

Sustainable Development Using Green Finance and Triple Bottom Line: A Bibliometric Review

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Abstract

A primary framework of finance involves the acquisition and management of financial resources, such as lending, saving, investing, borrowing, budgeting and planning. Green finance is the fastest emerging sustainable finance, utilising public funds, commercial loans and micro-lending to promote sustainability at its most basic level. Green finance and sustainable development are two interconnected concepts that play a critical role in addressing global environmental challenges and promoting long-term economic growth and social well-being. The Triple Bottom Line is a powerful tool to attain sustainable development, as it evaluates the performance of organisations and projects based on three interconnected pillars: economic, social and environmental. The aim of the research article is to examine the effect of green finance on Triple Bottom Line using bibliometric analysis. The study is an outcome of bibliometric analyses of 405 articles retrieved from Scopus from years 1997 to 2022. The findings revealed the positive correlation of green finance with Triple Bottom Line (economic, social and environmental).

Keywords

Governance, green finance, sustainability, Triple Bottom Line

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Introduction

A green finance approach is one that integrates finance and business with an environmental consciousness. It is an individual, regional, producer, investor and financial lender for various participants (Fatemi & Fooladi, 2013). Depending on the participant, green money can take several forms and be motivated by a desire to protect the environment, financial incentives or both (Jeucken, 2010). In comparison to typical financial functioning, the green economy lays a significant emphasis on environmental advantages and provides more attention to the environmental protection industry (Hoshen et al., 2017). World Bank (2021) determined the current scenario for green finance monitoring by examining the strategies for defining and assessing green finance mobilisation and ESG risk management. A survey of financial institutions was used to inform the analysis, which asked them which industries and activities included in the description of green finance. The following significant categories were among the respondents' top priorities: adaptability (conservation, bio system adaptation), carbon sequestration and storage, environmental protection (cogeneration, smart grid), energy efficiency (pollution control, prevention, and treatment), environmental friendly buildings, environmental friendly products and materials, energy from renewable sources (solar, wind, hydro), long-term land management (sustainable agriculture, forestry), transportation (metro/urban rail, electric, hybrid), waste disposal (recycling, waste management), drinking water (water efficiency, wastewater treatment) (Berrou et al., 2019). The green finance definitions share many similarities, such as renewable energy, green buildings and differences, Green bonds, green investments, green insurance, green credit and green infrastructural bonds are some of the major green finance products offered by banks (Akomea-Frimpong et al., 2022) such as nuclear power, noise reduction and carbon capture and storage (Green Finance, 2017). Green finance has the potential to significantly affect the environment and society, but there are many barriers to overcome, including a lack of awareness, inconsistent definitions, a lack of coordination between policymakers, inconsistent policies and a lack of incentives for investors and financial institutions (Ozili, 2022).

This article is based on bibliometric analysis and descriptive framework. Bibliometric analysis has conquered immense increase in usage as it is very effective in handling large volume of scientific data and producing high research impact (Donthu et al., 2021). Bibliometric provides the need for a quantitative investigation in formulating an overview, identifying key themes and for finding directions for future research in the subject domain (Pattnaik et al., 2020a). Bibliometric analysis and a rigorous literature review are performed to answer a series of research questions using specific bibliographic data retrieval process (Pattnaik et al., 2020b).

- RQ1. What is the current trend of research in the area of green finance?
- RQ2. Which are the leading, impactful sources adding to the literature of green finance?
- RQ3. Which are prominent themes prevailing in the area of green finance?

RQ4. What is the essential perspective and history of green finance?

RQ5. How are green finance and Triple Bottom Line related for developing countries?

RQ6. What are the future challenges for green finance in the Indian financial system?

The research questions RQ1, RQ2 and RQ3 are analysed using bibliometric analysis, whereas secondary data are reviewed for analysis of questions RQ4, RQ5 and RQ6.

Purpose of Green Finance

Announcing its ‘Intended Nationally Determined Contribution’ at the 2018 United Nations Climate Summit, India declared it would double its renewable energy production target from 175 GW to 450 GW by 2020. In 2022, India plans to generate 100 GW of solar power, 60 GW of wind power, 10 GW of biomass power and 5 GW of hydropower (National Institution for Transforming India, 2018). The nation aims to reach net zero emissions by 2070. The Asian Development Bank estimated that in 2030 alone, India will have to pay \$7.7 billion in acquisition costs in the energy sector to adapt to climate change (Press Information Bureau, Government of India, 2021).

Figure 1 includes public and private green investments in preparations and capital expenditures. Inclusion of products and services related to the environment (including water management and the protection of biodiversity and landscapes) elimination, minimisation, recompense of damages to the environment and climate (Lindenberg, 2014). The term ‘green investment’ refers to any investment that is environmental friendly.

Recent Drifts

According to the RBI, green finance has a lot of potential in India. In response to ambitious plans to reduce carbon emissions, the government has limited fiscal

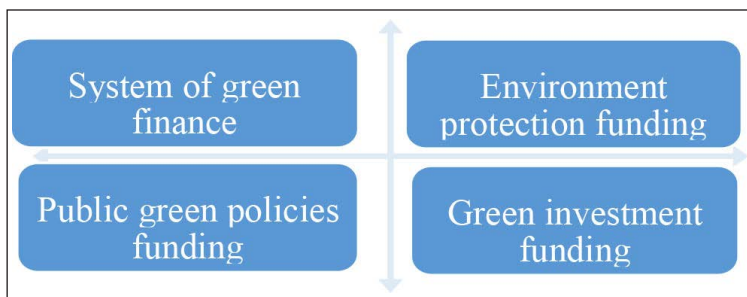


Figure 1. Structure of Green Finance.

Source: Lindenberg (2014).

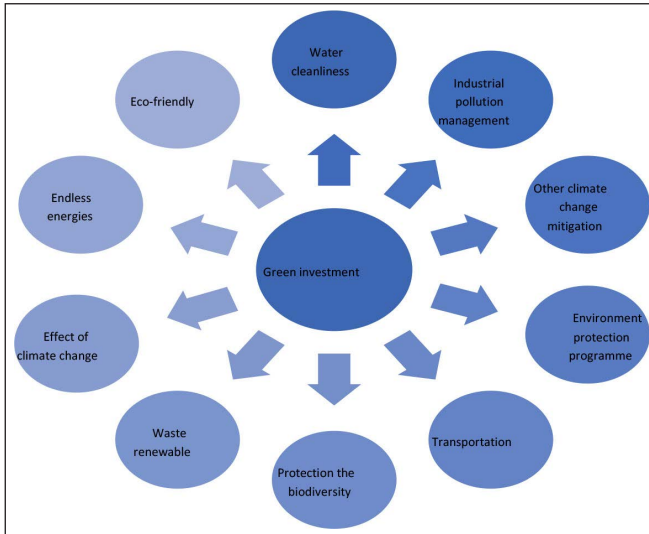


Figure 2. Diversity of Green Finance.

Source: Lindenberg (2014).

capacity to increase investment due to climate change goals. Figure 1 shows the Green Finance encompassing the range of financial tools, policies, and efforts directed at financing eco-friendly ventures and enterprises. It includes green bonds, loans, and sustainable investment funds, all complying with environmental standards and regulations to promote investments in climate-resilient and sustainable economic ventures. The government must take several corrective actions to avoid green finance blockades and develop strong policy measures in order to have its successful implementation (Gerster, 2011). Green finance is confronted with several obstacles, including structural impediments, supporting infrastructural facilities and a lack of clarity in policies and regulations. Green finance is available in India through a variety of channels (Robinson, 2001). Figure 2 shows the diversity of Green Finance including broad spectrum of financial tools, strategies, and methods that underpin environmentally sustainable and climate-resilient endeavors. The diversity defines green bonds, loans, sustainable investment funds, carbon markets, green insurance, and a multitude of policies and regulations geared toward addressing environmental issues and fostering sustainable progress. Few green finance products include green bonds, green insurance and other green finance investments. Indian Renewable Energy Development Agency issued a tax-free bond of ₹1,000 in 2014. In addition, in 2015, Yes Bank issued a 10-year green infrastructure bond. Overall, India was 33% of the way to fulfilling its 175 GW renewable installed power capacity target for 2022. However, the Indian government faces a significant deficit in the current fiscal year, making it harder to fund them (Charles & Philip, 2020).

History of Green Finance in India

India started emphasising green funding in 2007. The RBI published a notification on nonfinancial reporting, sustainable development and corporate social responsibility (CSR). They target the sustainable development is on global warming and climate change. The National Action Plan on Climate Change (NAPCC), which was developed in 2008, focuses on the broad framework of policies for the mitigation of the impacts of climate change. The Climate Change Finance Unit (CCFU), a coordinating agency for India's various green finance groups, was founded in 2011 within the Ministry of Finance. 2012: A significant strategic initiative since that year has been the adoption of sustainability disclosure standards. India started emphasising green funding in 2007. The RBI published a notification on nonfinancial reporting, sustainable development and CSR. The focus of sustainable development is on climate change and global warming. The NAPCC, which was developed in 2008, focuses on the broad framework of policies for minimising the effects of climate change. 2011: Within the Ministry of Finance, the CCFU was established as a coordinating body for India's many green finance organisations. From 2012 onwards, a significant strategic initiative since that year has been the adoption of sustainability disclosure standards (Ghosh, 2015).

There are a number of fiscal and financial incentives in place in India. These incentives are in line with India's goals under the 2015 Paris Agreement, which include reducing its intensity of greenhouse gas emissions by 33% to 35% below 2005 levels by 2030 and generating 40% of its installed electric capacity from non-fossil fuels. The Government of India offers the institutional, residential and social sectors in the majority of states a subsidy of 30% of the price of installing rooftop solar panels. In some category states, the assistance could account for up to 70% of the installation costs. Beneficiaries may also be eligible for a generation-based incentive of two units per generation if annual generation surpasses 1,100–1,500 kWh. In addition, extra power can be sold at a price determined by the government. Again, between 2015 and 2019, the India's government launched two phases of the FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) (Buja et al., 2016). Scheme to enhance credit flow, reduce the upfront cost of all vehicles and create infrastructure (such as charge stations) in order to promote the development and sale of green vehicles. The State Bank of India has developed a 'green auto loans' programme for electric vehicles that gives a 20 basis point lower interest rate and a longer repayment window than conventional car loans in order to offset the high initial cost of such vehicles. The government has also developed a Production-Linked Incentive (PLI) Scheme for the production of high-efficiency modules in the field of renewable energy (Lindenberg, 2014). Through aggressive policy measures, the Reserve Bank has also promoted and supported green finance activities. In 2015, it expanded its 'Priority Sector Lending' (PSL) (Khan & Farooqui, 2021) programme to take into account the tiny renewable energy industry. Families are eligible for loans of up to 10 lakhs for renewable energy investment, while businesses in the renewable energy sector are eligible for loans of up to 30 crores (up from 15 crores

commencing 4 September 2020). India said in September 2019 that it plans to produce 450 GW of renewable energy by 2030 (Kanungo & Gupta, 2021). About 20% of utility-scale electricity in the United States was generated by renewable sources in 2020, with hydropower (7.3%) and wind power making up the majority (8.4%). The fastest-growing source of power in the United States is solar energy, which will account for 3.3% of all generating in 2020 (including distribution). In 2020, the majority of the world's electricity came from hydropower, which accounted for 29% of all renewable energy sources (16.8%). Globally, a record-breaking 256 GW of new renewable energy capacity was built in 2020. More than 17% of all renewable energy utilised in the United States in 2020 was made up of renewable ethanol and biodiesel transportation fuels, a reduction from earlier years due to the COVID-19 epidemic. Modern renewables accounted for 11.2% of the global energy used for transportation, power and heating in 2019 compared with 8.7% a decade earlier. These sources include biomass, geothermal, solar, hydro, wind and biofuels. Renewable energy sources will generate 29% of the world's electricity by the year 2020. The total installed renewable power capacity increased by approximately 10% in 2020, with wind and solar PV accounting for the majority of the capacity additions (Da Rosa & Ordóñez, 2021). The G20 and other nations have made tremendous progress in securing the billions of dollars in public and private resources necessary for sustainable development and climate action, according to new UN Environment data released on 14 July 2017. As much as 10 times that amount would be required internationally in the coming years, according to studies from the United Nations Conference on Trade and Development, the investment required to deliver sustainable development to developing nations is currently short of \$2.5 trillion per year. The majority of this investment must come from private sources (Takamatsu et al., 2021).

The article is structured into eight sections, where 'Introduction' defined the introduction, 'Review of Literature' briefs a literature review followed by research methods and study design in 'Research Methods and Study Design', the results and discussion in 'Results and Discussion', the effect in 'Effect of Green Finance on Triple Bottom Line', the conclusion in 'Conclusion', future challenges in 'Future Challenges of Green Finance in Indian Financial System' and limitation of the study in 'Limitation of this Study'.

Review of Literature

Keerthi (2013) examined the latest trend and future potential of green finance in the rising market of India. This article discussed certain green projects and the need of implementing green finance in India. Vijai (2018) conducted the study to find out how knowledgeable clients think about green finance and green finance products. In

addition, this study focused on private sector banks' green finance initiatives. According to the findings, clients were aware of the green financing initiatives being programmed. Hoshen (2017), the researcher, investigated the allocation of green finance in various green projects in Bangladesh's banks and non-banking sector in this article. The study looked at current green finance efforts and their disbursement of direct and indirect funds in green finance. It also looked into Bangladesh Bank's green product refinance scheme. Reddy (2018) examined the importance, needs and requirements of green finance in India. In addition, this report focused on the impact of green financing on the Indian economy and government activities in this area. Sarangi (2018) in the report made it abundantly evident that there are many issues with India's renewable energy financing. Short loan periods, high capital costs and a dearth of sufficient debt financing are only a few of the traits of India's financial system as a whole that contribute to the challenge. Sectorial contours make it more difficult to raise the necessary finance due to technological peculiarities that demand high capital expenditures and essentially low operational costs. Jha and Bakhshi (2019) investigated the role of green finance in economic growth by directing the flow of funds from the governmental, private and non-profit sectors. This study looked into the various green financing channels for contributions in India and proposed numerous solutions to overcome the barriers to funding green items on the market. Sharma (2010) in the article looked for existing green banking literature where public sector banks and public sector enterprises promote goods, methods and technology that lessen environmental carbon footprints. The top banks from ICICI, HDFC, Executive Private Sector, SBI, PNB and Mumbai Public Sector have been selected (BBE and NSE and 2013–2012 Annual Report). Furthermore, compared to the selection, public banks are more active or pick private sector banks, and eventually become aware of the most current steps done by the Reserve Bank to promote such goods. Sarangi (2018) in this article, the researcher, examines the difficulties in obtaining the 175 GW of renewable energy target by 2022, with a particular emphasis on renewable energy in India. The researcher examines how these issues may affect the green development of the Indian economy by examining the installed capacities of various energy mixes as well as the compound average annual growth rate of India's power generation capacity. The article by Wang et al. (2021) aims to advance green finance research and discussion while clearly addressing policy-related questions about its implications for the energy sector. A description of four prospective green finance-related energy initiatives is also included. This study suggests that future research options include green bonds, government grants and carbon dioxide emissions. It also suggests that Fintech, big data and block chain can be used to further examine these topics. It also makes it easier to interpret green finance and energy policy research in a systematic and thorough way. Banks might improve financial inclusion, add to new finance solutions and help businesses stay afloat. Finally, from the standpoint of policy development, the findings of this study may aid regulators and managers in framing regulations

that address the demands of all stakeholders while also positioning banks to gain a competitive advantage in the banking market.

Research Methods and Study Design

The study is an outcome of bibliometric analyses and a literature review of secondary data from Scopus, research articles, government reports and other publications. Bibliometric work analyse and classify the studies by framing graphical summaries of the previous work (Donthu et al., 2020).

Search Strategy and Data Retrieval Process

Table 1 presents the data retrieval process from Scopus database using the search criteria:

TITLE-ABS-KEY ('Green Finance' OR ' Sustainable Finance') AND PUBYEAR > 2011 AND PUBYEAR < 2023 AND (LIMIT-TO (SUBJAREA, 'ECON') OR LIMIT-TO (SUBJAREA, 'BUSI') OR LIMIT-TO (SUBJAREA, 'MULT')) AND (LIMIT-TO (LANGUAGE, 'English')) AND (LIMIT-TO (DOCTYPE, 'ar') OR LIMIT-TO (DOCTYPE, 're'))

The data were subjected to bibliometric analysis using the R 4.0.3 package programme 'Biblioshiny', an R-based library and 'Bibliometric' web-based interface. Bibliometrics is an open-source software, has the features of flexibility, rapid upgrade and integration with other statistical R package, as it is very useful in an ever-changing science discipline such as Bibliometric (Aria & Cuccurullo, 2017). Unlike other literature review, bibliometric review establishes visualisation for large amount of domain-specific data (Goodell et al., 2021).

Table 1. Bibliographic Data Retrieval Process.

Stage	Filtering Criteria	Eliminated	Accepted
1	Initial search result (on search term)	–	1,629
2	Year filter (2012–2022)	296	1,333
3	Subject filter (economics, econometrics, finance, business, management and accounting, and multidisciplinary)	691	642
4	Language filter (English)	22	620
5	Document type (article, review)	159	461
6	Scimago ranking (Q1, Q2, Q3)	56	405

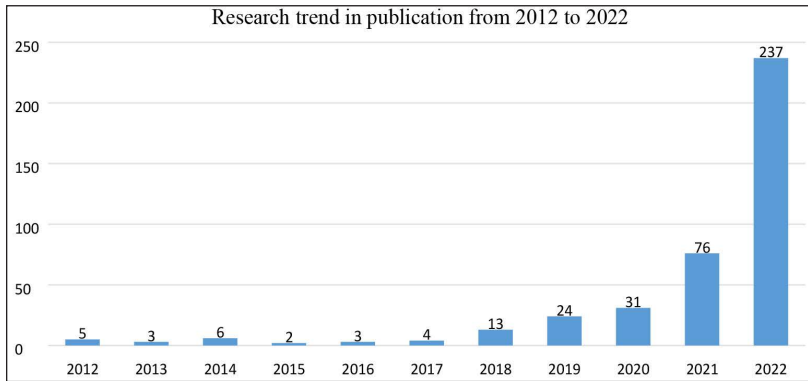


Figure 3. Research Trend in Publication on Green Finance from 2012 to 2022.

Table 2. Top 10 Journals on Green Finance.

Source	Publisher	NP	h index	Cite Score	SNIP	SJR	Country	Rank
<i>Journal of Sustainable Finance and Investment</i>	Taylor and Francis Ltd	45	20	4.5	1.241	0.642	United Kingdom	Q1
<i>Journal of Cleaner Production</i>	Elsevier Ltd	33	232	15.8	2.444	1.921	United Kingdom	Q1
<i>Resource Policy</i>	Energy Economics	22	80	7.6	1.996	1.461	United Kingdom	Q1
<i>Energy Economics</i>	Elsevier	18	168	11.3	2.347	2.549	Netherlands	Q1
<i>Business Strategy and the Environment</i>	John Wiley and Sons Ltd	11	115	11.9	2.289	2.241	United Kingdom	Q1
<i>Economic Research</i>	Taylor and Francis Ltd	11	35	4.9	1.329	0.565	United Kingdom	Q2
<i>Ekonomika Istraživanja</i>								
<i>Ecological Economics</i>	Elsevier	9	220	10.9	2.084	1.778	Netherlands	Q1
<i>Finance Research Letters</i>	Elsevier BV	9	62	9.3	2.53	2.007	Netherlands	Q1
<i>Economic Analysis and Policy</i>	Elsevier BV	9	34	4.7	1.533	0.773	Netherlands	Q1
<i>Global Finance Journal</i>	Elsevier	8	37	4.6	1.605	0.614	Netherlands	Q2

Note: NP: no. of publications in study; SNIP: source normalised impact per article; SJR: scientific journal ranking.

Results and Discussion

Research Trend and Scientific Productivity

Figure 3 shows an inclining research trend in green finance publications from 2012 to 2022. The graph depicts that the majority of the work on green finance is published after the COVID-19 global pandemic. The scientific production of articles in the field is constantly increasing over the last three years with annual growth rate of 16.11%.

The Influence and Impact of Most Influential Journals on Green Finance

Table 2 lists the top 10 journals publishing the content on green finance, the name of publisher, number of papers (NP) of the journal in the study, h index, cite score, SNIP, SJR, country and SC imago ranking of the journal. Journal of Sustainable Finance and Investment stands at the highest list of the contributors to the study

Table 3. Top 10 Authors Contributing to Study on Green Finance.

Author	Affiliated University	NP	h index
Farhad Taghizadeh-Hesary	Tokai University Japan	9	40
Yao Wang	Central University of Finance and Economics China	7	21
Chi-Chuan Lee	Southwestern University of Finance and Economics China	6	28
Yueyan Zhang	Southwest Jiaotong University	6	1
Naoyuki Yoshino	Keio University Japan & Tokyo Metropolitan University	5	22
Dongyang Zhang	Capital University of Economics and Business China	5	21
Ben Caldecott	Oxford University United Kingdom	4	9
Zhonglu Chang	Sichuan Tourism University China	4	7
Paola D'ORAZIO	Ruhr-Universitat Bochum Germany	4	6
Zheng He	School of Economics and Management Shanghai	4	1

with 45 articles, followed by Journal of Cleaner production with 33 articles. The majority of the journals with Q1 ranking are the most influential source contributing to study. Journal of Cleaner Production and Ecological Economics from the list with highest h index 232 and 220 contributes to 19.25% of all the articles under review for the study. The influence and impact of the sources are presented in the forms of h-index, cite score, SNIP and SJR showing the growth in publications (Kuhn, 1970) on green finance by various publishers.

The Most Relevant Authors Contributing to the Study on Green Finance

Table 3 represents the top 10 most contributing authors to the study on green finance. Farhad Taghizadeh-Hesary has the highest number of nine articles and highest value of h-index Yao Wang contributes seven articles, followed by Chi-Chuan Lee and Yueyan Zhang with six articles each. Most of the authors contributing to study belong to China and Japan.

Table 4. Top 10 Documents With Global Total Citations (TC).

Article Title	Author(s)	Year	TC
The way to induce private participation in green finance and investment	Taghizadeh-Hesary F., Yoshino N.	2019	280
How does green finance affect green total factor productivity? Evidence from China	Lee C.-C., Lee C.-C.	2022	217
Corporate green bonds	Flammer C.	2021	200
A bibliometric analysis on green finance: Current status, development, and future directions	Zhang D., Zhang Z., Managi S.	2019	185
The influence of firm size on the ESG score: Corporate sustainability ratings under review	Drempetic S., Klein C., Zwergel B.	2020	159
Sustainable business model archetypes for the banking industry	Yip A.W. H., Bocken N. M. P.	2018	151
Nexus between green finance, non-fossil energy use, and carbon intensity: Empirical evidence from China based on a vector error correction model	Ren X., Shao Q., Zhong R.	2020	134
Oil price shocks, geopolitical risks, and green bond market dynamics	Lee C.-C., Lee C.-C., Li Y.-Y.	2021	108
The role of green finance in reducing CO2 emissions: An empirical analysis	Saeed Meo M., Karim M. Z.A.	2022	101
Influence mechanism between green finance and green innovation: Exploring regional policy intervention effects in China	Irfan M., Razzaq A., Sharif A., Yang X.	2022	92

Table 5. Most Cited Countries.

Country	Total Citation	Average Article Citation
China	2,494	22.3
Italy	433	61.9
UK	367	16.7
Germany	362	13.4
India	326	14.8
Pakistan	201	25.1
France	194	27.7
Malaysia	154	51.3
Australia	143	10.2
Japan	116	16.6

Most Cited Documents

Table 4 represents the most cited article undertaken for the study on green finance with total count and year of publication. Among the highly cited articles, the work of Taghizadeh-Hesary and Yoshino, 'The way to induce private participation in green finance and investment' attains the topmost position with 280 total citations. Mostly the citation is above 100 for top 10 articles, whereas 18.07 is the average citation per document for the articles undertaken for the review.

Most Cited Countries

Table 5 represents the scientific production by the countries on green finance. China holds the topmost position with maximum count of 2,494 publications with 22.30 article citation frequency. The highest publication by the developed nation indicates the increasing trend of research on green finance. India stands on fifth rank with 326 total citations followed by other neighbouring countries.

Relationship Between Keywords

Figure 3 represents the co-occurrence network showing the relationship between keywords constituting the four clusters presenting the thematic analysis of co-citation network (Xu et al., 2018). Cluster 1 consists of 21 keywords, cluster 2 consists of 17 keywords, cluster 3 is formed of 7 keywords and cluster 4 comprises of 5 keywords. The relatedness of the items in the clusters can be explained by the distance between them (Goyal & Kumar, 2020). The co-occurrence network depicts green finance, sustainable development, China, green economy as the most explored keywords for the research. Co-occurrence of authors' specified

keywords identifies the spatial links among the research on green finance (Baker et al., 2021).

Research Interest and Future Research Direction

The thematic map in Figure 4 represents the research interest and future research direction. The map is formed with nine clusters present in various themes. Green finance and sustainable development forms the cluster in basic theme (fourth quadrant) directing the emergence of exploration of the topic.

Effect of Green Finance on Triple Bottom Line

The Committee on Agriculture (2018) has established the ‘2030 Agenda for Sustainable Development’, which endeavours to holistically address developmental challenges in the domains of society, finance and the environment. It seeks to achieve this objective through a harmonised strategy that fosters human progress towards sustainable development. Green finance helps accomplish the economic growth goal of sustainable development by encouraging environmental governance. In our everyday operations, we focus on environmental the protection and treatment of pollution in financial business, as well as promoting society’s long-term growth through the management of social, economic resources. The impact of green finance on the Triple Bottom Line (environment, society, finance) is discussed briefly with supporting explanation.

Impact of Green Finance on Society

In terms of green finance and society, there is a positive correlation (Tang, 2020). The reviewed study states the green finance has a positive impact on society (Fatema et al., 2021). Green financing aids in alleviating poverty, indicates such as creative cities, regional green cities, increase the quality of life, digital governance and improve the standard of living. The Energy Agency, the G20 and the Intergovernmental Panel on Climate Change have released estimates on the total cost of climate change. The necessary financial resources to achieve the various Sustainable Development Goals these have their methodologies. On a macro level, estimates should be based on a bottom-up strategy, Improvement Investors, regulators and other market participants a raised awareness of the impending climate problem (Malerba et al., 2019).

Accordingly, each region’s green finance development index and level of green finance development should be increased. It is necessary to increase financial assets. According to empirical evidence, financial support and poverty reduction have a positive link. The level of economic growth in all regions should be improved. According to empirical evidence, economic progress and poverty reduction have a positive association. We are increasing infrastructure investment. We can observe from the primary empirical research that infrastructure

construction has a favourable impact on poverty reduction (Zhang et al., 2021). Green finance promotes the smart city. They created assessment indicators such as creative cities, regional green cities, quality of life and digital governance. They conducted brilliant city evaluation work in various countries worldwide to encourage the long-term development of smart cities. Scholars then conducted smart city performance reviews, devised innovative performance measurement frameworks and conducted empirical research (Fernando et al., 2019).

The critical areas of the promotion of public-private partnerships on finance mechanisms including green bonds and microcredit-based capacity building for community companies. Helping the public sector creates a suitable environment. The UN Environment will assist nations in reviewing their policy and regulatory settings for the financing system and developing roadmaps for sustainable finance through its resource efficiency initiative. By aiding central banks and regulators in enhancing the regulatory framework of domestic financial markets, it will also promote multi-country policy initiatives at the sub-regional, regional and international levels. In order to link green economic activities, UN Environment will build on current initiatives, such as private climate finance, and work with legislators and corporate executives. Through policy change, UN Environment will also encourage and enlighten public and private investment (Zueva et al., 2021).

Green finance has two key goals: internalising environmental externalities and lowering risk perceptions. Promoting green financing broadly and profitably assures that green investments prevail over assets used for business as normal, maintaining unsustainable growth trends. Green finance promotes openness and long-term thinking in investments aimed at environmental goals, and it incorporates all of the UN Sustainable Development Goals' requirements for sustainable development. Combine a bottom-up and top-down approach to green finance research: Organisations such as the Food and Agriculture Organization and the World Health Organization are just a few examples. The Energy Agency, the G20 and the Intergovernmental Panel on Climate Change have released estimates on the total cost of climate change. The necessary financial resources to achieve the various Sustainable Development Goals have their own methodologies. On a macro level, estimates should be based on a bottom-up strategy (Stern & Lankes, 2022). Improvement Investors, regulators and other market participants will have easier access to centralised, complete and up-to-date qualitative and quantitative data (United Nations, 2022). Green investing, which was once considered a niche sector, has grown in popularity due to a series of natural disasters that have raised awareness of the impending climate problem. In 2020, mint money invested in ESG funds total \$51 billion, more than doubling the previous year's record (Gao et al., 2021).

Impact of Green Finance on Environment

There is a positive correlation between green finance and environment (Wang & Zhi, 2016). The reviewed study states the green finance has a positive impact on environment (Zhang & Wang, 2021). Green finance improves the environment quality, power sector increase, waste disposal, energy consumption and protecting

the environment, reducing pollution and greenhouse gas emissions, and more regulators requiring companies to disclose climate-related risks, green finance is expected to continue growing, resulting in better data on which companies are most vulnerable and better insight on how to make a profit while saving the earth. Green finance sets targets for sustainable goals and fulfils them. International carbon prices hasten the shift to a green economy. In response to climate policy, investments in the power industry only rise close to 500 and 460 ppm stability scenarios over the first half of the century. Global investments in the power sector decline in the 680 and 560 ppm scenarios, as electricity demand declines as a result of high-efficiency gains brought on by climate legislation (Investopedia, 2021). Waste management, energy use and environmental protection were the three environmental development factors that six indicators were chosen to measure. Sulphur dioxide, solid waste and energy use all have a negative impact on the growth of green finance. The development of green finance is positively correlated with forests and natural reserves (Da Rosa & Ordenez, 2021). With most governments around the world focused on reducing pollution and greenhouse gas emissions, and more regulators requiring companies to disclose climate-related risks, green finance is expected to continue growing, resulting in better data on which companies are most vulnerable and better insight on how to make a profit while saving the earth (Carraro et al., 2012). Green finance gives some rules and regulations for the environment target period 2021–2030: double its renewable energy production 175 to 450 GW by 2020. Renewable energy was the fastest-growing energy, 42% increase between 2010 and 2020. In 2022, 100 GW solar power, 60 GW of wind power, 10 GW of biomass and 5 GW of hydropower. The 2020 goal is to generate 227 GW of electricity from renewable sources. India was 33% of the way to fulfilling its 175 GW renewable installed power capacity target for 2022 (Da Rosa & Ordenez, 2021).

Impact of Green Finance on Finance Sector

There is a positive correlation between green finance and finance sector (Latif et al., 2022). The reviewed study states the green finance has a positive impact on sector (Chen et al., 2022). Green finance improves the quality of investors, international development banks, researchers and policymakers seeking green finance data, new products (datasets) and services (research) could be created that provides a business model for data providers, bank lending, green bond, improve the standard of living, reduce poverty and increasing investment savings. The global awareness of climate change's systemic influence on the economy and financial system, as well as the resulting impact on financial stability, is evolving, and central banks and supervisors around the world are responding appropriately. The corporate and governmental sectors must build on our early achievements, recognising what we already know and quickly filling in the gaps around what we do not (Secretariat of the Convention on Biological Diversity, 2021). Create new services for clients who give or want data on green finance: With investors, international development banks, researchers and policymakers seeking green finance data, new products (datasets) and services (research) could be created that

provide a business model for data providers. Bank lending—leverage the experience of green bonds: The Green Bond Principles define and track bonds straightforwardly. Similar methods should be implemented in the credit market, as well as maybe in equity investments. A new green designation for select companies can supplement existing energy-efficiency rules (Wu et al., 2020). Green finance focus on the financing condition of the people improving the standard of living, reducing poverty and increasing investment savings.

Conclusion

India must develop green finance methods and products to shape economic development in a sustainable manner. The results have shown an increasing research trend in green finance publications from 2012 to 2022, as the scientific production of articles in the field has constantly increased over the last three years with an annual growth rate of 16.11%. The bibliometric graph depicts that the majority of the work on green finance has been published after COVID-19. The Q1 ranking journals, *Journal of Sustainable Finance and Investment*, *Ecological Economics* and *Journal of Cleaner Production* are the most influential sources contributing to this study. China and Japan add majorly to this study with Farhad Taghizadeh-Hesary, Yao Wang, Chi-Chuan Lee and Yueyan Zhang as the top contributors to the green finance studies. The highest publication by the developed nation indicates the increasing trend of research on green finance. India stands at fifth rank with 326 total citations, followed by other neighbouring countries. Green finance and sustainable development form the cluster in the basic theme (fourth quadrant of thematic map), directing the emergence of exploration of the topic.

Green finance positively affects the Triple Bottom Line, as green finance is a tool that helps businesses achieve sustainable outcomes and address environmental and social challenges. By investing in green finance initiatives, businesses can generate financial returns while also contributing to the well-being of society and the environment. A green finance initiative promotes public-private collaborations in the form of green bonds, microcredit-based capacity building for small and medium-sized enterprises, and smart city initiatives. Green finance promotes openness and long-term thinking in investments aimed at environmental goals, and it incorporates all of the UN Sustainable Development Goals' requirements for sustainable development (SDGs) by creating assessment indicators such as creative cities, green cities, quality of life and digital governance. Sustainable finance aims at improving the standard of living of the people, reducing poverty and increasing investment savings. India needs to implement green financing, focus on regulatory policies that are more transparent, provide infrastructure-supporting facilities, create trust and confidence among investors, and focus on both domestic and international investors. Green finance and the Triple Bottom Line are important concepts in the modern business world, as more and more companies are recognising the need to prioritise sustainability and social responsibility in order to remain competitive and contribute to a healthier planet.

Future Challenges of Green Finance in Indian Financial System

Barriers in the Form of Structures

One of the key hurdles to Green Finance is effectively managing foreign exchange risk. Whether the money is green or not is also an issue related to small projects.

Infrastructure Supporting Facilities

Green finance's successful implementation will necessitate the strengthening of supporting infrastructure for the market to take off. Green projects are lacking in comparability, openness and reflectiveness.

Regulations and Policies

Green finance rules and regulations lack sufficient clarity. The majority of investors are therefore reluctant to take part in green finance prospects. Therefore, it is essential to create suitable standards and laws to draw investors and guarantee the scheme's efficiency (Charles & Philip, 2020). Currently, the world is facing COVID-19 and its effects on global economic expansion. Without a doubt, reviving the world economy is the most important problem in terms of policy right now. Economy, on the other hand, the pandemic has created a chance, the chance for all parties to reconsider the situation policies, as well as budgetary and operational plans they have taken and advocated for a strategy so far. In the long run, it is more environmentally sustainable. Green finance is unquestionably an essential tool that aid in such a change towards long-term sustainability expansion of the economy (Dzau et al., 2021).

India confronts difficulties in building its green financial market, including a lack of transparency brought on by inconsistent disclosure and verification standards for green bonds, as well as illiquidity brought on by a tiny investor base and low levels of environmental knowledge. The market relies heavily on the banking sector, and green investments tend to be geared towards renewable energy and energy efficiency. In addition, green debt securities do not have clear pricing advantages over conventional securities but are subject to greenwashing risks.

A future study could compare the findings from Scopus with other databases, such as Elsevier and Springer, to provide a more comprehensive understanding of the relationship between green finance and the Triple Bottom Line. Conducting surveys or interviews with stakeholders involved in green finance initiatives could provide additional insights and perspectives, enhancing the understanding of the impact on the Triple Bottom Line. Future research could incorporate case studies to explore specific examples of successful green finance projects and their effects on the Triple Bottom Line. This would provide in-depth analyses and practical implications for sustainable development. Also, extending the timeframe of the

analysis to include more recent publications would enable the examination of evolving trends and changes in the relationship between green finance and the Triple Bottom Line over time. Incorporating interdisciplinary perspectives from fields such as economics, environmental science and social sciences could provide a more holistic understanding of the impact of green finance on the Triple Bottom Line. To find the impact assessment, future studies could explore methodologies to assess the direct and indirect impacts of green finance on environmental, social and financial outcomes, providing a more nuanced understanding of the Triple Bottom Line effects.

Limitation of This Study

The already published secondary data from academic articles have been used for the study. The depth of information or insights into particular aspects of the relationship between Green Finance and the Triple Bottom Line may be limited in the absence of primary data collection methods, such as surveys or interviews. For the bibliometric analysis, the study only used Scopus as a database for paper retrieval, which could result in a restricted representation of the literature on green finance and its effect on the Triple Bottom Line. The inclusion of other databases could prevent the analysis from being incomplete.

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