

A Summary of Recent Studies Published by DIU Researchers

7 AFFORDABLE AND CLEAN ENERGY



Daffodil
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University

The researchers of Daffodil International University (Faculty, Students, Alumni) have conducted a number of research projects related to SDG 7 (Affordable & Clean Energy) and results of the projects have also been published as research papers in various international reputed peer reviewed and Scopus indexed journals. The summary of the research publications related to SDG 7 are given below:

1. Roadmap for achieving energy sustainability in Sub-Saharan Africa: The mediating role of energy use efficiency

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[Energy Reports, Volume 8](#)

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Abstract

The core objective of this study is to evaluate whether improving energy use efficiency can help Sub-Saharan African nations to attain their energy sustainability objectives. As opposed to the conventional approaches, the multidimensional aspects of energy sustainability are captured in this study by predicting an energy sustainability index using data related to four key targets mentioned under the seventh sustainable development goal declared by the United Nations. Overall, for the entire panel, the findings reveal that a 1% rise in the energy efficiency level increases the energy sustainability index by around 11% in the long run. Thus, energy efficiency improvements can be expected to complement the energy sustainability agenda of the Sub-Saharan African nations. In contrast, economic growth is witnessed to impede energy sustainability within these nations. However, the results also certify that

energy efficiency improvement performs a mediating role in neutralizing the energy sustainability-inhibiting effects of economic growth. In addition, higher emissions of carbon dioxide found to encourage the Sub-Saharan African nations to implement policies related to attainment of energy sustainability. Besides, trade and financial globalization are also witnessed to impede and stimulate energy sustainability, respectively. Furthermore, the results reveal that financial development facilitates energy sustainability attainment while higher population growth inflicts opposite impacts. Finally, implementation of the Kyoto Protocol is evidenced to be contributing to the attainment of energy sustainability in the selected Sub-Saharan African nations. In light of these findings, several energy sustainability-related policies are recommended.

Keywords

- Energy sustainability
- Energy efficiency
- Clean energy transition
- Renewable energy
- SDG7
- Electricity access

2. The impacts of renewable energy, financial inclusivity, globalization, economic growth, and urbanization on carbon productivity: Evidence from net moderation and mediation effects of energy efficiency gains

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[Renewable Energy, Volume 196](#)

<https://doi.org/10.1016/j.renene.2022.07.012> [Get rights and content](#)

Highlights

- 1% improvement in energy efficiency enhances carbon productivity by 0.3%.
- Energy efficiency improvement exerts moderating and mediating effects.
- Renewable energy use does not directly influence carbon productivity.
- Financial inclusivity, economic growth, and urbanization reduce carbon productivity.
- Globalization exerts heterogeneous impacts on carbon productivity.

Abstract

Although the relevance of establishing low-carbon economic growth has been extensively highlighted in the Paris Agreement and the Sustainable Development Goals declarations, the analysis of the macroeconomic determinants of carbon productivity has remained overlooked in the literature. Therefore, this study makes a novel attempt to evaluate whether energy

efficiency gains, along with renewable energy use, financial inclusivity, economic growth, globalization, and urbanization, improve carbon productivity in the emerging seven countries between 2007 and 2018. Moreover, the study contributes to the literature by predicting the net moderating and mediating effects of energy efficiency improvements on carbon productivity. The findings support that enhancing the level of energy use efficiency by 1% helps to improve carbon productivity by around 0.3% in the long run. In addition, the predicted net effects reveal that energy efficiency gains exert a moderating effect on the level of carbon productivity and reverse the negative impact of financial inclusivity, trade globalization, and urbanization on carbon productivity. However, energy efficiency gains cannot moderate to neutralize the carbon productivity-inhibiting impact associated with economic growth. Moreover, the analysis shows that energy efficiency gains mediate to jointly boost carbon productivity alongside higher renewable energy use. Lastly, financial globalization is evidenced to enhance carbon productivity in the emerging seven countries in the long run. Accordingly, a set of relevant policies are recommended.

Keywords

- Carbon productivity
- Energy efficiency
- Financial inclusivity
- Renewable energy
- Emerging countries
- Urbanization

3. Recent progress in emerging hybrid nanomaterials towards the energy storage and heat transfer applications: A review

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[Journal of Molecular Liquids, Volume 360](#)

<https://doi.org/10.1016/j.molliq.2022.119443> [Get rights and content](#)

Highlights

- The overview of the emerging nanomaterials is discussed.
- Insight review on synthesis of emerging hybrid nanomaterials and their obtained structures.
- Elaborated discussion on the recent progress on hybrid nanomaterials towards energy storage applications.
- Detail discussion on current progress on hybrid nanomaterials in heat transfer fluids.
- The challenges and new opportunities of hybrid nanomaterials are outlined for future research.

Abstract

Hybrid nanomaterials, which is a combination of two or more nanoparticles have been extensively evaluated as a promising candidate for energy storage and heat transfer applications, benefitting from the rise of synergistic effects between them. The unique form of this emerging combination of nanomaterials not only offers the improved features of the integrated nanoparticles but gives us the opportunity to tailor their physicochemical properties simply by modifying their composition and morphology. Scientific findings have demonstrated that the dispersion of hybrid nanomaterials in the base fluids, known as - hybrid nanofluids gives us the alternative way to replace mono nanofluid and the conventional heat transfer fluids as it provides a much better heat transfer enhancement that is beneficial for advanced heat transfer devices. On the other hand, when hybrid nanomaterials were utilized for energy storage devices, it exhibits an outstanding electrochemical performance, providing a significant contribution to the specific capacitance which permits a new strategy to design new electrodes for advanced energy storage devices. In this article review, we summarised the recent advancements made on the emerging hybrid nanomaterials, comprising of the general overview of the emerging nanomaterials, the synthesis routes for hybrid nanomaterials and their acquired hybrid structures along with their practical applications as electrodes in electrochemical energy storage and as heat transfer fluids for advanced heat transfer devices. Finally, we have also outlined some challenging issues associated with hybrid nanomaterials that requires further attention for future research.

Keywords

- Emerging nanomaterials
- Hybridization of nanomaterials
- Energy storage and Heat transfer application

4. A path towards environmental sustainability: The role of clean energy and democracy in ecological footprint of Pakistan

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[Journal of Cleaner Production, Volume 358](#)

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Abstract

Political institutions play a key role in countries' [environmental footprints](#) since they govern environmental policies. Democracy is an important institutional variable that can exacerbate or alleviate the [ecological footprint](#) (EF). The limited literature on democracy and EF association unfold conflicting results. Therefore, this empirical research studies the effect of democracy on EF in Pakistan, where various strict policies have weakened democracy and the country has also been severely affected by climate change. The study employs the novel Augmented ARDL (AARDL) approach to quantify the impact of democracy on EF by including population density, clean energy, and economic growth. The findings from the AARDL method unfold cointegration among variables. The long-run results reveal that democracy is negatively associated with EF. The results also suggest the Environment [Kuznets Curve](#) (EKC) hypothesis between EF and economic growth while accounting for democracy

in the model. Hence, the study concludes that democracy is a significant driver of environmental [sustainability](#). Further, the estimates of the AARDL also support a mitigating impact of clean energy on EF, while population density upsurges EF. Finally, the AARDL based causality test is applied, which disclosed causality between most [regressors](#) and EF. Lastly, detailed policy implications are directed.

5. Pathways to securing environmentally sustainable economic growth through efficient use of energy: a bootstrapped ARDL analysis

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[Environmental Science and Pollution Research](#), **volume 29**

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Abstract

Oman has traditionally relied upon natural gas and oil for meeting its domestic energy demand. As a result, despite growing economically, the level of carbon dioxide emissions in Oman has persistently surged; consequently, the nation has failed to ensure environmentally sustainable economic growth. Against this background, this current study aims to explore the impacts of energy consumption, energy efficiency, and financial development on Oman's prospects of attaining environmentally sustainable growth over the 1972-2019 period. The estimation strategy is designed to take into account the structural break issues in the data. Using the carbon productivity level as an indicator of environmentally sustainable economic growth, we find long-run associations amid the study variables. Besides, higher energy consumption and greater financial development are found to impede carbon productivity while improving energy efficiency is observed to boost carbon productivity in Oman. Therefore, it is pertinent for Oman to consume low-carbon and energy-efficient fossil fuels, improve energy efficiency levels, and green its financial sector to achieve environmentally sustainable growth.

Keywords: Carbon productivity; Energy consumption; Energy efficiency; Environmentally sustainable growth; Financial development.