closed | March 18, 2008     | July 31, 2014     | 15855.00           | 3000.00          |
| Renewable Energy & Energy Efficiency | Rampur Hydropower Project                     | Closed | September 13, 2007 | December 31, 2014 | 5025.00            | 3000.00          |
| Renewable Energy & Energy Efficiency | Grid-Connected Rooftop Solar Program          | Active | May 13, 2016       | November 30, 2021 | 6862.50            | 2116.50          |
| Renewable Energy & Energy Efficiency | Shared Infrastructure for Solar Parks Project | Active | March 30, 2017     | July 31, 2022     | 1500.00            | 63.75            |
| Clean Transportation                 | Sustainable Urban Transport                   | Closed | December 10, 2009  | March 31, 2018    | 2462.48            | 666.00           |

|   |  |        |                   |                   |          |         |
|---|--|--------|-------------------|-------------------|----------|---------|
| Clean Transportation                                  | Eastern Dedicated Freight Corridor - II                | Active | April 22, 2014    | December 31, 2020 | 12375.00 | 2217.75 |
| Water & Wastewater Management                         | Andhra Pradesh Water Sector Improvement                | Closed | June 3, 2010      | July 28, 2018     | 7417.28  | 2994.00 |
| Agriculture, Land Use, Forests & Ecological Resources | Maharashtra Project on Climate Resilient Agriculture   | Active | February 27, 2018 | June 30, 2024     | 4496.63  | 31.50   |
| Agriculture, Land Use, Forests & Ecological Resources | Meghalaya Community-led Landscapes Management Project  | Active | March 13, 2018    | June 30, 2023     | 450.00   | 2.25    |
| Agriculture, Land Use, Forests & Ecological Resources | Tamil Nadu Irrigated Agriculture Modernization Project | Active | December 1, 2017  | June 2, 2025      | 3418.50  | 366.75  |

Source: World Bank

## Annexure - 2

(₹ in Crores)

| Mission                               | Brief description  | Estimated costs/benefits for the period 2012–2017 | Details of financial estimates were derived from  |
|---------------------------------------|--|---|---|
| National green mission                | To reach national target of 33 % land area under forest and tree cover from the current level of 23 %. Mission to be taken up on degraded forest land through direct action by communities, organized through Joint Forest Management (JFM) Committees and guided by Department of Forests   | 70650   | <a href="http://moef.nic.in/download/public-information/GIM-Report-PMCCC.pdf">http://moef.nic.in/download/public-information/GIM-Report-PMCCC.pdf</a> |
| National mission on energy efficiency | The mission aims to provide binding targets to designated consumers (DCs) to achieve energy efficiency during period 2011–2014. There are about 685 DCs mainly heavy industries and power sector that are required to specific energy consumption reduction targets. The mission works through a market mechanism of Perform, Achieve, and Trade (PAT), wherein the DCs can trade their excess credits to below achievers  | 90000   | <a href="http://www.moef.nic.in/downloads/others/Mission-SAP-CC-NMEEE.pdf">http://www.moef.nic.in/downloads/others/Mission-SAP-CC-NMEEE.pdf</a>       |
| National solar mission                | The mission targets include (i) deployment of 20,000 MW of grid-connected solar power by 2022, (ii) 2,000 MW of off-grid solar applications including 20 million solar lights by 2022, (iii) 20 million sq. m. solar thermal collector area, (iv) to create favorable conditions for developing solar manufacturing capability in the country, and (v) support R&D and capacity building activities to achieve grid parity by 2022. The program also aims to reduce to the cost of solar power along | 120000  | <a href="http://mnre.gov.in/file-manager/UserFiles/draft-jnnsmpd2.pdf">http://mnre.gov.in/file-manager/UserFiles/draft-jnnsmpd2.pdf</a>               |

|   |   |        |   |
|---|---|--------|---|
|   | with creating favorable conditions for solar manufacturing industry   |        |   |
| National mission on sustainable agriculture               | Mission aims to devise strategies to make Indian agriculture more resilient to climate change. Identify and develop new varieties of crops (thermal resistant crops, alternative cropping patterns, capable of withstanding extreme weather). Orientation of agricultural research systems to monitor and evaluate climate change and recommend changes in agricultural practices. Convergence and integration of traditional knowledge | 135000 | <a href="http://agricoop.nic.in/image/default/whatsnew/nmsagide_lines.pdf">http://agricoop.nic.in/image/default/whatsnew/nmsagide_lines.pdf</a> |
| National water mission                                    | The Overall objective is “Conservation of water, minimization of wastage, and ensuring its equitable distribution both across and within states through integrated water resource management”   | 30000  | <a href="http://wrmin.nic.in/writereaddata/nwm28756944786.pdf">http://wrmin.nic.in/writereaddata/nwm28756944786.pdf</a>                         |
| National mission on sustainable habitat                   | Targets improvements in energy efficiency in buildings, management of solid waste, and accelerating modal shift to mass transport   | 67500  | <a href="http://www.urbanindia.nic.in/programme/uwss/NMSH.pdf">http://www.urbanindia.nic.in/programme/uwss/NMSH.pdf</a>                         |
| National mission on sustaining Himalayan ecosystem        | To evolve management measures for sustaining and safeguarding the Himalayan glacier and mountain ecosystem. The mission would seek to address the impacts in Himalayan region and establish community-based management of Himalayan ecosystems  | 1500   | <a href="http://dst.gov.in/scientific-programme/NMSHE_June_2010.pdf">http://dst.gov.in/scientific-programme/NMSHE_June_2010.pdf</a>             |
| National mission on strategic knowledge of climate change | Mission to identify the challenges of and the responses to climate change through research. Understand the Socioeconomic impacts of climate change including impact on health, demography, mitigation patterns, and livelihoods of coastal communities. Establishment of network of dedicated climate change-related units in academic and scientific institutions  | 3000   | <a href="http://www.dst.gov.in/scientific-programme/nmskcc_july_2010.pdf">http://www.dst.gov.in/scientific-programme/nmskcc_july_2010.pdf</a>   |

**Source:** National Action Plan on Climate Change, Govt. of India

**Reference**

1. Bai, Y. (2011). Financing a green future: An examination of China's banking sector for green finance. IIIIEE Master Thesis.
2. Baldwin E, C. S.-C. (2019). Why do countries emulate each others' policies? A global study of renewable energy policy diffusion. *World Development*, 29-45. doi:10.1016/j.worlddev.2019.03.012
3. Barbara Buchner, B. N. (2021). Global Landscape of Climate Finance 2021. Climate Policy Initiative.
4. Buchner B, C. A. (2019). Global Landscape of Climate Finance. Climate Policy Initiative.
5. Ghosh, K. C. (2019, September). Greening New Pastures for Green Investments. Centre for Energy Finance.
6. Hattle, A. (2021). Climate Adaptation Finance: Fact or Fiction? CARE Denmark & CARE Netherlands.
7. Herwadkar, S. (2017, December). Corporate Leverage in EMEs: Did the Global Financial Crisis Change the Determinants? BIS Working Paper No. 681.
8. Jain, P. J. (2020). Are the Sustainable Development Goals really sustainable? A policy perspective. 28(6), 1642-1651. doi:10.1002/sd.2112
9. Kapoor, A. (2016). Mobilizing & Leveraging Climate Finance in India: Predictable, Assured and Transparent. POLICY BRIEF.
10. Kyle Blocher, C. S. (2022, August). Climate Finance Innovation for Africa. Climate Policy Initiative.
11. London, A. J. (2022, March). Climate Infrastructure Investing: Risks and Opportunities for Unlisted Renewables.
12. Morgan Richmond, C. M. (2020). A Snapshot of Global Adaptation Investment and Tracking Methods. Climate Policy Initiative.
13. Naran, D. C. (2020). Examining the Climate Finance Gap for Small-Scale Agriculture. Climate Policy Initiative.
14. Rishikesh Ram Bhandary, K. S. (2021). Climate finance policy in practice: a review of the evidence. *CLIMATE POLICY*, 21(4). doi:10.1080/14693062.2020.1871313
15. Rishikesh Ram Bhandary, K. S. (2021). Climate finance policy in practice: a review of the evidence. *CLIMATE POLICY*, 21(4), 529–545. doi:10.1080/14693062.2020.1871313
16. Sandra Guzmán, G. D. (2022, June). The State of Climate Finance in Africa: Climate Finance Needs of African Countries. CLIMATE POLICY INITIATIVE.
17. SEBI. (2017). Report of the Committee on Corporate Governance. Securities Exchange Board of India.
18. Sheeba Pakkan, C. S. (2022). A correlation study of sustainable development goal (SDG) interactions. *Quality & Quantity*. doi:10.1007/s11135-022-01443-4
19. Singh, D. (2017). Climate Finance Architecture in India. Centre for Budget and Governance Accountability (CBGA).
20. Singh, S. A. (2017). Unlocking the green bond potential in India. TERI.
21. Sophie A. Shive, M. M. (2020). Corporate Governance and Pollution Externalities of Public and Private Firms. The Society for Financial Studies. doi:10.1093/rfs/hhz079
22. Stefano Giglio, B. T. (2020, December). CLIMATE FINANCE. NATIONAL BUREAU OF ECONOMIC RESEARCH.
23. Swann, A. M. (2019). Driving Finance Today for the Climate Resilient Society of Tomorrow. United Nations Environment Programme Finance Initiative (UNEP FI) and the Global Commission on Adaptation (GCA).
24. Vinayak Nikam, A. J. (2019). Quantitative Methods for Social Science. New Delhi: ICAR - National Institute of Agricultural Economics and Policy Research.