A Systematic Literature Review on Strategic Energy Policy for Enhancing Renewable Energy Investment to Support Economic Growth, Environmental Sustainability, and Energy Resilience in Indonesia

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Abstract: The urgency of transitioning to renewable energy (RE) is intensifying in response to escalating climate change risks, energy security challenges, and volatile global economic conditions. As one of the largest energy consumers in Southeast Asia, Indonesia stands at a pivotal juncture in its efforts to reduce dependence on fossil fuels while meeting growing domestic energy demands. Despite its abundant renewable energy potential, investment and infrastructure development remain significantly below expectations, hindering progress toward national energy objectives. To address these challenges, this study employs a Systematic Literature Review (SLR) of peer-reviewed publications from Scopus-indexed journals published between 2019 and 2024 to examine the impact of renewable energy investment on three critical dimensions: economic growth, environmental sustainability, and energy resilience. Guided by the PRISMA framework and applying structured inclusion and exclusion criteria, 56 high-quality articles were selected for in-depth analysis. The literature is categorized into three thematic areas: (i) Renewable Energy Investment (REI) and Economic Growth, (ii) REI and Environmental Sustainability, and (iii) Energy Resilience and Investment.

Renewable energy (RE) investment plays a vital role in driving economic growth, especially in developing and emerging economies. It supports job creation, technological innovation, and attracts foreign direct investment (FDI), contributing to macroeconomic stability. Studies highlight a strong positive correlation between RE investment and GDP growth, particularly in OECD and BRICS countries, with greater benefits observed in nations with stable governance and regulatory frameworks. Environmentally, while solar and wind energy help reduce emissions, challenges such as biofuel-related deforestation, land use conflicts, and limited lifecycle assessments persist. Green finance and strong environmental governance are crucial to maximizing these benefits. In terms of energy resilience, REI enhances energy security by diversifying sources and reducing reliance on fossil fuel imports. However, high initial costs, weak infrastructure, and limited domestic technology capacity hinder rapid implementation, particularly in developing regions.

Based on these findings, this study proposes a strategic policy framework to accelerate Indonesia's renewable energy transition. Key recommendations include regulatory reforms to streamline licensing, targeted financial incentives such as green subsidies and tax exemptions, investment in local R&D to reduce technological dependence, and the promotion of Public-Private Partnerships to bridge funding gaps and foster innovation. Strengthening community engagement and improving grid infrastructure are also essential to enhance the acceptance and feasibility of RE deployment. Integrating renewable energy investment into national development strategies requires robust monitoring and evaluation mechanisms to support effective implementation and adaptive policymaking. Based on Indonesia's Net Zero Emissions (NZE) target by 2060, a comprehensive policy framework is needed to balance economic growth, environmental sustainability, and energy

resilience. A just transition must ensure equitable energy access, capacity building, and support for communities affected by the decline of fossil fuel industries. This review offers valuable insights for policymakers, planners, and investors by contextualizing global best practices within Indonesia's unique socio-economic landscape. With aligned policies, financing, and innovation, Indonesia can realize its renewable energy potential and lead a sustainable energy future in the region.

Keywords: Economic Growth, Energy Policy in Indonesia, Energy Resilience, Environmental Sustainability, Renewable Energy Investment.

Introduction

The transition to renewable energy has gained momentum as a response to climate change, energy resilience concerns, and economic stability. The United Nations Sustainable Development Goal 7 (UNSDG 7) emphasizes the need for affordable, reliable, sustainable, and modern energy for all by 2030. Despite this, fossil fuels still dominate global energy consumption, accounting for 80% of the total supply (IEA, 2022).

Indonesia, as the largest economy in Southeast Asia, faces a significant challenge in reducing its reliance on fossil fuels despite its vast renewable energy potential, including solar, wind, hydro, and geothermal resources. However, investments in renewable energy remain limited, with only 40% of the targeted amount realized in 2022 (Migas ESDM, 2022). Several barriers hinder progress, including policy and regulatory uncertainty, which delays investment decisions, as well as the high initial capital costs required for renewable energy infrastructure. Additionally, inadequate grid infrastructure restricts the integration of renewable energy sources, while reliance on imported technology for solar panels and wind turbines further complicates efforts to accelerate the transition to sustainable energy.

Indonesia's commitment to achieving Net Zero Emissions (NZE) by 2060 requires a significant increase in RE investment and policy intervention. Thus, analyzing the economic, environmental, and energy resilience implications of RE investment is crucial for shaping strategic policies that promote sustainable energy transitions.

Methodology

This study employs a Systematic Literature Review (SLR) approach to examine the impact of Renewable Energy Investment (REI) on economic growth, environmental sustainability, and energy resilience. The research utilizes SCOPUS as the primary database, with keyword searches based on: (i) "Renewable Energy Investment" AND "Economic Growth," (ii) "Renewable Energy Investment" AND "Environmental Sustainability," and (iii) "Energy Resilience" AND "Investment." These keywords were selected to align with the research objectives. The search yielded 166 data entries (n = 166), distributed as follows: 93 articles on economic growth, 34 articles on environmental sustainability, and 39 articles on energy resilience. To refine the dataset, exclusion criteria were applied, removing 21 articles based on publication year (2019–2024), 23 articles due to document type, 0 articles for language, 54 articles based on research area, and 12 articles due to keyword relevance. This systematic approach ensures that the final selection of articles is highly relevant, methodologically rigorous, and aligned with the study's objectives.

Results

This section will present the results and analysis of data processing conducted using the Systematic Literature Review (SLR) approach. This research uses three keywords: (i) "Renewable Energy Investment" AND "Economic Growth"; (ii) "Renewable Energy Investment" AND "Environmental Sustainability"; and (iii) "Energy Resilience" AND "Investment." Before delving deeper into the results of each keyword, the following will show the development of studies/literature on the topic of Renewable Energy Investment (REI) in the Scopus database.

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Figure 1: Literature Productivity per Year Based on Number of Documents (Renewable Energy Investment)
2019-2024
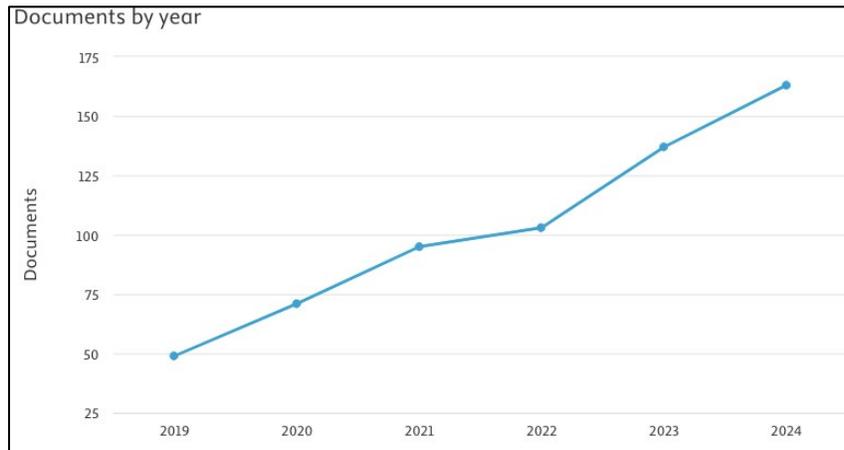
The figure above shows that the productivity of literature related to Renewable Energy Investment (REI) has consistently increased each year over the past six years. The growth over the last five years is presented in the following table:

Table 1: Growth of Literature Productivity (Renewable Energy Investment)
2019-2024

Year	Documents	Growth	
2019	49	-	
2020	71	44,90	
2021	95	33,80	232,65
2022	103	8,42	
2023	137	33,01	
2024	163	18,98	

Based on the table above, it can be observed that 2020 recorded the highest productivity growth at 44.9%. The second-highest growth occurred in 2021 and 2023, with respective values of 33.80% and 33.01%. Meanwhile, the lowest growth was in 2022, at 8.42%. If traced back to the initial year (2015), the total data growth reached 232.65% by 2019. The following section also presents the most productive sources over the past six years, as illustrated in the figure below:
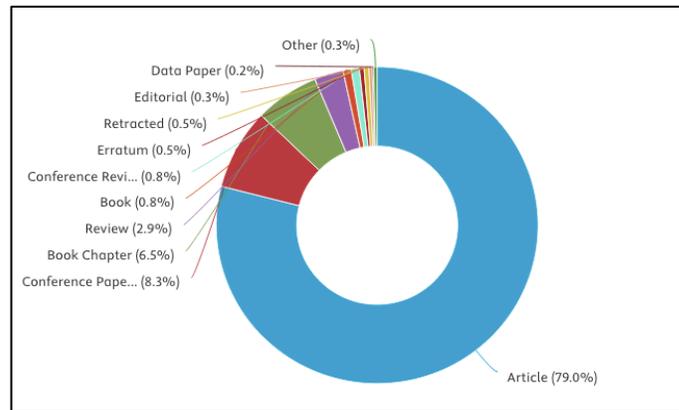
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Figure 2: Literature Productivity per Year Based on Sources
(Renewable Energy Investment) 2019-2024
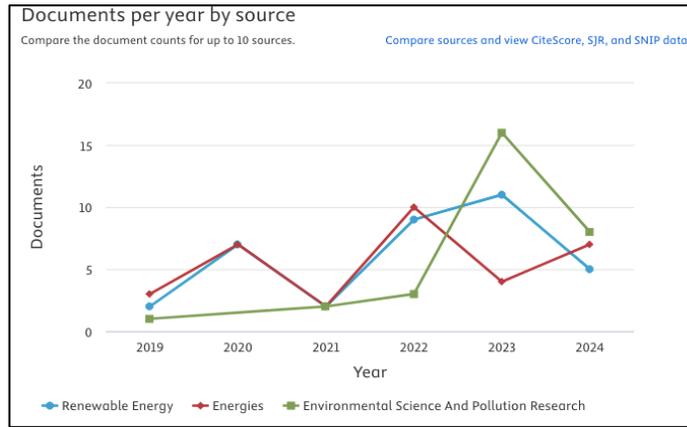
The figure above shows that *Renewable Energy* is the most productive journal source, contributing 36 publications, followed by *Energies* with 33 publications. The third position is held by *Environmental Science & Pollution Research*, with a total of 30 publications. This productivity is categorized into several document types, including Articles (79.9%), Conference Papers (8.3%), Book Chapters (6.5%), and others. The following figure illustrates this distribution.

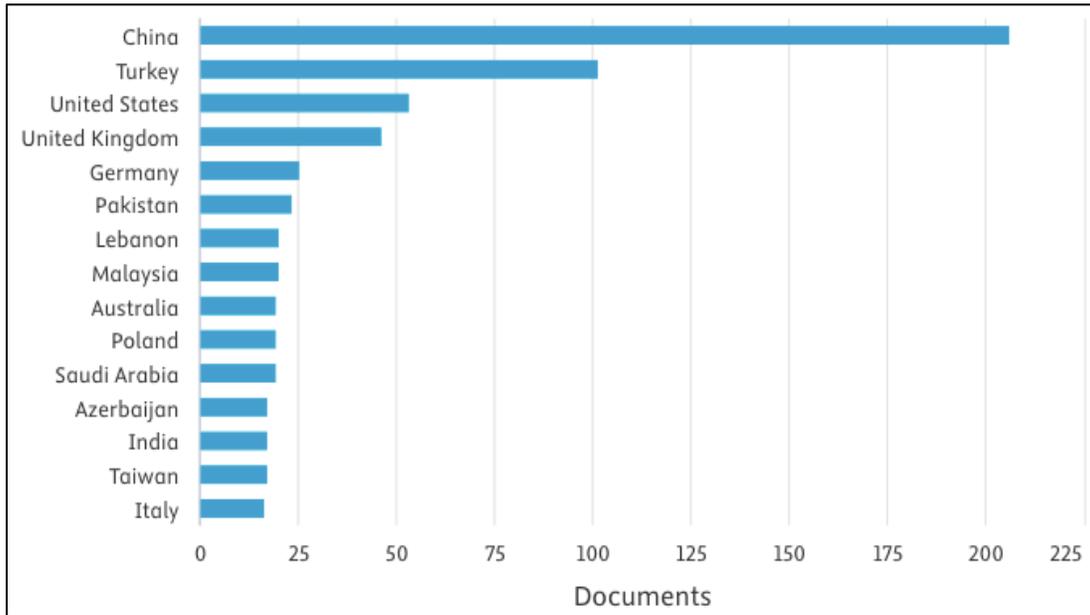**Figure 3: Literature Productivity per Year Based on Document Type**
(Renewable Energy Investment) 2015-2024

The figure above shows that, over the past six years, literature on Renewable Energy Investment (REI) has been predominantly published as journal articles, followed by conference papers. Furthermore, the distribution of contributions by country has also been mapped.

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**Figure 4: Literature Productivity per Year Based on Country (Renewable Energy Investment) 2015-2024**

Based on the figure above, the most productive countries in generating literature on Renewable Energy Investment (REI) from 2019 to 2024 are China, Turkey, the United States, the United Kingdom, Germany, and others. The number of publications produced by each country is presented in the following table:

Table 2: Literature Productivity per Year Based on Country
(Renewable Energy Investment) 2015-2024

Rank	Country	Document
1	China	206
2	Turkey	101
3	United States	53
4	United Kingdom	46
5	Germany	25
6	Pakistan	23
7	Lebanon	20
8	Malaysia	20
9	Australia	19
10	Poland	19
11	Saudi Arabia	19
12	Azerbaijan	17
13	India	17
14	Taiwan	17
15	Italy	16

Based on the table above, China contributed 206 documents, Turkey contributed 101 documents, and the United States contributed 53 documents, among others. These results are categorized into several subject areas, as illustrated in the following figure:

**Figure 5: Literature Productivity per Year Based on Subject Area
(Renewable Energy Investment) 2019-2024**
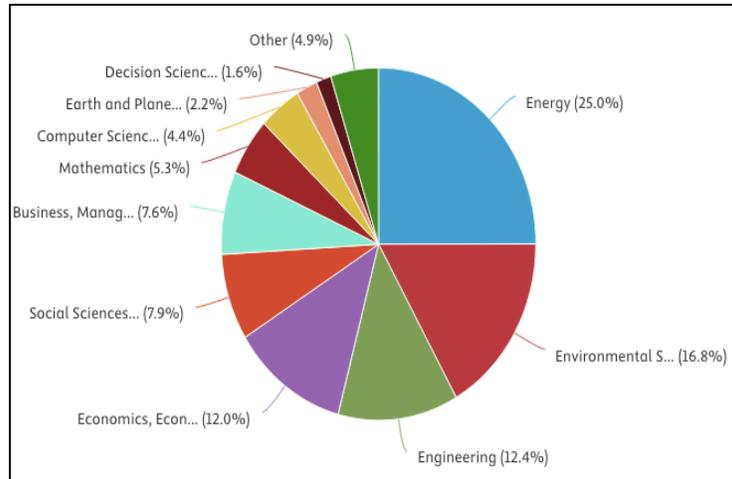
Based on these results, the subject area with the highest contribution to literature productivity is *Energy*, accounting for 25%. *Environmental Science* follows with a contribution of 16.8%, while *Engineering* accounts for 12.4%, and *Economics, Econometrics & Finance* contribute 12%.

In the next stage, the screening results of each data source (article) will be presented for further analysis. As previously explained, the article screening process was conducted using inclusion and exclusion criteria with the assistance of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) diagram.

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Figure 6: PRISMA
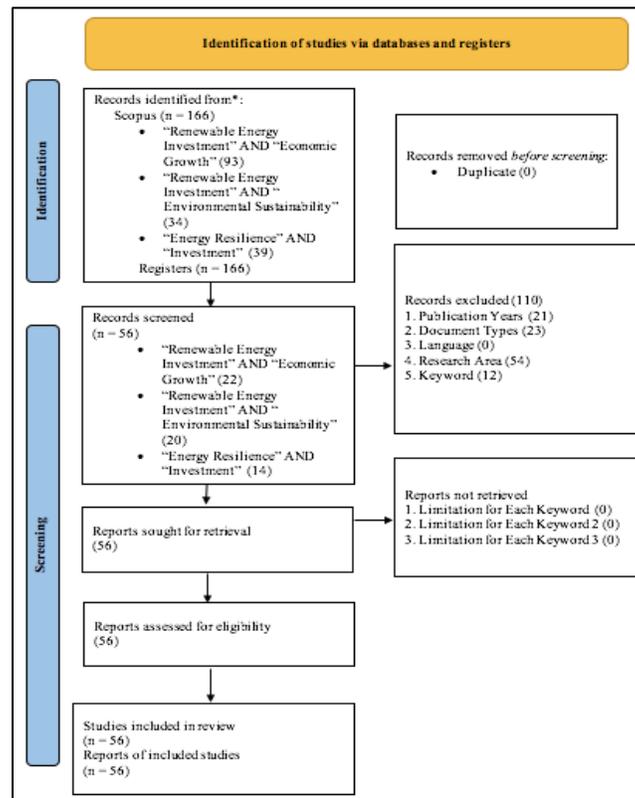

Referring to the figure above, this study considers publications from 2019 to 2024, covering a six-year period. The selected keywords include **(i)** "Renewable Energy Investment" AND "Economic Growth," **(ii)** "Renewable Energy Investment" AND "Environmental Sustainability," and **(iii)** "Energy Resilience" AND "Investment." These keywords were chosen based on the research objectives to ensure relevance to the study's focus. The keyword search yielded **166 data entries (n = 166),** distributed as follows: 93 entries for "Renewable Energy Investment" AND "Economic Growth," 34 for "Renewable Energy Investment" AND "Environmental Sustainability," and 39 for "Energy Resilience" AND "Investment." To refine the dataset, exclusion criteria were applied, resulting in the removal of **21 entries** based on publication year, **23** due to document type, **0** for language, **54** for research area, and **12** for keyword relevance. Ultimately, **56 eligible articles** were selected for further data analysis.

Renewable Energy Investment (AND) Economic Growth

The study identified 22 selected articles related to renewable energy investment and economic growth, spanning various journals and research contexts from 2019 to 2024. These articles explore key themes such as the impact of economic policies, financial development, geopolitical risks, and energy resilience on renewable energy investments. The research covers diverse geographical regions, including G7 countries, OECD economies, BRICS nations, and high-income countries, providing insights into the role of renewable energy in economic sustainability. By analyzing firm-level data, policy recommendations, and novel evaluation methods, these studies contribute to understanding the relationship between renewable energy investment, economic performance, and environmental sustainability.Based on the studies above, the following figure presents the most frequently occurring keywords:

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Figure 7: Most Frequent Words "Renewable Energy Investment" AND "Economic Growth"
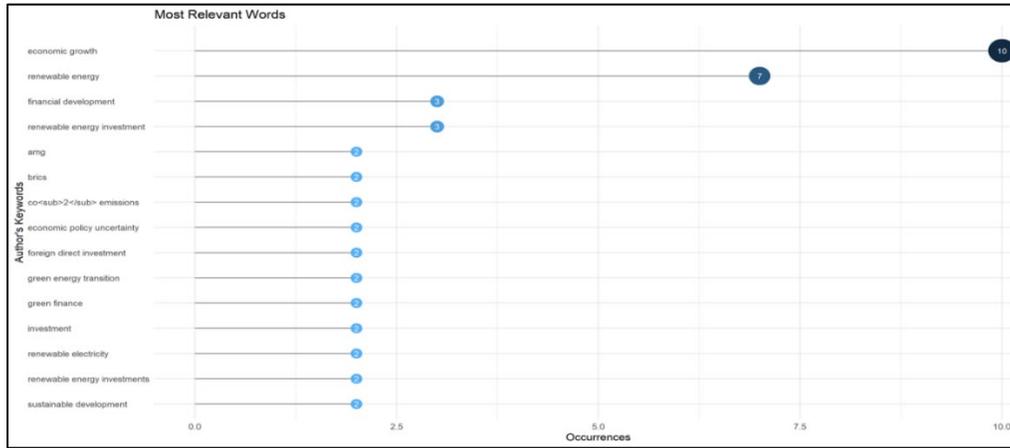
The figure above highlights that the keyword "Economic Growth" appears most frequently and has a strong association with "Renewable Energy Investment" (REI). Several studies reinforce this relationship. Kerrouche & Zehri (2024) analyzed 93 companies in Saudi Arabia from 2000 to 2003 and found that REI significantly boosts GDP growth, Foreign Direct Investment (FDI) inflows, and job creation. Similarly, Zhang (2022) examined OECD countries and concluded that REI plays a crucial role in enhancing economic growth, attracting FDI, and stimulating international trade. Additionally, Jaradat (2022) studied the impact of REI on economic growth in GCC countries (2010–2019), finding a significant positive effect in the UAE, Saudi Arabia, and Qatar, while the impact was not significant in Bahrain, Kuwait, and Oman. These findings suggest that REI is a key driver of economic expansion and financial development, though its effects may vary across regions.

Figure 8: Keyword Network Cluster "Renewable Energy Investment" AND "Economic Growth"
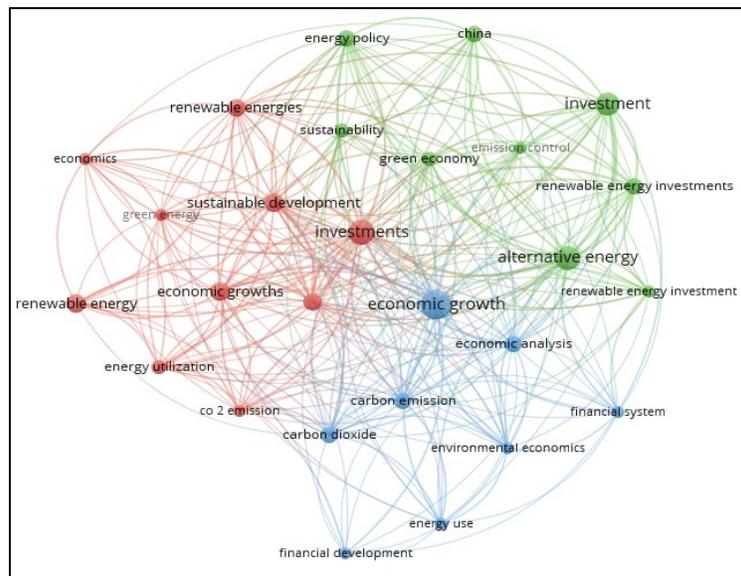
The keyword clustering analysis of the **22 selected articles** on **Renewable Energy Investment (REI) and Economic Growth** reveals three main clusters, as illustrated in the figure above. **Cluster 1 (Red)** comprises **10 nodes**, including **CO_2 Emission, Economic Growth, Energy Utilization, Green Energy, and Sustainable Development**, highlighting the strong link between REI and environmental sustainability. **Cluster 2 (Green)** consists of **9 nodes**,

such as **Alternative Energy, Emission Control, Energy Policy, and Green Economy**, indicating the policy and regulatory aspects influencing REI. **Cluster 3 (Blue)** includes **8 nodes**, featuring **Carbon Dioxide, Economic Analysis, Financial Development, and Environmental Economics**, emphasizing the financial and economic impacts of REI. These clusters illustrate the **multidimensional relationship** between renewable energy investments, economic growth, environmental sustainability, and financial systems, providing a foundation for further research in this field.

Figure 9: Renewable Energy Investment vs Economic Growth

Based on the figure above, it can be observed that the keyword **"Renewable Energy Investment"** is strongly associated with **"Economic Growth," "Sustainable Development," "Carbon Emission,"** and related terms.Next, the **thematic clustering of keywords** will be presented to analyze the relevance and development of the topic. The following figure illustrates this relationship:

Figure 10: Thematic Map - Renewable Energy Investment vs Economic Growth

Based on the figure above, the relationship between the keywords **"Economic Growth"** and **"Renewable Energy"** is positioned in **Quadrant 3 (Q3), approaching Quadrant 4 (Q4).**

This indicates that the relevance of the keyword relationship is **moderate** and its **development is still slow.** Therefore, this topic holds **significant potential** for further exploration and expansion in the **Scopus database.**

Renewable Energy Investment (AND) Environmental Sustainability

A total of 20 articles were identified from the data screening process, highlighting the connection between Renewable Energy Investment (REI) and sustainability factors. The selection was based on the query targeting economic growth, investment, and sustainability-related keywords within relevant subject areas, including economics, business, and

social sciences. The studies cover diverse geographic regions and explore various aspects of green finance, energy resilience, environmental policies, and sustainable energy transitions. Key findings include the role of REI in economic performance (Zhang, 2022), the impact of green finance on sustainability (Hu & Jin, 2023), and policy recommendations for sustainable development (Chen, Liu, & Wei, 2023). The articles provide valuable insights into how REI contributes to economic resilience, environmental sustainability, and long-term energy strategies, reinforcing the need for strategic policy interventions to optimize renewable energy investments in different economic contexts. Based on the studies above, the following figure presents the most frequently occurring keywords:

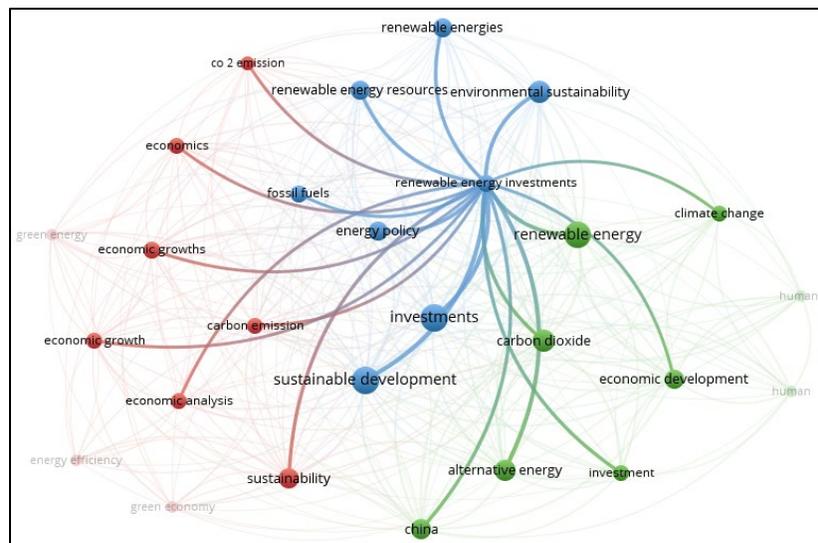**Figure 11: Most Frequent Words "Renewable Energy Investment" AND "Environmental Sustainability"**
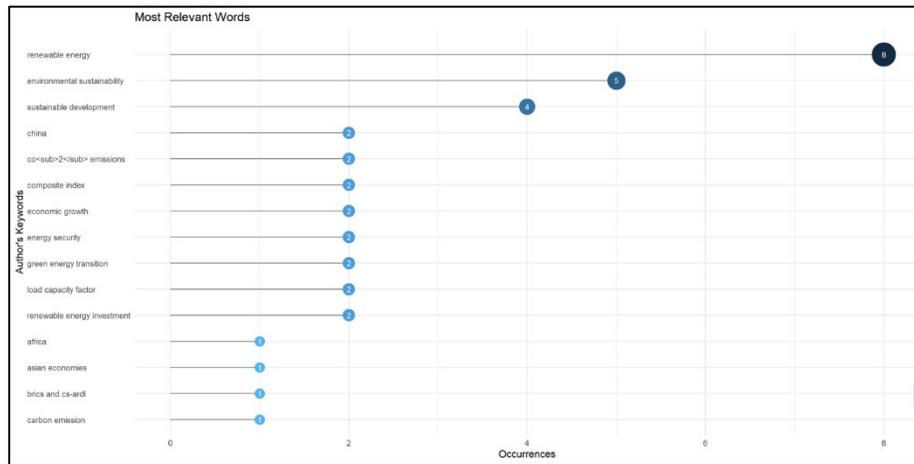
The figure above highlights that "Environmental Sustainability" is the second-most frequent keyword, appearing five times, and is strongly linked to "Renewable Energy Investment" (REI). Several studies support this connection. Nulambeh & Jaiyeoba (2024) found that transitioning to renewable energy reduces the ecological footprint and emphasized the need for government intervention to increase REI and minimize environmental degradation. Similarly, Yadav et al. (2024) analyzed the relationship between governance, REI, and green finance in BRICS countries using the CS-ARDL model and concluded that strong governance and green financing significantly reduce CO_2 emissions while promoting sustainable development. In line with these findings, Abbas et al. (2023) also confirmed that REI plays a crucial role in enhancing environmental sustainability, further reinforcing its importance in achieving long-term ecological and economic stability. The relationships among these keywords are illustrated in the following figure:

**Figure 12: Keyword Network Cluster "Renewable Energy Investment" AND "Environmental Sustainability"**
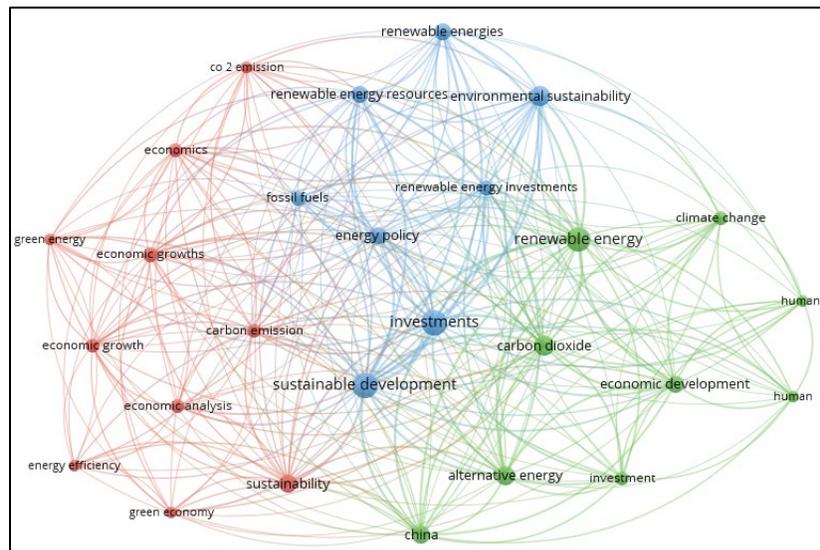
The keyword clustering analysis of the 20 selected articles on Renewable Energy Investment (REI) and Environmental Sustainability reveals three main clusters, as shown in the figure above. Cluster 1 (Red) – Core Topics (10 items) includes CO_2 Emission, Economic Growth, Energy Efficiency, Green Energy, and Sustainability, highlighting the fundamental connection between REI and environmental impact. Cluster 2 (Green) – Policy & Investment (9 items) consists of Alternative Energy, Climate Change, Economic Development, and Renewable Energy, emphasizing the role of policy measures and investments in fostering sustainable energy transitions. Cluster 3 (Blue) – Economic & Financial Aspects (8 items) includes Energy Policy, Environmental Sustainability, Fossil Fuels, and Sustainable Development, underscoring the financial and regulatory considerations influencing REI. These clusters illustrate the multidimensional nature of REI in advancing environmental sustainability, economic resilience, and policy-driven energy strategies.

Figure 13: Renewable Energy Investment vs Environmental Sustainability

The figure above highlights that the keyword "Renewable Energy Investment" has a strong association with "Environmental Sustainability," "Sustainable Development," "Sustainability," and other related terms. This connection underscores the critical role of renewable energy investments in fostering long-term environmental and economic stability. To further examine the relevance and development trends of this topic, the thematic clustering of keywords will be presented in the following figure, which provides insights into the evolution, significance, and future research directions within the Renewable Energy Investment and Environmental Sustainability framework.

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Figure 14: Thematic Map - Renewable Energy Investment vs Environmental Sustainability
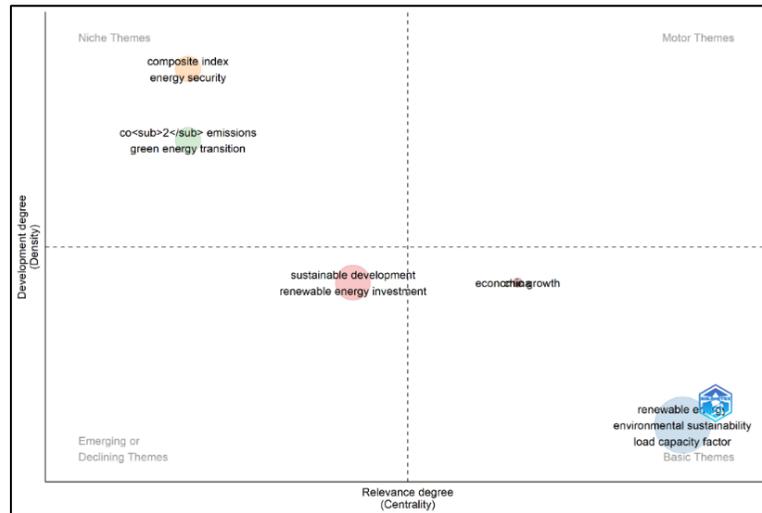

The figure above shows that the relationship between "Renewable Energy Investment" and "Sustainable Development" is positioned in Quadrant 3 (Q3), approaching Quadrant 4 (Q4), indicating moderate relevance and slow development. Similarly, "Environmental Sustainability" falls within the same category, suggesting that while these topics are recognized in academic research, their growth and impact remain underdeveloped. This positioning highlights a significant research gap, presenting an opportunity for further exploration and expansion in the Scopus database. Given their importance in addressing climate change, energy resilience, and economic resilience, these keywords hold strong potential for future research and policy development, making them valuable areas for academic and industry-focused studies.

Energy Resilience (AND) Investment

A total of 14 articles were identified through the data screening process, focusing on the relationship between energy resilience and investment. The selected studies cover diverse topics, including renewable energy deployment, decentralized energy solutions, techno-economic assessments, and policy strategies to enhance energy security and resilience. Several studies explore optimal grid flexibility (Zaheb et al., 2023), storm hardening in typhoon-prone regions (Castro et al., 2023), and sustainable energy independence through hydrogen-based systems (Laimon & Yusaf, 2024). Other research highlights policy-driven transitions (Verrier & Strachan, 2024) and ecological-economic assessments of renewable energy adoption (Huang et al., 2020). These findings emphasize the growing need for strategic investments in renewable energy technologies, infrastructure resilience, and sustainable energy transitions, making energy resilience a crucial area for future research and policy development. Based on the studies above, the following figure presents the most frequently occurring keywords:

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**Figure 15: Most Frequent Words "Energy Resilience" AND "Investment"**
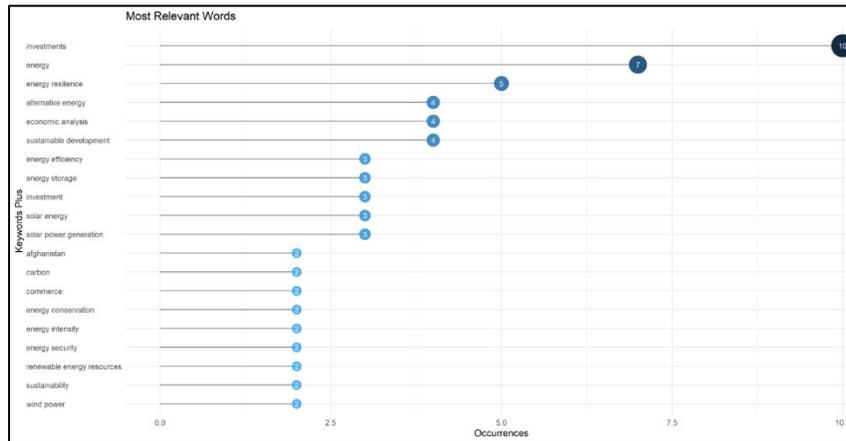
The figure above reveals a strong connection between "Energy Resilience" and "Investment," with occurrence frequencies of 5 and 10, respectively. Li et al. (2024) examined sustainability in the mining industry across ASEAN countries within the Comprehensive Economic Partnership in East Asia (CEPEA) over 1.5 decades. Their findings emphasize the necessity of green management policies and highlight renewable energy investment (REI) as a key factor in strengthening energy resilience by reducing energy intensity in both the short and long term. Similarly, Li & Zhang (2023) analyzed 30 provinces in China (2015–2018) and concluded that renewable energy development, energy investment, economic growth, and policy coordination are essential in sustaining regional energy resilience. These studies underscore the critical role of REI in ensuring long-term energy resilience, economic stability, and sustainable development. The relationships among these keywords are illustrated in the following figure:

**Figure 16: Keyword Network Cluster "Energy Resilience" AND "Investment"**
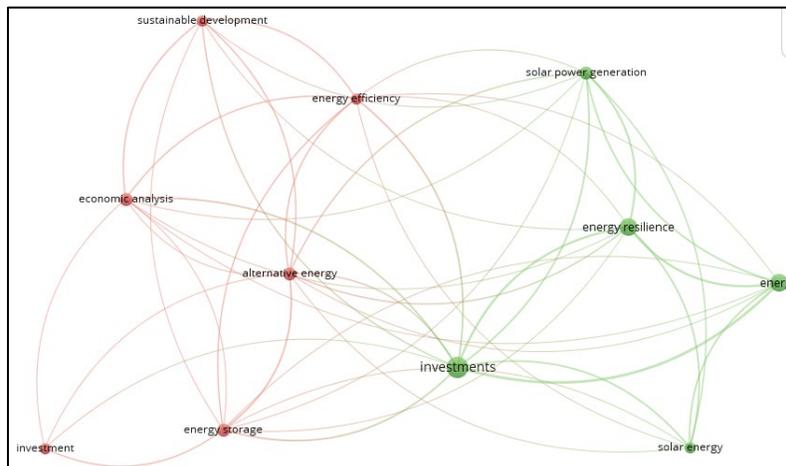
The keyword clustering analysis of 20 selected articles on Energy Resilience and Investment reveals two main clusters. Cluster 1 (Red) – Economic & Efficiency Focus (6 items) includes Alternative Energy, Economic Analysis, Energy Efficiency, Energy Storage, Investment, and Sustainability, highlighting the financial and efficiency-related aspects of energy resilience. Cluster 2 (Green) – Energy & Solar Power Focus (5 items) consists of Energy, Energy Resilience, Investments, Solar Energy, and Solar Power Generation, emphasizing the role of renewable energy sources, particularly solar power, in enhancing energy resilience. These clusters illustrate the interdisciplinary nature of energy resilience, demonstrating its reliance on economic investment, technological advancements, and renewable energy adoption for long-term sustainability and stability. The relationship between Energy Resilience and Investment is illustrated in the following figure:

Figure 17: Energy Resilience vs Investment
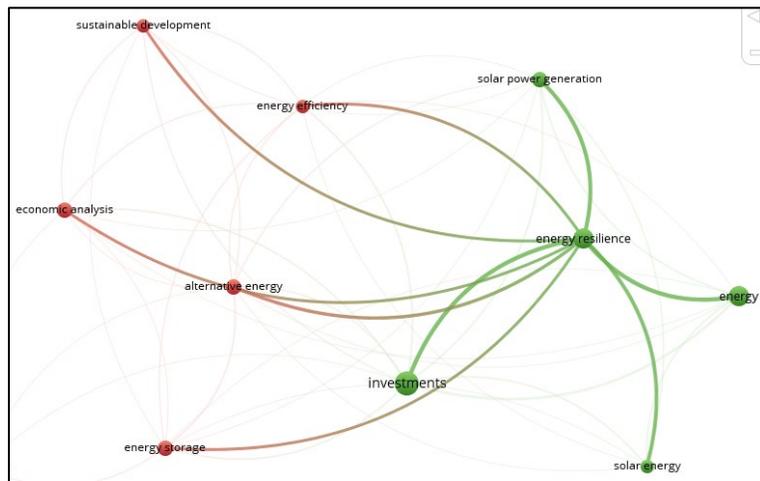
The figure above highlights that the keyword "Energy Resilience" is strongly linked to "Investment," "Solar Energy," "Sustainable Development," and other related terms, underscoring the crucial role of renewable energy investments in ensuring long-term energy stability. This association reflects the growing emphasis on solar power, economic sustainability, and technological advancements in strengthening energy resilience. To further explore the relevance and development trends of this topic, the thematic clustering of keywords will be presented in the following figure, providing insights into emerging research directions, key focus areas, and potential gaps for future studies.

Figure 18: Thematic Map – Energy Resilience AND Investment
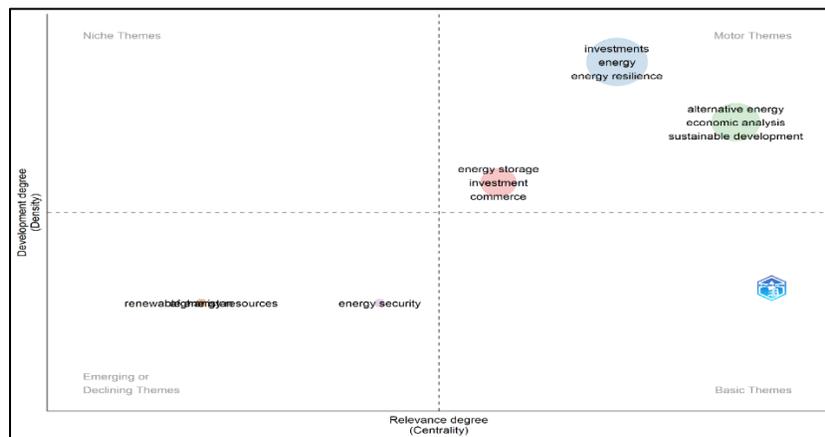
The figure above positions the relationship between "Investments" and "Energy Resilience" in Quadrant 1 (Q1), indicating high relevance and a well-established research foundation, particularly in Scopus-indexed studies. The strong connection between energy resilience and investment highlights its critical role in sustainable energy transitions, economic stability, and infrastructure development. Given its extensive study and significance, this topic serves as a mature research area, providing a solid foundation for further exploration, technological advancements, and policy development to enhance global energy resilience strategies.

Discussion

The analysis, structured into Scientific Production, Word Frequency, Thematic Map, and Keyword Networks, highlights the significant role of Renewable Energy Investment (REI) in economic growth, environmental sustainability, and energy resilience. Studies show that REI positively impacts GDP growth, Foreign Direct Investment (FDI) inflows, and job creation, with evidence from Saudi Arabia, the UAE, Qatar, and OECD countries. Additionally, REI contributes to environmental sustainability by reducing the ecological footprint, with strong

governance and green financing playing crucial roles in supporting renewable projects. Furthermore, Green Investment strategies and Green Technology adoption enhance energy resilience by reducing energy intensity and ensuring long-term energy resilience. These findings underscore the multifaceted benefits of REI, emphasizing its importance in shaping sustainable economic and energy policies.

The productivity of literature related to Renewable Energy Investment (REI) has shown a consistent annual increase over the past six years, with the highest growth rate of 44.9% recorded in 2020. The second-highest growth was observed in 2021 (33.80%) and 2023 (33.01%), while the lowest growth occurred in 2022 (8.42%). Examining the long-term trend since 2015, the total number of publications increased by 232.65% by 2019, reflecting a growing research focus on REI. Among academic sources, Renewable Energy stands out as the most productive journal, publishing the highest number of articles on the topic. At the country level (2019–2024), China, Turkey, the United States, the United Kingdom, and Germany are the leading contributors to REI-related research, demonstrating strong academic engagement and policy interest in advancing renewable energy investments worldwide.

Findings indicate that Renewable Energy (RE) investment positively impacts GDP, employment, and Foreign Direct Investment (FDI). Zhang et al. (2022) found that a 1% increase in RE investment leads to a 0.6% GDP growth in OECD countries, while Bhattacharya et al. (2016) highlighted that RE projects attract FDI in emerging markets. Regarding environmental sustainability, wind and solar energy significantly reduce emissions, but biofuel production may contribute to deforestation (OECD, 2015). The Environmental Kuznets Curve (EKC) theory suggests that as economies grow, environmental impacts initially rise before improving (Grossman & Krueger, 1991). In terms of energy security and resilience, RE investment diversifies the energy mix, reducing dependence on fossil fuels, while grid modernization is essential for efficient RE integration (IEA, 2023). Additionally, public-private partnerships (PPPs) play a crucial role in bridging investment gaps for large-scale RE projects, ensuring long-term energy resilience and sustainability.

Conclusion and Recommendations

The key findings highlight that Renewable Energy (RE) investment accelerates economic growth, attracts Foreign Direct Investment (FDI), and creates green jobs, while its environmental benefits vary, necessitating strong governance and monitoring. Additionally, energy resilience improves with RE integration, but challenges related to grid infrastructure and technological constraints must be addressed. To enhance RE adoption, several policy recommendations are proposed, including regulatory reforms to simplify licensing and investment approvals, financial incentives such as tax benefits and subsidies, and increased technology innovation through local R&D to reduce dependence on imports. Furthermore, infrastructure development, particularly smart grid expansion, is essential for efficient RE integration, while Public-Private Partnerships (PPP) can drive private sector engagement in green energy projects. For future research, key areas of exploration include a comparative analysis of RE investment in ASEAN nations, an impact assessment of decentralized renewable energy systems, and the application of AI and Big Data in RE investment decision-making. These insights provide a foundation for shaping sustainable energy policies and advancing renewable energy development globally.

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