ECONOMIC PROSPERITY IN THE PRESENCE OF GREEN ENERGY: A GLOBAL PERSPECTIVE AND REGULATION

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Abstract

This article investigates the connection between renewable energy (RE) and economic development, in selected developed countries such as Japan, France, China, the US, Italy, Canada, and the UK, and developing countries including South Asia, Bangladesh, Indonesia, Saudi Arabia, Ghana, Vietnam, Pakistan, Rwanda, Morocco, and the Philippines. The entire review process was conducted using a PRISMA flow chart. A total of 533 papers were identified in the Scopus database, with 118 articles subjected to eligibility assessment. Among these, 173 articles were excluded for various reasons. The analysis revealed several key findings regarding the relationship between renewable energy and economic development. Firstly, in developed countries, the integration of renewable energy sources has led to substantial economic benefits, including job creation, technological innovation, and reduced reliance on fossil fuels. These countries have demonstrated that a transition towards green energy can stimulate economic development while achieving environmental sustainability. Secondly, in developing countries, the research found that the application of renewable energy technologies is crucial for attaining sustainable economic development. These countries face unique challenges, including energy poverty, environmental contamination, and volatile energy markets. However, the findings suggest that investing in renewable energy infrastructure can address these challenges while promoting inclusive growth and poverty alleviation.

Keywords: Economic Growth, Green Energy, Developed Countries, Developing Countries, Sustainability

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1. INTRODUCTION

The transformation towards green energy (GE), has received scholarly significant attention because of its efficiency in mitigating climate change and eliminate the fossil fuels dependency (Sweidan & Elbargathi, 2021; Awad et al., 2023). In addition to, its environmental advantages, the green energy has emerged as one of the main factors that can control economic growth worldwide (Abu-Rumman et al., 2020; Lagum & Elektorowicz, 2022; Srouji et al., 2023).

Renewable energy (RE) plays a role, in driving economic growth by contributing to job creation, technological advancements, and environmental sustainability (Saadh et al., 2024). The renewable and green energy sectors are essential for promoting development through the generation of employment opportunities across expertise levels (Hsu et al., 2024). From manufacturing and installation to research and development sustainable energy infrastructure like wind farms create jobs that not boost local economies but also nurture a skilled workforce thereby fostering sustained economic growth (Al-Ghriybah & Lagum, 2024).

Besides, the pursuit of energy drives innovation. Ongoing advancements in solar, wind, hydro, and other renewable sources result in increased efficiency, reduced costs, and improved energy storage capabilities (Li et al., 2023; Duhduh et al., 2024). These technological breakthroughs often have effects on industries leading to broader technical innovation. By investing in energy solutions countries position themselves as leaders, in cutting-edge technology. This competitive advantage attracts investments and fosters an environment to innovation ultimately fueling expansion.

Furthermore, the environmental sustainability that is inherent in the utilization of renewable and green energy practices plays a significant role in fostering long-term economic prosperity (Saadh et al., 2024). Societies can offset the costs of negative externalities, such as environmental deterioration and climate change, by decreasing their dependence on fossil fuels (Hsu, Adhab, et al., 2023). Moreover, adopting cleaner energy sources contributes to the attainment of energy security and resilience, diminishing vulnerability to the economic consequences of limited resources and geopolitical tensions associated with reliance on fossil fuels (Duhduh et al., 2023). The adoption of renewable and green energy not only supports environmental objectives but also lays the groundwork for a stronger and more sustainable economy in the future (Hsu, Adhab, et al., 2023).

The current advances in renewable energy have encouraged researchers from diverse disciplines, leading to a wide-ranging exploration of its different aspects. Subsequently, this field has become more diversified, complex, and interconnected. This paper hypothesizes that there are positive and substantial relations between green energy consumption and economic development in both developed and developing countries. Our hypothesis is based on the premise that the adoption and utilization of renewable energy sources, such as solar (Alawamleh et al., 2023), wind (Al-Ghriybah et al., 2024), hydroelectric (Paramanantham et al., 2024), and biomass (Lagum, 2024), contribute to sustainable economic development by fostering innovation, reducing dependency on fossil fuels, and alleviating environmental damages. Therefore, the objectives of this article are to critically review the recent studies that explore the relationship between renewable energy and economic growth. In addition, the author seeks to comprehend how this extensive body of work influences the course of economic development. By applying a systematic review approach, this article contributes to the updating of the existing literature by identifying novel research directions in this field and critically evaluating related research articles to address the research questions.

The theoretical framework for this study involves integrating existing theories and concepts from economics, environmental studies, and sustainable development. The sustainable development framework was chosen and implemented. Such a framework highlights the interconnection of economic, social, and environmental dimensions of development. It is an approach to policymaking that balances economic growth with social equity and environmental sustainability. In the context of green energy consumption, this framework underscores the importance of promoting inclusive growth, reducing energy poverty, and addressing climate change challenges. By aligning economic incentives with environmental objectives, policymakers can create enabling environments for green energy investments and foster long-term sustainable development pathways.

Overall, this research aims to articulate a comprehensive review of the effect of GE's economic development on developing and developed nations by critically studying the articles identified in the Scopus database. The structure of this paper is as follows. Section 2 reviews the relevant literature. Section 3 analyses the research methodology. Section 4 presents the study results. Section 5 covers the discussion. Section 6 provides the conclusion.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The relationship between economic growth and environment and renewable energy has become a major field of research in the recent past. One of the widely discussed theories is the environmental Kuznets curve (EKC) hypothesis which states that pollution increases up to a critical point and then declines with the increase in an economy's development (Stern, 2004). Conclusively, environmental impact grows at higher stages of development, particularly in the initial developmental phases. But for the environmental impact, it is observed that after crossing a certain threshold level of income per capita the environmental impact begins to decline as the economy expands further.

The EKC hypothesis has profound implications for the rationale of the linkage of renewable energy and growth. As Shafiei and Salim (2014) pointed out, the technological fix of renewable energy is a crucial solution to sustain economic growth without creating negative environmental impacts. Their analysis of Organisation for Economic Co-operation

and Development (OECD) countries provided them with supporting data of the EKC, which means that with an increase in incomes, there is also a significant rise in investment in the renewable energy sector. Evidently, these findings indicate that although the environmental impact may rise in the process of initial industrialization, the augmentation of renewable energy can enable the economy to gradually shift to a pattern of sustainable growth, in line with the EKC model.

It is, therefore, important to employ the EKC theory to understand the adoption of renewable energy sources and the connection with economic development. Then, the EKC will be well developed as the empirical evidences come in. Thus, will help design and implement sustainable development policies based on various national conditions. As will be shown in the literature review discussion, integrating these observations from the EKC literature into the renewable energy argumentation can shed light on key possibilities and risks in constructing the route to a sustainable economy.

3. RESEARCH METHODOLOGY

The field of renewable and green energy economics has grown significantly, resulting in a vast amount of research and a wide range of viewpoints on the connection between renewable and green energy and economic growth (Taşkın et al., 2020). With the increasing expansion of information in this sector, it is crucial to methodically combine and assess the existing literature in order to offer a thorough comprehension of the present state of knowledge. There are several alternative methods that would be suitable for conducting such research, such as: 1) scoping review, 2) narrative review, and 3) rapid review, etc. This research intends to tackle this urgent matter by employing a rigorous systematic review technique, which is widely acknowledged as the highest standard for synthesizing evidence. Systematic reviews are essential for increasing academic and scientific knowledge as they offer a thorough and comprehensive synthesis of existing research on a specific issue (Xiao & Watson, 2019). These evaluations utilize a methodical and clear-cut strategy to find, assess, and combine pertinent studies, providing a substantial degree of evidence that can guide decision-making in diverse domains (Candra et al., 2023). The academic value of these discoveries resides in their capacity to synthesize a wide range of research, enabling researchers and scholars to provide a robust basis for their work. Through a methodical examination of the current body of academic work, researchers can pinpoint deficiencies, contradictions, and subjects that require additional exploration. This process aids in improving the formulation of research inquiries and the creation of more focused and knowledgeable research plans.

From a scientific standpoint, systematic reviews play a crucial role in evidence-based practice as they provide a dependable and impartial overview of existing research (Tranfield et al., 2023). They play a crucial role in evaluating the quality and robustness of the evidence, assisting in the development of guidelines and policies based on evidence. The methodical process of literature review guarantees transparency, reproducibility, and reduces bias, hence enhancing the reliability and credibility of the findings. Systematic reviews are widely acknowledged as the highest level of synthesizing evidence. The academic and scientific significance of systematic reviews rests in their capacity to consolidate information, enhance research procedures, and contribute to evidence-based decision-making in diverse fields. Through a methodical approach, our goal is to understand the intricate connection between renewable and green energy and economic growth. We aim to identify any gaps or inconsistencies and extract important insights. This research will not only contribute to academic discussions but also guide future research and practical applications in the field of renewable and green energy economics. The objective of this method is to present a detailed and fact-based viewpoint on the existing information, providing significant insights to academics, policymakers, and practitioners in the field of renewable and green energy economics. Our goal is to analyze the existing evidence to address the following research question:

RQ: How do renewable and green energy impact economic growth?

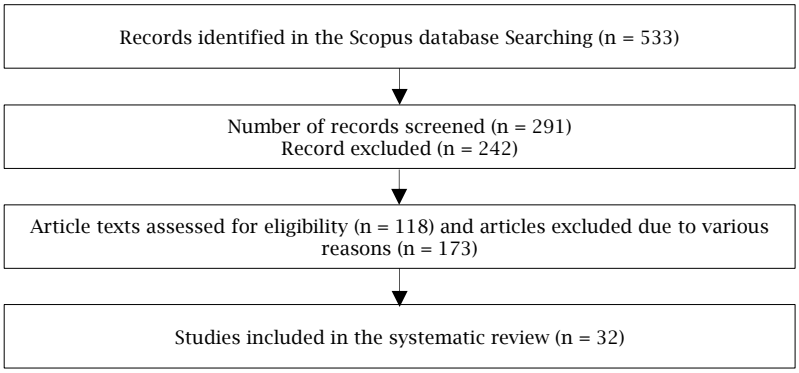
We also want to expand the methods used in this field and promote informed decision-making in academic and professional settings.

To address the research question, we examined the current landscape of renewable energy research and its impact on economic development in both developed and developing nations. To achieve this, we employed a systematic review approach, which involves identifying, collecting, analyzing, and evaluating data from a specific research area. The objective is to gather all empirical evidence relevant to our research question. Therefore, this review was conducted using the Scopus database, covering the period from 2021 to 2024, allowing us to engage with the most recent literature in this field of research. The inclusion of recent studies is crucial for staying abreast of advancements in this area. Articles were selected with a focus on both developed countries such as Japan, France, China, the US, Italy, Canada, and the UK, as well as developing countries including South Asia, Bangladesh, Indonesia, Saudi Arabia, Ghana, Vietnam, Pakistan, Rwanda, Morocco, and the Philippines. Our search utilized the key terms "*renewable energy*" and "*economic growth*". The aim was to retrieve all journal articles containing these terms in their titles. Only peer-reviewed papers, specifically articles and review papers, were included in the review, while conference papers and book chapters were excluded. The Scopus search yielded 533 papers, of which 291 were screened for eligibility. Subsequently, 242 records were excluded for various reasons. From the remaining articles, 118 underwent a full-text assessment to determine eligibility, leading to the exclusion of 173 articles due to multiple factors. Finally, the analysis encompassed 32 articles that met the inclusion criteria.

The entire review process was conducted using a PRISMA flow chart, providing a systematic approach to article selection and ensuring transparency in our methodology. While the PRISMA method itself does not evaluate the credibility of a systematic review, it aids in critically evaluating the selected articles for inclusion in our study.

Adhering to PRISMA guidelines, literature reviews followed the APA referencing style for the author's name and were organized chronologically, with the most recent studies listed first. Google Scholar was utilized for citation purposes. The PRISMA flow chart illustrates the process of selecting articles from various journals. Our analysis primarily focused on the abstracts and conclusions of the articles from each year.

Figure 1. The PRISMA flow chart (identification of studies)



The exclusion of records at each stage of the PRISMA flow chart was guided by predefined criteria aimed at ensuring the relevance and quality of the included articles. Records were initially screened based on title and abstract to identify potentially eligible studies. Subsequently, a full-text assessment was conducted to determine eligibility, leading to the exclusion of records that did not meet the inclusion criteria. The reduction in the number of eligible articles from the initial pool of identified records (533) to 118 after the full-text assessment is a result of stringent inclusion criteria applied to select studies that specifically addressed the relationship between green energy consumption and economic growth in the context of selected developed and developing countries. Only studies meeting these criteria were deemed eligible for inclusion in our review. The exclusion of 173 articles in the final phase of the review process can be attributed to various reasons, including but not limited to: 1) lack of relevance to the research question, 2) insufficient data or analysis on the economic implications of green energy consumption, 3) methodological limitations such as inadequate study design or data quality, 4) focus on regions or countries outside the scope of our study, and 5) duplication of data or findings already covered by included studies. The final inclusion of 32 articles in our review reflects the culmination of a rigorous selection process aimed at identifying high-quality studies that contribute meaningfully to our understanding of the relationship between green energy consumption and economic growth. These articles were deemed to meet our inclusion criteria and provide valuable insights into the topic under investigation.

4. RESULTS

As a result of reviewing the relevant papers, it is evident that the relationship between economic growth and green energy is complex and multifaceted, with a generally positive impact that is significantly influenced by various moderating factors such as government policies, technological advancements, market conditions, and social acceptance.

When examining the relationship between economic growth and green energy, it is crucial to give more attention to these moderating variables, which can significantly influence the nature of this relationship, affecting both its strength and direction. It can include factors such as government policies; that provide subsidies and incentives for green energy can enhance its positive impact on economic growth by making green technologies more affordable and attractive for investment. Conversely, a lack of supportive policies can hinder the adoption of green energy and its potential benefits for the economy. Also, technological advancements play a crucial role as well. Innovations in green technology can reduce costs and increase efficiency, thereby making green energy a more viable and attractive option for both consumers and businesses. This, in turn, can drive economic growth by creating new industries and job opportunities. Furthermore, the market conditions, such as the availability of resources and competition within the energy sector, also act as important moderators. A competitive market can drive down prices and improve the quality of green energy products, further stimulating economic growth. On the other hand, limited resources or monopolistic practices can restrict the growth potential of green energy. Social acceptance is another key moderator. Public support for green energy initiatives can lead to increased demand and investment, thus boosting economic growth. In contrast, resistance or apathy towards green energy can limit its adoption and economic benefits.

In summary, paying close attention to these moderating variables is essential for understanding and optimizing the relationship between economic growth and green energy. These factors can significantly influence how green energy contributes to economic development, and addressing them can help maximize the positive impacts of transitioning to a greener economy.

In conclusion, the association between economic development and green energy is generally positive, as GE has a significant impact on economic propensity through cost savings, environmental and health benefits, job creation, energy security, and

technological innovation. However, the strength and nature of this relationship are influenced by various moderating factors, highlighting the need for supportive policies and conducive market conditions to fully realize the economic benefits of green energy.

5. DISCUSSION

5.1. The renewable energy consequences on economic development in emerging countries

In developing countries, especially rural areas, residents lack sufficient dependable or long-lasting electricity. Although developing countries have inadequate renewable energy sources, several people in rural and urban areas rely on fossil fuels, kerosene, and diesel to meet daily needs (Sweidan & Elbargathi, 2023). The energy sector in developing nations, particularly Bangladesh, remains deficient, affecting countries' smooth development and progress (Sarker et al., 2023). According to Yang et al. (2022), the sustainable development goal has drawn significant attention to the significance of consuming RE and maintaining energy efficiency. Besides importing power from neighboring nations, the government of N-11 (Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, the Philippines, Turkey, South Korea, and Vietnam) countries have closed the electricity demand and supply gap by installing coal-fired plants (Yang et al., 2022). However, Pakistan still faces several challenges in supplying enough power. Approximately 1.94 billion people in South Asia are vulnerable to environmental issues such as green gas emissions (Fang et al., 2022). According to Fang et al. (2022), between 2002 and 2018, the South Asian economy suffered a 149 billion loss in a natural catastrophe brought by environmental challenges. According to Amin and Song (2023), the study findings illustrate that South Asia's use of RE has a long-term causal connection with economic development. Therefore, the country should implement policies supporting various RE sources to lower carbon dioxide emissions and forecast financial development (Amin & Song, 2023; Ahmad & Majeed, 2022). According to Jiang et al. (2022), in East Asia and the Pacific region, an increase in consumption of Geo biomass optimizes economic growth while a decrease retards growth.

Nguyen and Le (2022) proposed research to examine the consequence of renewable energy and nonrenewable energy (NRE) usage and carbon dioxide productions on the growth of individual income in Vietnam from 1990 to 2019. The study adopts autoregressive distributed lag (ARDL) cointegration for data collection. The study's results indicate that the prolonged utilization of NRE sources results to an upsurge in individual income levels. However, this income growth is counteracted by the negative impact of carbon emissions, resulting in a reduction in per capita income. In addition, the study outcome displays that the short-run changes in RE and NRE raise the individual income of residents in Vietnam. However, the use of NRE in the previous years has caused adverse effects on current income in Vietnam. Furthermore, foreign direct investment promotes RE consumption in Asian countries where capital is scarce (Wang et al., 2023; Fakher et al., 2022; Kuo et al., 2022).

Bouyghrissi et al. (2021) discuss the nexus in Morrocco between RE usage and economic development. The empirical results suggest that a causality exists between RE and economic evolution. From the study, the success of RE is achieved by incorporating policies that are adaptable to nationwide goals, economy, and technological proficiencies.

Saba (2023) investigated the battle of global warming in South Africa and recommended a remedy. The study findings from the ARDL simulation approach suggest a lasting connection between variables while the causality differed. The researcher recommends synergizing growth, renewable energy, and environmental policies to promote environmental quality. Moslehpour et al. (2022) studied the consequences of tourism and economic development on renewable energy manufacture in Vietnam. The researchers used variables like employment rate, human capital, gross domestic product, and expenditure when measuring economic growth. Meanwhile, international tourism was measured using variables like expenditure and receipts. The outcome from the NARDL model revealed that economic and tourism development in Vietnam has a substantial positive association with RE production (Moslehpour et al., 2022; Le, 2022). At the same time, a study that surveyed the connection between RE, economic development, and the human development index (HDI) in Pakistan in a timeframe of 1990 to 2014 using the two-stage least method illustrates that RE does not improve the HDI in Pakistan (Wang & Wang, 2020). The higher the country's HDI, the lower the income. According to Wang and Wang (2020), the emission of CO2 contributes to an increase in the HDI. In addition, from causality analysis, the trade liberations in Pakistan hinder progress in human development.

Bhuiyan et al. (2022) document how RE consumption promotes Pakistan's economic development. The study integrates data from 1972 to 2011. Based on 100% renewable energy microgrids, the study incorporates the techno-economic and geospatial study for the Philippines. As a result, the study combines energy system modeling, geospatial analysis, and cluster analysis for examining trends. Wang et al. (2023) support the findings that CO2 emissions adversely affect the environment and economic development in Seven Northeast Asian countries. Based on the study, using RE diminishes the effect of per capita, CO2 productions on economic growth and human growth.

Murshed et al. (2022) conducted a study in seven emerging countries: Indonesia, China, India, Turkey, Brazil, Russia, and Mexico. From the survey, a 1% increase in energy efficiency leads to 0.3% long-run carbon productivity improvement. Economic growth is still affected since energy efficiency fails to inhibit carbon productivity. Therefore, the author recommends implementing relevant policies to enhance financial inclusivity, the use of RE, and efficient use of efficiency.

5.2. The renewable energy and economic development in industrialized countries

Tugcu and Menegaki (2023) explored the connection between RE and economic development in the US economy between 1950–2020 utilizing cointegration and causality analyses for electric

power, commercial sector, transportation, residential, industrial, and Fourier components approximation. The main findings reveal that long-term use of RE causes economic development by creating jobs during commercial restructuring and replacing fossil energy. On the contrary, based on the Granger causality test, the short-term results indicate that the causal connection between RE usage and economic advance is less stable. Additionally, the article guides policymakers on enhancing energy sources and reducing fossil fuel dependency. The limitation of the study is that the article focuses on the period between 1950 to 2020, which fails to capture recent changes in policy and development. Therefore, there is a need for recent studies that expand the timeframe to more recent data.

According to Taghizadeh-Hesary et al. (2023), from the thirty provinces in China, the analysis between fintech and renewable energy illustrates that financial technology positively influence RE in China. Fintech accelerates development of RE by incorporating green innovations and technology (Taghizadeh-Hesaryf et al., 2023; Wang et al., 2022). Although the research provides an understanding of the effect of RE on economic evolution, it fails to highlight the long-term effect of fintech on social sustainability and economic growth. Several economies, including South America, experience adverse impacts of tradeoffs between decisions on economic development and environmental sustainability. Le (2022) conducted a study to evaluate spillover and nonlinear effects on renewable energy consumption. The results reveal an N-shaped curve between RE and economic advancement and an inverted N-shaped curve for carbon emission and pollution. The results indicate that RE reduces economic growth by 40%, increases pollution by 30%, and raises CO2 emissions by 60% in all the provinces in China. However, it's worth noting that the 60% carbon emission is a positive effect in China.

Ali et al. (2023) draw strengths from the United Nations (UN) Sustainable Development Goals (SDGs) to study the environmental connection between nonrenewable energy, renewable energy, economic evolution, and globalization in South America in a timeframe of 1995 to 2020. From the pooled mean group, dynamic fixed effects, cointegration tests, cross-sectional dependence, and panel unit root, the study findings indicate that a rise in environmental pollution upsurges economic development and a reduction occurs with the rise in RE in the short and long runs (Ali et al., 2023; Banga et al., 2024).

Another study by Aydin et al. (2023) pinpoints that nanotechnological innovations lower environmental degradation in the US, thereby increasing the consumption of RE and efficient use of power. However, in the UK and Italy, the technologies degrade the environment. According to Aydin et al. (2023), the study has some limitations. It was conducted between 1990 to 2018, and the data for ecological footprints and nanotechnological patents are limited to G7 (Canada, France, Germany, Italy, Japan, the UK, and the US) countries. As a result, the time frame is limited to that period. Therefore, in the future, the model can be expanded to other countries with Nano technological patents.

To summarize, the adoption of renewable energy technologies has led to significant job creation and economic growth. For instance, in France and China, the expansion of solar and wind energy projects has created employment opportunities in the manufacturing, installation, and maintenance sectors, contributing to economic development (Mohamed et al., 2019; Gu & Zhou, 2020). Industrialized countries including Germany, Japan, and the US are at the forefront of renewable energy technology development. Research and development initiatives, coupled with supportive policies and incentives, have adopted innovation in areas such as solar photovoltaics, wind turbines, energy storage, and smart grid technologies (Paramanantham et al., 2023). This technological leadership enhances competitiveness in global clean energy markets and drives economic growth through exports and technology transfer. Furthermore, the transition to renewable energy in developed countries results in significant environmental benefits, including reduced greenhouse gas emissions, improved air quality, and conservation of natural resources (Ito, 2016). Policies promoting renewable energy deployment, such as renewable portfolio standards and carbon pricing mechanisms, contribute to mitigating climate change impacts and improving public health outcomes (Sokka et al., 2016).

Overall, these findings underscore the positive impact of renewable energy deployment on economic growth in developed countries, highlighting the importance of supportive policies, investment incentives, and public-private partnerships in realizing the full potential of clean energy transitions.

5.3. The rise in renewable energy compromises economic development

Some studies reveal that the consumption of RE compromises economic development. Feng and Zhao (2022) identify that economic expenses incurred when shifting production methods from fossil energy to renewable are high. The findings in Khan et al. (2023) study suggest that using renewable energy lowers the consumption of production factors, thereby lowering the speed of economic development. Similarly, the findings in a study by Sun et al. (2022) reveal that RE has substantial adverse effects on economic development while ecological footprints illustrate positive impacts. Akram et al. (2021) study the heterogenous effect of RE consumption on economic progress in BRICS countries between 1990 and 2014. From the study results, energy efficiency is a primary source of economic development in BRICS countries. The study's fixed quartile regression analysis illustrates that the financial growth components' effect is heterogeneous in all quartiles, and energy efficiency is most robust in the 50th to 60th quartile of economic evolution. Consequently, the outcomes reveal that consuming renewable energy retards the economic development of BRICS economies. Still, the negative effect is more significant in the upper quartiles of economic growth between 0.6 to 0.9.

6. CONCLUSION

Environmental pollution, global warming, and climate change are significant challenges globally. Although cost analysis, workforce skills, financial resources, maintenance expenses, and awareness affect the spread of sustainable energy, the United Nations Framework Convention on Climate Change (UNFCCC) is involved in developing renewable energy technologies for sustainability. Renewable energy sources mitigate issues related to greenhouse gases and carbon dioxide productions and contribute to energy security. The systematic review investigated articles published in the Scopus database using a search criterion focused on keywords like "renewable energy" and "economic growth" within the titles. Also, the research included a few online articles. The study findings reveal that RE is critical for a country's economic development. Therefore, developing more potent renewable energy is essential for developing countries like Pakistan, Bangladesh, Nigeria, India, South Africa, Turkey, and Egypt. Consuming renewable energy reduces global monitoring and emissions that affect climate change associated with floods, drought, and landslides. Such effects influence economic conditions in countries (Rehman et al., 2022). Consequently, the green growth strategy is vital for developed nations to achieve sustainable goals (Hák et al., 2016). Therefore, to promote the development of green energy, policymakers should control globalization to lessen the cost of technologies in RE and implement policies that make the products available to low- and middle-income households. It is important to note that the research has some limitations. It focuses on developed and developing nations and fails to incorporate underdeveloped nations. Therefore, there is less evidence on how factors observed in the study can influence the economic growth of underdeveloped countries. In general, As the global economy transitions towards sustainability, rigorous research in this area can identify effective strategies and policies that maximize the economic advantages of green energy while mitigating potential drawbacks. This knowledge is essential for shaping a future where economic progress does not come at the expense of environmental health, ensuring a balanced approach to development that benefits both current and future generations exploring the relationship between green energy and economic development is vital for future research because it holds the key to sustainable and resilient economic growth in the face of environmental challenges. Understanding this relationship can inform policymakers and stakeholders about the economic benefits of investing in renewable energy sources. Furthermore, the review only includes articles published from 2021 in English, missing critical information published in foreign languages. Additionally, the study's timeframe and scope may not capture long-term economic impacts or emerging trends in green technology advancements.

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