International Journal for Novel Research in Economics , Finance and Management
www.ijnrefm.com
ISSN:
3048-7722
Volume 4, Issue 2, Mar-Apr-Aug-2026, PP: 01-10

# Impact Of Green Finance On Environment Sustainability

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***Abstract*- Green finance has emerged as a vital mechanism for promoting sustainable development by aligning environmental priorities with economic growth. Rising environmental degradation, climate change and increasing carbon emission largely driven by rapid industrialization and conventional financial system have intensified the need to redirect financial resources towards environmental sustainability activities. This examines the impact of green finance on sustainable growth in India. It analyzes the expansion of green finance instruments, evaluates their contribution to carbon emission reduction and assesses their role in advancing renewable energy and environmentally responsible investments. The findings indicate a steady increase in green bond issuance and sustainable debt instruments in India, reflecting growing investor awareness supportive regulatory measures and proactive policy initiatives. Green bonds account for a significant share of the sustainable debt market primarily financing renewable energy ,clean transportation and sustainable infrastructure projects comparative emission analysis further shows that electric vehicles significantly reduce lifecycle carbon emissions compared to conventional vehicles , thereby supporting India transition towards a low carbon economy .Despite this progress challenges such as the lack of a standardized green taxonomy limited private sector participation investment risks and concern related to greenwashing continue to hinder broader implementation .Lastly strengthening regulatory frameworks enhancing environmental, social and governance disclosure standards and encouraging greater private sector involvement are essential to maximizing the long term environmental and economic benefits of green finance in India .**

***Keywords*-Carbon emissions reduction, Electric vehicles, Environmental, Governance Green finance, green bonds, Sustainable development, Sustainable debt market..**

## I. INTRODUCTION

It explains that green finance refers to financial activities that support environmental protection, renewable energy, and other eco-friendly projects. It highlights that green finance helps in reducing pollution and conserve natural resources, encourages industries and entrepreneurs to adopt cleaner technologies, promoting awareness of organic and green farming, requires coordinated national policies across agriculture, industries and services. Improves environmental quality which does not affect human health and wellbeing. Addresses problems like CO2emissions, climate change, industrial pollution, and agricultural degradation. Supports research & development and technology innovation to reduce pollution but without government action such as taxes, regulations, carbon trading pollution cannot be controlled it also discusses global issues such as globalization, pollution havens, climate change, organic farming demand and the economic role of environmental quality (Khan et al., 2022).

Green economic growth means developing the economy while protecting the environment. It says growth and green technology, green finance is presented as a basic requirement for green growth because importantly in financial sectors such as banks, mutual funds , stock companies must make to promote and fund eco-friendly projects even if they are not immediately get the profits, regime shall supports through subsidies , Highlight that regime have become serious about global warming, co2emission and ecological imbalance, especially after international agreements like the Kyoto protocol this led to increasing focus on green funding, green investments and green technologies .It explains that if green finance is weak , green industries will not grow, consumers will not receive green products, and large – scale environment improvement will fail (Soundarrajan & Vivek, 2016).

Green finance plays a vital activity in achieving sustainable economic development. It explains that economic growth often leads to pollution and environmental damage, so many of the countries started concentrating on clean energy, low carbon development, and ecofriendly technologies. Green finance provides funding for renewable energy, waste management, and environmentally responsible industries. It emphasizes that climate change, global warming, deforestation and rising carbon emissions have pushed governments and financial institutions to shift balance progress with environmental protection by directing funds towards green projects (Divya & Parimalam, n.d.).

## II. STATEMENT OF THE PROBLEM

Finance is essential to create, sustain and destroy. Finance contributes majorly to the growth of countries' economy. Rapid growth and profit motives make citizens degrade the air, water, land. These natural gifts are turned against human society known for global warming, climate change, air pollution water pollution, deforestation, plastic

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pollution, scarcity of water and questioning futuristic survival, commonly known as environmental issues and its ecosystem. And even affect humans' health leading to certain critical stage of lives cause uncurable diseases and death. So, this study gives solutions and paves a path for sustainable industrialization and developmental progress without any environmental issues. provides green economy growth in a country and improves better standard of living with the support of natural resources and helps future generations free from side effects of development and industrialization.

## III. REVIEW OF LITERATURE

Role of global climate funds shown to be essential for supporting climate projects in developing countries acts as a catalyst by funding the risky or non-bankable parts of large projects. This helps attract private investors and scale up climate action. climate risk, geopolitics, and sustainable investing link firms with environment social governance performance are getting to affect during crises example Russia and Ukraine conflict. Extreme climates events increase awareness of climate risk in global markets. renewable energy trade openness and the natural resource use are strongly connected to green finance stimulates renewable energy projects and oil price getting increases and natural resource consumption influence investment decisions (Fu et al., 2023).

Environmental sustainability is needed for long term economic health ensuring environment protection supports both present and future generation link between green finance and economic growth reveals a positive relationship between green finance and overall economic development green finance encourages businesses to adopt eco-friendly processes. it makes innovation in renewable energy and sustainable industries. Needs for strong global and national initiatives, stricter environmental regulation, role of global institutions to support climate actions (Nenavath & Mishra, 2023).

Green finance fosters sustainable agriculture and rural development through initiative like bio-fertilizers, water conversation, forestry, dairy, jute processing, and eco-tourism with institutions such as NABARD playing a pivotal role. However, many green projects are perceived as high-risk due to unfamiliar technology extended payback periods and uncertain returns, discouraging with traditional credit systems further slow momentum. Additionally, markets often underestimate climate and price risks including regulatory cost reputational and litigation concerns add to the barriers. thus, while the potential of green finance in India is immense, overcoming these obstacles is crucial for its effective implementation and long-term success (Keerthi & College, 2013).

Private ESG markets often suffer from greenwashing because of unclear standards, inconsistent ESG ratings, and investors warm – glow or value alignments preference, where the benefits are derived from owing "green" assets rather than achieving real environment improvements. theoretical research differentiates between exclusion based and impact oriented investing with most findings suggesting that value aligned preference and narrow ESG mandates alone are insufficient to meaningfully influence firm behavior ..several scholars emphasize that conventional environment policy instrument ,such as emission taxes and minimum regulatory standards remain more effective in correcting environment externalities while sustainable finance should function as a complementary mechanism rather than a institutional conflicts when financial regulators assume environmental responsibility through ESG taxonomies (Inderst & Opp, 2025).

Global institution including the world bank IMF, UN, and G20 consistently advocate green finance as a key solution to bridging the substantial funding gap for agenda 2030, especially in developing nations despite growing awareness and expansion of green financial tools , progress remains hindered by fragmented policies the absence of a standardized green taxonomy ,weak risk – mitigation frame works inadequate disclosure practice and the limited institutional capacity. In India green finance is largely government led with banks and public institutions dominating while private sector involvement is constrained by high perceived risk extended gestation momentum by disrupting supply chains reducing energy demand and diverting public expenditure towards emergency opportunities are evident in green recovery initiatives digital financial platforms the growing competitiveness of renewable energy and heighted ESG awareness among investors (Mishra, 2022).

Organizations for economic co-operation and development and price water house coopers describe green finance as financial mechanisms that stimulate economic growth while reducing environmental risks enhancing energy efficiency and supporting environmentally responsible investment. Further argue that green finance should be recognized as a distinct category of financial services shaping lending, investment and risk management decisions with sustainability outcomes. Scholars also highlight the role of specific green financial instrument. A strong connection between green finance and social security observes that green finance fosters employment generation poverty reduction, improved public health and social equity by advancing green industries and energy efficient infrastructure. Nonetheless, persistent challenges, including weak regulatory frameworks, a shortage of skilled professionals, limited investor awareness, and inadequate state support, especially in developing countries (Cheberyako et al., 2021).

Financial innovation accelerates renewable energy adoption and the expansion of sustainable infrastructure.it

reveals that climate induced economic losses could be substantial unless nations adopt climate resilient financial strategies these findings reinforce the importance of green finance as a policy instrument to achieve Paris agreement commitments and national climate objectives (Rongcai et al., n.d.).

Regulators such as RBI and SEBI have introduced guidelines and emphasized climate risk, but stronger coordination clearer standards and better disclosures are needed. Barrier includes high project risk and limited expertise, opportunities rise in India renewable energy targets, digital finance and growing ESG investment interest. studies show green bonds boost investor confidence and capital for clean infrastructure though market remains nascent with challenges like low awareness and regulatory gaps (Pasupuleti et al., 2025).

Green finance functions as a comprehensive economic tool rather than merely an environmental initiative as it integrates financial decision making with ecological responsibility.it plays a vital role in environmental and financial risks. It helps mitigate climate changes, pollution and resource depletion by supporting low corban and energy efficient projects. Green finance is especially crucial for developing countries at the grassroots level (Personal & Archive, 2013).
Green finance is evolving from a policy – driven concept into a market -driven necessity. The main bottleneck is not lack of green projects but lack of financial architecture. Developing economies like India face a structural challenge where short-term financial priorities conflict with long term sustainable goals makes private sector participation critical. Grassroots level green finance acts as a bridge between macro sustainability goals and micro economic welfare (Charles & Philip, n.d.).

Banks, institutional investors, international financial institutions reserve banks and regulators as key actors in driving green finance. Persistent challenges such as unclear definitions of green information asymmetry, short, medium -term investment horizons, and weak cooperation bridges environmental and financial policies restrict private capital flows (Berensmann & Lindenberg, 2016).

Global research on green finance (2011-2023) using a systematic bibliometric review of 978 empirical studies shows that green finance research has grown rapidly after 2020, driven by climate change concern sustainability goals and policy pressure. Literature converges around seven core themes. research is heavily concentrated on China revealing strong leadership but also a geographical research gap in Africa, Latin America, and parts of Europe (Mudalige, 2023).

Green finance alone does not automatically lead to green growth using data from 52 countries (2005-2019),the study finds that green finance has a negative impact on green growth when green finance is effectively combined with green energy use and green production its impact turns positive and significant .the study also demonstrates that Bayesian regression offers deeper insights than traditional by estimating probabilities of positive or negative impacts ,rather than just coefficients (Nguyen et al., 2024).

Green finance is shown not as a luxury of rich countries but as a survival tool for developing countries. countries that contributed the least to climate change are being forced to redesign their entire banking system just to stay afloat. Sustainability is not about slogans; it's about patient structural work. Green finance here feels like an idea and more like a quiet fight against time (Rahman et al., 2022).

Green finance has extended widely rapidly due to global issues about climate change and sustainable nature. shows that companies actively involved in environmental responsible practices can create value not only for shareholders but also for non-financial stakeholders like customers, communities and government. It explains the challenges such as no universal definition of green, inconsistent ESG systems and endogeneity problem. Green finance has potential to support sustainable development, but it is still in its early position and structurally limited (Gilchrist et al., 2021).

## IV. OBJECTIVES OF THE STUDY

This research is carried with the aim

- To examine environmentally friendly investments that helps financial sustainability.
- To examine the sustainable growth of green economy.
- To identify the trends in green finance instruments.
- To analyse the growth of Green Finance on a sectoral manner.
- To suggest measures that strengthen green banking and financial policies.

## V. RESEARCH MEDHODOLOGY

**Research Design-** Descriptive research design is used in this research to elucidate the current status, growth, and trends of green finance instruments such as green bonds, green loans and ESG investments. Analytical research design indicates carbon emission impacts.

**Sampling method and sampling method** - The study uses purposive sampling focus on bonds issuance, sustainable debt, and carbon emissions.

**Data collection method -** The study is based on secondary data collected from the annual reports published on the official concern website. The data will be collected for a

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ISSN:
3048-7722
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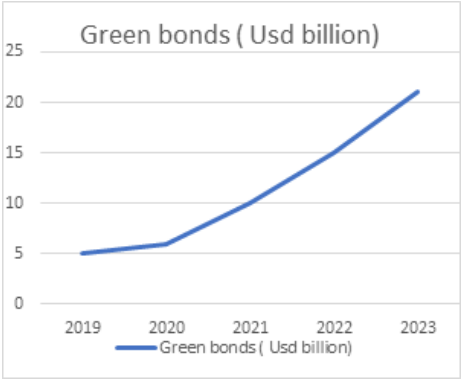
specific period of last 5 years and 7 years to ensure consistency and uniformity.

**Tools used for analysis** –

- Graphical representation to present trends and growth patterns of green finance instrument.
- Trend analysis to examine year wise growth and identify patterns over the study period
- Comparative analysis to compare changes in green finance investments and carbon emission levels

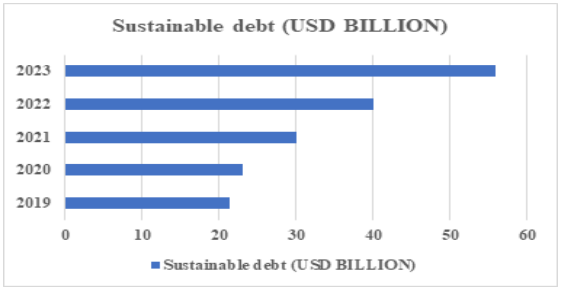
## VI. GRAPH-1 TREND OF GREEN BONDS INSURANCE IN INDIA




**SOURCE : Climate Bonds**

A clear and consistent upward trend in green bond issuance in India from 2019 to 2023, increasing from around USD 5 billion in 2019 to approximately USD 21 billion in 2023 .while growth was moderate between 2019 and 2020,a significant acceleration is observed from 2021 onwards with sharp increases in 2022 and 2023 .this steady rise indicates growing investor confidence ,stronger policy support , and increased focus on sustainability and climate related financing .The trend reflects the expanding role of green bonds as an important financial instrument supporting india sustainable development and transition towards a low carbon economy.

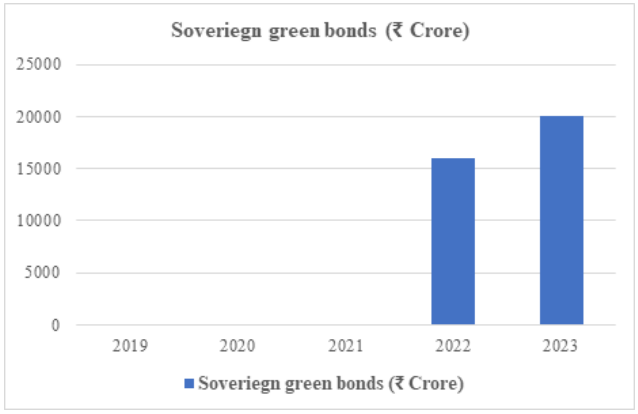
## VII. GRAPH-2 CUMULATIVE SUSTAINABLE DEBT MARKET (USD BILLION)




SOURCE : climate bonds

A steady and significant increase in India cumulative sustainable debt market from 2019 to 2023. The total sustainable debt rose consistently from around USD 20-22 billion in 2023with noticeable acceleration after 2021.the sharp rise between 2021 and 2023indicates growing investor participation ,expansion of green and sustainable financial instruments and stronger policy support for climate related financing .the continuous upward trend reflects the increasing importance of sustainable debt in funding renewable energy ,infrastructure and environmental projects ,shows rapid development and strengthening of India sustainable finance market

## VIII. GRAPH-3 SOVEREIGN GREEN BOND INSURANCE (₹ CRORE)




SOURCE : financial express

Sovereign green bond issuance in India began in 2022 and increased significantly in 2023. The issuance rose from around rupees 15000crore in 2022 to approximately rupees 19000-20000 crore in 2023,indicating strong growth within a short period .The absence of data before 2022 suggests that sovereign green bonds are a recent initiative by the government of India the sharp increase in 2023 reflects rising government commitments towards financing climate friendly projects ,strengthening sustainable infrastructure and promoting low carbon economic development overall, the trend shows growing policy support and increasing importance of sovereign green bonds in India sustainable finance frameworks

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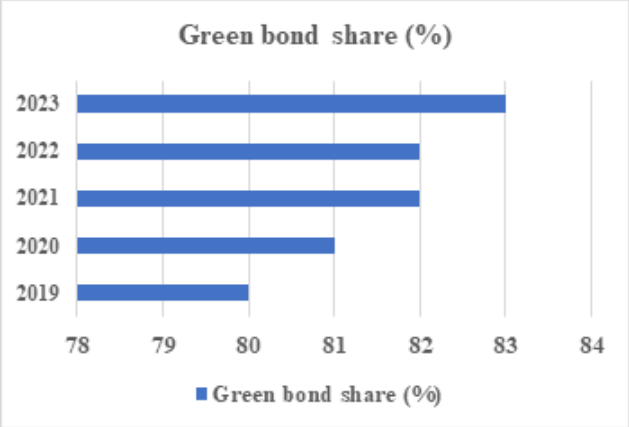
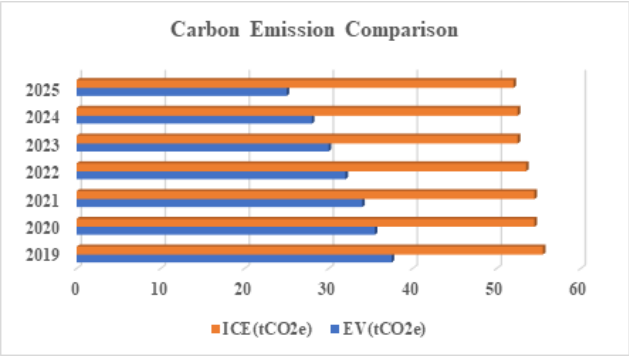
## IX. GRAPH-4 SHARE OF GREEN BONDS IN TOTAL SUSTAINABLE DEBT




SOURCE : climate bonds

A gradual increase in the share of green bonds in total sustainability debt from 2019 to2023.The percentage rose from around 80% in 2019 to approximately 83% in 2023, with steady growth each year and noticeable improvement after 2020.This indicates that green bonds constitute a dominant and expanding portion of India sustainable debt market .The consistent rise reflects increasing investor preference stronger policy supports and growing emphasis on environmental focused financing .overall the trend shows the strengthening role of green bonds as the primary instrument within the sustainable debt framework in India

## X. GRAPH-5 GLOBAL AVERAGE LIFECYCLE EMISSIONS (tCO2e per vehicle)




SOURCE: (IEA)international energy agency, international energy agency, international council on clean transportation

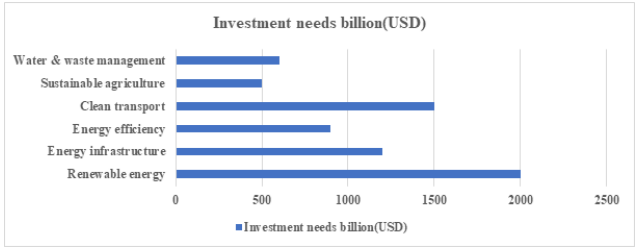
A comparison of global average lifecycle carbon emissions between internal combustion engine (ICE) from 2019 to2025.Throughout the period, EVs consistently produce significantly lower lifecycle emission compared to ICE vehicle. while ICE vehicle emission remain relatively high and stable EV emission show a gradual decline over the years indicating improvements in battery technology and cleaner electricity generation. The consistent emission gap demonstrates that EV are environmental more sustainable than conventional vehicle, overall, the trend shows the crucial role of electric vehicles in reducing carbon emissions and supporting global climate change mitigation efforts

## XI. GRAPH-6 INDIA SPECIFIC LIFECYCLE EMISSION (tCO2e per vehicle)


Sources: ICCT study, central electricity authority, NITI aayog EV

A comparison between electric vehicle (EV) and internal combustion engine (ICE) vehicle from 2019 to2025.the data indicates that lifecycle emission of EV decrease over the years dropping from 45 $tCO_2e$ in 2019 to around 18 $tCO_2e$ in 2025.this steady decline suggests improvement in India electricity generation mix increased use of renewable energy advancements in battery technology and more efficient manufacturing processes in contrast ICE vehicle emission shows only a slight reduction decreasing from approximately 62 $tCO_2e$ in 2019 to about 54 $tCO_2e$ in 2025.the relatively small decline reflects continued dependence on fossil fuels and limited improvements in fuel efficiency the gap between EV and ICE emission widens considerably and by 2025 EV emissions are nearly three times lower than the ICE vehicles ,graph clearly demonstrates that EV became increasingly environmentally sustainable compared to conventional ICE vehicles in the Indian context

## XII. GRAPH-7 SUSTAINABLE FINANCE NEEDS BY SECTOR



Sources: international energy agency, organisation for economic co-operation and development

"Sustainable Finance Needs by Sector" presents the estimated investment requirements (in billion USD) across major sectors. It clearly shows that renewable energy requires the highest level of investment, at around USD 2000 billion, indicating that the global transition to clean energy sources is the top priority in sustainable development. This reflects the urgent need to reduce carbon emissions and shift from fossil fuels to solar, wind, and other renewable sources. The second highest investment need is in clean transport (approximately USD 1500 billion), highlighting the importance of electric vehicles, public transport systems, and low-carbon mobility solutions in achieving climate goals. Energy infrastructure follows with nearly USD 1200 billion, emphasizing the need to modernize grids and support renewable integration. Energy efficiency requires about USD 900 billion, showing significant focus on reducing energy consumption in industries and buildings. In comparison, water & waste management (around USD 700 billion) and sustainable agriculture (around USD 600 billion) require relatively lower but still substantial investments. Overall, the graph indicates that the energy sector (renewable energy, infrastructure, and efficiency) dominates sustainable finance needs, suggesting that achieving environmental sustainability largely depends on transforming the energy system.

## XIII. CONCLUSION

Green finance has emerged as a crucial mechanism for balancing economic growth with environmental sustainability. The study shows that traditional growth models driven by profit motive have significantly contributed to environmental degradation, including climate change and pollution resource depletion. The graphical analysis clearly shows the steady growth of green bonds, sustainable debt instruments, and sovereign bond issuance in India between 2019 and 2023.The increasing share of green bonds in the total sustainable debt market reflects growing investor confidence and stronger policy support. Regulatory initiatives by institutions such as RBI and SEBI have strengthened the green finance ecosystem though coordination and standardization are still required. The comparative lifecycle emission analysis between electric vehicles and internal combustion engines vehicle confirms that EV significantly reduce carbon emissions, especially in India. Overall study highlights key challenges in green finance, including high project risks, lack of a unified taxonomy, limited private sector involvement, green washing concerns, and weak disclosure frameworks. Research indicates that green finance alone cannot drive green growth unless combined with renewable energy adoption, strong environmental regulations, and supportive government policies. Green finance is thus a long-term economic strategy crucial for sustainable development. Strengthening green banking, improving regulations, enhancing transparency, and encouraging private participation are essential for India's transition to a low-carbon, climate-resilient economy. Proper implementation can improve environmental quality, raise living standards, and secure sustainability for future generations.

## XIV. LIMITATIONS OF THE STUDY

This research has the following limitations:

- Dependence on secondary data
- Limited time period, which may not reflect long term trends
- Limited coverage of green finance instruments
- External factors not fully controlled like economic, political and global factors

## XV. IMPLICATIONS OF THE STUDY

- Companies investing in renewable energy and low-carbon production can gain long-term competitive advantages.
- Improved environmental quality enhances public health and living standards.
- Green finance supports rural development, organic farming, and sustainable livelihoods.

## XVI. SUGGESTIONS OF THE STUDY

- Creation of a professional green finance body (similar to CA)
- Establishing National Green Audit Apex Authority
- Launching Independent environmental regulator (similar to RBI)
- Institute MBA specialization in green finance.
- Founding National green bank of India

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