# Analyzing the Impact of Renewable Energy Adoption on Economic Recovery of Developing Nations

## 1 Introduction

The research on the impact of renewable energy adoption on economic recovery in developing nations is crucial for several reasons. Firstly, it addresses the pressing need for sustainable economic growth in regions that often face significant financial and developmental challenges. By investigating how renewable energy can contribute to economic recovery, this study provides valuable insights that can help policymakers design effective strategies to foster sustainable development. This aligns with the United Nations Sustainable Development Goals (SDGs), particularly SDG 7 (Affordable and Clean Energy) and SDG 8 (Decent Work and Economic Growth). The findings from this research can guide investments in renewable energy, ensuring they are both economically beneficial and environmentally sustainable.

A review of existing literature is essential for several reasons. It provides a contextual understanding of the current state of research in the field, allowing for the building upon existing knowledge and avoiding redundancy. By examining previous studies, gaps in the research that this study can address are identified, making the work more impactful. Additionally, reviewing methodologies used in past research can help refine the approach, ensuring that the research design is robust and reliable. This is particularly important in a field as complex and multifaceted as renewable energy and economic recovery, where methodological rigor is crucial for producing valid and actionable insights. Overall, a thorough literature review strengthens the foundation of the research and enhances its relevance and contribution to the field.

## 2. Organization

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| Authors | Published Date | Title |
| Sadorsky[1] | 2009 | Renewable energy consumption and income in emerging economies |
| Li et.al[2] | 2021 | The relationship between energy prices, economic growth and renewable energy consumption: Evidence from Europe |
| Xie et.al[3] | 2022 | Renewable energy and economic growth hypothesis: Evidence from N-11 countries |
| Wang et.al[4] | 2022 | Renewable energy and economic growth: New insight from country risks |
| Yadav et.al[5] | 2024 | Unravelling the role of financial development in shaping renewable energy consumption patterns: Insights from BRICS countries |

## 3. Summary and Synthesis

### 3.1 Literature Summary

1. Renewable energy consumption and income in emerging economies

This study investigates the relationship between economic growth and renewable energy consumption in emerging economies, focusing on the impact of real per capita income. Using panel cointegration models, the analysis reveals that a 1% increase in real income per capita leads to a 3.5% rise in per capita renewable energy consumption in the long term. Additionally, the study finds that the long-term price elasticity of renewable energy consumption is approximately -0.70, indicating that higher prices moderately reduce renewable energy usage. The results highlight the significant influence of economic growth on renewable energy adoption in emerging markets.

2. The relationship between energy prices, economic growth and renewable energy consumption: Evidence from Europe

This study examines the relationship between renewable energy consumption and economic growth in seven European countries from 1985 to 2018 using panel data methodologies. The analysis includes real GDP and electricity generation price indexes for coal and natural gas as explanatory variables. The results indicate long-run causality from economic growth and fossil fuel prices to renewable energy consumption, with short-run causality from fossil fuel prices as well. However, the study finds no evidence of Granger causality from renewable energy consumption to economic output, suggesting that while economic growth drives renewable energy adoption, it does not directly influence overall economic output.

3. Renewable energy and economic growth hypothesis: Evidence from N-11 countries

This study examines the relationship between renewable energy consumption and economic growth in the Next-11 economies from 1990 to 2020. Using a non-parametric panel data approach, the findings support the renewable energy-led growth hypothesis, indicating that renewable energy positively influences economic growth. Additionally, industry value added, gross national expenditure, and trade openness are found to positively impact economic growth. The analysis also reveals heterogeneous slope coefficients and cross-sectional dependency within the panel. The study identifies a two-way causal relationship between these variables and provides policy implications for policymakers and researchers based on the results.

4. Unravelling the role of financial development in shaping renewable energy consumption patterns: Insights from BRICS countries

This paper investigates between financial development and renewable energy utilization in BRICS economies, contributing to UNSDGs-7 and -13. The findings reveal a positive correlation between economic growth and renewable energy consumption, as well as significant positive relationships between the consumer price index, domestic credit, and renewable energy consumption. A counterintuitive relationship between foreign direct investment and renewable energy consumption is also uncovered.

5. Renewable energy and economic growth: New insight from country risks

This study examines the relationship between renewable energy consumption and economic growth in OECD countries from 1997 to 2015, considering political, financial, economic, and composite risks. Using a panel threshold model, the results reveal a single threshold for composite and political risks, where exceeding the threshold enhances the positive impact of renewable energy on economic growth. For economic and financial risks, a double threshold exists: exceeding the first but not the second threshold positively impacts economic growth, while not lying between the two thresholds results in an insignificant negative correlation.

### 3.2 Comparison and Contrast of Literature on Renewable Energy and Economic Growth

## 3.2.1 Commonalities:

1. Focus on Economic Growth and Renewable Energy: All five studies emphasize the relationship between economic growth and renewable energy consumption. They generally support the notion that economic growth influences renewable energy adoption, whether through direct income effects (as in the study on emerging economies) or through more complex interactions involving financial development and energy prices.

2. Use of Panel Data Methodologies: Each study employs panel data methodologies to analyze the relationship between renewable energy consumption and economic growth. This approach allows for the examination of both cross-sectional and time-series data, enhancing the robustness of the results across different regions and time periods.

3. Regional Focus: The studies all focus on specific groups of countries or regions, such as emerging economies, European nations, the Next-11 economies, BRICS countries, and OECD countries. This regional focus allows for tailored insights into how renewable energy consumption is influenced by economic and policy variables within distinct economic contexts.

4. Long-term Perspective: Most studies, particularly those focusing on Europe and emerging economies, emphasize long-term relationships, identifying significant effects of economic growth on renewable energy consumption over extended periods. This long-term perspective is crucial for understanding the sustainability of renewable energy adoption.

## 3.2.2 Differences

1. Causality and Direction of Influence: While several studies, such as the one on the Next-11 countries, support the renewable energy-led growth hypothesis (where renewable energy consumption drives economic growth), others, like the study on European nations, find no evidence of Granger causality from renewable energy consumption to economic output. This suggests that the direction of influence between renewable energy consumption and economic growth may vary across regions and contexts.

2. Role of Energy Price: The European study uniquely incorporates fossil fuel prices (coal and natural gas) as key explanatory variables, finding both long-run and short-run causality from these prices to renewable energy consumption. This contrasts with other studies that focus more on economic growth, financial development, or institutional factors rather than energy prices as primary drivers of renewable energy adoption.

3. Impact of Financial Development: The study on BRICS countries highlights the role of financial development in shaping renewable energy consumption patterns, an aspect that is less emphasized in other studies. This paper finds significant relationships between financial variables like domestic credit and renewable energy consumption, uncovering the complex financial dynamics involved in the renewable energy transition.

4. Consideration of Risks: The study on OECD countries introduces a unique focus on political, financial, and economic risks, analysing how these risks interact with renewable energy consumption and economic growth. This approach differs from the other studies, which generally do not explicitly consider the role of country-specific risks in their analyses.

5. Geopolitical and Economic Context: Each study's regional focus brings out different geopolitical and economic contexts that affect the renewable energy-economic growth nexus. For instance, the emphasis on BRICS and OECD countries highlights the role of economic development stages and institutional factors, whereas the Next-11 study underscores the potential of emerging markets in renewable energy adoption and economic growth.

## 4. Summary

The reviewed literature highlights the relationship between renewable energy consumption and economic growth, with variations across different regions and contexts. Studies indicate that economic growth influences renewable energy adoption, particularly in emerging economies, where rising income levels drive renewable energy consumption. In developed regions like Europe, economic growth and energy prices impact renewable energy consumption, but there is no reciprocal effect on economic output. Factors such as financial development, institutional conditions, and country-specific risks are critical, demonstrating that renewable energy policies need to be context-specific to be effective.

[This research aims to understand the specific impacts of renewable energy adoption on economic recovery in developing nations1](https://edgeservices.bing.com/edgesvc/chat?udsframed=1&form=SHORUN&clientscopes=chat,noheader,udsedgeshop,channelstable,ntpquery,devtoolsapi,udsinwin10,udsdlpconsent,udsfrontload,cspgrd,&shellsig=2a268980ae474664568e87757c4917a0c81c5376&setlang=en-US&darkschemeovr=1&udsps=0&udspp=0#sjevt%7CDiscover.Chat.SydneyClickPageCitation%7Cadpclick%7C0%7Cc8a98f9d-908c-4634-9beb-7d51fac83792). These regions face challenges such as financial limitations, political instability, and underdeveloped infrastructure, which differ from those in more developed countries. The research will provide insights into how renewable energy can be utilized to promote sustainable economic growth, aligning with the United Nations Sustainable Development Goals (SDGs) 7 (Affordable and Clean Energy) and 8 (Decent Work and Economic Growth).

## References

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[2] Li R and Leung G C K 2021 The relationship between energy prices, economic growth and renewable energy consumption: Evidence from Europe *Energy Reports* **7** 1712–9

[3] Xie P, Zhu Z, Hu G and Huang J 2023 Renewable energy and economic growth hypothesis: Evidence from N-11 countries *Economic Research-Ekonomska Istraživanja* **36**

[4] Wang Q, Dong Z, Li R and Wang L 2022 Renewable energy and economic growth: New insight from country risks *Energy* **238** 122018

[5] Yadav A, Bekun F V, Ozturk I, Ferreira P J S and Karalinc T 2024 Unravelling the role of financial development in shaping renewable energy consumption patterns: Insights from BRICS countries *Energy Strategy Reviews* **54** 101434