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Editorial: Carbon neutrality and high-quality development

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Editorial on the Research Topic

Carbon neutrality and high-quality development

Introduction

In this editorial, we summarize the six articles to the Research Topic “Carbon Neutrality and High-quality Development” of the journal *Frontiers in Energy Research*.

In this Research Topic of *Frontiers in Energy Research*, we focus on the pressing global challenge of achieving carbon neutrality while fostering high-quality economic development. This Research Topic of five insightful articles explores diverse strategies and impacts related to this theme, each offering a unique perspective on how different factors (Le et al.)—ranging from oil price volatility to digital technologies (Li et al.)—intersect with carbon performance and high-quality development (Yusuf et al.), providing valuable insights for policymakers, businesses, and researchers.

Multidimensional approaches to advancing carbon neutrality and high-quality development

The transition towards carbon neutrality and high-quality development is deeply influenced by various economic, technological, and policy factors. One critical aspect is oil price volatility, which significantly impacts energy market stability. “Investigating factors influencing oil volatility: a GARCH-MIDAS model analysis”, using a GARCH-MIDAS model highlights how geopolitical risks and economic policies shape market fluctuations, affecting strategies for carbon neutrality. This study underscores the broader context in which energy market stability is crucial for achieving sustainable economic growth and carbon mitigation goals.

At the sectoral level, the relationship between economic growth and carbon emissions is not uniform, requiring targeted approaches to carbon neutrality. “Testing the environmental Kuznets Curve hypothesis at the sector level”, applies the Environmental Kuznets Curve (EKC) hypothesis to various sectors within OECD countries. Their findings reveal sector-specific dynamics in the relationship between economic growth and CO₂ emissions, emphasizing the importance of tailored environmental policies. This sector-specific insight

is crucial for developing effective carbon-neutral strategies that cater to the unique challenges of each sector.

Another key factor in achieving carbon neutrality is the development of green supply chains and sustainable pricing strategies. “Green degree decision and pricing strategy of dual-channel supply chains” Luo et al. examines how green supply chain decisions influence pricing strategies within dual-channel markets. Their research indicates that higher degrees of green certification can enhance consumer satisfaction and corporate profitability, aligning economic incentives with environmental goals.

However, regulatory frameworks, particularly tax policies, play a crucial role in shaping corporate environmental investments. “Does tax enforcement reduce corporate environmental investment?” explores how increased tax enforcement might inadvertently lower corporate environmental investments, especially in financially constrained sectors. This paper highlights the complex interactions between fiscal policies and corporate environmental strategies. It calls for the potential trade-offs in policy design and the need to balance regulatory measures to avoid unintended negative consequences on sustainability efforts.

Technological advancements, particularly digital transformation, have emerged as powerful enablers of carbon neutrality. “Digital technology, green innovation, and the carbon performance of manufacturing enterprises”, demonstrates that digital technologies could significantly improve the carbon performance of manufacturing enterprises through green innovation and effective data utilization. This study provides valuable insights into how digital transformation can facilitate carbon neutrality.

The intricate interplay between trade facilitation and global warming, emphasizing the ramifications of trade facilitation on climate change dynamics, has drawn more and more attention. “Trade Facilitation and Global Warming: Based on Cross-Country Panel Data,” Jiang quantifies the effects of trade facilitation on global warming. This research employed both spatial econometric and traditional econometric models, leveraging data spanning 129 countries from 2010 to 2019. The empirical findings reveal a notable direct negative correlation between trade facilitation and global warming.

Synthesis and emerging themes

The articles collectively stress the necessity of integrating economic and environmental objectives to achieve sustainable, high-quality development. While each paper addresses different facets of the carbon neutrality challenge, they all emphasize the importance of aligning environmental goals with economic growth. This integration is vital for ensuring that efforts toward carbon reduction do not undermine the broader development goals of businesses and governments. The research underscores that carbon neutrality cannot be achieved through blanket policies or one-size-fits-all approaches. Rather, tailored, sector-specific strategies are needed, as each industry has unique characteristics that influence its emissions profiles and capacity for

decarbonization. For instance, the research on the Environmental Kuznets Curve studied by Yusuf et al. suggests that the relationship between economic growth and CO₂ emissions differs across sectors, pointing to the need for policies that are designed to address the specific challenges and opportunities within each sector.

Another key theme that emerges from the articles is the potential of digital technologies and green innovations in enhancing carbon performance. As industries increasingly turn to digital solutions, such as big data, blockchain, and smart technologies, they have the opportunity to significantly improve their environmental impact. The paper on digital technology and green innovation reported by Li et al. provides compelling evidence of how these tools can help manufacturing enterprises reduce carbon emissions while also boosting operational efficiency. By harnessing the power of digital transformation, businesses can not only improve their environmental performance but also drive innovation that can lead to new, sustainable business models. This highlights the crucial role of technological advancements in the transition to a low-carbon economy.

Finally, He et al. highlights the importance of carefully considering economic policies and tax enforcement measures to avoid unintended negative consequences on environmental investments. While policies such as tax enforcement are essential for holding businesses accountable and ensuring compliance with environmental regulations, the research on tax enforcement reveals that stricter tax policies can sometimes reduce corporate investment in environmental initiatives. For companies facing financial constraints, the increased tax burden may lead to a reduction in environmental expenditures, even when such investments are crucial for long-term sustainability. This suggests that policymakers must strike a balance between enforcing regulations and providing businesses with the financial flexibility to invest in green technologies and sustainable practices.

Conclusion: towards sustainable and inclusive growth

This Research Topic contributes significantly to the literature on carbon neutrality and high-quality development. It highlights the multifaceted nature of the transition to a low-carbon economy, underscoring the importance of technological innovation, market strategies, and policy frameworks. As we move forward, fostering collaboration across various sectors and disciplines will be crucial in ensuring a sustainable, carbon-neutral future. The insights provided here aim to guide policymakers, researchers, and industry leaders in making informed decisions that align with both environmental sustainability and economic growth.

Author contributions

YW: Writing – review and editing, Writing – original draft. GK: Writing – review and editing, Writing – original draft. YL: Writing –

review and editing, Writing – original draft. LX: Writing – original draft, Writing – review and editing. ZL: Writing – original draft, Writing – review and editing.

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Conflict of interest

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