

Synopsis Seminar

Seminar Title	: Essays on Paradigms of Carbon Neutrality: A Developmental Insight into the Emerging Economies
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Abstract	: The expansion of economic activities and the growth of the urban population worldwide have increased the demand for energy, food, and natural resources, aggravating concerns about climate change. In this context, carbon neutrality has emerged as a key strategy for mitigating climate impacts while maintaining long-term economic growth. Several countries have set long-term carbon neutrality objectives, leading to a growing body of literature exploring alternative solutions to reduce carbon emissions and address climate change. Mitigation pathways are critical for achieving carbon neutrality, as reducing CO <sub>2</sub> emissions has become an urgent global issue due to the environmental difficulties posed by climate change. Identifying factors that can successfully mitigate carbon emissions is critical for transitioning the global economy to a low-carbon paradigm. However, a study of the available literature reveals a considerable research gap, particularly in terms of targeted carbon emission reduction approaches in emerging regions. Addressing the current challenges and major influencing factors in these circumstances is crucial.

Against this backdrop, this study seeks to bridge this gap by proposing four key objectives. First, it investigates the primary drivers of carbon emissions to mitigate the adverse impacts of climate change. The analysis includes the relationship between economic growth and carbon emissions and the identification of decoupling trends and convergence because of decoupling patterns across emerging economies. Second, the study examines the non-linear effect of low-carbon energy transition and green growth, considering the threshold effects of government effectiveness and environmental policy stringency. Third, it estimates carbon emission efficiency and evaluates how green technology innovation, the digital economy, and political stability affect this efficiency. Finally, the study investigates the trade-offs or synergies between mitigation and adaptation, focusing on the simultaneous impacts of carbon neutrality and adaptive capacity, highlighting the role of country readiness as a moderator in this relationship.

The current research drew several contributions by addressing the key challenges in achieving carbon neutrality in emerging economies, focusing on the intersection of economic growth, energy transition, green technology, financial development, and governance from 1995 to 2022. First, the study focuses on the decomposition and decoupling of carbon emissions, aiming to uncover the underlying determinants of carbon emissions and evaluate whether countries achieve economic growth while reducing emissions through absolute or relative decoupling. By assessing the decoupling pattern of these countries presented in Chapter II, the study makes a novel contribution to whether these countries are converging towards a common decoupling path regarding CO<sub>2</sub> and GDP. Second, many studies have investigated carbon emissions, focusing on carbon neutrality. However, there is a lack of research that measures carbon neutrality accounting for both carbon emission and sequestration, which is critical for offering a more comprehensive and accurate evaluation of a country's actual carbon footprint. Also, the study makes a novel contribution by making a low-carbon energy transition index, using a vector angle approach, which accounts for the degree of changes from high-carbon energy structure to low-carbon energy structure. This index captures the static proportions of energy types and how these proportions change over time, showing the dynamics of the energy transition. Assuming a non-linear relationship exists between low-carbon energy transition, green growth, and carbon neutrality, Chapter III focuses on the threshold effects of government effectiveness and environmental policy stringency, investigating how these factors enhance the mitigation effect beyond specific policy thresholds. Third, a further contribution is the study estimates the total factor carbon emission efficiency for the emerging economies, which provides insights into how effectively these economies are decreasing emissions relative to their economic output and identifies areas for improvement in carbon emission performance. Similarly, while previous studies have examined the direct effect of green technology, the digital economy, and political stability on carbon emission efficiency, their asymmetric impact remains unexplored. The study assesses the gap and further investigates the mediating effect through which green technology indirectly affects carbon emission efficiency through various mediation channels, as discussed in Chapter IV. Finally, constructing a carbon-neutral performance index offers a comprehensive measure to assess a country's overall progress towards carbon neutrality. As the two sides of the same coin, most of the studies have focused on mitigation strategies, often overlooked yet essential components of achieving carbon neutrality targets. Both are essential and should work together to address climate concerns effectively. This study assesses the synergies and trade-offs between mitigation and adaptation, providing a comprehensive framework to assist policymakers in constructing balanced strategies. Additionally, the study extends the analysis by exploring how country readiness affects his relationship in Chapter V. The current study effectively combines these ideas,

summarizes the main ways to achieve these goals, and offers policy recommendations that provide a holistic approach to addressing climate change.