



Munich Personal RePEc Archive

An Empirical Assessment of India's Position in Global Sustainable Bond Market

Susanta, Datta

Seva Sadan's R. K. Talreja College of Arts, Science and Commerce,
Ulhasnagar, Dist. Thane, Maharashtra, India 421003

20 January 2024

Online at <https://mpra.ub.uni-muenchen.de/119925/>
MPRA Paper No. 119925, posted 31 Aug 2024 13:18 UTC

An Empirical Assessment of India's Position in Global Sustainable Bond Market

Susanta Datta

Assistant Professor, Department of Economics
Seva Sadan's R. K. Talreja College of Arts, Science and Commerce
Ulhasnagar, Dist. Thane – 421003
susantadatta2005@gmail.com

Abstract: The Indian sustainable debt market has grown significantly, dominated by green bonds, but green finance is still at a nascent stage in India. This paper tries to assess India's relative position in green bond market with reference to world market on the basis of listing and trading information of global sustainable bond markets. Disaggregate level data retrieve from Luxembourg Green Exchange from 1999 to 2024 and SEBI, NSE and Climate Bond Initiatives for Indian Sustainable Bond Market used for this research. The empirical evidence suggest green bond has capture maximum market share in the global market. Luxembourg Green Exchange has maximum variability of bond coupon as well as duration (in months) of bond maturity. EUR, USD widely used currency used for bond trading, while INR has limited presence in the global market. World Bank is the highest issuing institute for both for Green Bonds and Sustainable Bonds in global market. Indian private sector has 84% market share in Indian sustainable bond market. Indian Companies have been involved in issuing green, social, and sustainability bonds, as well as innovative debt instruments such as Sustainability-Linked Bonds and skill impact bonds. However, there are several challenges faced by the green bond market in India, including the lack of a standardized framework for green bonds, limited investor awareness, and the need for more robust disclosure and reporting standards. Increased standardization, openness, and alignment with national and international best practices in policy formulation are essential for the development of India's sustainable finance sector.

Keywords: Green Finance, Sustainable Finance, Bond, Debt, Securities, Green, Sustainable

JEL Classification: G12, G14, Q54

An Empirical Assessment of India's Position in Global Sustainable Bond Market

Susanta Datta

Assistant Professor, Department of Economics
Seva Sadan's R. K. Talreja College of Arts, Science and Commerce
Ulhasnagar, Dist. Thane – 421003
susantadatta2005@gmail.com

I: Introduction

The field of sustainable finance is rapidly expanding and attracting interest from scholars, policymakers, and business professionals worldwide. The Environment, Social, and Governance (ESG) disclosure projects operate on a voluntary basis and face challenges in reaching completion. Implementing ESG concerns and appropriate disclosure may be associated with better financial performance and reduced information asymmetries. Global public authorities are increasingly emphasizing ESG risks, highlighting their importance in maintaining sustainable economic growth. Long-term sustainability necessitates the integration of ESG concepts into investment practices and policy (Ghosh et al, 2023). Several major economies, including India, have already mandated sustainability disclosures for publicly traded corporations. It is anticipated that all industrial and service sectors, including the large informal sector in emerging nations, will eventually experience simplified ESG disclosures. India, as one of the largest Emerging Market Economies (EMEs), is attracting international investment in line with the Sustainable Development Goals (SDGs) (see Box 1 for details).

Several alternative investment strategies fall under the broad category of sustainable debt financing, including "green finance," "green bonds," and "social finance." These strategies are being employed in response to growing concerns about climate risk and sustainable development. It's important to note that there are key differences between sustainable debt and sustainable bonds. Sustainable bonds, also known as green, social, or sustainability bonds, are specifically used to finance initiatives such as renewable energy, energy efficiency, sustainable agriculture, affordable housing, and healthcare. On the other hand, sustainable debt refers to any type of debt instrument issued to finance projects or activities with a positive environmental or social impact. Sustainable bonds offer transparency and accountability to investors, ensuring that the funds obtained will be used for sustainable projects. With supportive government policies, increasing investor demand, and a robust pipeline of sustainable projects, the sustainable debt and bond markets are expected to continue expanding.

Box 1 demonstrates the significant growth of the Indian sustainable debt market and emphasizes the importance of policy development in establishing the necessary infrastructure for the market to thrive. The Ministry of Finance has established a Sustainable Finance Task Force to create four actionable recommendations, indicating the government's support for the market. The market is expected to continue growing due to supportive government policies and increasing investor demand. Sustainable debt plays a vital role in funding sustainable development initiatives, with green bonds being the predominant product in India's expanding sustainable debt market. Furthermore, bonds with social and environmental themes are gaining popularity and are used to finance initiatives such as universal healthcare and affordable housing.

Box 1: Highlight of The India Sustainable Debt State of the Market 2021 report
<p>These highlights underscore the significant progress and potential for further expansion of sustainable finance in India, reflecting a growing focus on environmental and social responsibility within the financial sector.</p> <ul style="list-style-type: none"> • Significant Growth: The Indian sustainable debt market has experienced substantial growth, reaching a total size of USD19.5bn as of 31 December 2021. Indian GSS debt issuance increased more than six-fold (+585%) to reach USD7.5bn in 2021, following a pandemic-induced decline in issuance in 2020. The cumulative volume has almost doubled in the last two years to represent USD19.5bn in value. <ul style="list-style-type: none"> ➤ Total size of the Indian GSS market: USD18.3bn for green, USD600m for social, and USD500m for sustainability, totalling USD19.5bn. ➤ Number of issuers: 72 for green, 1 for social, and 2 for sustainability, totalling 75 issuers. ➤ Number of currencies: 3 for green, 1 for social, and 2 for sustainability, totalling 3 currencies. ➤ Size of Indian Sustainable debt market • Dominance of Green Bonds: Green bonds dominate the market, with USD6.4bn in issuance in 2021, followed by social and sustainability bonds. • Policy Development: The report emphasizes the importance of policy development in creating the necessary framework for the growth of the sustainable finance market in India. The Ministry of Finance has established a Sustainable Finance Task Force to develop four pillars of action, including an Indian Taxonomy of sustainable activities, reporting and disclosure, financial policy and regulation, and ecosystem development. • Financing Sustainable Development: Sustainable debt in India serves as a crucial tool for financing projects that contribute to sustainable development and address environmental and social challenges. • Expected Continued Growth: The report anticipates the sustainable debt market in India to continue growing, driven by supportive government policies, and increasing investor demand. <p>Source: India Sustainable Debt State of the Market 2021 published by Climate Bonds Initiative</p>

The research highlights the significant progress in sustainable finance in India and the potential for further growth in this area. It reflects the increasing focus of the financial sector on social and environmental responsibility. The utility-scale renewable energy sector is identified as a

key driver of green finance in India, supported by domestic financial systems and a robust project financing ecosystem. The availability of financing has led to the issuance of green bonds by developers and financial institutions, reducing the cost of winning bids in renewable energy auctions. Government measures promoting electric vehicles (EVs) have contributed to their increasing popularity in India. The government has also introduced Production-Linked Incentive (PLI) programs to support the establishment of a local EV manufacturing ecosystem, along with incentives for charging infrastructure in the 2022 Union Budget. The Indian GSS bond market shows a promising pipeline of projects across various industries, indicating potential for further expansion.

The Green, Social and Sustainable (GSS) bond market in India is expected to expand in the future, supported by a strong pipeline of projects across various industries. The utility-scale renewable energy industry is projected to maintain its leading position among Use of Proceeds (UoP) categories, thanks to robust asset auction processes and support from the financial community. The increasing popularity of electric vehicles (EVs) in India, driven by government regulations and incentives, also presents growth opportunities for the EV ecosystem. The government has introduced Production-Linked Incentive (PLI) programs to foster the development of a regional EV manufacturing ecosystem, along with proposed incentives for charging infrastructure in the Union Budget for 2022.

II. Review of Literature

(A) Global Perspective:

Following the recommendations of the Taskforce on Climate-related Financial Disclosures (TCFD), premium enterprises listed in the UK are required to report on climate change using the "comply-or-explain" method starting in the financial year 2021–2022. By the financial year 2024–2025, the entire economy will have embraced the required climate-related disclosures due to the gradual expansion of these disclosures' scope and necessity. The European Union (EU) is strengthening the "Non-Financial Reporting Regulation," which mandates ESG disclosure from businesses operating in the EU with more than 500 employees. According to the TCFD framework, all listed equity and debt issuers will be required to make mandatory climate-related disclosures by 2023. Additionally, the US Securities and Exchange Commission has expressed its intention to focus more on climate-related disclosures. In Hong Kong, key performance indicators (KPIs) can be disclosed on a "comply or explain" basis, while the board statement and significant climate issues affecting the issuer are required to be

disclosed. Taiwan has also mandated sustainability disclosures for companies with paid-up capital above a certain threshold, and Singapore has been implementing sustainability reporting on a "comply or explain" basis since June 2016. (SEBI, 2021).

The "Sustainable Debt Global State of the Market 2022" report by Climate Bonds Initiative analyses the green, social, and sustainability (GSS) markets, as well as sustainability-linked bonds (SLBs) and transition bonds. Key points from the report include:

- 1) Sovereign Sustainability-Linked Bonds (SLBs) tie the cost of repaying liabilities to the fulfilment of national climate and environmental objectives, promoting accountability. The World Bank has released key performance indicators for sovereign SLBs.
- 2) The Climate Bonds Initiative aims to encourage investment in projects for a quick shift to a low-carbon economy and to mobilize funds globally for climate action. In 2022, the total amount of social and sustainability bonds captured by Climate Bonds fell by 31% year over year to USD291.5 billion, mainly due to the decline in COVID-19 related activities.
- 3) The China Development Bank and the Agricultural Bank of China were involved in certified green agreements, while Calpine Corporation had the largest position under the Climate Bonds' Geothermal Criteria with a USD 1.8 billion approved green loan.
- 4) In May, Hong Kong SAR priced a HKD20 billion (USD2.55 billion) three-year green retail bond tied to the Hong Kong Consumer Price Index (HKCPI), marking the first instance of an inflation-linked sovereign green bond.
- 5) France and Hong Kong SAR issued index-linked bonds to alleviate investor concerns about the green transition and provide protection against increasing inflation. France also issued a 2038 maturity transaction for EUR4 billion (USD 4.2 billion) with a coupon based on the European Consumer Price Index (ECPI).
- 6) Germany was the largest sovereign green issuer in 2022, pricing USD14.8bn split between a new five-year bond and multiple taps. There were no recorded sovereign social bonds in 2022, and the sustainability label was applied to 15% (USD15.1bn) of the sovereign debt priced in 2022.
- 7) Austria became the first country to issue a green Treasury Bill in October 2022, following the publication of its Green Financing Framework. The green Treasury Bill attracted a bid/cover ratio of 2.69 times, with 85% of the book comprised of investors describing themselves as green.

- 8) Uruguay has issued sustainability-linked bonds (SLBs) tied to key performance indicators (KPIs) related to the reduction of greenhouse gas emissions and the preservation of forests.
- 9) Chile has issued bonds linked to sustainability, social responsibility, and the environment, with KPIs related to GHG emissions, renewable energy capacity, and peak emissions. Chile was the largest issuer in the sovereign market, with three USD offers and one CLP, totalling USD 5 billion in volume.
- 10) Using the Sovereign sustainability-linked bonds (SLB) framework, the Chilean Ministry of Finance cited the World Bank's most recent release of key performance indicators (KPIs). Chile was the biggest issuer in the sovereign market, with three USD deals and one CLP, totalling USD 5 billion in volume.
- 11) Japan has released sustainability bonds with greenium or green-premium pricing for shorter tranches.
- 12) A 25-year sustainability tranche that attained book cover five times was part of a USD 2-billion sale in Asia.
- 13) New Zealand has a National Climate Change Risk Assessment and an Emissions Reduction Plan.

(B) Indian Perspective:

In recent years, the global transition to sustainable development and the need to adapt to and mitigate the effects of climate change have become major concerns. The rise in overall assets and new investments in sustainable funds indicates a growing interest among investors in sustainability. The Covid-19 pandemic has made environmental, social, and governance (ESG) considerations more important to investors. With the increasing popularity of sustainable investing, there is a need for corresponding changes in disclosure requirements. Global authorities are now demanding greater ESG disclosures from companies, while stakeholders and investors are exerting more pressure on companies to disclose their ESG practices, risks, and outcomes.

The impact of climate change on the Indian economy, particularly in relation to how weather patterns affect various economic indicators, is significant. Empirical research in the article underscores the importance of considering climate change risks in macroeconomic analysis and policy formulation. To mitigate these risks, the article proposes several policy recommendations, including integrating climate risks into analytical models, addressing data

gaps in environmental finance, promoting bank support for environmentally friendly projects, and introducing weather derivatives to mitigate the risk of unseasonal rainfall (Dilip, A, 2020).

In an effort to provide valuable information to policymakers, financial institutions, and other stakeholders, Ghosh, S., Nath, S., and Ranjan, A. (2021) present a comprehensive review of the progress and challenges of green finance in India. Collaboration among policymakers, financial institutions, and other stakeholders is essential to address these issues. The thorough examination of the current state of green financing in India in the article can greatly benefit those seeking to support sustainable economic growth in the country.

Climate-related disasters, referred to as "green swan events," pose a significant threat to macroeconomic and financial outcomes due to their potential to cause physical and transitional hazards. This is demonstrated by Ghosh et al (2021). The study highlights the necessity of well-thought-out and globally coordinated strategies to reduce the frequency, severity, and macroeconomic impact of green swan events. Additionally, the report emphasizes the need for adaptation methods to mitigate the impact of natural disasters and the vulnerability of Indian coastal states to them. Ultimately, the study suggests that the findings may assist decision-makers in developing appropriate mitigation and green financing policies.

Ghosh et al (2022) suggests that the shift towards achieving net-zero carbon emissions may pose risks to the Indian banking sector. The income, interest coverage ratio, and non-performing assets of other industries could be affected by the transition to green energy, despite the fact that bank credit is largely derived from just three industries directly linked to fossil fuels. These concerns are being monitored by the Reserve Bank of India and addressed in its publications. In addition to India's reliance on fossil fuels, the report also discusses international emission guidelines, laws, and policies. Overall, the banking industry is not expected to be particularly vulnerable to disruptions in industries heavily reliant on fossil fuels.

Prakash (2022) emphasizes the importance of Green GDP in measuring the impact of environmental degradation and climate change on national income accounts, particularly in the post-COVID era. The report discusses the concept of the Environmental Kuznets Curve (EKC) in relation to pollution levels and per capita income, and highlights the adverse effects of economic growth on environmental sustainability. It stresses the need for more environmentally friendly and resource-efficient economic growth, while also acknowledging

the current discourse surrounding "green growth." The process for calculating Green GDP is described, considering the costs of resource depletion, environmental damage, and resource conservation. The report also underscores the significance of regularly monitoring environmental indicators and potential directions for environmental accounting research. Overall, the report indicates that India has made progress towards green growth, but emphasizes the need for additional action and cooperation in areas such as power distribution, electric vehicle charging infrastructure, and financial policy and regulation for adequate funding and green financing.

Jha et al. (2023) utilize a novel modelling technique called multivariate adaptive regression splines (MARS) to examine the impact of climate risk factors on various parameters of agricultural productivity in India. Their findings indicate that precipitation, irrigation water usage, and CO₂ emissions are significant climatic factors affecting agricultural production and productivity in India.

Ghosh et al (2023) analyse input and output inter-linkages between subsectors to estimate the future aggregate and sectoral growth path for the Indian economy. They create a structure to quantify the transition and physical hazards. Reviving the severely damaged economy and transitioning to a greener economy present challenge for the Indian economy. The green economy's scars from the pandemic were less severe, demonstrating its resilience. The interconnectedness of the brown and green industries should be considered when designing policies. A smooth transition to a greener future requires the right incentives and technological transfer. Sectoral interconnectedness may be a binding obstacle to achieving net-zero policies and sustainable growth.

III. Gap in Research

On the basis of available literature, this paper tries to identify research gaps as follows:

- 1) Although the nation has made considerable progress toward fostering sustainable finance, India's green finance industry is still in its nascent stage. The need for more coordinated efforts to promote green finance in India is further highlighted by the low level of interest in green bonds from web searches and the dominance of corporate issuers in this space.

- 2) It also draws attention to the difficulties the Indian green bond market faces, such as the absence of a standardized framework, low investor knowledge, and the requirement for stricter transparency and reporting guidelines.
- 3) One major obstacle to calculating ESG indicators and effect assessments is data availability. However, public policy may be able to help by standardizing and expediting corporate ESG reporting. Closing the gap between green bonds and green finances can be achieved in part by creating a reliable ESG database, rating, and communication system. Reducing asymmetric information and financial intermediation is mostly the responsibility of banks in emerging markets, such as India.
- 4) In the short and long terms, a better business outlook may be linked to the ESG disclosures. To simplify and standardize ESG, a reliable grading system, communication channel, and ESG database are required.
- 5) The launch of a domestically issued sovereign green bond through traditional channels is anticipated to spark additional issuance in the domestic green bond markets from both public and private sector organizations. This effect is likely to be felt practically immediately.
- 6) Increased standardization, openness, and alignment with national and international best practices in policy formulation are essential for the development of India's sustainable finance sector.
- 7) The formulation of policies is essential to establishing the framework required for the expansion of India's sustainable finance sector. In order to build the four action pillars defined in its Sustainable Finance Roadmap—an Indian Taxonomy of sustainable activities, reporting and disclosure, financial policy and regulation, and ecosystem development—the Ministry of Finance (MoF) established the Sustainable Finance Task Force.

It is clear from the above discussion that India is lagging behind with regards to formulating policy on green finance coupled with designing regulatory framework as compared to the Developed countries. However, it is important to note that several measures has already been initiated to continue growth in this sector. For better understand and formulating macro policy purpose, disaggregated level or micro foundation is important to formulate any regulatory policy. Hence, an attempt has been made to study both global and Indian sustainable debt market at the disaggregated level and explore emerging dynamics in this field to suggest public policy and advocacy purpose.

IV. Objectives:

The broad objective in this paper is to assess India's relative position in green bond market with reference to world market on the basis of listing and trading information of sustainable bond across selected global markets. The specific objectives are as follows: (a) to review existing research/report to understand issues and challenges related to Indian green bond market as compared to global green bond market, (b) To understand several classifications of sustainable bond market and categorize them in terms of types of market, currency, coupon rate, duration of bond yield, different exchange markets etc at the disaggregated level and (c) to carry out an assessment for India and depicting its relative position in sustainable bond market.

V. Research Methodology

(A) Sources of data

(A1) For Global Sustainable Bond

A global marketplace for green assets, including climate bonds, sustainability bonds, and green bonds, is the Luxembourg Green Exchange (LGX). In partnership with the Luxembourg Bankers' Association and the Luxembourg Ministry of Finance, the Luxembourg Stock Exchange (LuxSE) introduced it in 2016. The LGX is intended to give green securities issuers a platform to interact with investors who are looking to make sustainable investments. It provides a number of services, such as statistics and analysis on the green bond market in addition to the listing and trading of green securities. By 2024, there were 3,600+ securities listed on the LGX from issuers in more than 50 countries, including 1,870+ labeled bonds. More than €970 billion worth of green bonds were issued through LGX securities and were listed on the LGX. The market for green bonds has grown significantly with the help of the LGX. It has made green bonds more widely known and given issuers and investors a place to interact. Additionally, the LGX has contributed to Luxembourg's reputation as a premier hub for sustainable finance.

(A2) For India's Sustainable Bond

(i) Nifty India Sovereign Green Bond Jan 2028 Index

The Nifty India Sovereign Green Bond Jan 2028 Index is a benchmark index that measures the performance of sovereign green bonds issued by the Government of India. The index, which tracks the performance of government-issued green bonds with a maturity date of January 31, 2028, was introduced on February 27, 2023 (Base Date: January 27, 2023). Bonds that satisfy

specific requirements, such as being issued by the Indian government, maturing on January 31, 2028, and being categorized as green bonds, make up the index. Green bonds are bonds that are issued to fund initiatives that benefit society or the environment.

(ii) Nifty India Sovereign Green Bond Jan 2033 Index

The Nifty India Sovereign Green Bond Jan 2033 Index is a benchmark index that tracks the performance of rupee-denominated sovereign green bonds issued by the Government of India. The index, which has a January 31, 2033 maturity date, was introduced on January 27, 2023 (Base Date: January 27, 2023) with the goal of giving investors a clear and practical means of entering the Indian green bond market.

The index is composed of bonds that meet certain eligibility criteria, including:

- Issuer: The bonds must be issued by the Government of India.
- Currency: The bonds must be denominated in Indian rupees.
- Maturity: The bonds must have a maturity of at least 5 years.
- Green Bond Certification: The bonds must be certified as green bonds by a recognized third-party certifier.

The weight of each bond in the index determines its balance, which is adjusted every six months. The National Stock Exchange of India (NSE) computes and distributes the index.

(iii) SEBI Green Debt Securities

In 2017, the Securities and Exchange Board of India (SEBI) issued a circular that codified the process of issuing green debt securities, also known as "GDS." This circular was incorporated in the SEBI (Issue and Listing of Non-Convertible Securities) Regulations, 2021, also known as the "ILNCS Regulations," and was accompanied by Chapter IX of the Operational Circular on the subject. The regulatory framework for GDS issuance in India has been reviewed following a Consultation Paper on Green and Blue Bonds as a Mode of Sustainable Finance dated August 4, 2022. SEBI approved amendments to the current regulatory framework for GDS issuance at its meeting on December 20, 2022.

The press release from the Board Meeting states that SEBI conducted a review of the regulatory framework for green debt securities in response to the increasing interest in sustainable finance

in India and globally. The aim was to align the existing framework for green debt securities with the updated Green Bond Principles (GBP) recognized by IOSCO. The announcement of the SEBI (ILNCS) Amendment Regulations, 2023 ("Amendment Regulations") will expand the definition of GDS and modify its scope. Chapters IX-A to the current operational circular provide guidance on avoiding green-washing. Additionally, chapters IX to the current operational circular amend chapter IX to require third-party reviewers and improve disclosure obligations. The revised definition of GDS can be applied to any issuances made on or after February 2, 2023, as the Amendment Regulations take immediate effect.

The greenwashing standards outlined in Operational Circular Ch. IX-A apply to all current and planned GDS issuances. The revised version of Operational Circular Ch. IX, effective from February 6, 2023, specifies that the circular's provisions will apply to all green debt securities issued on or after April 1, 2023. This means that only GDS issuances initiated after April 1, 2023 will be subject to the heightened disclosure requirements, while the previous disclosure obligations will still apply to earlier issuances where the proceeds have not been fully utilized. It's important to note that the regulatory framework discussed applies specifically to GDS issuances intended for listing on Indian stock exchanges. General requirements under the Companies Act, 2013, and any special requirements relevant to the jurisdiction where the bonds are proposed to be listed, will apply to bond issuances intended for listing on foreign markets.

(B) Selection of Variables and period of study

Given the available secondary sources of data for both Indian as well as global bond market, following variables are selected to carry out this research.

(B1) For Global bond market

- 1) Four Types of bonds viz. Social Bonds, Green Bonds, Sustainability Linked Bonds, and Sustainable Bonds listed and traded in Luxembourg Green Exchange
- 2) Name of Green bond Exchange: Bourse de Luxembourg; Euro MTF, and Lux SE SOL
- 3) Time duration of bond: Expressed in month estimated from the difference between the listing date and maturity date.
- 4) Bond Coupon – return from bond per year
- 5) Bond Issuing institution by types of bonds
- 6) Top traded Currency by types of bonds

- 7) Timeframe of study: 1999 to 2024

(B2) For Indian Bond Market

- 1) The Nifty India Sovereign Green Bond Jan 2028 Index
- 2) The Nifty India Sovereign Green Bond Jan 2033 Index
- 3) Green Debt securities
- 4) Green bond issuer by type
- 5) Company level bond issue information

VI. Research Findings

(A) Global Sustainable Bond Market

Table 1(a) depicts the four different types of bonds -Social Bonds, Green Bonds, Sustainability Linked Bonds and Sustainable Bonds- traded in 3 different exchanges -Bourse de Luxembourg, Euro MTF and Lux SE SOL- during listing year (retrieved from listing date) 1999 to 2024. Among the 3 Green Exchanges, “Bourse de Luxembourg” Exchange has maximum record of trading bonds (74.84%) as compared to other exchanges. Green bond is the highest trading bond across all 3 exchanges, sustainable bond is the second traded bond in the “Bourse de Luxembourg” Exchange and “Euro MTF” Exchange and while social bond is the second traded bond in the “Lux SE SOL” Exchange.

Table 1(a): Types of bonds listed and traded in the Global market by Exchange

Types of bonds	Bourse de Luxembourg	Euro MTF	Lux SE SOL	Total
Social Bonds	125 (69.44)	30 (16.67)	25 (13.89)	180 (100)
Green Bonds	1486 (74.08)	432 (21.54)	88 (4.39)	2006 (100)
Sustainability Linked Bonds	39 (41.05)	52 (54.74)	4 (4.21)	95 (100)
Sustainable Bonds	507 (84.36)	87 (14.48)	7 (1.16)	601 (100)
Grand Total	2157 (78.84)	601 (20.85)	124 (4.30)	2882 (100)

Source: Luxembourg Green Exchange, several years

Note: Figures in the parenthesis represents percentage value

Table 1(b) depicts that green bond has the highest share among the traded bonds (69.60%), followed by Sustainable bond (20.85%), Social bonds (6.25%) and lastly Sustainability Linked bonds (3.30%).

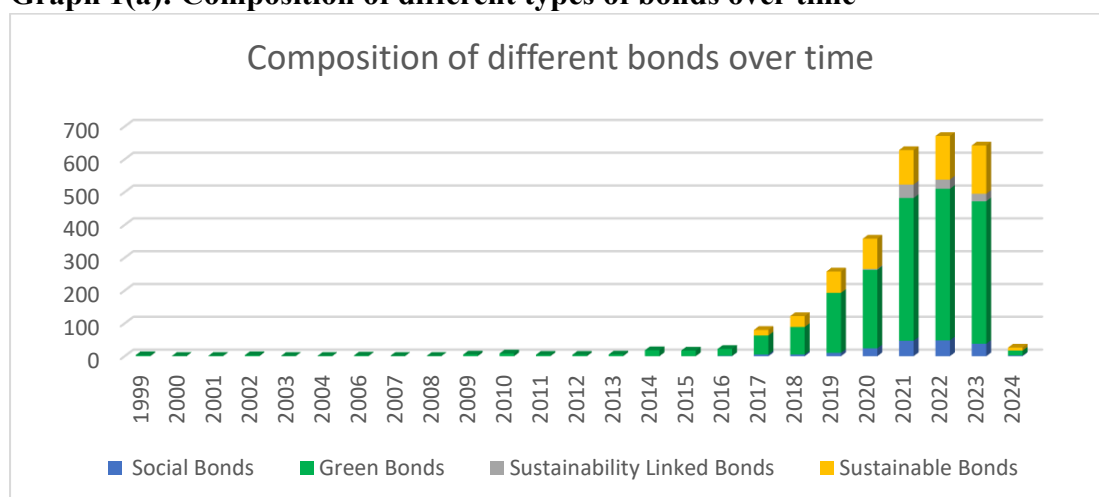
Table 1(b): Exchange wise traded bonds by different types in the Global market

Types of bonds	Bourse de Luxembourg	Euro MTF	Lux SE SOL	Total
Social Bonds	125 (5.80)	30 (4.99)	25 (20.16)	180 (6.25)
Green Bonds	1486 (68.89)	432 (71.88)	88 (70.97)	2006 (69.60)
Sustainability Linked Bonds	39 (1.81)	52 (8.65)	4 (3.23)	95 (3.30)
Sustainable Bonds	507 (23.50)	87 (14.48)	7 (5.65)	601 (20.85)
Grand Total	2157 (100)	601 (100)	124 (100)	2882 (100)

Source: Luxembourg Green Exchange, several years

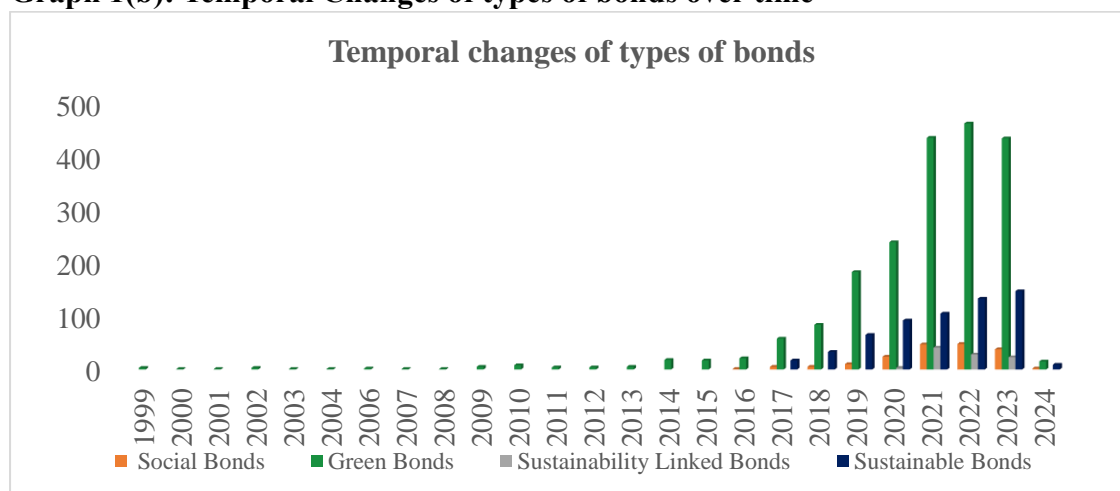
Note: Figures in the parenthesis represents percentage value

Graph 1(a): Composition of different types of bonds over time



Source: Luxembourg Green Exchange, several years

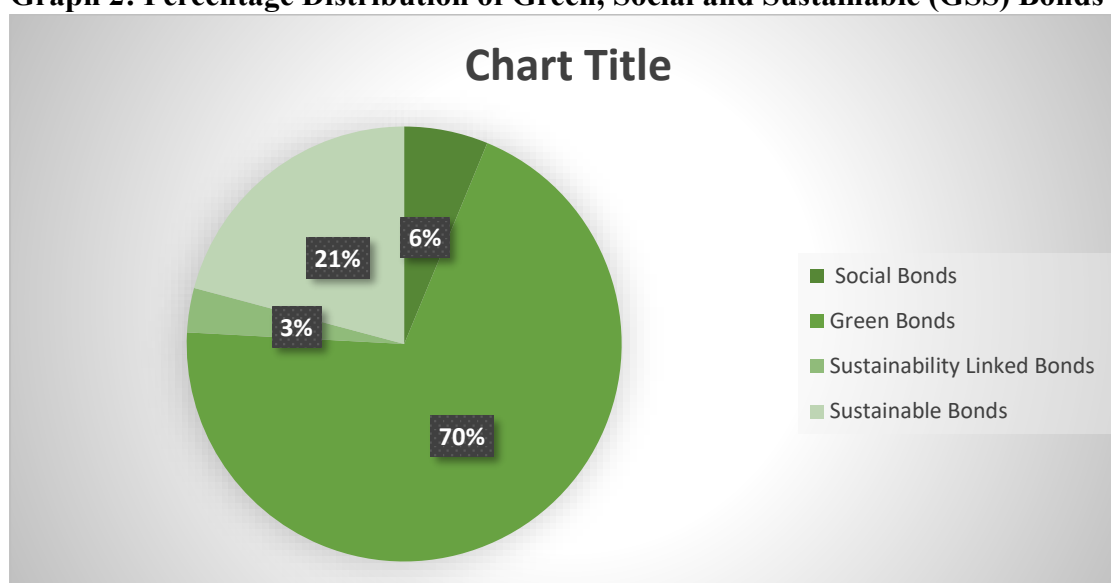
Graph 1(b): Temporal Changes of types of bonds over time



Source: Luxembourg Green Exchange, several years

Graph 1(a) and 1(b) shows that the green bonds introduced in the Luxembourg Green Exchange around 1999, however, green bonds increases its share since 2016 onwards and its share sustained till 2022. Sustainable bonds has started increase its share since 2017 in the global bond market and sustained in trend till 2023, while the social bond has grown relatively at a slower rate during 2017 to 2023. The presence of sustainability linked bond found during the COVID 10 period.

Graph 2: Percentage Distribution of Green, Social and Sustainable (GSS) Bonds



Source: Luxembourg Green Exchange, several years

Graph 2 shows the market share of 4 bonds – green bonds by 70%, followed by Sustainable bonds by 21% totalling 90% of the global market share. The market share for social bonds and sustainability linked bonds are 6% and 3% respectively.

Table 2 represents descriptive statistics of coupon by 4 different types of bonds across 3 different exchanges. The difference between Maximum and Minimum represents Range, Average represents arithmetic mean, stdDev represents standard deviation around mean and coefficient of variation is the ratio of the standard deviation to the mean. The higher the coefficient of variation, the greater the level of dispersion around the mean. The coefficient of variation is highest irrespective of any bond for Bourse de Luxembourg exchange.

Table 2: Descriptive statistics of bond coupon by types of bonds traded in Exchange

Exchange	Social Bonds					
	N	Max	Min	Average	StdDev	Coefficient of Variation
Bourse de Luxembourg	103	0.0688	0.0001	0.0180	0.0169	93.79
Euro MTF	26	0.1070	0.0013	0.0557	0.0294	52.82
LuxSE SOL	20	0.1050	0.0285	0.0700	0.0237	33.86
Exchange	Green Bonds					
	N	Max	Min	Average	StdDev	Coefficient of Variation
Bourse de Luxembourg	1152	0.1350	0.0001	0.0268	0.0218	81.55
Euro MTF	375	0.1070	0.0001	0.0362	0.0222	61.39
LuxSE SOL	72	0.1550	0.0001	0.0487	0.0334	68.45
Exchange	Sustainability Linked Bonds					
	N	Max	Min	Average	StdDev	Coefficient of Variation
Bourse de Luxembourg	38	0.065	0.004	0.026	0.020	75.72
Euro MTF	50	0.090	0.009	0.045	0.020	42.90
LuxSE SOL	4	0.051	0.036	0.043	0.008	18.06
Exchange	Sustainable Bonds					
	N	Max	Min	Average	StdDev	Coefficient of Variation
Bourse de Luxembourg	393	0.1350	0.0001	0.0301	0.0239	79.63
Euro MTF	72	0.0950	0.0001	0.0345	0.0190	55.18
LuxSE SOL	5	0.0835	0.0088	0.0400	0.0297	74.09

Source: Luxembourg Green Exchange, several years

Table 3 shows range of bond duration expressed in months derived from the difference between the maturity date and the listing date. Except Green bond, maximum duration is highest for other 3 bonds in Bourse de Luxembourg Exchange while green bond's maximum duration found in Euro MTF Exchange.

Table 3: Range of bond duration (in months) by types of bonds across Exchanges

Duration (in Months)	Bourse de Luxembourg			Euro MTF			LuxSE SOL		
	N	Max	Min	N	Max	Min	N	Max	Min
Social Bonds	125	720	24	30	359	33	25	52	11
Green Bonds	1486	723	5	432	735	23	88	239	11
Sustainability Linked Bonds	39	240	48	52	144	53	4	116	58
Sustainable Bonds	507	600	9	87	602	35	7	175	35
Grand Total	2157	723	5	601	735	23	124	239	11

Source: Luxembourg Green Exchange, several years

Out of 27 currencies used for bond trading in Bourse de Luxembourg Exchange, Table 4(a) shows top 10 currency used for bond trading. Among them, EUR, USD, SEK are top 3 currency having market share of 53.31%, 14.65% and 5.93% respectively.

Table 4(a): Top 10 currency used by types of bonds trading in Bourse de Luxembourg

Currency	Social Bonds	Green Bonds	Sustainability Linked Bonds	Sustainable Bonds	Total
EUR	100	830	35	185	1150 (53.31)
USD	11	188	2	115	316 (14.65)
SEK	5	109	2	12	128 (5.93)
GBP	2	45	0	18	65 (3.01)
NOK	1	37	0	17	55 (2.55)
CAD	3	33	0	13	49 (2.27)
UYU	0	24	0	23	47 (2.18)
AUD	0	26	0	17	43 (1.99)
BRL	1	23	0	15	39 (1.81)
MXN	0	23	0	13	36 (1.67)
Grand Total	125	1486	39	507	2157 (100)

Source: Luxembourg Green Exchange, several years

Note: Figures in the parenthesis represents percentage value

Out of 18 currencies used for bond trading in Euro MTF Exchange, Table 4(b) shows top 10 currency used for bond trading. Among them, USD, EUR and AUD are top 3 currency having market share of 44.09%, 41.76% and 2.96% respectively.

Out of 42 currencies used for bond trading in LuxSE SOL Exchange, Table 4(c) shows top 10 currency used for bond trading. Among them, EUR, USD and INR are top 3 currency having market share of 29.03%, 25.0% and 11.29% respectively.

Table 4(b): Top 10 currency used by types of bonds trading in Euro MTF

Currency	Social Bonds	Green Bonds	Sustainability Linked Bonds	Sustainable Bonds	Total
USD	17	178	29	41	265 (44.09)
EUR	2	187	23	39	251 (41.76)
AUD	1	13	0	4	18 (2.96)
GBP	0	14	0	1	15 (2.50)
SEK	0	8	0	1	9 (1.50)
CAD	0	8	0	0	8 (1.33)
COP	2	6	0	0	8 (1.33)
NOK	0	6	0	0	6 (0.99)
MXN	1	2	0	1	4 (0.67)
UYU	1	1	0	0	2 (0.33)
Grand Total	30	432	52	87	601 (100)

Source: Luxembourg Green Exchange, several years

Note: Figures in the parenthesis represents percentage value

Table 4(c): Top 10 currency used by types of bonds trading in LuxSE SOL Exchange

Currency	Social Bonds	Green Bonds	Sustainability Linked Bonds	Sustainable Bonds	Total
EUR	2	29	4	1	36 (29.03)
USD	6	24		1	31 (25.0)
INR	6	8			14 (11.29)
CNY	2	8		1	11 (8.87)
GEL	2	3		1	6 (4.84)
AMD		2		2	4 (3.23)
COP	1	1			2 (1.61)
IDR	1	1			2 (1.61)
ZAR	1	1			2 (1.61)
RON	1	1			2 (1.61)
Grand Total	25	88	4	7	124

Source: Luxembourg Green Exchange, several years

Note: Figures in the parenthesis represents percentage value

Table 5 depicts top 10 out of 348 bond issuing institute for different bonds – Social Bonds (62.78%), Green Bonds (41.92%), Sustainability Linked Bonds (29.47%) and Sustainable Bonds (85.69%). NedWaterBank is the highest issuing institute for social bonds, WorldBank is the highest issuing institute for both for Green Bonds and Sustainable Bonds and AEGEA FINANCE is the highest issuing institute for Sustainable Bonds.

Table 5: Bond Issuing Institute by type of bonds from Luxembourg Green Exchange

(A) Bond Issuing Institute	Social Bonds	(B) Bond Issuing Institute	Green Bonds
NedWaterBank	23	WorldBk	437
MicSmalMedEntBd	19	BEI	68
UE	13	DeutscheBank	61
CouncilEurDevBk	12	DBahnFinance	55
EBRD	10	KfWA	42
CentAmBkEcoInte	8	CredAgrCIBFiSol	41
CommunFrDeBelg	8	NedWaterBank	35
CAIFRAFINLOC	7	MicSmalMedEntBd	35
CitigroupGlobMa	7	NatixisStructI	35
AfDB	6	EBRD	32
Sub Total (Top 10 Issuer)	113 (62.78%)	Sub Total (Top 10 Issuer)	841 (41.92%)
Grand Total (348 Issuer)	180 (100%)	Grand Total (348 Issuer)	2006 (100%)

(C) Bond Issuing Institute	Sustainability Linked Bonds	(D) Bond Issuing Institute	Sustainable Bonds
AEGEA FINANCE	4	WorldBk	384
OrbAdvCorp	4	IntDevAss	24
EQT	3	BNGBank	22
HenkelAG&Co	3	SGIssuer	19
Rexel	3	DevelopBkJapan	14
TDCNetAS	3	BEI	13
A2A	2	WorldBk FRN	13
Hera	2	NatlBankCanada	13
KlabinAustria	2	ActionLogeServ	7
RumoLuxembourg	2	GoldmanSFCI	6
Sub Total (Top 10 Issuer)	28 (29.47%)	Sub Total (Top 10 Issuer)	515 (85.69%)
Grand Total (348 Issuer)	95 (100%)	Grand Total (348 Issuer)	601 (100%)

Source: Luxembourg Green Exchange, several years

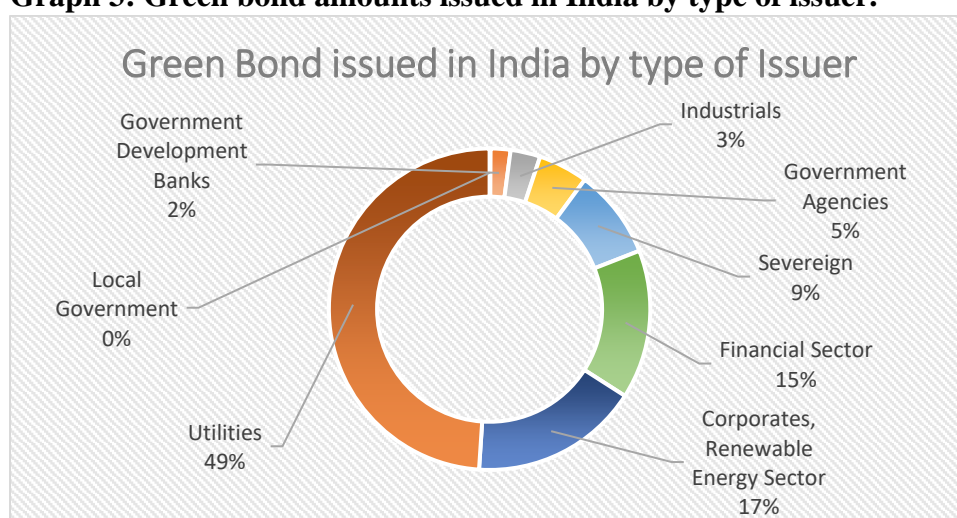
Note: Figures in the parenthesis represents percentage value

(B) Indian Sustainable Bond Market

(B1) Indian GSS bond Market:

According to the India Sustainable Debt State of the Market 2021 report, the year 2021 was a landmark year for thematic debt in India, with significant growth and diversification in the sustainable debt market, particularly in the green, social, and sustainability-linked bond segments. The total size of the Indian GSS market was USD 19.5 billion, with USD 18.3 billion for green bonds, USD 600 million for social bonds, and USD 500 million for sustainability-linked bonds. The report also highlights a growing interest in social and sustainability bonds, with the Indian Social and Sustainability bond market standing at USD 1.1 billion. The preference for issuing in USD continues, with 87% of the cumulative amount issued being USD-denominated. Green, Social, and Sustainability (GSS) debt issuance in India surged by over six-fold (+585%) to reach USD 7.5 billion in 2021, following a decline in 2020, bringing the cumulative volume to USD 19.5 billion. Green-labelled instruments dominated, with USD 6.4 billion in issuance in 2021, representing a 484% year-on-year growth. The report also highlights the emergence of social and sustainability bonds, with the first social bond priced in 2018 and a second in 2021, totalling USD 548 million across two deals. Additionally, a sustainability bond (USD 600 million) and sustainability-linked bonds (USD 1.2 billion) were introduced in 2021. The report provides insights into the market composition by issuer type, with three-quarters of the cumulative labelled bond volume originating from the private sector, led by non-financial corporates, government-backed entities, and financial corporates. The market composition has evolved, with corporates maintaining a consistent presence since 2016.

Graph 3: Green bond amounts issued in India by type of issuer.



Source: World Bank with data from Bloomberg¹ (excerpted from Hussain and Dill, 2023)

¹([https://blogs.worldbank.org/climatechange/india-incorporates-green-bonds-its-climate-finance-strategy#:~:text=Indian%20green%20bond%20issuances%20have,total%20\(see%20Figure%201\).&text=The%20largest%20green%20bond%20issuer,with%20its%20green%20bond%20proceeds.](https://blogs.worldbank.org/climatechange/india-incorporates-green-bonds-its-climate-finance-strategy#:~:text=Indian%20green%20bond%20issuances%20have,total%20(see%20Figure%201).&text=The%20largest%20green%20bond%20issuer,with%20its%20green%20bond%20proceeds.))

Financial institutions and government agencies have used the instrument since 2015. Indian green bond issuances have reached a total of \$21 billion as of February 2023. The private sector was responsible for 84%. The largest green bond issuer in India Greenko Group is funding hydro, solar, and wind power projects in several Indian states with its green bond proceeds. Ghaziabad Nagar Nigam, a civic body in Uttar Pradesh, is the first Indian local government to have issued a green bond (USD 20 million in 2021). Indore Municipal Corporation issued USD 87 million in green bonds in 2023.

Indian issuers have issued a greater amount of green bonds (\$21 billion) than other emerging markets in Asia, excluding China. With the foray of the Government of India into the green bond market, we can look forward to more investments in green and climate-friendly projects and activities that will contribute towards India's transition towards green, resilient, and inclusive development.

(B2) Green Debt Securities

SEBI Green Debt Securities (GDS) are debt instruments issued by companies or governments to finance projects that have positive environmental or climate benefits. These securities are designed to attract investors who are interested in supporting sustainable development and reducing their carbon footprint. The Securities and Exchange Board of India (SEBI) has been promoting the issuance of GDS in India as a way to encourage responsible investment and support the country's transition to a greener economy. SEBI has issued guidelines and regulations for the issuance and listing of GDS, including requirements for disclosure of environmental and social impact information.

Table 6: SEBI Green Debt Statistics as on 30/11/2023

Sr. no	Issuer	Date of Issue	Date of Maturity	Amount (Rs. In Crores)	Coupon (%)	Tenure	ISINs
1	L&T Infrastructure Finance Company Ltd	29/06/2017	18/11/2024	667.00	7.59%	7.39	INE691I07DZ9
2	Tata Cleantech Capital Limited	18/12/2018	18/12/2023	180.00	8.74%	5.00	NE857Q07216
3	Indian Renewable Energy Development Agency Limited	03/01/2019	03/01/2029	275.00	8.51%	10.01	NE202E07260
4	Indian Renewable Energy Development Agency	17/01/2019	17/01/2029	590.00	8.47%	10.01	INE202E07278
5	Ghaziabad Nagar Nigam *	31/03/2021	06/04/2025 06/04/2026 06/04/2027 06/04/2028 06/04/2029 06/04/2030 06/04/2031	150.00	8.10%	4.02 5.02 6.02 7.02 8.02 9.02 10.02	NE0GVF24014 INE0GVF24022 INE0GVF24030 INE0GVF24048 INE0GVF24055 INE0GVF24063 INE0GVF24071
6	Yarrow Infrastructure Private Limited	01/07/2021	01/07/2024	581.00	6.49%	3.00	INE001W07011
7	Priapus Infrastructure Limited	01/07/2021	01/07/2024	16.00	6.49%	3.00	INE964M07011
8	Rattanindia Solar 2 Private Limited	01/07/2021	01/07/2024	227.00	6.49%	3.00	INE935V07012
9	Malwa Solar Power Generation Private Limited	01/07/2021	01/07/2024	197.00	6.49%	3.00	INE999X07014
10	Citra Real Estate Limited	01/07/2021	01/07/2024	19.00	6.49%	3.00	INE969M07010
11	Sepset Constructions Limited	01/07/2021	01/07/2024	197.00	6.49%	3.00	INE961M07017
12	Fermi Solarfarms Private Limited	28/02/2022	28/02/2025	337.00	6.75%	3.00	INE404X07015
13	Clean Sustainable Energy Private Limited	28/02/2022	28/02/2025	334.00	6.75%	3.00	INE00JT07017

14	Avaada Sataramh Private Limited	28/02/2022	28/02/2025	270.00	6.75%	3.00	INE0CSU07013
15	Avaada Solarise Energy Private Limited	28/02/2022	28/02/2025	499.00	6.75%	3.00	INE07H107012
16	Indore Municipal Corporation *	20/02/2023	20/02/2026 20/02/2028 20/02/2030 20/02/2032	244.00	8.15%	3.00 5.00 7.00 9.00	INE00QS24019 INE00QS24043 INE00QS24027 INE00QS24035
				4783.00			

Source: SEBI Green Debt Statistics, as on 30/11/2023

Note : *Also considered under Municipal Bond Issuance Data.

Some key statistics related to SEBI GDS include:

- 1) As of March 2023, there have been a total of 16 GDS issuances in India, raising over ₹10,000 crore (approximately \$1.3 billion).
- 2) The largest GDS issuance to date was by the Indian Renewable Energy Development Agency (IREDA) in 2022, which raised ₹3,000 crore (approximately \$390 million).
- 3) The majority of GDS issuances have been by public sector entities, such as IREDA and the National Bank for Agriculture and Rural Development (NABARD).
- 4) The proceeds from GDS issuances have been used to finance a variety of green projects, including renewable energy, energy efficiency, sustainable agriculture, and water management.
- 5) Overall, the issuance of SEBI GDS has been a positive development for sustainable finance in India and has helped to raise awareness of the importance of environmental and social responsibility in investment decisions.

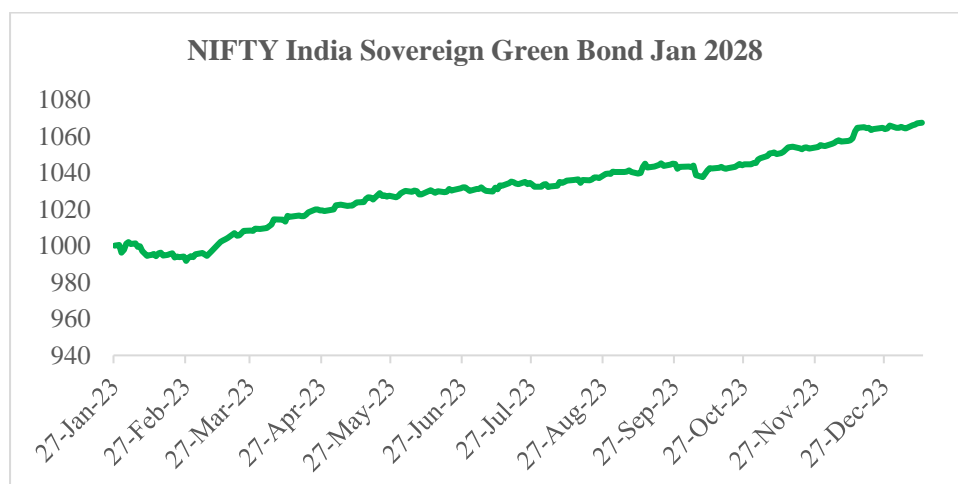
Contribution by Indian companies in Green Bonds

The India Sustainable Debt State of the Market 2021 report highlights as follows:

- 1) Green bonds are the most popular among Indian issuers, with 26 out of 29 issuers having issued at least one green debt instrument since 2015.
- 2) Renewable energy dominates the use of proceeds of the USD 18.3 billion issued via labelled green instruments, with more than USD 16.4 billion (89%) earmarked for renewable energy and related activities.

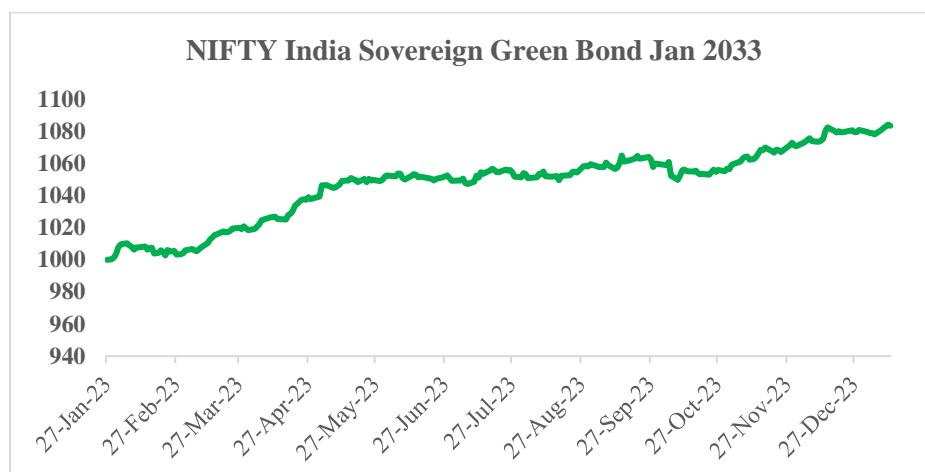
- 3) The largest green bond transaction was the USD 1.35 billion deal from Adani Green Energy, with proceeds earmarked for a hybrid portfolio of solar and wind power projects.
- 4) The market composition by issuer type, with non-financial corporates comprising the largest issuer type by volume (USD 12.6 billion) and number of deals (40 of 77).
- 5) Indian companies viz. Adani Green Energy, Hero Future Energies, ReNew Power, Tata Cleantech Capital, and Azure Power have raised significant amounts of capital through green bonds to finance renewable energy projects and other sustainable initiatives.
- 6) The emergence of sustainability-linked bonds (SLBs) in the Indian market. It notes that Indian issuers are beginning to explore SLBs as a means of raising capital, with three such bonds issued by the end of 2021, totalling USD 1.2 billion.
- 7) Indian Companies viz. Adani Electricity, UltraTech Cement, JSW Steel, National Skill Development Corporation and Foreign Common Development Organization (FCDO) have been involved in issuing green, social, and sustainability (S&S) bonds, as well as innovative debt instruments such as Sustainability-Linked Bonds (SLBs) and skill impact bonds. These companies have set Key Performance Indicators (KPIs) related to reducing their carbon emissions and increasing the share of renewable energy sources, with the bonds being linked to the achievement of these targets.

Graph 4: Daily closing data movement for NIFTY India Sovereign Green Bond Jan 2028



Source: NSE Historical data

The base value is Rs. 1000. As on December 31, 2023, the average yield is 7.21%, with a quarterly return of 2.16% and 3.49 as half yearly return. There is a gradual upward trend found from the figure 4.

Graph 5: Daily closing data movement for NIFTY India Sovereign Green Bond Jan 2028

Source: NSE Historical data

The Nifty India Sovereign Green Bond Jan 2033 Index is a valuable tool for investors who are looking to gain exposure to the Indian green bond market. The index provides a transparent and efficient way to track the performance of rupee-denominated sovereign green bonds issued by the Government of India. The base value is Rs. 1000. As on December 31, 2023, the average yield is 7.31%, with a quarterly return of 1.97%% and 3.04 as half yearly return.

VII. Conclusion

Sustainable debt in India is an important tool for financing sustainable development projects, and the market is expected to continue growing due to supportive government policies and increasing investor demand. The Indian sustainable debt market has grown significantly, dominated by green bonds, but green finance is still at a nascent stage in India. Empirical assessment has carried out to understand India's relative position in green bond market with reference to world market on the basis of listing and trading information of sustainable bond across selected global markets.

The empirical evidence suggest green bond has capture maximum market share followed by sustainable bond in the global market. Luxembourg Green Exchange has maximum variability of bond coupon as well as duration (in months) of bond maturity. EUR, USD widely used currency used for bond trading, while INR has limited presence in the global market. World Bank is the highest issuing institute for both for Green Bonds and Sustainable Bonds in global market.

Indian private sector has 84% market share in Indian sustainable bond market. The leading green bond issuer in India Greenko Group, Ghaziabad Nagar Nigam, Indore Municipal Corporation etc. Indian companies viz. Adani Green Energy, Hero Future Energies, ReNew Power, Tata Cleantech Capital, and Azure Power have raised significant amounts of capital through green bonds to finance renewable energy projects and other sustainable initiatives. The emergence of sustainability-linked bonds (SLBs) in the Indian market. Indian Companies viz. Adani Electricity, UltraTech Cement, JSW Steel, National Skill Development Corporation and Foreign Common Development Organization (FCDO) have been involved in issuing green, social, and sustainability (S&S) bonds, as well as innovative debt instruments such as Sustainability-Linked Bonds (SLBs) and skill impact bonds.

However, there are several challenges faced by the green bond market in India, including the lack of a standardized framework for green bonds, limited investor awareness, and the need for more robust disclosure and reporting standards. Increased standardization, openness, and alignment with national and international best practices in policy formulation are essential for the development of India's sustainable finance sector.

References:

Climate Bonds Initiative (2022). India Sustainable Debt State of the Market 2021

Climate Bonds Initiative (2023). Global Sustainable Debt State of the Market 2022

Climate Bonds Initiative (2023). Sustainable Debt Global State of The Market 2022

Dilip, A. and Kundu, S. (2020). Climate Change: Macroeconomic Impact and Policy Options for Mitigating Risks. RBI Bulletin, 74(4):105-125.

Ghosh, S., Nath, S. and Ranjan, A. (2021). Green Finance in India: Progress and Challenges. RBI Bulletin, 75(1):61-72.

Ghosh, S., Kundu, S., Dilip, A. (2021). Green Swans and their Economic Impact on Indian Coastal States. Reserve Bank of India Occasional Papers, 42(1):1-69.

Ghosh, S., Nath, S., Narayanan, A. and Das, S. (2022). Green Transition Risks to Indian Banks, RBI Bulletin, 76(3):63-74.

Ghosh, S., Gopalakrishnan, P. and Mazumder, D. (2022, 2023). COVID Scarring and Sustainable Recovery Challenges: A Production Function Approach. World KLEMS Conference, 2022 Manchester, UK. Forthcoming EPW, 2023.

Ghosh, S. and Nath, S. (2023). ESG Disclosure and Performance: Cross Country Evidences. RBI Bulletin, 77(2):99-112.

Jha, P., Chinnghaihan, S., Upreti, P., and Handa, A (2023). Machine Learning Approach to Assess Implications of Climate Risk Actors on Agriculture: The Indian Case. (Accepted for publication in the Journal- Climate Risk Management, Elsevier).

Prakash, A., Sarkar, K.K. and Kumar, A. (2022). Estimation of Green GDP for India. RBI Bulletin, 76(10):149-164.

Weblink used:

- 1) <https://vinodkothari.com/2023/02/sebi-revises-framework-for-green-debt-securities/>
- 2) <https://www.luxse.com/discover-lgx>
- 3) <https://www.luxse.com/search?lgxOnly=true>
- 4) <https://www.rbi.org.in/>
- 5) [https://blogs.worldbank.org/climatechange/india-incorporates-green-bonds-its-climate-finance-strategy#:~:text=Indian%20green%20bond%20issuances%20have,total%20\(see%20Figure%201\).&text=The%20largest%20green%20bond%20issuer,with%20its%20green%20bond%20proceeds.](https://blogs.worldbank.org/climatechange/india-incorporates-green-bonds-its-climate-finance-strategy#:~:text=Indian%20green%20bond%20issuances%20have,total%20(see%20Figure%201).&text=The%20largest%20green%20bond%20issuer,with%20its%20green%20bond%20proceeds.)