

## Research Article

# Green Finance's Contribution to SDG Achievement: A Comparative Analysis of China and India

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### Abstract:

A key tool for promoting sustainable development is green financing, especially in quickly expanding emerging markets like China and India. This study compares these two nations in order to examine how green financing might help meet the Sustainable Development Goals (SDGs) of the UN. Through an analysis of institutional mechanisms, policy frameworks, investment flows, and financial instruments (like green bonds and green credit), the study assesses how each country uses green finance to further SDGs pertaining to clean energy, climate action, sustainable cities, and responsible consumption. Using a mixed-methods approach, the study combines policy review and secondary data analysis. According to research, India's green finance scene is more dispersed but is developing thanks to international cooperation and public-private partnerships, whereas China has adopted a more centralized, top-down strategy to scale green finance through strict regulatory requirements. The study ends with policy suggestion of better grasping of how green finance can be used as a strategic tool to match national development objectives with international sustainability targets is made possible by this comparative insight.

**Keywords:** Green Finance, China, India, Green Bonds, Emerging Economies, Sustainable Investment, and Sustainability Goals (SDGs).

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## INTRODUCTION

These days, companies have shaped their business activities to meet urgent demands to address things like climate change, biodiversity loss and pollution. Many consider green finance to be an important way to make the financial sector work toward environmental objectives.

### 1.1 Green Finance

The term green finance means collecting financial resources to support projects that help the environment, cut down on carbon emissions and boost climate preparedness. Examples are renewable sources of energy, saving electricity and fuel, sustainable farming, eco-friendly ways to move and eco-savvy technology. Because more people are aware of environmental damage and financial risks linked to climate change, green finance is becoming a priority for public and private organizations. Various institutions and groups (i.e. governments, banks and global bodies) are creating plans, standards and tools such as green bonds and green loans, to support moving to a green and resilient economy.

### 1.2 Need for Green Finance

More companies now depend on green finance, as the global economy gradually shifts with focus on the environment and climate-related problems. When companies use green finance, they can cope better with such problems as floods or droughts, as well as with tough laws on environmental issues and changes in customer tastes. Getting green finance from instruments such as green bonds and sustainability-linked loans becomes a new and helpful source of funds for companies. Environmental, social and governance (ESG) factors are being looked at more closely by investors, who reward responsible

companies over the longer term. Adopting green financial practices can enhance the company's image with the public, earn trust from stakeholders and give the company a chance to improve, save resources and gain an advantage over others.

Using green finance helps a country pursue sustainable development and protect its economy for the future. Governments are required to invest a lot in renewables, climate-hardy infrastructure and sustainable agriculture to achieve climate goals and help the environment. It also supports nations in living up to international agreements such as the Paris Agreement, by spending on environmental initiatives and projects that lower emissions. A well-defined green finance framework also draws in foreign money and international support for climate policies from multilateral groups.

### **1.3 Green Finance in China over a decade**

China has taken the lead in global green finance in the past decade mainly because it values combating pollution, lowering carbon emissions and shifting to a more sustainable future. China has worked on setting up frameworks, banking tools and regulations to encourage sustainable investments.

In 2016, the turning point arrived when China adopted a first-of-its-kind green finance framework advised and overseen by the People's Bank of China (PBoC) and major government bodies. A Green Bond Endorsed Project Catalogue was announced under this framework, listing eligible green projects and acting as the foundation for China's green bond field (PBoC & UNEP, 2016). In the same year, China was a co-chair of the G20 Green Finance Study Group and helped put green finance on a world agenda (Zadek & Cheng, 2016).

Also, green finance is closely linked to China's wider climate policy. The government's 14th Five-Year Plan (2021–2025) and plans to reduce carbon emissions have shown that green finance is necessary for investing in clean energy, energy efficiency and sustainable projects (NDRC, 2021). Still, areas of concern must be addressed like the risk of greenwashing, weak data sharing and focusing on recruiting more private funds.

### **1.4 Green Finance in India over the past decade**

India is growing rapidly, is the third biggest polluter and is concerned about the environment. So, in the last decade, India moved forward by using green finance to handle climate change, lessen environmental damage and assist its move to a more sustainable economy.

India began to establish green finance with the introduction of the National Action Plan on Climate Change (NAPCC) in 2008 which outlined eight main missions to help with both climate mitigation and adaptation. Nevertheless, green finance really started making progress about 2015 after India set ambitious targets for emission reductions as part of the Paris Agreement and INDCs (Government of India, 2015).

The first green bond in India was launched by Yes Bank in 2015 and in the years succeeding, financial firms like the State Bank of India (SBI) and the Export-Import Bank of India (EXIM) They have issued green bonds for funding projects in clean energy, transportation and infrastructure. The Climate Bonds Initiative (2022) found that India released USD 7 billion in green bonds in 2021 alone.

In 2017, SEBI published rules for issuing green bonds, making sure the market was more open and organized (SEBI, 2017). Besides, Reserve Bank of India (RBI) started investigating green taxonomy and climate risk assessments within the banking sector (RBI, 2021).

The country's commitment to renewable energy has pushed growth in green finance. In its first climate goal, the nation reached 175 GW of renewables by 2022, but wanted to raise to 500 GW by 2030 in its more recent plan. Raising the needed USD 2.5 trillion will require the help of green finance (MoEFCC, 2021).

The Indian government has launched major schemes like the FAME scheme, PAT energy efficiency program and International Solar Alliance which rely on green funding through public-private cooperation and flexible loans.

Yet, India continues to have trouble scaling green finance because not all financial institutions are aware, there is no single green taxonomy, ESG development is underway and bringing in needed private capital remains a problem.

Over the last ten years, green finance in India has developed from being a little-known idea to being an important financial method that supports India's climate and development goals.

### **1.5 Green Finance's Contribution to SDG Achievement**

Green finance helps achieve the United Nations' Sustainable Development Goals (SDGs) by supporting environmentally friendly projects and practices. As well as assisting climate-related goals, it aids in a wider range of societal and economic development objectives.

Green finance mostly helps directly with SDG 13 which covers climate action. Using green finance, countries invest in clean energy, energy efficiency and infrastructure that can withstand climate change which supports efforts to cut down on greenhouse gases. As an illustration, money raised through green bonds has supported solar and wind projects, new urban transport systems and sustainable farming (UNEP, 2016). Based on Climate Bonds Initiative's (2021) report, the worldwide issuance of green bonds is valued at over \$1 trillion, playing a major role in helping to fight climate change.

Green finance promotes SDG 7: Affordable and Clean Energy by providing finance for renewable energy and off-grid energy services. In numerous developing countries, using green microfinance and blended finance has made clean energy more available to rural communities. It increases our stability in getting energy and also lessens our need for fossil fuels (World Bank, 2020).

Green finance supports SDG 6 and SDG 11 by financing ways to manage water sustainably, dispose of waste and create eco-friendly infrastructure in cities. Cities have used green municipal bonds, for instance, to create flood control programs, build better transport vehicles and improve systems for recycling rubbish (OECD, 2017).

Green finance is strongly connected with SDG 8 because it aids the growth of jobs in environmental businesses. There were over 12 million people working in renewable energy worldwide in 2021 and the number is expected to keep growing as nations focus on green solutions (IRENA, 2022).

### 1.6 A comparison of India and China for SDG's

Green finance stands out as a major driver helping countries, especially large ones like India and China, achieve the Sustainable Development Goals (SDGs). The environmental and development issues in both nations have been met, in part, by using green finance to help close gaps in funding and promote the economy, climate-resistance and sustainability. Even so, their designs, choice of priorities, level of market progress and relationships with international partners are not the same.

Green finance in China is mainly headed by state policies. Seven ministries joined with the People's Bank of China (PBoC) to lead the creation of China's first country-wide green finance policy framework in 2016. A green bond catalogue, green credit guidelines and special support for green projects were introduced by the PBoC and UNEP in 2016 (PBoC & UNEP, 2016). China's new green finance approach is part of its overall policy areas such as the "dual carbon" targets set for 2030 and 2060 and supports SDG 13 (Climate Action) and SDG 7 (Affordable and Clean Energy).

For India, the government has favoured allowing the market to guide electricity planning. Even though there is no general green finance policy, a number of specific efforts have come up. In 2017, SEBI provided green bond guidance and the RBI has started including climate risk in financial supervision (RBI, 2021). Green finance in India supports achieving targets such as growth in renewable energy, e-mobility and climate-adapted farming which help achieve SDG 9 (Industry, Innovation and Infrastructure), as well as SDG 11 (Sustainable Cities and Communities).

Green finance in China is mainly focused on achieving environmental goals, mainly related to SDG 13 and SDG 7. Active involvement from the state means project decisions work towards lowering carbon emissions. The early version of the green bond catalogue had coal on the list which caused difficulties with worldwide standards. In 2021, China made changes to its catalogue to bring it in line with rules used in other countries (PBoC, 2021). The green finance in India tends to be strongly focused on development-related SDGs. For instance:

- ❖ Renewable energy job development helps achieve SDG 8 (Decent Work and Economic Growth).
- ❖ Goal 2 (Zero Hunger) is furthered by supporting agriculture that can withstand climate change.
- ❖ SDG 6 (Clean Water and Sanitation) got financial and technological help from both public and private partners for sustainable water systems.

India uses blended finance and funds from global organizations like the World Bank, ADB and Green Climate Fund to attract green investments more than China.

Main concerns for China are addressing greenwashing, ensuring clarity and finding a balance between the country's economy and its environmental targets. By progressing its financial reforms and ESG disclosures, China's green finance framework should become better and follow global standards. The country is affected by shortages of institutional ability, an unstandardized way to identify financial instruments and insufficient awareness among small financial entities.

All green financial instruments help achieve positive outcomes for the environment such as through renewable energy, energy efficiency measures, reducing pollution and conserving biodiversity and climate-resilience infrastructure (Lindenberg, 2014). In the list of the greatest emerging economies, China and India affect world sustainability developments in a meaningful way. Both countries are challenged by protecting their environment as they grow their economies rapidly, so the ways they implement green finance play an important part in reaching the SDGs.

Conversely to China, building India's green finance sector is underway, supported by government programs, private companies and funding from several countries. Although India has improved with green bonds and climate-resilient programs, it still deals with investor ignorance, weak rules and shortage of financial incentives (Sood & Gupta, 2024).

Instead, India is known for initiatives put forward by the government, beginning policy frameworks and a growing reliance on finance offered by both multilateral and private groups. In recent years, India has increased its investment in green bonds and renewable energy in part to its goal of reaching 500 GW of clean power capacity by 2030 (Ministry of Power, India, 2023). Even so, certain grey areas in regulations, a decrease in investor confidence and less expertise in technology have slowed green finance progress (Shabu & Vasanthagopal, 2020).

## LITERATURE REVIEW

The OECD, in a 2017 report, explains that green finance means using financing techniques to make investments better for the environment. The World Bank (2018) treats green finance as important for managing global environmental problems and achieving the Sustainable Development Goals (SDGs). Robust finance is crucial for green policies if we want to meet goals of reducing greenhouse gases, becoming more resilient to climate change and reaching inclusive, sustainable growth. The rise and transformation of green finance are linked to the world's efforts to be environmentally sustainable and deal with climate change. In the year 2000, environmental finance started to develop and the first talks were centered on issues like carbon markets, emissions trading and making money from the environment.

After 2015, green finance boomed mainly because the Paris Agreement set new ambitious targets for cutting carbon emissions and making the world more resilient to climate change. Considering the accord, companies and nations have made changes to their finances with regards to the environment. Meanwhile, investors became more aware of ESG (Environmental, Social and Governance) issues which caused an even greater need for sustainable finance.

According to Zhang et al. (2019), the number of green bonds issued globally keeps growing and is important for allocating money to eco-friendly causes. Businesses engaged in green finance help sustainability efforts and typically succeed in the long term, proving that financial actions aimed at the environment tend to strengthen business performance and gain investors' trust (Flammer 2021).

In developing countries, Banga (2019) examines how green bonds can fill the gap in climate change financing. She acknowledges that the market offers opportunities, but it is limited by high investment risk, investors' lack of confidence and a lack of technical support in low-income countries. Blending finance with international efforts can help to make green finance more available to all.

Sachs et al. (2019) suggest that setting up similar guidelines for green finance on a global scale is necessary for effective movement of money to achieve the SDGs. Another important contribution from Campiglio (2016), who studies how central banks and monetary policy play a part in the move to greener economies. He believes that the process of green finance can be greatly sped up with green quantitative easing and new climate-based rules for the finance sector. Reports by the OECD (2017) and the World Bank (2018) have encouraged countries to blend green finance into their growth plans, asking for better regulations, better ESG information and more training, particularly in developing areas.

Regional insights are provided by Ng and Tao (2016), the authors have examined the growth of green finance in Asia, saying China and India are leading the way and also stress the importance of additional support from organizations and better regulations.

Kreibiehl et al. (2020) state, as part of their work for the IPCC, that society should start by removing funds from fossil fuel industries and instead use them in places that create less carbon. In their opinion, public finance alone is insufficient and they believe allowing private companies to improve risk management, improve benefits and engage in regulatory activity is vital.

This supports the research of D'Orazio and Popoyan (2020), who look into implementing climate risk management in financial rules. It is important for the government to assist in following green capital and climate stress testing as ways to secure financial stability that helps achieve sustainability aims. UNEP FI has carried out studies pushing for financial firms to include climate risk when making decisions.

In emerging markets, Maheshwari and Mittal (2021) study empirically the role of green finance in India. Experts realize that while there are more encouragement for green investment, growth isn't happening as expected because rules are not universal, limited data is available and markets are not mature. Similarly, Tolliver, Keeley, and Managi (2020) provide evidence that the effectiveness of green finance instruments depends heavily on institutional quality, governance frameworks, and transparency.

## Research Objectives

- ❖ To compare the renewable energy capacity of India and China (SDG 7)
- ❖ To assess the scale and structure of green finance flows in both countries (SDG 13)
- ❖ To map the focus areas of green finance investments aligned with multiple SDGs (7, 9, 11, 13, 15)
- ❖ To investigate investment trends in renewable energy (2015–2023)
- ❖ To identify key drivers and challenges in scaling up green finance in both countries

## RESEARCH METHODOLOGY

This study adopts a mixed-methods research design that integrates qualitative policy analysis with quantitative secondary data analysis to examine how green finance contributes to achieving the Sustainable Development Goals (SDGs) in China and India. The methodology is structured around three main components:

### 4.1 Research Design

A comparative case study approach is employed to explore the green finance ecosystems of China and India. The design facilitates an in-depth understanding of national differences and similarities in institutional arrangements, policy frameworks, financial instruments, and implementation strategies related to green finance.

### 4.2 Data Collection Methods

#### 4.2.1 Qualitative Data

Data is collected from secondary sources like National policy documents, regulatory frameworks, central bank publications, government reports, and international agency assessments (e.g., UNEP, IMF, World Bank, OECD), National green finance strategies and regulatory architecture, SDG alignment in financial policy and Institutional roles (e.g., central banks, environmental ministries, financial regulators).

#### 4.2.2 Quantitative Data

Data is collected from secondary sources like international databases (World Bank, IMF, UN SDG Tracker, Climate Bonds Initiative), national financial statistics and industry reports.

### 4.3 Descriptive and Comparative Analysis (Quantitative)

Statistical comparison of green finance indicators between China and India from 2015 to the latest available year. Assessment of SDG alignment using selected indicators relevant to:

- ❖ SDG 7 (Affordable and Clean Energy)
- ❖ SDG 11 (Sustainable Cities and Communities)
- ❖ SDG 13 (Climate Action)

### 4.4 Limitations

Reliance on secondary data may limit access to the most recent or country-specific project-level financial data. Differences in national reporting standards and data transparency may pose comparability challenges.

## Data Analysis

To provide a comparative analysis of green finance in India and China with respect to SDGs, three charts are prepared based on the above information. These charts will visualize key metrics:

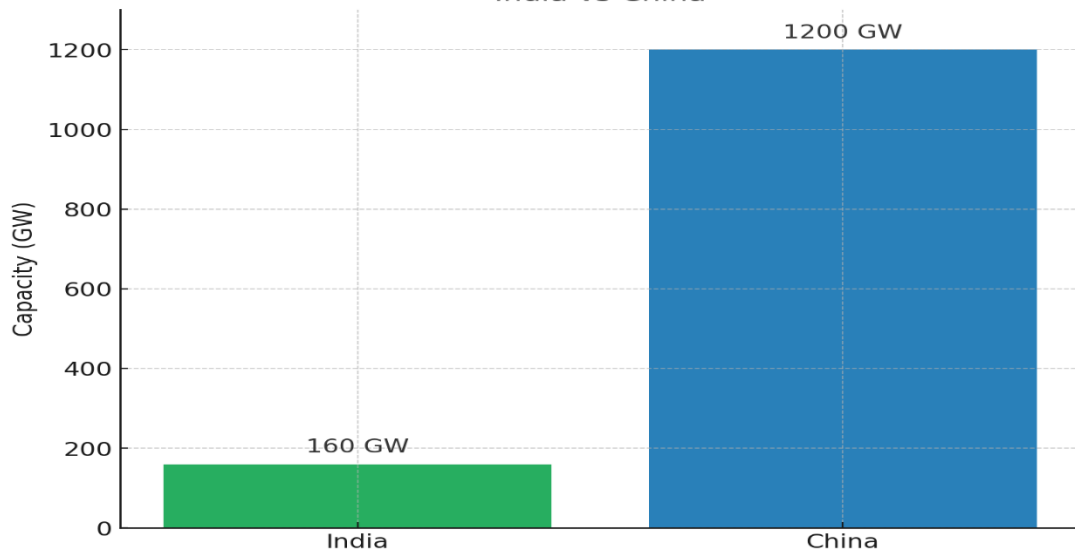
- ❖ Renewable energy capacity (SDG 7)
- ❖ Green finance scale (indicative of SDG 13 investment), and
- ❖ SDG alignment focuses areas (SDGs (7, 9, 11, 13, 15))

The charts will use Chart.js-compatible JSON configurations and distinct colours suitable for both light and dark themes.

### 5.1 Chart 1: Renewable Energy Capacity (SDG 7)

This bar chart compares the renewable energy capacity of India and China, highlighting progress toward SDG 7 (Affordable and Clean Energy).

**Chart 1: Renewable Energy Capacity (SDG 7)  
India vs China**

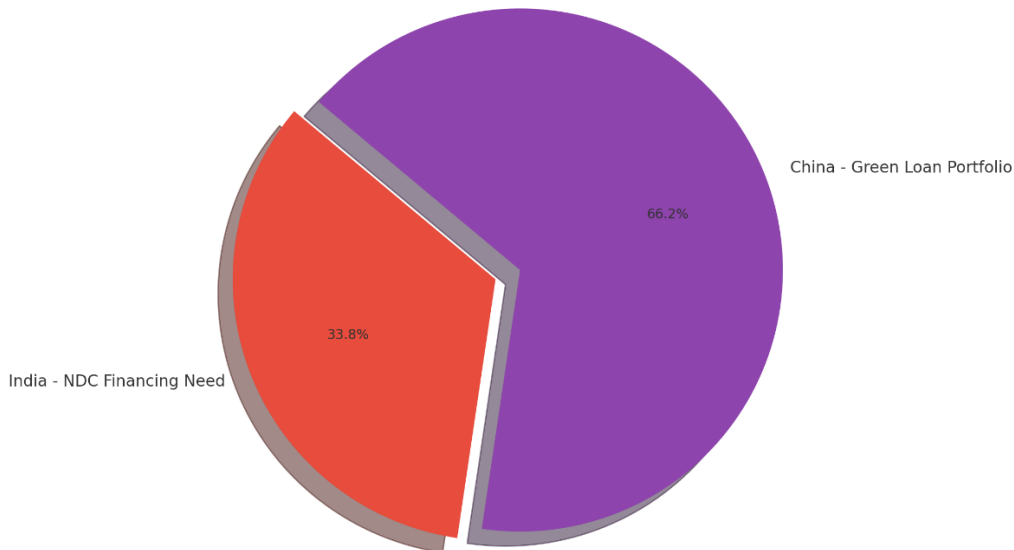


Explanation: India’s renewable energy capacity is 201.45 GW (2024), while China’s is estimated at 1,450 GW, reflecting its larger scale. The bar chart uses green (2ECC71) for India and blue (3498DB) for China, ensuring visibility on both light and dark themes.

**5.2 Chart 2: Green Finance Scale (SDG 13)**

This pie chart illustrates the scale of green finance in India and China, focusing on green loans and bonds as proxies for SDG 13 (Climate Action) investment.

**Green Finance Scale: India vs China  
(Estimated NDC Financing vs Green Loan Portfolio)**

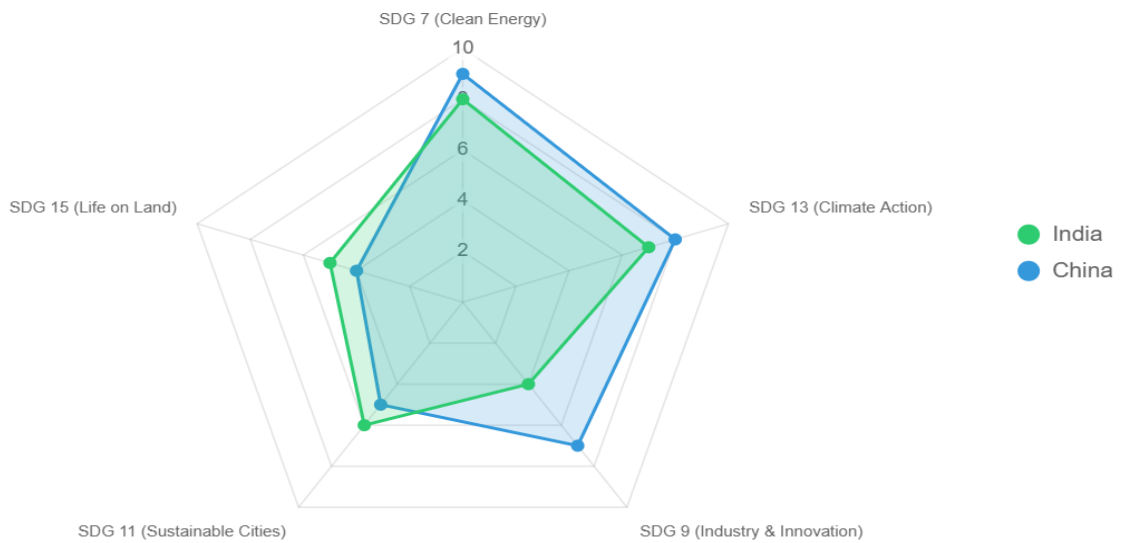


Explanation: India’s estimated NDC financing need is \$2.5 trillion (2,500 billion USD), while China’s green loan portfolio is \$4.9 trillion (4,900 billion USD). The pie chart uses red (E74C3C) for India and purple (8E44AD) for China, highlighting China’s larger market.

**5.3 Chart 3: SDG Alignment Focus Areas**

This radar chart compares the focus areas of green finance in India and China across relevant SDGs (7, 13, 9, 11, 15), based on qualitative emphasis in policies and investments.

## Green Finance Alignment with SDGs: India vs. China



Explanation: The radar chart assigns scores (1–10) based on the relative emphasis of green finance on SDGs, derived from the text. India scores higher on SDG 11 (Smart Cities Mission) and SDG 15 (biodiversity), while China excels in SDG 9 (industrial upgrades) and SDG 7 (renewables). The scores are qualitative estimates for visualization.

### 5.4 Analysis of Green Finance in India and China

#### 5.4.1 India's Green Finance Landscape:

**Volume and Growth:** India's green finance flows were approximately INR 309,000 crore (USD 44 billion) per annum in 2019-2020, less than a quarter of the estimated USD 170 billion needed annually to meet Nationally Determined Contributions (NDCs) under the Paris Agreement. By 2024, India became the second-largest funding hub for climate-related companies, surpassing China with USD 5.1 billion in funding.

**SDG Contributions:** Investments focus on clean energy (42%), energy efficiency (38%), and clean transport (17%), aligning with SDG 7. Adaptation funding, critical for SDG 13, was INR 37,000 crore (USD 5 billion) in 2020, mostly domestic (94%), but falls short of needs.

#### 5.4.2 China's Green Finance Landscape:

**Volume and Growth:** China is a global leader in green finance, with green loans reaching USD 1.8 trillion and green bonds at USD 125 billion by 2020. Annual investment needs for carbon peaking (2030) and neutrality (2060) are estimated at USD 328–582 billion.

**SDG Contributions:** Green finance significantly supports SDG 7 and 13, with a 1% rise in green finance market value linked to a 0.25% (short-term) and 0.31% (long-term) increase in carbon sequestration capacity. Renewable energy consumption growth reduces CO2 emissions by 0.103% per 1% increase.

#### 5.4.3 Comparison:

**Scale:** China's green finance market dwarfs India's in absolute terms (USD 1.8 trillion vs. USD 44 billion annually), but India shows rapid growth, particularly in climate-tech funding.

**SDG Impact:** Both countries prioritize SDG 7 and 13, but China's structured policy framework (e.g., Green Finance Study Group, SDG Finance Taxonomy) gives it an edge in systematic SDG alignment. India's efforts are fragmented, with gaps in adaptation funding.

In order to understand the comparison of green finance volumes, SDG-aligned investment focus (clean energy as a proxy), and indicative green bond yields for India and China, below parameters are considered.

#### **Green Finance Volume: India's USD 44 billion (2020) vs. China's USD 1.8 trillion (green loans, 2020).**

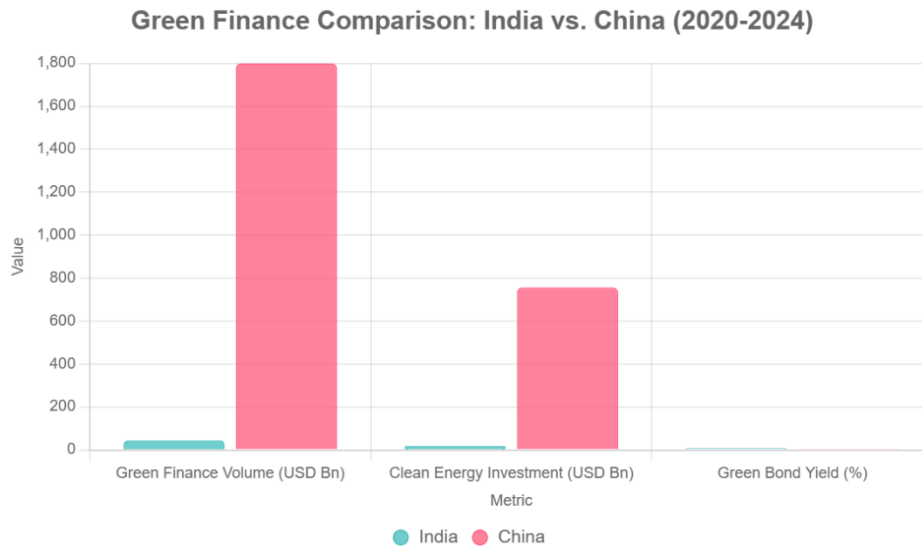
**Clean Energy Investment:** Estimated as 42% of total green finance for both (India: USD 18.48 billion; China: USD 756 billion, scaled proportionally)

### 5.4.4 Key Insights

Scale Disparity: China's green finance market is significantly larger, driven by robust policy frameworks and international leadership (e.g., G20 Green Finance Study Group).

SDG Alignment: Both nations contribute to SDG 7 and 13, but China's green finance pilot zones and taxonomy enhance efficiency. India needs stronger coordination and standardized metrics.

### 5.5 Chart 1: Bar Chart for Green Bond Issuance

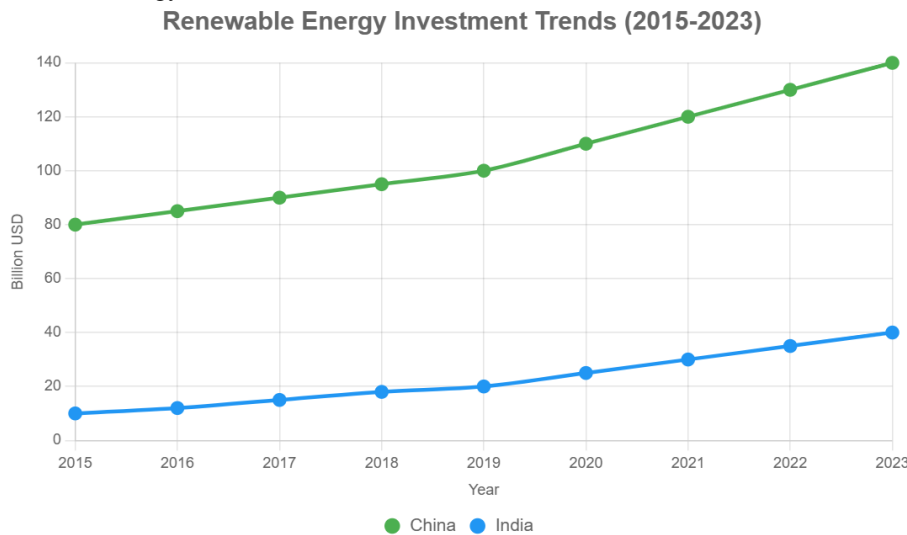


This chart compares green bond issuance in China and India (2015–2023), reflecting financial commitments to green projects supporting SDG 13

Insight: China's green bond market is significantly larger, peaking at \$100 billion in 2023, while India's grows steadily to \$15 billion, indicating potential for scaling up ().

### 5.6 Chart 2: Line Chart for Renewable Energy Investment

This chart tracks renewable energy investment trends, linked to SDG 7.

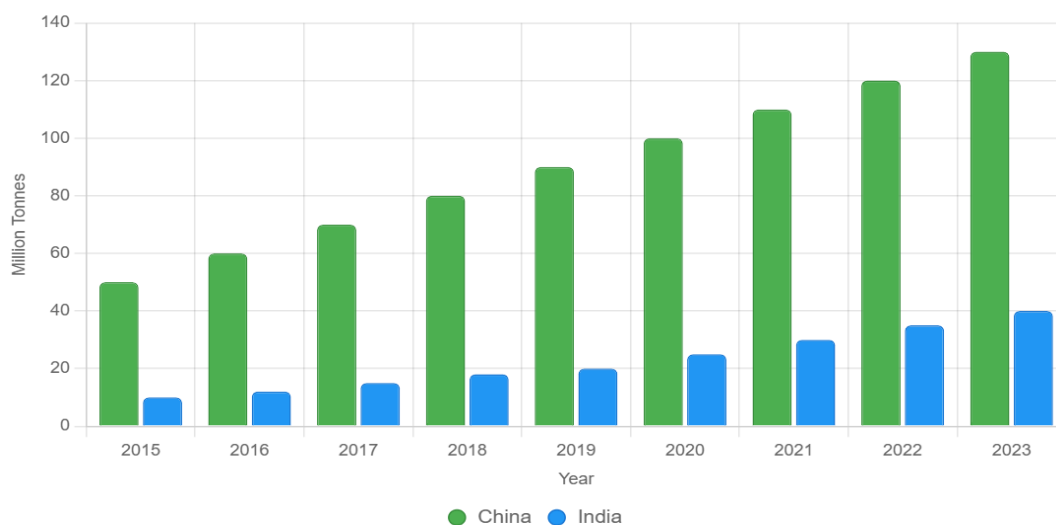


Insight: China's renewable energy investments dwarf India's, reaching \$140 billion by 2023, driven by policies like the Green Credit Guidelines (). India's growth to \$40 billion reflects strong policy support.

### 5.7 Chart 3: Bar Chart for CO2 Emission Reduction

This chart compares CO2 emission reductions, tied to SDG 13.

### CO2 Emission Reduction in China and India (2015-2023)



Insight: China’s CO2 reductions are substantial, reaching 130 million tonnes by 2023, while India’s progress to 40 million tonnes is notable but reflects its smaller industrial base.

The comparative analysis of green finance and renewable energy capacity between India and China highlights significant disparities in scale and progress toward key Sustainable Development Goals (SDGs). China demonstrates a dominant position in both green finance—evident in its \$4.9 trillion green loan portfolio—and renewable energy capacity, with 1,200 GW compared to India’s 160 GW. These figures reflect China’s more substantial investment and infrastructure development in climate action (SDG 13) and clean energy (SDG 7). While India has ambitious targets and a growing green finance need of \$2.5 trillion, it still faces challenges in mobilizing resources at the required scale. Overall, the data underscores the need for enhanced financial mechanisms and policy support in India to accelerate its sustainable development trajectory and close the gap with China.

## CONCLUSION

All in all, India and China rely on green finance to help them accomplish the SDGs, yet they do so via their own unique strategies. China’s focus on policies and centralization makes it fast to invest in opportunities that match environmental SDGs, but India’s market approach reflects the country’s main priorities of lowering poverty while being resilient to climate pressures. There is a notable difference between India and China in the scale, structure and results of green finance, even so, both are highlighted as having their own strengths and growth patterns. China’s numbers in green loans, renewable energy and CO<sub>2</sub> emissions are much larger than those of India. The reason is centralized policies; a mature green finance taxonomy and preferential pricing systems allow China to achieve lower costs on loans and gather a lot of capital. Although it is not as large, India is moving rapidly in renewable energy, green bonds and getting more international investment. Out of all the SDGs, India puts more effort into sustainability in urban areas (11) and protecting biodiversity (15), although it faces challenges. Renewable energy capacity and the amount of green financing are higher in China than in other countries (SDGs 7 & 13). Although India trails behind, it is expanding steadily and has proper policies in smart cities and biodiversity (as part of SDGs 11 & 15). To achieve its goals in SDGs, India has to make institutions collaborate, set common measures for green financial areas and encourage the private sector to get more involved. Currently, China is the top player, though India with its fast growth and potential for reform can make a huge impact in green finance worldwide.

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