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INNOVATIVE GREEN FINANCE PRACTICES FOR SUSTAINABLE INDIAN ECONOMY: A THEMATIC REVIEW

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The concept of Green Finance practices defines that socio-economic inclusion is essential to India's sustainable development. Governments and authorities are concentrating more on global warming and climate change, thus enabling businesses to work in innovative Green Finance practices. The evolution of Green Finance is a deliberate move to achieve the United Nations Sustainable Development Goals (UN SDGs) which promote technological innovations, focus financial support for green projects, and accelerate the greener revolution of India. Therefore, Green Finance practices are being implemented to attain sustainability in the nation. To better understand how Green Innovation and Green Finance practices act as a spark for India's sustainability, this paper aims to present a thematic review of these concepts. This thematic evaluation consists of 77 scholarly publications from the Scopus and Web of Sciences databases, seven themes were found: 1) Green Finance and Innovation in the financial sector, 2) Green Finance for Environmental Protection, 3) Green Finance investments 4) Green Finance practices for Sustainability, 5) Green Finance for Economic Development, 6) Green Finance Policy and 7) Trends and Future directions of Green Finance are all discussed. As a result, this thematic review paper makes a significant addition to exploring inclusive green finance and green innovation, which shows that green finance greatly contributes to green innovation.

Keywords: Green Finance, Innovation, Economic Development, Sustainability.

1. Introduction

The Indian economy urgently has to undergo a green transformation due to the discrepancies between natural resource availability, environmental protection, and economic development of the country. A particular approach to advance green development in the context of green economic restructuring is definitely through the implementation of green finance. The Green Finance Initiative works to increase the amount of money that the public, private, and nonprofit sectors can access through financial institutions, investment funds, insurance, and microcredit to achieve sustainable development goals. India has achieved its green finance development, which prominently leads to the sustainability of the nation, contrary to the United Kingdom, the United States of America, Germany, France, and other developed nations where green finance mostly depends on the development of emerging innovative trends Huang et al (2021). To tackle climate change, inclusive use of green money supports sustainable economic transformation and generates green innovation Irfan et al (2022). The Indian government demands an inclusive green technology revolution that entails a thorough green

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transformation of the economy and society to achieve the United Nations Sustainable Development Goals (UN SDGs) by 2030. (Yu et al, 2021) Due to the stagnant adoption level of climate change, now businesses focus their innovative research work on their environmental performance and financial performance in their operations to meet conventional innovation and green innovation. By inspiring nations like China, Japan, and the European Union to adopt net zero aims and set carbon neutrality goals, the statement adopted from the Paris Agreement (2015) was a remarkable success. To achieve net zero emissions, every developing nation must pledge to cut emissions almost completely, with any leftover emissions that are harmful being reabsorbed with little negative effects on the environment. To address the aim of the Paris Agreement, Lin et al (2022), implementing green finance practices in society is crucial which also promotes allocating green investment funds to technologically advanced initiatives. It leads to the degradation of the environment and shifts attention to the sustainability of the nation. It is predicted that five to seven trillion dollars in funding for green innovations are needed annually for all economic segments to meet the Sustainable Development Goals (UN SDGs). Financial instruments concentrate mainly on reducing pollution or greenhouse gas emissions while additionally improving the economy through green bonds, green banks, and green investment funds.

The linkage between environmental protection and the financial sector is gradually coming to light as a result of growing environmental consciousness and the stringent enforcement of environmental regulations. Wang et al (2021), Green finance considers environmental protection as a far-reaching starting point for green investment in projects and financing decisions, serving as a link between the financial and environmental sectors. Lin et al (2022) state green finance directs social resources while taking into account all possible environmental dangers. This means that money from polluting sectors is taken out and more money is made accessible to green projects, green businesses, or green industries. Ibrahim et al (2022), to diversify investment risks related to the environment, accomplish the goal of proactively managing environmental risks, and advance sustainable social and economic growth, green finance also depends on diverse capital markets. The majority of studies were conducted on the development of green finance policy and its evolution. Green innovation leverages technological advancement to produce new goods, services, processes, and market solutions that limit the use of natural resources, mitigate ecological harm, and improve the effectiveness of resource allocation. As a result, it provides the impetus behind the realization of and support for sustainable economic growth routes. The World Intellectual Property Organization (WIPO) has issued its 2020 Global Innovation Index, which indicates that innovation is primarily heading eastward. Green financing, therefore, can be crucial in quickening this shift and establishing the prerequisites for ensuring fair competition between conventional and green economies.

A World Bank analysis states that by 2040, there might be a US$1.6 trillion investment potential in energy-efficient, alternative, and creative technology for maintaining temperature in places. Companies in the private sector are funding green initiatives because they perceive the possibility of long-term benefits and favorable effects on the environment. Green, yellow (solar), and blue (marine) bonds are among the Green Social, Sustainability, and Sustainability-linked (GSSS) bonds that are progressively becoming more and more popular. As of January 2023, GSSS-linked debt instruments represented US$20 billion in the Indian debt market, according to research published by Fitch Ratings.

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2. Theoretical Mechanisms and Research Questions

In the Indian economy, green finance is becoming a vital instrument for achieving net zero emissions. Sustainable growth requires that environmental factors be considered while making financial decisions. The transition of India's economy toward a greener one is being driven by programs like carbon pricing, green bonds, and sustainable investment techniques. Green finance is becoming more recognized as playing a critical part in India's shift to a net zero economy (Jiakui et al, 2023), as sustainability becomes an agenda item for national, cross-policy, and sector-wide initiatives. However, green finance as an idea is still developing. Thus far, it has manifested itself in various ways such as bonds, equity investments, and loans. The transmission channel through which green finance influences energy-environmental performance is green technology innovation. Feng et al (2022), the impact mechanism test demonstrates that scale efficiency is not impacted by digital banking services; rather, it affects pure technical efficiency. Moreover, this research comes upon the areas with minimally evolved credit and capital markets, green finance has a stronger stimulant effect on energy-environmental performance.

2.1 Innovative Technologies in Green Finance:

Globally, technological innovation has been a major factor in advancing the use of green finance. In India, to achieve sustainable development and mitigate climate change, green finance is critical, and technology innovation has been instrumental in making it more inexpensive, accessible, and sustainable. Habiba et al (2022) demonstrate new financial instruments like green bonds, green loans, and green funds have been developed because of innovation taking place in the role of financial technology, giving investors several possibilities for funding environmentally friendly projects to the economy. These financial tools aim to lessen climate change, encourage sustainable growth, and cut carbon emissions (Chen et al, 2021). They provide investors with a great opportunity to fund ecologically conscious businesses and projects.

In the context of green finance, the convergence of technologies like blockchain, artificial intelligence, and the Internet of Things is especially fascinating because measurement and disclosure are critical to the emergence of new sustainability-linked products and the growth of carbon trading markets. Xiong et al (2023) through the removal of financial barriers and the promotion of green technological innovation, the growth of green finance indirectly contributes to a reduction in carbon emissions. To enhance the impact of green finance on reducing carbon emissions, we ought to provide additional backing for its growth, lessen financial barriers for eco-friendly and energy-efficient businesses, and promote the advancement of green and innovative technology research and development. Every nation's economy has expanded quickly since the Industrial Revolution (Chen 2021). However, growing environmental issues brought on by economic development, like sea level rise and global warming, have put human health and social advancement in grave danger. In light of this, the developed nations that had advanced through the stages of industrialization actively engaged in financial innovation to lower environmental pollution.

2.2 Growth of Green Finance:

Presently the effects of climate change are becoming more apparent and faster to occur, and

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environmental sustainability is quickly rising in importance for enterprises, governments, and consumers. A larger wave of sustainable finance includes the green finance sector's explosive rise. Bhattacharyya et al (2022) however, it is challenging to estimate the size of the green finance business due to the absence of consistent definitions, taxonomies, or trustworthy statistics. Green Finance is tied to companies' overall sustainability aims, and sustainability-linked bonds because they can be used for broad corporate reasons rather than only for initiatives that would help the environment or the climate. The Indian government's environmental regulations and financial oversight can strengthen the role that green finance plays in advancing energy-environmental performance. According to Habiba et al (2022), India should speed up the financial market's digitization to take advantage of its potential to reduce emissions and save energy. According to Wei et al. (2015), financial development has a significant impact on climate change and energy. Yu et al (2021) found green finance establishes the scale of the national economy and provides essential investments for economic growth. The financial industry, however, also contributes vital funding for innovation, which helps to advance the creation of innovative energy and emission-reduction solutions.

The results of this study will act as a roadmap for upcoming green finance research projects related to green innovation practices. Taking into account the goals of our investigation, we developed the following research questions:

Q1: From what theoretical approach has the research of environmental upgrading and green finance practices been carried out?

Q2: What role does innovation in green finance play in environmental improvement?

Q3: How do green investments contribute to the funding of green innovation?

Q4: How do green projects promote sustainable development in India?

3. Methodology

This study examined the themes and future needs of green finance using a scoping review methodology. The procedures for data retrieval, extraction, and synthesis conclude this section.

3.1 Data Selection Process

To identify and select related papers, the study follows a two-stage procedure that includes an initial search and paper selection. This two-stage search process consists of an initial search and the selection and approval of relevant articles. This is explained theoretically in the following way.

3.2 Data Collection

Papers for the thematic review were mostly retrieved from the databases of Scopus, Web of Science, and Google Scholar. Both carry out comparable activities for searching the literature, but because Scopus offers a wide selection of highly recommended sources, it is more user-friendly and frequently utilized in literature surveys. Debrah et al. (2022) found that the most significant phase after choosing the database was selecting the keywords. The study decided on the keywords using definitions from previous studies. Even though this study's focus was on these keywords, it was crucial to cover all the keywords in one study.

3.3 Data Extraction

The collected information that was extracted included the title, author names, journal information, year,

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purpose, goals, variables, and procedures. The results are synthesized descriptively through a complete evaluation of the study.

3.4 Data Synthesis

The scope of "Innovative Green Finance Practices for Sustainable Development" is outlined in this review methodology by concentrating on a few chosen reviewed studies and looking at significant themes and keywords. Promising domains for further investigation were also determined and examined. In addition, the distinctions between academic and grey literature were noted and assessed to provide directions for future studies and research about innovations in green finance practices.

4. Results and Discussion

4.1 Publication Trend Analysis

The number of publications for the sample period spanning 2019 to 2023 is shown in Figure 1. The current research on "Innovative Green Finance Practices for Sustainable Development" which is widely accessible and published within the selected time frame has been selected for this study. During this time, this idea also became widely known worldwide. The research discovered a sharp uptick in the green financing trend starting in 2019. Green finance continues to be a hot topic among academics as seen by the continual rise in research; Even though green finance has become quite popular in these years, Hu et al. 2021 state that it is yet unable to fully realize its potential.

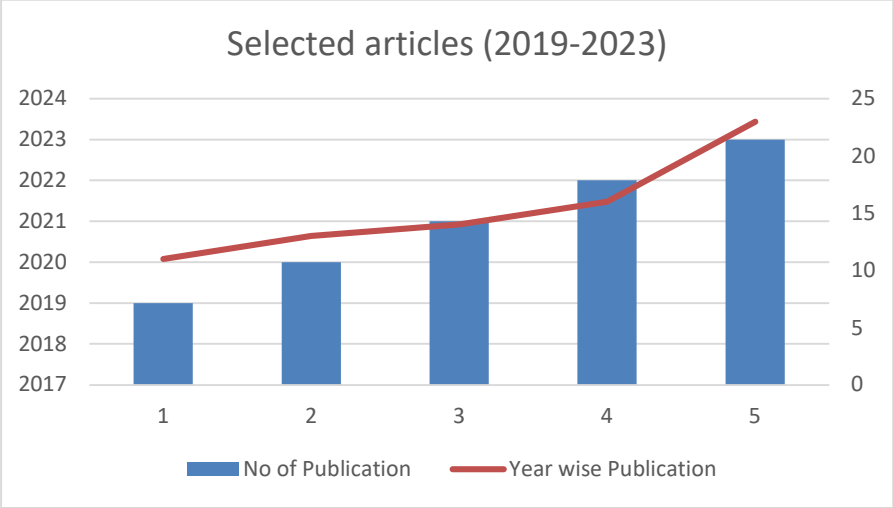


Fig 1: Year-wise Research Articles distribution from 2019 to 2023

4.2 Journal distributions in Green Finance

Notably, interdisciplinary journals like Frontiers in Environmental Science indicate that green finance is an interdisciplinary field that examines the relationships between finance and a range of environmental challenges that pave the way for a sustainable economy. The significance of economic and financial analysis of green finance is demonstrated by the establishment of journals such as Finance Research Letters and Economic Research. A list of the journals that were part of the sample and published more than six pertinent publications is shown in Table 1. Not unexpectedly, publications that specialize in sustainability, renewable energy, and environmental science tend to publish more articles about green finance than any other journal.

Table 1: Top Journals in Green Finance

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No	Title of the Journal	Publisher	Ranking	Country	No. of Publications
1	Journal of Cleaner Production	Elsevier	Q1	United Kingdom	17
2	Sustainability	MDPI	Q2	Switzerland	12
3	Journal of Environment and Development	SAGE Publications	Q1	United States	10
4	Frontiers in Environmental Science	Frontiers	Q1	Switzerland	10
5	Environmental Science and Pollution Research	Springer	Q2	Germany	8
6	Economic Research	Taylor and Francis	Q2	United Kingdom	5
7	Journal of Sustainable Finance and Investment	Taylor and Francis	Q2	United Kingdom	5
8	Finance Research Letters	Elsevier	Q1	Netherlands	4
9	Environmental Management	Springer	Q2	United States	3
10	Science of the Total Environment	Elsevier	Q1	Netherlands	3

4.3 Citation Analysis

A summary of the most often cited studies on "Innovative Green Finance Practices for Sustainable Development" may be found in Table 2. Citation analysis is crucial for assessing an article's quality and the influence it has on other people's work when they utilize it. Understanding the most well-liked publications on green finance practices can help direct future study efforts. All databases, including Scopus, Google Scholar, and Web of Science, are used to calculate citation numbers. The most cited paper on green financing innovation is by Jiakui et al. (2023). It is followed by articles with 100 citations or more by Lee (2020), Wang et al. (2022), Umair et al. (2023), and Ziolo et al. (2021).

Table 2: Most Cited Journals in Green Finance for Sustainable Development

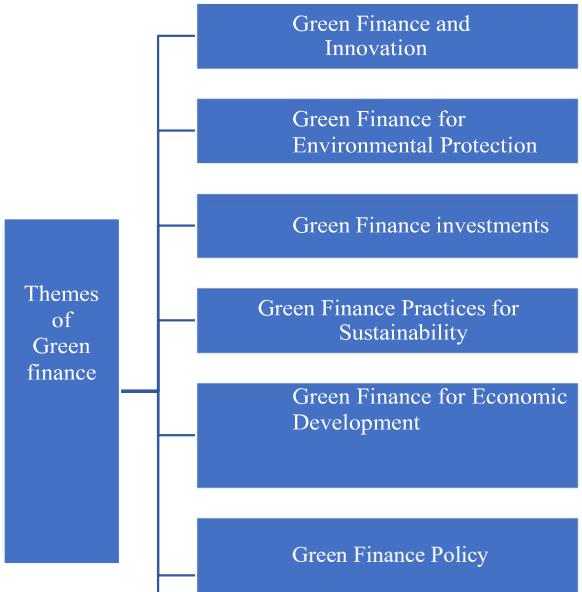
Reference	Title	Citations
Yu et al (2021)	Demand for green finance: Resolving financing constraints on green innovation in China	497
Irfan et al (2022)	Influence mechanism between green finance and green innovation: exploring regional policy intervention effects in	313

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	China	
Sachs et al (2019)	Importance of green finance for achieving sustainable development goals and energy security	308
Zhou et al (2022)	The impact of fintech innovation on green growth in China: Mediating effect of green finance	238
Jiakui et al (2023)	Green technological innovation, green finance, and financial development and their role in green total factor productivity: Empirical insights from China	218
Wang et al (2021)	Research on the impact of green finance on the upgrading of China's regional industrial structure from the perspective of sustainable development	196
Volz et al (2018)	Fostering green finance for sustainable development in Asia	157
Falcone et al (2020)	Environmental regulation and green investments: The role of green finance	156
Lee et al (2020)	Green finance and sustainable development goals: The case of China	130
Wang et al (2022)	Does green finance inspire sustainable development? Evidence from a global perspective	113
Huang et al (2022)	Impacts of green finance on green innovation: A spatial and nonlinear perspective	107

Themes of Green Finance Practices for Sustainable Development

Several topics of green finance for sustainable development have been found in this study, and the selected papers create a potential framework for future research. The descriptions of the topics are shown in Figure 2. Table 3 presents green finance themes together with important contributing papers and frequently used keywords.



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Fig 2: Themes of Green Finance

Table 3: Common Keywords used in previous studies

No	Themes	Sources	Common Keywords
1	Green Finance and Innovation	Jiakui et al 2023; Sadiq et al 2023; Fu et al 2020; Liu et al 2020	Green Finance, Green Innovation, and Innovation Practices.
2	Green Finance for Environmental Protection	Wang et al 2022; Sachs et al 2019; Cen et al 2018; Zhou et al 2022	Green credit, Environmental Protection, and Financial development.
3	Green Finance Investments	Lee 2020; Tolliver et al 2021; Ibrahim et al 2022	Green Investments, Green bonds, and Sustainable Investments
4	Green Finance Practices for Sustainability	Zhang et al 2022; Fu et al 2020; Lin et al 2023	Green credit, Environmental Protection, and Investment regulations.
5	Green Finance for Economic Development	Wang et al 2022; Ziolo et al 2023; Hailiang et al 2023	Green Finance, Credit, Economic Growth, and Sustainability.
6	Green Finance Policy	Irfan et al 2022; Lee et al 2023; Zhang et al 2023	Green Credit Policy, Financial Regulations, and Economic Development.
7	Trends and Future Directions of Green Finance	Zhou et al 2020; Yu et al 2021	Green Finance, Green Innovative Practices, Trends of

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			Green Finance.

5.1 Green Finance and Innovation:

According to Hu et al. 2021, green innovation in broad terms is referred to as the development of green technology to eliminate emissions and pollution while preserving energy. Green innovation supplies businesses a competitive edge and significantly improves the competitiveness of their products (Wang et al. 2021). We concentrate on innovation in high-pollution industries in this literature. Research has indicated that green finance has a beneficial impact on green innovation (Liu et al. 2021). Green finance benefits green innovation more in Non-State-Owned Enterprises than it does in State-owned Businesses. This may be because Non-State-Owned Enterprises are more likely to take on additional environmental protection responsibilities and have close relations with the government (Jiang et al. 2022).

4.4 Green Finance for Environmental Protection:

Initially, companies may leverage advancements in technology to get government subsidies for innovation and environmental protection, which boosts a product's marketing earnings (Wang et al. 2021). Decisions on the environment are positively impacted by a company's ownership. An owned business is more concerned with green innovation and environmental conservation (Liu et al. 2021). Corporate environmental responsibility significantly boosts a company's ability to innovate green technologies by elevating the environmental accountability of manufacturing enterprises (Wang et al. 2021).

5.3 Green Finance Investments:

A worldwide movement toward environmentally conscious and sustainable business methods have led to significant growth in green investments and financing. Green financial markets depend on green bond quality verification since green bonds fund environmentally favorable enterprises. Cui et al (2020) said, to implement green bonds in achieving sustainability objectives, scholars have examined their quality protocols and criteria. The way financial organizations bond up with green investment and financing teams is a significant aspect of research in the field of green finance. Understanding bank behavior and structure is essential to advancing the green finance agenda to promote sustainable investment (Khalatur et al, 2022). The development and impact of green financial instruments is a further research area. Scholars have found that green finance instruments, such as minibonds and green bonds, assess their effectiveness and influence on sustainability and environmental objectives.

5.4 Green Finance Practices for Sustainability:

One of the most important topics addressing the urgent global challenges of environmental sustainability and financial stability is the unification of green finance and innovation. Despite thorough studies (Ullah et al, 2023) on green finance and innovation, some themes and gaps continue to surface, highlighting the subject's complexity. Innovation is encouraged by green funding tools and policies, particularly in the fields of renewable energy and environmental technologies. Saunila et al (2024) found whether green finance promotes sustainable technology and how it influences green innovation has been the subject of numerous studies.

5.5 Green Finance for Economic Development:

One area of increased interest in green finance research is the connection between economic

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development and carbon intensity. Research has been done on how countries can transition to low-carbon economies while still experiencing economic development. The amount that green financing policies increase economic growth and lower carbon emissions has been measured in some studies. Asian nations' efficient use of their natural resources has drawn attention as a means of fostering green economic growth. Scholars have examined how countries might minimize environmental harm while optimizing economic benefits from natural resources. The majority of current research on green finance is concerned with environmental and economic issues. It is necessary to do integrated research integrating social, environmental, and economic sciences. It can offer a comprehensive perspective on all of the possibilities of green finance policy.

5.6 Green Finance Policy:

The green credit policy is an essential tool for green finance that, when credit resources are widely used, can produce a win-win situation for environmental conservation and economic development (Wang et al. 2020). Academics and businesses alike are paying close attention to green credit as a crucial component of environmental legislation (Liu et al., 2021). The connection between green finance and environmental protection was the subject of one component of the examined papers. Green financing has been shown to improve environmental sustainability (Huang and Zhang, 2021), which can add value to the company (Kang et al., 2020). When opposed to private firms, government enterprises typically care about environmental protection.

5.7 Trends and Future Directions of Green Finance:

Green finance growth by sector analysis is prevalent however there may be a knowledge gap about how different sectors could learn from one another to develop more effective sectoral plans. It's critical to analyze the structural obstacles to green financing, but it's also important to comprehend how customers, governments, and organizations must collaborate imperative that governments and organizations collaborate to close this gap. Although institutional and political constraints for green financing have been well studied, cross-national comparisons may highlight shared issues and creative solutions.

5. Conclusion

Green finance offers a way to allocate capital to initiatives and investments that support environmental sustainability, like the creation of clean technologies, renewable energy sources, and sustainable infrastructure. Furthermore, pressure from international initiatives like the Paris Agreement has forced financial institutions and governments to match their plans with climate goals, which has raised interest in studying green finance policies and practices. To sum up, technological innovation has been crucial in advancing green finance practices worldwide, especially in developing countries like India. Through the development of innovations in green finance, People can now more easily obtain financing for environmentally friendly initiatives, which supports social, economic, and sustainable development. Technology innovation has been a major factor in India’s leadership role in promoting green finance. Companies implementing innovative green finance practices enable businesses to reach global markets for eco-friendly goods and services, fostering both economic expansion and sustainable development. A select number of terms that might not fully reflect the study's scope were used in the literature search. Future assessments might make use

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of more terms. However, research in the area of green finance particularly advances sustainability in the sector and improves the environment.

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