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Article

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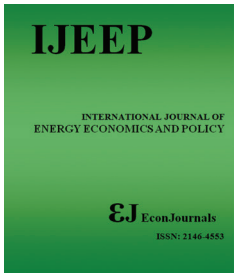
Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: Shah, Shangram Bahadur/Sopin Jirakiattikul et. al. (2023). A systematic review on nexus between green finance and climate change : evidence from China and India. In: International Journal of Energy Economics and Policy 13 (4), S. 599 - 613. https://www.econjournals.com/index.php/ijeep/article/download/14331/7427/33865. doi:10.32479/ijeep.14331.



International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2023, 13(4), 599-613.

A Systematic Review on Nexus Between Green Finance and Climate Change: Evidence from China and India

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Received: 13 March 2023 **Accepted:** 19 June 2023 **DOI:** https://doi.org/10.32479/ijeep.14331

ABSTRACT

The efforts of developing economies are mainly concerned with integrating different socio-economic requirements. In contrast, those economies only concentrate on the immediate impact to be resolved instead of focusing on efforts to mitigate long-run effects such as climate change: a global challenge due to long-term shifts in weather and temperature pattern. Climate change has resulted in global warming, severe storms, and increased droughts, including risks to human health, loss of biodiversity, poverty, and displacement, whereby green finance is considered a primary solution to mitigate such problems that can ensure sustainable environmental outcomes while promoting the agenda of, decarbonization, green tech innovation, green financial innovation, and green growth. This systematic review paper studies the nexus between green finance and climate change in China and India. This article follows Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines and reviews Scopus and Web of Science indexed peer-reviewed articles of 5 years published from 2018 AD to 2022 AD and 58 full-text articles were reviewed. The paper's significant findings reveal that innovation in finance and technology are the major frontiers of green financing that are critical in addressing the problems of climate change. It is environmental regulations that accentuate the process of green financial innovation and green technology innovation. However, green financial innovation is also a catalyst for green technology innovation. Green financial innovations are related to developing and innovating green financial products such as green bonds or loans, green insurance or securities, ESG rating, perception of environmental issues, and carbon drifting. On the other hand, green tech innovations are innovations in energy, transport, construction, and buildings. Innovations in technology and finance backed by environmental regulations strengthen the effort toward decarbonization. Regulatory interventions in green financing have more pronounced effects on emission reduction. Such actions are oriented towards green growth where the desired sustainable outcomes are realized regarding climate change adaptation, mitigation, or carbon neutrality.

Keywords: Green Finance, Climate Finance, Climate Change, Prisma, Green Bonds, Systematic Review
JEL Classifications: G20, G21, Q01, Q582

1. INTRODUCTION

1.1. Background and Context of the Study

The unprecedented economic growth post World War-II (WW-II), in conjunction with globalization, liberalization, and financial deregulation, created a paradigm shift in the nation's economic development (Laybourn-Langton and Jacobs, 2018). This growth phenomenon catapulted the living standard of people, alleviating millions of people from poverty and hunger in the newly industrialized nations (Deyo, 1987). Further, the advent of industrialization depleted nature's abundance and resources with increasing human desires (Perez, 2016). A common consensus on environmental issues and natural resource depletion transpired during the mid-nineties. However, the strenuous efforts to restore ecological balance and reverse the impact of climate change were strictly prioritized after COP 21, targeting to keep the global temperature rise below 1.5-2°C (Bashir et al., 2022; Christoff, 2016). Achieving such promising targets require sustainable

growth, smooth renewable energy transition, and the development of carbon-neutral business technologies (Shen et al., 2023).

Asian emerging economies like China, India, Taiwan, Vietnam, Indonesia, Bangladesh, and Malaysia became a part of the global production network as they shared a competitive edge on comparative advantages over developed economies (Haddad, 2007; Hanson, 2012; Kaplinsky and Messner, 2008). Cheaper factors of production (land and labour), smooth demographic transition (Bloom and Williamson, 1998), relaxed trade policies, assurance on repatriation of profits, and infrastructural push (Special Economic Zones, (SEZ's) and Trade Processing Zones (TPZs)) flooded these markets with foreign capital (Adhikary, 2017; Adhikary and Mengistu, 2008; Hossain, 2019) changing their economic landscapes and improving trade competitiveness. Outsourcing and offshoring businesses, compartmentalizing production processes, and interlinkages among global supply chains turned these countries into international production houses (Gereffi, 1996, 2018). The ramifications are imperative across the environment, natural resources, energy prices and markets, labour shortages, human rights abuses, and climate. This paradigm shift of growth in emerging economies has seriously harmed their environment, and the repercussions of environmental damage are cataclysmic (Khan et al., 2019; Sabir and Gorus, 2019; To et al., 2019).

Since the publication of the "World Commission on Environment and Development" report, the idea of "Sustainable Development" has been in the public discourse that, prioritized inclusive growth (shared positive externalities of growth among all sections of society) and environmental protection (reduce or mitigate existing/prospective ecological damages). Climate change and global warming are the two primary environmental outcomes of unsustainable growth, and Green House Gas emission (GHG) largely contributes to this phenomenon. Dependence on fossil fuels to fulfil energy demand adds to GHG emissions (Hanif et al., 2019; Ray et al., 2023). The study by (Lu, 2017) establishes the bidirectional causal relationship between energy consumption, Gross Domestic Product (GDP), and greenhouse gas emissions; and between GDP, greenhouse gas emissions, and energy consumption for Asian economies. Reducing greenhouse gas emissions is inevitable to promote sustainable growth, and greening the power sector (i.e., switching to renewable energy for industrial uses, electricity, heat, and transportation) requires sizable short and medium-term investments (ADB, 2017). As (Volz, 2018) agrees that to achieve sustainable development, economies should shift from traditional energy reliance to resource-efficient models and business technologies, whereby the role of the financial sector can be promising to fulfil that unprecedented shift. Asian economies are widely adapting to the new measures of green financing (Azhgaliyeva and Liddle, 2020). The financial industry, through the means of green financing, can develop financial technology and further improve financial inclusion relating to energy efficiency that helps in climate change mitigation (Kamran et al., 2020; Liu et al., 2022). Correspondingly, for the expansion of environmental quality and sustainable technology in Asia, green growth through green financing is essential (Saleem et al., 2022). To shift towards sustainable growth paradigms, green financing in Asia has promoted environmentally influenced multifactor productivity growth, including green bond issuance, green policies, and green FDI (Tolliver et al., 2021) where (Azhgaliyeva and Liddle, 2020) explain the reason for rising energy consumption and economic growth. Thus the role of green finance in promoting RE transition for energy security in Asian economies becomes vital for green growth (Sachs et al., 2019a).

Green finance is: innovation in financial mechanisms (flow of finances from banking and financial institutions) and financial instruments (green bonds and loans, green insurance and securities, green taxes, Environmental Social and Governance ratings) that stimulate green investments aimed at mobilizing higher investments in sustainable sectors that protect the environment, and promote positive social purposes while embracing the goals of sustainable development and Paris Climate Agreement (Berrou et al., 2019; Khan et al., 2022b). Such finances are mobilized from local, national, international, and transnational bodies intended to reverse, mitigate, or adapt to climate change's effects (Nhamo and Nhamo, 2016), and (Noh, 2018) segregates relevant green financial products into four categories:

1. Retail Banking: Green Mortgages, Green Home Equity Loans, Green Commercial Building Loans, Green Car Loans, Green Cards
2. Corporate And Investment Banking: Green Project Finance, Green Securitization, Green Venture Capital And Private Equity, Green Indices, Carbon Commodities
3. Assets Management: Green Fiscal Funds, Green Investment Funds, Carbon Funds
4. Insurance: Green Insurance And Carbon Insurance.

The categories above are the recent developments and innovations in green financing that are widely used as financing instruments (Liu et al., 2022; Sharma et al., 2022; Versal and Sholoiko, 2022; Zhang et al., 2022). They are the metamorphosis of existing financial services or the development of procedural and regulatory requirements that are complied with to promote technological innovation, renewable energy transition, reduce emissions, and adhere to sustainable development goals without compromising the prospects of modern economic growth (Barua, 2022; Marsiglio and Privileggi, 2021; Vazquez-Brust et al., 2014a, 2014b). Banks and financial institutions, like traditional banks and financial institutions that have just stepped into the green financing market and "green only" financial institutions, are perceived as essential intermediaries in the green economic transition (Kung et al., 2022).

On the other hand, green financing also promotes green technology innovations (energy, transport, construction, wastewater treatment, chemical processing, and material innovation), which are significant tech developments and breakthroughs advancing efforts to decarbonization and elevating green growth (Badri Shah, 2021; Chen and Chen, 2021; Debrah et al., 2022; Jin, 2021; Li et al., 2020; Liu et al., 2022; Ma et al., 2021; Wang et al., 2019; Zhou et al., 2020; Zhu et al., 2021). Followed the studies by (Al Mamun et al., 2022; Chang et al., 2021; Lin et al., 2023; Nawaz et al., 2021; Wang et al., 2019; Zhang et al., 2022) reveal that green financing efforts are critical in minimizing the impacts of climate change and fostering sustainable growth. Efficient

green financing facilitates smooth renewable energy transition, technology innovation, decarbonization, and environmental protection while promoting green growth (Du et al., 2023). A study by (Lin et al., 2023) measures the impact of change, trade, financial development, and renewable energy (RE) transition with CO_2 emission where the econometric results are mixed. As green financing, financial development, and RE transition increase, CO_2 emission decreases (Al Mamun et al., 2022; Zhou et al., 2020), whereas with increased economic growth, trade, energy consumption, and FDI, the rate of CO_2 emission increases. Reasonable developments and actualization of efforts in reducing CO_2 emission, green technology innovation, and innovation of financial systems help the development of renewable energy systems (Sachs et al., 2019b), minimizing the use of non-renewable resource consumption and reducing emissions (Hu and Zhou, 2014) where the risks and uncertainties related to climate change are adapted (Shuai and Fan, 2020; Wang et al., 2021). The study by (Do and Burke, 2023) in Vietnam suggests that international support is a primary driver for the renewable energy transition, and domestic financing opportunities are limited to push green growth. Following the studies by (Bashir et al., 2023; Hasan and Du, 2023; Li and Umair, 2023; Markhayeva et al., 2023; Xu et al., 2023), the conclusions are paramount in ascertaining the significant role of green financing in; green financial innovation, green technology innovation, renewable energy transition, offsetting carbon emission and sustaining green growth. Thus, green financing is a powerful solution to reverse the effects of climate change without compromising on the prospects of modern economic growth. (Mastini et al., 2021) Synthesizes the concept of "Green New Deal" and "Degrowth" into a "Green New Deal without growth." The followers of the "Green New Deal" argues that economic growth is imminent in transitioning to the "Green New Deal," which furthers green development (Mastini et al., 2021). In contrast, proponents of "Degrowth" argues that growth induces CO_2 emissions; thus, energy usage should be minimized for a smooth renewable energy transition (Mastini et al., 2021). (Bai et al., 2022) assesses the comparative analysis of China's economy during the time of COVID-19 and uses unit root tests and the General method of moments (GMM) to make inferences that conclude sufficient green energy financing is required to reduce the rising energy costs by economizing the production cost of gas, and other energy sources. Thus, the recent developments of green financing mechanisms are appropriate to reverse the effects of climate change. Consequently, identifying the policy choices and evaluating existing trends and results that challenge: growth, the pathway to carbon neutrality, distributional effects of decarbonization, air pollution, and environmental hazard, renewable energy transition in energy-reliant industries, climate-driven development framework, prioritizing policy actions for climate-neutral development outcomes become vital. Policy reforms, political prioritization, and the ability to attract sufficient foreign direct investment (FDI) are crucial to withstand the effects of climate change.

Economies like China and India are the 3rd and 7th largest counties globally. Their booming demographic mix further heightens their significance in the region. Both nations rely heavily on energy use, where China and India account for 32.9% and 7% of global CO_2 emissions, respectively, furthering their needs to curtail their CO_2 emissions and adhere to the Paris Agreement's goals. This has elevated the need for green financing for a clean energy transition. In addition, both economies have a significant presence in the world economy, which is crucial to global growth. Despite the geographical proximity and similarities, the two nations widely differ in their economic system. Based on income level, China belongs to the upper-middle-income economy, whereas India belongs to the lower-middle-income economy. There is a burgeoning need for China and India to promote green financing for curtailing their Green House Gas (GHG) emissions, where significant financial commitments are being concocted to resolve the climate crisis. India is estimated to require approximately USD 10.1 trillion to achieve net-zero emissions by 2070 AD (Khanna et al., 2022). China should make an approximate frontload investment of an additional USD 17 trillion by 2030 AD (Asia, 2022). Thus, green financing is widely adopted to accelerate power transition, decarbonize energy-intensive sectors, strengthen climate-resilient development, and foster global climate action. China is leading the course for green financing with the largest market for the green financial system where the outstanding green loans of the Chinese banks have reached from US$0.85 trillion to US$2.3 trillion while the share of outstanding green bonds has increased from US$37.6 to US$254 billion(Asia, 2022).

Further, India has also taken decisive actions through initiatives like National Clean Energy Fund and the Green Energy Corridor. The green financing practices by China and India help develop solid insight into green financing and the implementation of large-scale sustainable projects and overcome the barriers like access to capital, regulatory requirements, and technology innovation. These unique attributes build a case for studying China's and India's approach toward sustainable growth for those economies with similar socio-economic characteristics: Nations that are heavily reliant on fossil fuel consumption, the dependence of rural micro households in natural resources, low green technology innovation, barriers to renewable energy transition where green financing practices and their efforts to net-zero carbon emissions teach global lessons.

The manuscript simultaneously uses sustainable growth and green growth, and both connote the positive results of green financing leading to sustainable economic growth or the outcomes of Sustainable Development Goals that are in coherence with the Paris Climate Agreement.

1.2. Research Aims

Despite the predominant increase in green financing practices worldwide, limited studies have extensively examined the existing nexus between green financing and climate change in China and India. This systematic review aims to establish the nexus between green finance and climate change, and the central research questions are as follows:

RQ 1. What are the relationship dynamics between green finance, climate change, and green growth?

RQ 2. What studies undertake major methodological approaches to investigate the nexus between climate change and green financing?

1.3. Organization of the Study

This article is divided into various sections to elaborate on the significant ideas presented in the article. To start with, section 2 describes the research methodology adopted for the systematic review. Section 3 discusses the result of the study. Finally, section 4 presents conclusions and recommendations.

2. RESEARCH METHODOLOGY

2.1. Inclusion and Exclusion Criteria

The systematic literature review follows Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines (Liberati et al., 2009) and reviews peer-reviewed articles of 5 years published from 2018 AD to 2022 A.D. Only the English language articles were reviewed pertaining to the relationship between green finance and climate change nexus in India and China. All studies that jointly or separately studied green finance or climate change in India or China were eligible. In addition, studies that were in accordance with the notion of this study but did not explicitly mention the name or names of the countries being studied were also selected as eligible.

Scopus and Web of Science-indexed journals were taken into account for the review. The aforementioned databases were searched during the extraction of journal articles to avoid possible search biases. The search criteria included green finance, green investment, and sustainable finance as a synonym for green finance. Further, additional reference searches are conducted through citation and other reference operations.

2.2. Keywords and Search Terms

All the articles relevant to green finance and its nexus with climate change were extracted using valid and appropriate keywords. The keywords and inclusion criteria further assisted in selecting the most relevant studies from India and China. Initially, the keyword "Green Finance" was considered. Synonyms like "Green Investment," "Climate Finance," and "Sustainable finance" were used to ensure a broader and more robust literature search. Similarly, the keywords "Climate Change," "Weather Change," "Environment Change," "Temperature Change," "Weather Fluctuation," "Ozone Depletion," and "Global Warming" was used for database search. The keyword search string is: (TITLE-ABS-KEY (((Green finance*) OR (Green Invest*) OR (Green tech*) OR (Sustainable finance)) AND ((Climate Change) OR (Weather Change) OR (Environment* Change) OR (Temperature Change) OR (Weather Fluctuat*) OR (Ozone depletion) OR (Global warming)))).

2.3. Literature Search Process

The literature was searched on two significant databases: Scopus and Google Scholar. The four-stage search process proposed by (Adhikari et al., 2023; Khan et al., 2003; Mayeda and Boyd, 2020) was carried out to identify the studies relevant to the 'nexus between green finance and climate change. The stepwise procedure adopted are:

- Step 1: Searching the articles from the databases.
- Step 2: Identifying the critical journals of the field that were not included in the search results.
- Step 3: Exploring further from citation and reference list searching concerning step 2.
- Step 4: Removing redundancy and researching from given databases.

The initial search was undertaken in Scopus and Google Scholar on October 25, 2022. The Scopus and Google Scholar searches yielded 14701 and 17600 preliminary studies, respectively. After using the inclusion and exclusion criteria, 206 studies were identified as relevant from Scopus. After implementing advanced search criteria, 100 pieces of literature were eligible for the Google Scholar search screening. The literature was thoroughly searched in Google Scholar, and its relevance was meticulously determined through manual proofreading until the search results became irrelevant and redundant. The articles on both databases were explored based on relevance. All other relevant literature sources were identified to further the scope of the systematic review and avoid possible search biases. Additional references of such relevant literature were screened. 84 additional references were identified for systematic review through backward and forward literature searching(Haddaway et al., 2022).

3. RESULTS

The result is divided into four sections. The sections interpret the PRISMA flow diagram, bibliometric study, results from the data extraction matrix, and principal methodologies implied by various studies reviewed in this manuscript.

3.1. PRISMA Flow Diagram

The PRISMA flow diagram exhibits (Page et al., 2021) the process flow of the systematic literature review from identification of literature to full-text review (Figure 1).

Two major databases were searched. 206 study results were imported from Scopus, whereas 100 were imported from Google Scholar. Furthermore, 84 results were imported from additional references. A total of 390 pieces of literature were imported for screening, where 6 duplicates were removed, and 384 studies were identified as eligible for the title and abstract screening. After screening 384 studies, 176 were assessed as eligible for full-text review. Finally, 58 studies were included for full-text review, while 118 studies were excluded citing the following reasons:

i. 73 articles were irrelevant
ii. 30 articles did not involve study in China and India
iii. Seven articles were from Scopus unindexed journals
iv. 5 Manuscript unavailable
v. 2 grey literature excluded
vi. 1 article was excluded based on time.

3.2. Results from the Bibliometric Study

Bibliometric analysis is carried out to show the output performance of the reviewed studies so that the research can cover the various distribution sites of journal articles and other relevant studies. This bibliometric study considers the extent of citations, the nature of the study, the authors, and the country of study of the published documents.

Table 1 summarizes the bibliometric analytics of the full-text articles reviewed. The table exhibits 58 articles reviewed from 32 significant sources., Of the 58 articles considered, 55 are research articles, and 3 are review articles. The 32 significant sources from which the articles are borrowed are presented in Table 2. Further, it also shows the indexed status of the source (Journal title). The studies extracted were either from a Scopus or WOS-indexed journal. All of them are indexed in Scopus, while 21 are indexed in both.

Figure 2, created using "R," is a three-field plot diagram representing countries on the left-hand side, authors in the middle, and area of study on the right-hand side. It is observed that China is more significant compared to India, which shows that 39 studies were conducted in China, and 5 studies were conducted in India. The study areas are pertaining to sustainable development, economic development, environmental policies, environmental economics, innovation, green economy, energy efficiency, and climate change. The authors from Malaysia, Taiwan, and India have also contributed to exploring climate change and green financing studies. However, the significant studies are deficient and narrow in scope.

Furthermore, this systematic review considers only the study on China and India. However, the 3-field plot shows two additional countries, Malaysia and Taiwan. Section 2.1 of the study clearly states the inclusion and exclusion criteria of the literature search process, which justifies the appearance of countries like Malaysia and Taiwan in the 3-field plot.

3.3. Green Finance and Climate Change

In the extensive review of 58 full-text articles, several ideas were generated relating to green finance and climate change, and the relevant themes of the studies are conceptualized in 8 different headings presented as follows:

1. Studies relating to Green finance: (Ahmad, 2021; Akomea-Frimpong et al., 2021; Al Mamun et al., 2022; Chang et al., 2021; Debrah et al., 2022; Durrani et al., 2020; Li et al., 2022; Nawaz et al., 2021; Qadir et al., 2021; Tauhid and Zawani, 2018; Wu, 2022; Wu, 2022; Zhang et al., 2022)
2. CO2 Emissions: (Al Mamun et al., 2022; Avotra et al., 2021; Chang et al., 2021; Qu et al., 2022; Shao and Xue, 2022; Zahoor et al., 2022; Zhang et al., 2022; Zhou et al., 2020)
3. Green Tech Investments: (Cao and Niu, 2022; Chen and Chen, 2021; Dong et al., 2020; Liu et al., 2022; Ma et al., 2021; Qu et al., 2022; Shao and Xue, 2022; Wang and Liang, 2022; Wang et al., 2019; Yang et al., 2020; Ye et al., 2021; L. Zhu et al., 2021)
4. Climate finance for Green-tech Investments and Innovation: (Qu et al., 2022; Sharma et al., 2022; Tu et al., 2021; Zhang et al., 2022; L. Zhu et al., 2021)
5. Green technology innovations and investments for decarbonization: (Cai et al., 2019; Qu et al., 2022; Shao and Xue, 2022; Tu et al., 2021; Versal and Sholoiko, 2022; L. Zhu et al., 2021)
6. Green Finance for Decarbonization: (Al Mamun et al., 2022; Chang et al., 2021; Nawaz et al., 2021; Qu et al., 2022; Tolliver et al., 2019; Tu et al., 2021; Wang and Liang, 2022; Zahoor et al., 2022; Zhang et al., 2022; Zhou et al., 2020)

Table 1: Bibliometric analytics of full-text reviewed articles

Description	Results
Documents	58
Sources	32
Keywords Plus (ID)	399
Author's Keywords (DE)	219
Period	2018-2022
Average citations per document	15.37
Authors	209
Author Appearances	219
Authors of single-authored documents	7
Authors of multi-authored documents	202
Single-authored documents	7
Documents per Author	0.282
Authors per Document	3.54
Co-Authors per Documents	3.71
Collaboration Index	3.88
Document types	
Primary Articles	55
Review Articles	3

Table 2: Source title and its indexed status

S. No.	Source title	Indexed	
1.	International Journal of Environmental Research and Public Health	Scopus	
2.	Frontiers in Environmental Science	Scopus	WOS
3.	Environmental Science and Pollution Research	Scopus	
4.	Energy Reports	Scopus	WOS
5.	Journal of Sustainable Finance and Investment	Scopus	
6.	Resources Policy	Scopus	WOS
7.	Ecological Indicators	Scopus	WOS
8.	Investment Management and Financial Innovations	Scopus	
9.	Polish Journal of Environmental Studies	Scopus	WOS
10.	Advances in Climate Change Research	Scopus	WOS
11.	Aerosol and Air Quality Research	Scopus	WOS
12.	Applied Ecology and Environmental Research	Scopus	
13.	Borsa Istanbul Review	Scopus	W.O.S.
14.	Building and Environment	Scopus	WOS
15.	Business Strategy and The Environment	Scopus	WOS
16.	Climate Policy	Scopus	WOS
17.	Energy Policy	Scopus	WOS
18.	Energy Strategy Reviews	Scopus	WOS
19 .	Environment Development and Sustainability	Scopus	
20.	Environmental Research Letters	Scopus	WOS
21.	Finance Research Letters	Scopus	WOS
22.	Frontiers in Energy Research	Scopus	WOS
23.	Journal of Cleaner Production	Scopus	WOS
24.	Journal of Environmental Studies and Sciences	Scopus	
25.	Journal of Infrastructure Policy and Development	Scopus	
26.	Journal of Regional and City Planning	Scopus	
27.	Mathematical Problems in Engineering	Scopus	WOS
28.	Regional Environmental Change	Scopus	WOS
29.	Renewable Energy	Scopus	WOS
30.	Science of The Total Environment	Scopus	WOS
31.	Sustainability Switzerland	Scopus	
32.	Technological Forecasting and Social Change	Scopus	

Figure 1: PRISMA flow diagram

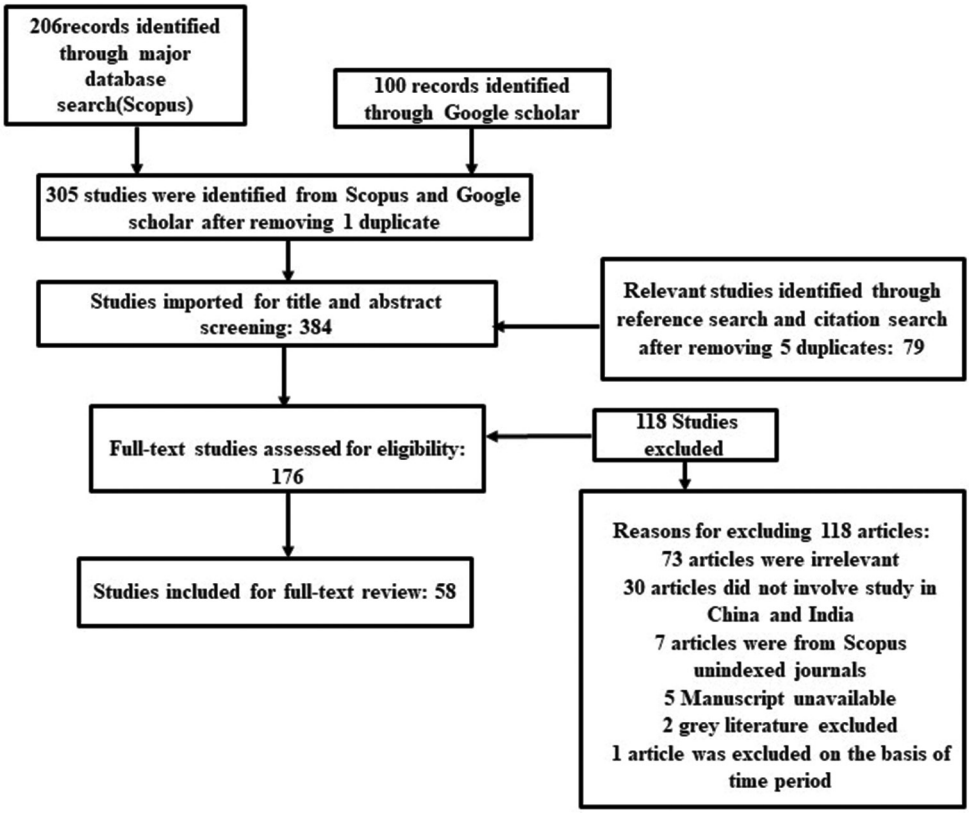
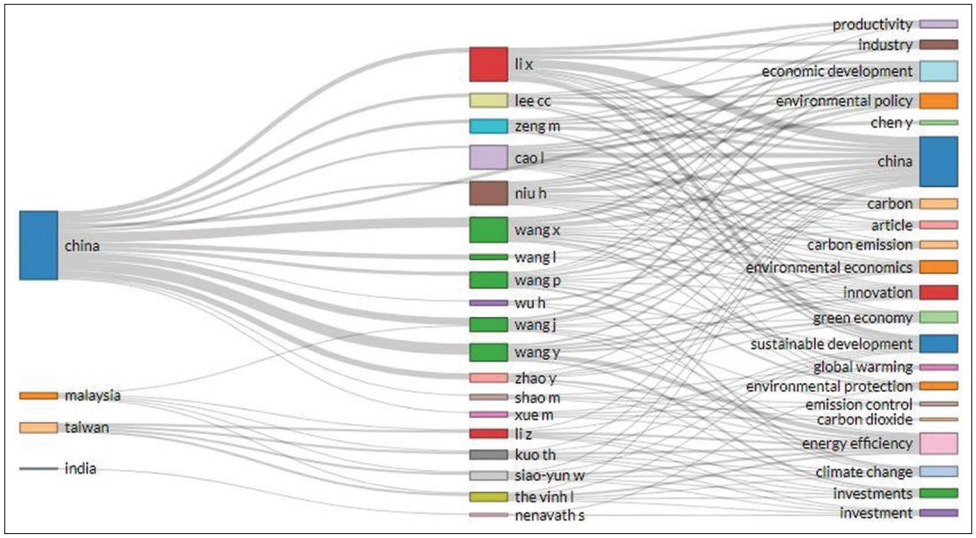


Figure 2: 3-field plot examination of the economies, keyword plus, and authors



7. Green Economy and Green Growth: (Chen et al., 2019; Geng et al., 2022; Li and Zhao, 2021)
8. Green Bonds: (Akomea-Frimpong et al., 2021; Al Mamun et al., 2022; Fatica and Panzica, 2021; Kung et al., 2022; Li et al., 2022; Prajapati et al., 2021; Tolliver et al., 2019; Versal and Sholoiko, 2022).

All of the articles have agreed on a common stance that green finance is a prerequisite to green-tech investment, accelerating green technology innovation and ultimately catalyzing the financial and technological efforts toward decarbonization to combat the impact of climate change while promoting sustainable growth. While this paper aims to explore the nexus between green finance and climate change in China and India, Table 3 depicts the current status of studies as per the final full-text reviewed articles. 39 studies are entirely associated with China. Similarly, 4 of the studies were carried out in India. Furthermore, each of the 5 studies was conducted in the panel of countries along with China and India. 6 global studies were reviewed.

Moreover, one study that did not mention the country's name was also reviewed. There is a vast difference in the number of studies

Table 3: Country-wise study table

Country wise study					
India	**China**	**Studies conducted in panel of countries along with China**	**Studies conducted in panel of countries along with India**	**Global studies**	**Studies that did not mention names of countries' studies**
(Mehta et al., 2019; Prajapati et al., 2021; Sharma et al., 2022; Sharma and Choubey, 2022)	(Ahmad, 2021; Avotra et al., 2021; Cai et al., 2019; Cao et al., 2021; Cao and Niu, 2022; Chang et al., 2021; Chen and Chen, 2021; Chen et al., 2019; Dong et al., 2020; Feng et al., 2021; Geng et al., 2022; Huang and Chen, 2022; Jin, 2021; Kung et al., 2022; Lee et al., 2022; Li and Zhao, 2021; Li et al., 2021; Li et al., 2020; Li et al., 2022; Liu et al., 2022; Ma et al., 2021; Pan et al., 2021; Qu et al., 2022; Ren et al., 2020; Shao and Xue, 2022; Tu et al., 2021; G. Wang et al., 2022; L. Wang et al., 2019; Wang and Liang, 2022; Wang et al., 2019; Wu, 2022; Wu, 2022; Xu et al., 2022; Yang et al., 2020; Yao, 2021; Ye et al., 2021; Zahoor et al., 2022; Zhu et al., 2021; Zhu et al., 2021)	(Ahmad, 2021; Debrah et al., 2022; Tolliver et al., 2019; Zahoor et al., 2022; Zhou et al., 2020)	(Ahmad, 2021; Debrah et al., 2022; Tauhid and Zawani, 2018; Tolliver et al., 2019; Zhou et al., 2020)	(Al Mamun et al., 2022; Debrah et al., 2022; Khan et al., 2022a; Mercure et al., 2018; Tolliver et al., 2019; Zhang et al., 2022)	(Akomea-Frimpong et al., 2021)
4	39	5	5	6	1

in India and China. The studies are considerably few in India and cover the following avenues in green financing:

i. Green banking/green finance/green bonds: (Khalil and Nimmanunta, 2021; Nawaz et al., 2021; Prajapati et al., 2021; Sharma and Choubey, 2022)
ii. Impact of financial technologies: (Sharma et al., 2022)
iii. Green infrastructure and Climate policy: (Tauhid and Zawani, 2018)
iv. Decarbonization Pathways: (Zhou et al., 2020).

The 58 reviewed papers were thoughtfully recorded in a data extraction matrix and thoroughly analyzed to summarize the nexus between green finance and climate change. The significant scope of the relationship between green finance and climate change is summarized as follows:

i. Relationship between Green Financial Innovation, Climate Change, and Green Growth
ii. Relationship between Green Financing and Green Technological Innovation for Renewable Energy Transition and Climate Change.

3.3.1. Relationship between green financial innovation, climate change, and green growth

The studies reviewed identify "Green Financial Innovation" as a strategic action to mitigate or adapt to climate change's effects. There are differences across the modes of green financing, and green financial innovation is a significant driver of green growth. Green financial innovation significantly reduces CO_2 emissions in the short and long run, which is relatively higher in the long run, and the evidence is relevant across many industries(Al Mamun et al., 2022). As (Akomea-Frimpong et al., 2021) identifies green loans/bonds, green investment, climate finance, green infrastructure bonds, green insurance, green securities, and carbon finance as major frontiers in green financial innovation. Correspondingly, studies by (Ahmad, 2021; Akomea-Frimpong et al., 2021; Al Mamun et al., 2022; Bhatnagar and Sharma, 2021a, 2021b; Fatica and Panzica, 2021; Kung et al., 2022; Li et al., 2022; Prajapati et al., 2021; Rawat and Anu, 2020; Sarma and Roy, 2022, 2021; Tolliver et al., 2019; Verma and Agarwal, 2020; Versal and Sholoiko, 2022; Zhang et al., 2022) have discussed implementing green bonds to accelerate climate financing through green financial innovation, furthered by the role of green funding on carbon drifts and their effectiveness in Climate change mitigation(Chang et al., 2021). The studies on 46 countries examine green bonds' adaptation to global climate challenges are an effective tool in decarbonizing the global economy. The contributions are more conclusive for economies with developed credit markets, high technological development, and potentially vulnerable to climate change. Green bonds are exceptionally efficient in achieving energy efficiency, waste management, pollution control, renewable production, and transition, where green financing and innovation jointly catalyze the fight against climate change. The market for green bonds is increasing rapidly, and the trend of the yearly proceeds depicts an upward trend in investments in sustainable energy, clean water, carbon-neutral transportation measures, and other Paris agreement and SDG-related investment categories. As a result, the projects and assets financed with green bonds in different study samples of 96 countries from 2008 to 2018 show the reduction of over 108 million tons of carbon dioxide equivalent (tCO_2e) of greenhouse gas emissions and over 1500 gigawatts of renewable energy capacity (Tolliver et al., 2019). The role of banks and financial intermediaries are remarkable in promoting green

financial mechanism never the less; investment risks, banking sector regulations, bank size, environmental policies and climate change, internal practices and ethics of organizations, technology and innovation, religion, interest rates, social inclusion, and social justice are the 9 key determinants that influence green financing behaviour of banks and financial institutions (Akomea-Frimpong et al., 2021).

Further, findings by (Sharma and Choubey, 2022) recommends the significance of green banking practices are key to regaining customer trust where 63% of all respondent agreed that their bank developed several green banking products and services, and 53% of bankers stated that their bank combines green internal processes into daily operations, 78% of respondents said that their bank engages in several green CSR initiatives, and 60% of respondents thought green banking initiatives helped regain customer trust. The amalgamation of green financing practices in banks is crucial to promote inclusivity, accessibility and institutional commitment to green growth. (Nenavath, 2022) used a text analysis approach to study the data from 2010 AD to 2020 AD and identify the correlation between green finances and policies where policies promoting green finances are significantly linked to reducing CO_2 emissions, and growth of financial technology promotes environmental safety.

Investments in clean energy and the development of the financial system are significant contributors to China's environmental and sustainable economic growth, where 3 moderating variables were considered to measure the economy from 1970 to 2016. The results conclude that investments in cleaner energy options negatively affect carbon emissions and environmental footprints while positively correlating to China's economic growth. Growth of the financial system, manufacturing activities, and urbanization positively impact carbon footprints and economic development. In contrast, renewable and clean energy investments assist sustainable growth at the cost of economic prospects. The role of local government becomes vital in promoting green financing strategy and easing the hurdles to clean energy investments, incentivizing carbon pricing and renewable energy subsidies, and addressing the regulatory and market limitations that are potent barriers to clean energy investments. As a result, a green financing strategy encourages sustainable economic growth (Zahoor et al., 2022). Countries like China and India are the biggest recipients of World Bank (WB) assistance, accounting for 45.9% of all project funding during the 2019/2020 fiscal year (Versal and Sholoiko, 2022). These nations are among the top emitters of CO2 in their regions, but they also show a commitment to bringing emissions down to a manageable level, earning them significant financing for their green financing initiatives. Institutional support, regulatory measures, and government intervention are vital in shaping the landscape for green financial innovation. (Ahmad, 2021)suggests developing a harmonious investment policy with the tax and financing regime that validates the clear goals of realigning the 14th, 5-year perspective plan(create compact, connected and clean cities) to maintain the internal consumption and export competitiveness achieving the targets of net zero emission by conveying distributional and employment generation goals.

Regulatory measures developed to improve the reporting standards for green bonds post-issuance have long-term positive implications in dilating the Paris Agreement and SDGs agendas. The effects of green bonds are very pronounced for bio-energy development and strengthening energy security. Findings from (Kung et al., 2022) extrapolate the approximate bond principal amount of 9.65 billion CNY and 7.81 billion CNY when invested in crop- and residual-based technology, respectively, promoting bio-power development and efficiency. Such investments are more than 98.3% of the low-priced bond. To test the variability of results across industries, (Fatica and Panzica, 2021) investigate the effectiveness of green bond issuances in reducing direct and aggregate emissions of non-financial companies.

When non-financial companies share common financial traits and environmental ratings like conventional bond issuers, green bond issuers reveal decreased carbon emissions, whereas the bonds issued after Paris Agreement have pronounced emission reduction. Individuals' investment choice widely determines people's acceptance of transitioning to green financing. Tax exemptions, knowledge of green bonds, and green bond issuers' Environmental, Social, and Governance (ESG) ratings (Prajapati et al., 2021) are determining factors for individual green investors. There seems to be a volatile positive trend regarding green economic efficiency, which differs with time and region. Furthermore, the agglomeration of the high-tech industry has a lagging effect.

Meanwhile, the regression coefficients of environmental regulation were found to be negative. In aggregate, the environmental regulations' efficiency in China's green economy was found to have increased. However, the impact measures differed with the varying intensity of government control (Geng et al., 2022). As (Sharma et al., 2022) illustrates, for the study period of 2010-2020, where green finance policies in India have substantially decreased industrial CO_2 emissions. The growth of financial technology is evident in SO2 emission reduction and positively influences environmental quality. Green finance and fintech policies are the critical drivers for ecological protection and emission reduction. Thus, green financial innovations are not only about broader policy initiatives or regulatory requirements but also individual preferences and their perception of environmental issues and policy options available for climate financing adaptation.

3.3.2. Relationship between green financing and green technological innovation for renewable energy transition and climate change

Technological innovation and green financing accentuate the clean energy transition, reduce carbon footprint and help mitigate the effects of climate change. A Simultaneous Equation Model was used to investigate the avenues for the energy-environment-climate nexus in 49 countries that issued green bonds in 2007-2019AD. There is a bidirectional relationship among energy-environment-climate nexus. Green financing effectively attenuates environmental pollution. Promoting green finance plays a significant role in achieving sustainable growth, where green financing particularly moderates the interaction between technology innovation and the energy-environment-climate nexus. Green financing promotes innovation in green technologies and

reduces non-renewable energy consumption. In contrast, a higher level of green finance promotes a higher level of green technology innovations, while such innovations have a more significant negative influence on CO_2 emission, and the impact of innovation on climate change is weakened. There is a two-way linkage between renewable energy sources, environmental pollution, and climate change. The interaction between; "innovation" and the "energy-environment-climate" nexus is moderated by green finance, and as a result, higher levels of green funding boost the use of renewable energy. Studies reveal that urbanization, value-added industry, and financial development promote economic expansion, and environmental costs are inherent. Environmental pollution and climate change can be efficiently reduced by green financing, which accelerates sustainable growth. Higher levels of green funding boost the renewable-energy-innovation transition. Such innovation has a more detrimental effect on CO_2 emissions and less on climate change when green finance is developing rapidly (Zhang et al., 2022).

Environmental regulations are key to promoting the decarbonization of the economy. Promoting energy-efficient regulatory measures across manufacturing and other industries solidifies the efforts of government and corporations to adapt the measures to carbon neutrality and promote energy efficiency. The study was undertaken from 2010 to 2019 and devised the strategic choices impacting energy efficiency measures(Wang and Liang, 2022). Regulatory requirements, tax policies, subsidies, and exemption policies are the foundation of energy efficiency and decarbonization. Furthermore, the study indicates three significant results on the impact of MERs in promoting Green-tech innovations. When induced independently, green tech investments are only true for SETP(SO2 Emission Trading Pilots), which clarifies that not all MERs promote green tech innovations. SETP and CETP(Carbon Emission Trading Pilots) together do not impact tech innovations. Repeated promotion of SETP and CETP policies fails to incentivize innovations. Furthermore, market-based environmental regulations (MER) results are diverse over Green Technology Investments. It is evident that SO2 emissions trading positively affects the promotion of Green Technology Investments, but CO_2 emission fails to produce the same results, and MER policies can only achieve a weak Porter Hypothesis (Qu et al., 2022). For the energy-powered industries, green tech innovation is at a fluctuating upward trend as they tend to benefit from improvement in research and development while achieving conversion efficiency. Green tech innovation is heterogeneous across energy-intensive industries, and the difference across innovation among energy-intensive industries is as weak as 0.615. Regulatory environmental policies, academic research, and scientific findings are key to promoting green tech innovation across small-scale and large-scale industries.

The overall efficiency of green technology innovation through green financing in energy-intensive industries as a whole showed a fluctuating upward trend from 2005 to 2015, benefiting from the improvement of technology, Research and Development (R&D), and achievement of conversion efficiency while facilitating smooth renewable energy transition to adapt the issues of climate change (Qu et al., 2022). On the other hand, the impact of the industrial structure was found to be negative. The regulations on expenditure promote green productivity by influencing Foreign Direct Investments (FDI). At the same time, investment-type regulations incentivize green productivity by stimulating technological innovations. Further, path dependence, spatial-temporal relationship, and spatial spillover effects exist among regulatory practices, green financing, green growth, and carbon drifting (Chang et al., 2021; Li and Zhao, 2021). There exists a negative correlation between CO_2 emissions and ecological footprint. Spending on clean energy advances environmental sustainability, reduces pollution, and minimizes the impact of climate change. Efficiency over energy uses, and the development of clean, renewable energy is core to emission reduction, and the idea of decarbonization has been at the center since the Paris Conference in 2015.

Shao and Xue (2022) identify the level of CO_2 emissions in China using 4 essential drivers: population level, level of economic development, energy utilization, and carbon emission. The study's outcomes convey an average reduction in CO_2 emission from 10.6% to 0.79% from 2011 to 2016 respectively. Amongst the four major drivers studied decline in energy utilization efficiency (−39.89%) predominantly contributes to offset emission reduction (−9%), followed by a reduction in the magnitude of carbon emission. Furthermore, clean energy practices and energy efficiency have facilitated the smooth transition of China toward a sustainable economy (Shao and Xue, 2022). Similarly, (Cai et al., 2019) explore the effectiveness of green finance policies on renewable energy investment during the time of COVID-19 emergency and reveals that the Levelized cost of electricity (LCOE) for offshore wind generation declined from 0.86 CNY/kWh in 2014 to 0.72 CNY/kWh in 2019, but increased to 0.79 CNY/kWh in 2020. The average LCOE drops to 0.76 CNY/kWh, 0.67 CNY/kWh, and 0.74 CNY/kWh with the introduction of the green-credit policy. Zhou et al. suggest that a significant revision of the energy mix is necessary to achieve the goal of "well below" 2°C. In particular, the study scenarios suggest a sharp decline in the use of fossil fuels, an expansion in the supply of low-carbon energy, and an increase in the pursuit of energy efficiency (Zhou et al., 2020). Scenarios that meet the 2°C and 1.5°C targets, such a shift will cause a significant reduction in CO_2 emissions of 78% and 93% by 2050, respectively. Environmental taxes and policies like green bonds have an enormous and beneficial impact on encouraging investment in renewable energy sources that assist in the renewable energy transition. On the other hand, inadequate green finance is a significant disturbance in the renewable resources transition, which increases the renewable innovation gap (Qadir et al., 2021). However, targeted incentives and strategies can positively assist in implementing Renewable Energy (RE) projects.

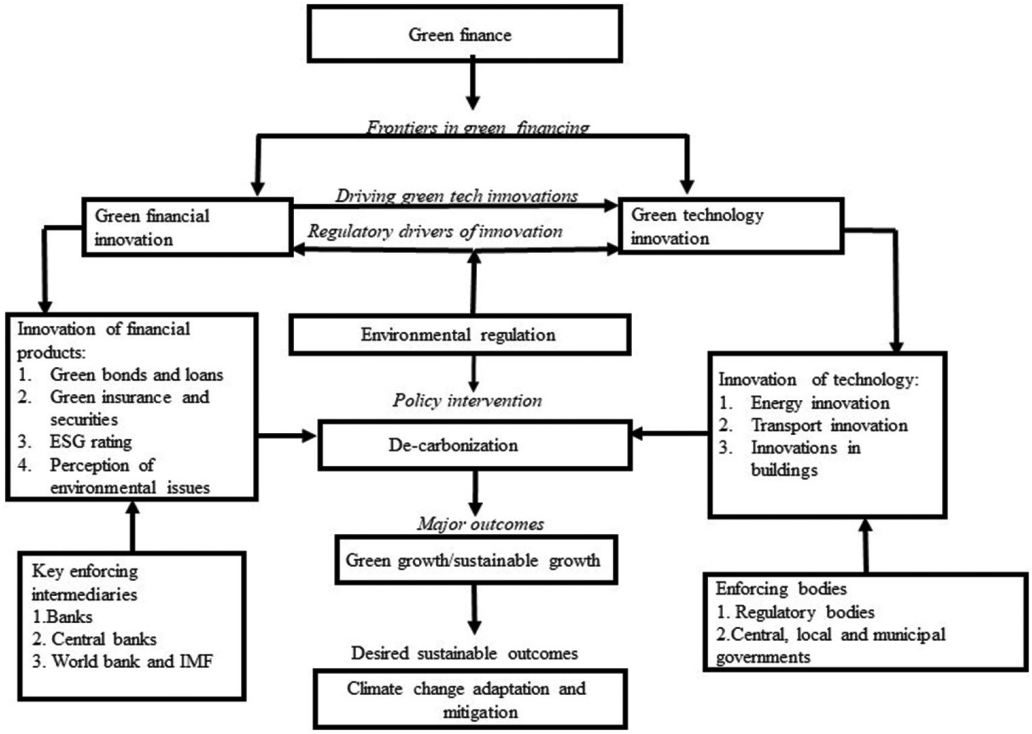
3.4. Major Methodologies Used

The extensive review of the 58 full-text literature identified that 31 methodologies are used. Among diverse methods implied in various studies, linear regression, regression, and conjoint analysis were used by 12 studies. Similarly, 9 studies have adopted a qualitative approach to understanding the intricacies between green financing and its nexus with climate change. Further, details on the significant methodologies exercised by reviewed studies are shown in Table 4.

Table 4: Major methodologies used in several studies

Major methodology implied	Studies
Qualitative studies	(Ahmad, 2021; Akomea-Frimpong et al., 2021; Debrah et al., 2022; Durrani et al., 2020; Jin, 2021; Mehta et al., 2019; Sharma and Choubey, 2022; Wang et al., 2019; Wu, 2022)
Descriptive and comparative statistics	(Tolliver et al., 2019; Versal and Sholoiko, 2022)
Linear Regression, Regression, and Conjoint Analysis	(Al Mamun et al., 2022; Fatica and Panzica, 2021; Khalil and Nimmanunta, 2021; Khan et al., 2022a; Lee et al., 2022; Li et al., 2022; Ma et al., 2021; Sharma et al., 2022; Tolliver et al., 2019; Wu, 2022; Zahoor et al., 2022; Zhu et al., 2021)
DID (Difference in Difference)	(Liu et al., 2022; Ma et al., 2021; Nawaz et al., 2021; Sharma et al., 2022)
DDD (Difference in Difference in Difference)	(Qu et al., 2022)
Global Integrated assessment model	(Zhou et al., 2020)
Unit root test and panel co-integration	(Chang et al., 2021; Nawaz et al., 2021)
Fully modified Least Square	(Zahoor et al., 2022)
Dynamic Least Square	(Zahoor et al., 2022)
Simultaneous equation model	(Zhang et al., 2022)
V.A.R.	(Ren et al., 2020; Wu, 2022)
Super Slacks-based Measure (SBM.)	(Chen et al., 2019; Pan et al., 2021; Ye et al., 2021)
Data Envelopment Analysis (DEA.)	(Chen et al., 2019; Geng et al., 2022; Li et al., 2020; Pan et al., 2021; Zhu et al., 2021)
General algebraic modeling system (GAMS)	(Chen et al., 2019)
System generalized moment method (SGMM.)	(Chen et al., 2019)
Generalized Method of Moments	(Cao et al., 2021; Qadir et al., 2021)
Levelized Cost of Electricity (LCOE.)	(Tu et al., 2021)
Wavelet Power Spectrum Techniques	(Li et al., 2021)
Global Malmquist-Luenberger productivity index	(Li et al., 2020; Xu et al., 2022)
Fixed-effect dynamic panel mode	(Li et al., 2020)
Moderation-Based Mediating Mode	(Cao and Niu, 2022)
Word vector method	(Huang and Chen, 2022)
Tobit Model	(Geng et al., 2022)
Experimental Design	(Cai et al., 2019)
Structural Equation Modeling	(Avotra et al., 2021)
Fuzzy-based multi-criteria decision analysis	(Yao, 2021)
Spatial panel Durbin model	(Dong et al., 2020)
Logarithmic mean Divisia index (LMDI) analysis	(Chen and Chen, 2021; Shao and Xue, 2022)
The two-stage stochastic programming model	(Kung et al., 2022)
Grey Prediction Model	(Wang et al., 2022)
BP neural network model	(Wang et al., 2022)

Figure 3: The relationship between green finance, and climate change



The choice of models is heterogeneous across studies due to the availability and nature of data (Hansen, 2005; Phillips, 1996). For example, four studies have employed Difference-in-Difference (DID) for quasi-experimental data. On the other hand, five studies have used DEA to understand the efficiency of green financing and evaluate its effectiveness. Apart from that, Descriptive and comparative statistics, DDD. (Difference in Difference in Difference), Global Integrated assessment model, Unit root test and panel co-integration, Fully modified least Square, Dynamic least Square, Simultaneous equation model, Vector Auto-regression (VAR), Super Slacks-based Measure (SBM), Data Envelopment Analysis (DEA) were used.

In summary, a thematic relationship between green finance and climate change is illustrated in Figure 3.

Green finance predominantly attributes to innovation in two major sectors, financial and technological innovation. It is environmental regulations that accentuate the process of green financial innovation and green technology innovation. However, green financial innovation is also a catalyst for green technology innovation. Green financial innovations are related to developing and innovating green financial products such as green bonds or loans, green insurance or securities, ESG rating, perception of environmental issues, and carbon drifting. On the other hand, green tech innovations are innovations in energy, transport, construction, and buildings. These two innovations and environmental regulations strengthen the effort toward decarbonization. Regulatory interventions in green financing have more pronounced effects on emission reduction. Such actions are oriented towards green growth where the desired sustainable outcomes are realized regarding climate change adaptation, mitigation, or carbon neutrality. Local, municipal, and central government bodies have deterministic roles in pushing green financing options to lessen the impacts of climate change.

4. CONCLUSION AND POLICY RECOMMENDATIONS

This systematic review identifies green finance as one of the significant variables in the fight against climate change. It uses PRISMA criteria and studies 58 full-text papers to establish the "nexus between green finance and climate change." It is evident that green financing positively impacts the efficiency and effectiveness of decarbonization efforts. The consensus over green financial practices is rising globally, from emerging to developed economies. The scope of green financing is vague and becoming indispensable as the tension for reducing carbon emissions mounts. This systematic review identifies financial and technological innovations as the two essential areas of green financing. Green financial innovations are the development of financial products (green bonds, green loans, green securities, green insurances) or systems designed to make short-term or long-term investments in business or projects that are either part of a climate-friendly solution or mitigate the effects of climate change. Such investments are more oriented toward reducing carbon footprints to zero. In contrast, green technology innovations are the technological developments (innovation in energy uses, transportation, construction, building materials, wastewater treatments, supply-chain) constantly being developed to neutralize GHG emissions. It is identified that green financial innovations are also a push for green tech innovations and regulatory measures by national, local, and municipal governments with adequate support from transnational organizations such as WB and IMF, in the form of grants amplifies the process of green growth. The studies helps us deduce that green financing practices are in the very early stage of their life cycle in India. Financial institutions have just started introducing green financial products, and individual customers are willing to participate in this financial solution. Banks, policymakers, and stakeholders are constantly evolving in the dynamics of financial geography.

The study recommends promoting green practices and using green bonds for climate finance transition and enhancing the growth of green finance through policy and market operation reforms, promoting green financial products, investments in green finance, and utilizing fintech to avoid systemic risks and further prioritizing green technology development, environmental preservation, energy conservation, and sustainable supply chain management practices to tackle climate change and developing policies based empirical evidence that helps smooth transition to sustainable growth.

REFERENCE

ADB. (2017), Meeting Asia's Infrastructure Needs. Mandaluyong: ADB.

Adhikari, S., Sopin, J., Techato, K.A., Mudbhari, B.K. (2023), A Systematic Review on investment risks in hydropower to developing sustainable renewable energy systems. International Journal of Energy Economics and Policy, 13(2), 222.

Adhikary, B.K. (2017), Factors influencing foreign direct investment in South Asian economies: A comparative analysis. South Asian Journal of Business Studies, 6(1), 8-37.

Adhikary, B.K., Mengistu, A.A. (2008), Factors influencing foreign direct investment (FDI) in" South" and" Southeast" Asian economies. The Journal of World Investment and Trade, 9(5), 427-437.

Ahmad, E. (2021), Multilevel financing of sustainable infrastructure in China- policy options for inclusive, resilient and green growth. Journal of Infrastructure, Policy and Development, 5(1), 1-24.

Akomea-Frimpong, I., Adeabah, D., Ofosu, D., Tenakwah, E.J. (2021), A review of studies on green finance of banks, research gaps and future directions. Journal of Sustainable Finance and Investment, 12(4), 1241-1264.

Al Mamun, M., Boubaker, S., Nguyen, D.K. (2022), Green finance and decarbonization: Evidence from around the world. Finance Research Letters, 46, 102807.

Asia. (2022), East Asia Pacific World Bank Group. Available from: https://www.worldbank.org

Avotra, A.A.R.N., Chenyun, Y., Yongmin, W., Lijuan, Z., Nawaz, A. (2021), Conceptualizing the state of the art of corporate social responsibility (CSR) in green construction and its nexus to sustainable development. Frontiers in Environmental Science, 9, 774822.

Azhgaliyeva, D., Liddle, B. (2020), Introduction to the special issue: Scaling up green finance in Asia. Journal of Sustainable Finance and Investment, 10(2), 83-91.

Badri Shah, N.S. (2021), Determining the financial performance of

Malaysian green technology companies using Tobin's Q. Malaysian Management Journal, 25, 818754346.
Bai, X., Wang, K.T., Tran, T.K., Sadiq, M., Trung, L.M., Khudoykulov, K. (2022), Measuring China's green economic recovery and energy environment sustainability: Econometric analysis of sustainable development goals. Economic Analysis and Policy, 75, 768-779.
Barua, S. (2022), Green growth and energy transition: An assessment of selected emerging economies. In: Shahbaz, M., Tiwari, A.K., Sinha, A., editors. Energy-Growth Nexus in an Era of Globalization. Ch. 14. Netherlands: Elsevier. p323-352.
Bashir, M.A., Dengfeng, Z., Khan, M.I., Shahzad, F., Khalil, S. (2023), Novel research methods on the net-zero economy of climate finance in the energy sector. Economic Research-Ekonomska Istrazivanja, 36(1), 2389-2399.
Bashir, M.F., Benjiang, M.A., Hussain, H.I., Shahbaz, M., Koca, K., Shahzadi, I. (2022), Evaluating environmental commitments to COP21 and the role of economic complexity, renewable energy, financial development, urbanization, and energy innovation: Empirical evidence from the RCEP countries. Renewable Energy, 184, 541-550.
Berrou, R., Ciampoli, N., Marini, V. (2019), Defining Green Finance: Existing Standards and Main challenges BT. In: Migliorelli, M., Dessertine, P., editors. The Rise of Green Finance in Europe: Opportunities and Challenges for Issuers, Investors and Marketplaces. Berlin: Springer International Publishing. p31-51.
Bhatnagar, S., Sharma, D. (2021a), Green financing in India: Identifying future scope for innovation in financial system. International Journal of Green Economics, 15(3), 185-212.
Bhatnagar, S., Sharma, D. (2021b), Green financing in India: Identifying future scope for innovation in financial system. International Journal of Green Economics, 15(3), 185-212.
Bloom, D.E., Williamson, J.G. (1998), Demographic transitions and economic miracles in emerging Asia. The World Bank Economic Review, 12(3), 419-455.
Cai, L., Feng, X.P., Yu, J.Y., Xiang, Q.C., Chen, R. (2019), Reduction in carbon dioxide emission and energy savings obtained by using a green roof. Aerosol and Air Quality Research, 19(11), 2432-2445.
Cao, J., Law, S.H., Samad, A.R.B.A., Mohamad, W.N.B.W., Wang, J., Yang, X. (2021), Impact of financial development and technological innovation on the volatility of green growth-evidence from China. Environmental Science and Pollution Research, 28(35), 48053-48069.
Cao, L., Niu, H. (2022), Green credit and total factor carbon emission performance-evidence from moderation-based mediating effect test. International Journal of Environmental Research and Public Health, 19(11), 19116821.
Chang, L., Wang, J., Xiang, Z., Liu, H. (2021), Impact of green financing on carbon drifts to mitigate climate change: Mediating role of energy efficiency. Frontiers in Energy Research, 9, 785588.
Chen, A., Chen, H. (2021), Decomposition analysis of green technology innovation from green patents in China. Mathematical Problems in Engineering, 2021, 6672656.
Chen, W., Huang, X., Liu, Y., Luan, X., Song, Y. (2019), The impact of high-tech industry agglomeration on green economy efficiency-evidence from the Yangtze river economic belt. Sustainability (Switzerland), 11(19), 11195189.
Christoff, P. (2016), The promissory note: COP 21 and the Paris climate agreement. Environmental Politics, 25(5), 765-787.
Debrah, C., Chan, A.P.C., Darko, A. (2022), Green finance gap in green buildings: A scoping review and future research needs. Building and Environment, 207, 108443.
Deyo, F.C. (1987), The Political Economy of the New Asian Industrialism. United States: Cornell University Press.
Do, T.N., Burke, P.J. (2023), Phasing out coal power in a developing country context: Insights from Vietnam. Energy Policy, 176, 113512.
Dong, Z., He, Y., Wang, H., Wang, L. (2020), Is there a ripple effect in environmental regulation in China?- Evidence from the local-neighborhood green technology innovation perspective. Ecological Indicators, 118, 106773.
Du, J., Shen, Z., Song, M., Vardanyan, M. (2023), The role of green financing in facilitating renewable energy transition in China: Perspectives from energy governance, environmental regulation, and market reforms. Energy Economics, 120, 106595.
Durrani, A., Rosmin, M., Volz, U. (2020), The role of central banks in scaling up sustainable finance-what do monetary authorities in the Asia-Pacific region think? Journal of Sustainable Finance and Investment, 10(2), 92-112.
Fatica, S., Panzica, R. (2021), Green bonds as a tool against climate change? Business Strategy and the Environment, 30(5), 2688-2701.
Feng, Y., Geng, Y., Liang, Z., Shen, Q., Xia, X. (2021), Research on the impacts of heterogeneous environmental regulations on green productivity in china: The moderating roles of technical change and efficiency change. International Journal of Environmental Research and Public Health, 18(21), 182111449.
Geng, Q., Wang, Y., Wang, X. (2022), Research on the impact of environmental regulation on the regional green economy efficiency of China based on super-efficiency DEA-tobit model. Polish Journal of Environmental Studies, 31(3), 2611-2624.
Gereffi, G. (1996), Global commodity chains: New forms of coordination and control among nations and firms in international industries. Competition and Change, 1(4), 427-439.
Gereffi, G. (2018), Global value chains and development: Redefining the contours of 21st century capitalism. In: Development Trajectories in Global Value Chains. Cambridge: Cambridge University Press.
Haddad, M. (2007), Trade Integration in East Asia: The Role of China and Production Networks. Vol. 4160. United States: World Bank Publications.
Haddaway, N.R., Grainger, M.J., Gray, C.T. (2022), Citationchaser: A tool for transparent and efficient forward and backward citation chasing in systematic searching. Research Synthesis Methods, 13(4), 533-545.
Hanif, I., Raza, S.M.F., Gago-de-Santos, P., Abbas, Q. (2019), Fossil fuels, foreign direct investment, and economic growth have triggered CO2 emissions in emerging Asian economies: Some empirical evidence. Energy, 171, 493-501.
Hansen, B.E. (2005), Challenges for econometric model selection. Econometric Theory, 21(1), 60-68.
Hanson, G.H. (2012), The rise of middle kingdoms: Emerging economies in global trade. Journal of Economic Perspectives, 26(2), 41-64.
Hasan, M.M., Du, F. (2023), Nexus between green financial development, green technological innovation and environmental regulation in China. Renewable Energy, 204, 218-228.
Hossain, M. (2019), Factors Influencing FDI Inflows in SouthAsian Countries: A Panel Data Analysis.
Hu, A., Zhou, S. (2014), Green development: Functional definition, mechanism analysis and development strategy. Chinese Journal of Population Resources and Environment, 24, 14-20.
Huang, C., Chen, Y. (2022), How to enhance the green innovation of sports goods? Micro- and macro-level evidence from China's manufacturing enterprises. Frontiers in Environmental Science, 9, 809156.
Jin, B. (2021), Research on performance evaluation of green supply chain of automobile enterprises under the background of carbon peak and carbon neutralization. Energy Reports, 7, 594-604.
Kamran, H.W., Haseeb, M., Nguyen, T.T., Nguyen, V.C. (2020), Climate Change and Bank Stability: The Moderating Role of Green Financing and Renewable Energy Consumption in ASEAN. Berlin: Researchgate.

Kaplinsky, R., Messner, D. (2008), Introduction: The impact of asian Drivers on the developing world. World Development, 36, 197-209.
Khalil, M.A., Nimmanunta, K. (2021), Conventional versus green investments: advancing innovation for better financial and environmental prospects. Journal of Sustainable Finance and Investment, https://doi.org/10.1080/20430795.2021.1952822
Khan, K.S., Kunz, R., Kleijnen, J., Antes, G. (2003), Five steps to conducting a systematic review. Journal of the Royal Society of Medicine, 96(3), 118-121.
Khan, M.A., Riaz, H., Ahmed, M., Saeed, A. (2022a), Does green finance really deliver what is expected? An empirical perspective. Borsa Istanbul Review, 22(3), 586-593.
Khan, M.A., Riaz, H., Ahmed, M., Saeed, A. (2022b), Does green finance really deliver what is expected? An empirical perspective. Borsa Istanbul Review, 22(3), 586-593.
Khan, S.A.R., Sharif, A., Golpîra, H., Kumar, A. (2019), A green ideology in Asian emerging economies: From environmental policy and sustainable development. Sustainable Development, 27(6), 1063-1075.
Khanna, N., Purkayastha, D., Jain, S. (2022), Landscape of Green Finance in India 2022. Climate Policy Initiative. Available from: https://www.climatepolicyinitiative.org/publication/landscape-of-green-finance-in-india-2022
Kung, S.S., Li, H.L., Li, S.R., Zhang, L.G., Kung, C.C. (2022), Effects of green bonds on bioenergy development under climate change: A case study in Taiwan province, China. Advances in Climate Change Research, 13(1), 97-106.
Laybourn-Langton, L., Jacobs, M. (2018), Paradigm shifts in economic theory and policy. Intereconomics, 53(3), 113-118.
Lee, C.C., Zeng, M., Wang, C. (2022), Environmental regulation, innovation capability, and green total factor productivity: New evidence from China. Environmental Science and Pollution Research, 29(26), 39384-39399.
Li, C., Umair, M. (2023), Does green finance development goals affects renewable energy in China. Renewable Energy, 203, 898-905.
Li, D., Zhao, Y. (2021), How does environmental regulation effect green growth? An empirical investigation from china. Polish Journal of Environmental Studies, 30(2), 1247-1252.
Li, M., Hamawandy, N.M., Wahid, F., Rjoub, H., Bao, Z. (2021), Renewable energy resources investment and green finance: Evidence from China. Resources Policy, 74, 102402.
Li, X., Shi, P., Han, Y., Deng, A., Liu, D. (2020), Measurement and spatial variation of green total factor productivity of the tourism industry in China. International Journal of Environmental Research and Public Health, 17(4), 17041159.
Li, Z., Kuo, T.H., Siao-Yun, W., Vinh, L.T. (2022), Role of green finance, volatility and risk in promoting the investments in Renewable Energy Resources in the post-covid-19. Resources Policy, 76, 102563.
Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., Ioannidis, J.P.A., Clarke, M. (2009), Annals of internal medicine academia and clinic the PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions. Annals of Internal Medicine, 151(4), W65-W94.
Lin, Y., Anser, M.K., Peng, M.Y.P., Irfan, M. (2023), Assessment of renewable energy, financial growth and in accomplishing targets of China's cities carbon neutrality. Renewable Energy, 205, 1082-1091.
Liu, H., Yao, P., Latif, S., Aslam, S., Iqbal, N. (2022), Impact of Green financing, FinTech, and financial inclusion on energy efficiency. Environmental Science and Pollution Research, 29(13), 18955-18966.
Liu, X., Zhang, J., Liu, T., Zhang, X. (2022), Can the special economic zones promote the green technology innovation of enterprises? An evidence from China. Frontiers in Environmental Science, 10, 870019.
Lu, W.C. (2017), Greenhouse gas emissions, energy consumption and economic growth: A panel cointegration analysis for 16 Asian countries. International Journal of Environmental Research and Public Health, 14(11), 1436.
Ma, J., Hu, Q., Shen, W., Wei, X. (2021), Does the low-carbon city pilot policy promote green technology innovation? Based on green patent data of chinese a-share listed companies. International Journal of Environmental Research and Public Health, 18(7), 18073695.
Markhayeva, B., Ibrayev, A.S., Beisenova, M., Serikbayeva, G., Arrieta-López, M. (2023), Green banking tools for the implementation of a state's environmental policy: Comparative study. Journal of Environmental Management and Tourism, 14(1), 160-167.
Marsiglio, S., Privileggi, F. (2021), Three dimensional fractal attractors in a green transition economic growth model. Communications in Nonlinear Science and Numerical Simulation, 93, 105509.
Mastini, R., Kallis, G., Hickel, J. (2021), A Green New Deal without growth? Ecological Economics, 179, 106832.
Mayeda, A.M., Boyd, A.D. (2020), Factors influencing public perceptions of hydropower projects: A systematic literature review. Renewable and Sustainable Energy Reviews, 121, 109713.
Mehta, L., Srivastava, S., Adam, H.N., Alankar, Bose, S., Ghosh, U., Kumar, V.V. (2019), Climate change and uncertainty from "above" and "below": Perspectives from India. Regional Environmental Change, 19(6), 1533-1547.
Mercure, J.F., Pollitt, H., Edwards, N.R., Holden, P.B., Chewpreecha, U., Salas, P., Lam, A., Knobloch, F., Vinuales, J.E. (2018), Environmental impact assessment for climate change policy with the simulation-based integrated assessment model E3ME-FTT-GENIE. Energy Strategy Reviews, 20, 195-208.
Nawaz, M.A., Seshadri, U., Kumar, P., Aqdas, R., Patwary, A.K., Riaz, M. (2021), Nexus between green finance and climate change mitigation in N-11 and BRICS countries: Empirical estimation through difference in differences (DID) approach. Environmental Science and Pollution Research, 28(6), 6504-6519.
Nenavath, S. (2022), Impact of fintech and green finance on environmental quality protection in India: By applying the semi-parametric difference-in-differences (SDID). Renewable Energy, 193, 913-919.
Nhamo, G., Nhamo, S. (2016), Paris (COP21) Agreement: Loss and damage, adaptation and climate finance issues. International Journal of African Renaissance Studies-Multi-, Inter-and Transdisciplinarity, 11(2), 118-138.
Noh, H.J. (2018), Financial Strategy to Accelerate Green Growth. Available from: https://www.adb.org/publications/financial-strategy-accelerate-green-growth
Pan, Y., Weng, G., Li, C., Li, J. (2021), Coupling coordination and influencing factors among tourism carbon emission, tourism economic and tourism innovation. International Journal of Environmental Research and Public Health, 18(4), 1-17.
Perez, C. (2016), Capitalism, technology and a green global golden age: The role of history in helping to shape the future. Rethinking Capitalism. Economics and Policy for Sustainable and Inclusive Growth, 1, 191-217.
Phillips, P.C.B. (1996), Econometric model determination. Econometrica: Journal of the Econometric Society, 64(4), 763-812.
Prajapati, D., Paul, D., Malik, S., Mishra, D.K. (2021), Understanding the preference of individual retail investors on green bond in India: An empirical study. Investment Management and Financial Innovations, 18(1), 177-189.
Qadir, S.A., Al-Motairi, H., Tahir, F., Al-Fagih, L. (2021), Incentives and strategies for financing the renewable energy transition: A review. Energy Reports, 7, 3590-3606.
Qu, F., Xu, L., Chen, Y. (2022), Can market-based environmental regulation promote green technology innovation? Evidence from

China. Frontiers in Environmental Science, 9, 823536.
Rawat, S.K., Dr. Anu. (2020), Green finance: An emerging prospective towards sustainable development in India. International Journal of Advanced Science and Technology, 29(3), 8456-8467.
Ray, S., Aditya, I., Pal, M.K. (2023), The influence of energy consumption, economic growth, industrialisation and corruption on carbon dioxide emissions: Evidence from selected Asian economies. In: The Impact of Environmental Emissions and Aggregate Economic Activity on Industry: Theoretical and Empirical Perspectives. United Kingdom: Emerald Publishing Limited. p93-110.
Ren, X., Shao, Q., Zhong, R. (2020), Nexus between green finance, non-fossil energy use, and carbon intensity: Empirical evidence from China based on a vector error correction model. Journal of Cleaner Production, 277, 122844.
Sabir, S., Gorus, M.S. (2019), The impact of globalization on ecological footprint: empirical evidence from the South Asian countries. Environmental Science and Pollution Research, 26, 33387-33398.
Sachs, J.D., Woo, W.T., Yoshino, N., Taghizadeh-Hesary, F. (2019a), Importance of green finance for achieving sustainable development goals and energy security. In: Handbook of Green Finance. Berlin: Springer. p3-12.
Sachs, J.D., Woo, W.T., Yoshino, N., Taghizadeh-Hesary, F. (2019b), Why is Green Finance Important? ADBI Working Paper Series.
Saleem, H., Khan, M.B., Mahdavian, S.M. (2022), The role of green growth, green financing, and eco-friendly technology in achieving environmental quality: Evidence from selected Asian economies. Environmental Science and Pollution Research, 29(38), 57720-57739.
Sarma, P., Roy, A. (2021), Green financial instruments in India: A study on its current status and future prospects. International Journal of Business Innovation and Research, 26(2), 194-218.
Sarma, P., Roy, A. (2022), Current status and future prospects of green finance in SAARC nations. International Journal of Business Innovation and Research, 28(2), 180-204.
Shao, M., Xue, M. (2022), Decomposition analysis of carbon emissions: Considering China's energy efficiency. Energy Reports, 8, 630-635.
Sharma, M., Choubey, A. (2022), Green banking initiatives: A qualitative study on Indian banking sector. Environment, Development and Sustainability, 24(1), 293-319.
Sharma, M., Choubey, A., Prajapati, D., Paul, D., Malik, S., Mishra, D.K., Nenavath, S. (2022), Impact of fintech and green finance on environmental quality protection in India: By applying the semi-parametric difference-in-differences (SDID). Investment Management and Financial Innovations, 193(1), 293-319.
Shen, J., Ridwan, L.I., Raimi, L., Al-Faryan, M.A.S. (2023), Recent developments in green hydrogen-environmental sustainability nexus amidst energy efficiency, green finance, eco-innovation, and digitalization in top hydrogen-consuming economies. Energy and Environment, https://doi.org/10.1177/0958305X231153936
Shuai, S., Fan, Z. (2020), Modeling the role of environmental regulations in regional green economy efficiency of China: Empirical evidence from super efficiency DEA-Tobit model. Journal of Environmental Management, 261, 110227.
Tauhid, F.A., Zawani, H. (2018), Mitigating climate change related floods in urban poor areas: Green infrastructure approach. Journal of Regional and City Planning, 29(2), 98-112.
To, A.H., Ha, D.T.T., Nguyen, H.M., Vo, D.H. (2019), The impact of foreign direct investment on environment degradation: Evidence from emerging markets in Asia. International Journal of Environmental Research and Public Health, 16(9), 1636.
Tolliver, C., Fujii, H., Keeley, A.R., Managi, S. (2021), Green innovation and finance in Asia. Asian Economic Policy Review, 16(1), 67-87.
Tolliver, C., Keeley, A.R., Managi, S. (2019), Green bonds for the Paris agreement and sustainable development goals. Environmental Research Letters, 14(6), 064009.
Tu, Q., Mo, J., Liu, Z., Gong, C., Fan, Y. (2021), Using green finance to counteract the adverse effects of COVID-19 pandemic on renewable energy investment-The case of offshore wind power in China. Energy Policy, 158, 112542.
Vazquez-Brust, D., Smith, A.M., Sarkis, J. (2014a), Managing the transition to critical green growth: The 'Green Growth State.' Futures, 64, 38-50.
Vazquez-Brust, D., Smith, A.M., Sarkis, J. (2014b), Managing the transition to critical green growth: The 'Green Growth State.' Futures, 64, 38-50.
Verma, A., Agarwal, R. (2020), A study of green bond market in India: A critical review. IOP Conference Series: Materials Science and Engineering, 804(1), 012052.
Versal, N., Sholoiko, A. (2022), Green bonds of supranational financial institutions: On the road to sustainable development. Investment Management and Financial Innovations, 19(1), 91-105.
Volz, U. (2018), Fostering green finance for sustainable development in Asia. In: Routledge Handbook of Banking and Finance in Asia. Oxfordshire: Routledge. p488-504.
Wang, G., Li, S., Yang, L. (2022), Research on the pathway of green financial system to implement the realization of China's carbon neutrality target. International Journal of Environmental Research and Public Health, 19(4), 19042451.
Wang, L., Qiu, X.M., Zhang, X.X., Ma, R.H., Jiang, Y.H. (2019), Development status and environmental impact evaluation of China's green finance. Applied Ecology and Environmental Research, 17(5), 12245-12258.
Wang, P., Liang, S. (2022), Environmental regulations and energy efficiency: The mediating role of climate change and technological innovation. Frontiers in Environmental Science, 10, 909082.
Wang, Q., Qu, J., Wang, B., Wang, P., Yang, T. (2019), Green technology innovation development in China in 1990-2015. Science of the Total Environment, 696, 134008.
Wang, Y., Zhao, N., Lei, X., Long, R. (2021), Green finance innovation and regional green development. Sustainability, 13(15), 8230.
Wu, G. (2022), Research on the spatial impact of green finance on the ecological development of Chinese economy. Frontiers in Environmental Science, 10, 887896.
Wu, H. (2022), Trade openness, green finance and natural resources: A literature review. Resources Policy, 78, 102801.
Xu, M., Qin, Z., Wei, Y. (2023), Exploring the financing and allocating schemes for the Chinese Green Climate Fund. Environment, Development and Sustainability, 25(3), 2487-2508.
Yang, G., Zha, D., Wang, X., Chen, Q. (2020), Exploring the nonlinear association between environmental regulation and carbon intensity in China: The mediating effect of green technology. Ecological Indicators, 114, 106309.
Yao, S. (2021), Fuzzy-based multi-criteria decision analysis of environmental regulation and green economic efficiency in a post-COVID-19 scenario: The case of China. Environmental Science and Pollution Research, 28(24), 30675-30701.
Ye, T., Zheng, H., Ge, X., Yang, K. (2021), Pathway of green development of yangtze river economics belt from the perspective of green technological innovation and environmental regulation. International Journal of Environmental Research and Public Health, 18(19), 181910471.
Zahoor, Z., Khan, I., Hou, F. (2022), Clean energy investment and financial development as determinants of environment and sustainable economic growth: Evidence from China. Environmental Science and Pollution Research, 29(11), 16006-16016.
Zhang, K.Q., Chen, H.H., Tang, L.Z., Qiao, S. (2022), Green finance,

innovation and the energy-environment-climate nexus. Frontiers in Environmental Science, 10, 879681.

Zhou, W., McCollum, D.L., Fricko, O., Fujimori, S., Gidden, M., Guo, F., Hasegawa, T., Huang, H., Huppmann, D., Krey, V., Liu, C., Parkinson, S., Riahi, K., Rafaj, P., Schoepp, W., Yang, F., Zhou, Y. (2020), Decarbonization pathways and energy investment needs for developing Asia in line with 'well below' 2°C. Climate Policy, 20(2), 234-245.

Zhu, L., Luo, J., Dong, Q., Zhao, Y., Wang, Y., Wang, Y. (2021), Green technology innovation efficiency of energy-intensive industries in China from the perspective of shared resources: Dynamic change and improvement path. Technological Forecasting and Social Change, 170(12), 120890.

Zhu, Y., Sun, Z., Zhang, S., Wang, X. (2021), Economic policy uncertainty, environmental regulation, and green innovation-an empirical study based on chinese high-tech enterprises. International Journal of Environmental Research and Public Health, 18(18), 18189503.