**Long-run Causality and Short-term Adjustments: The Role of Financial Development and Renewable Energy in Reducing GHG Emissions in Africa**

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**Introduction and Background**

The African region combines emerging and low-income economies, each with distinct economic growth and development paths. A significant characteristic of these economies is their dependence on Foreign Direct Investment (FDI) because the natural resources in the region attract investment. This makes the region dependent on advanced and rich countries for investment. Production in the region predominantly relies on inefficient and non-renewable energy sources, obstructing the achievement of SDG 7’s clean energy goals. This energy inefficiency not only diminishes industrial competitiveness but also curtails job creation. Inconsistent energy infrastructure and a lack of sustainable practices deter FDI, as investors often prioritise stable energy prices and sustainable operations. Despite the emphasis on SDG 12’s sustainable consumption and production, the region’s industries are slow in adopting these practices, affecting global competitiveness and investor appeal. Seeing the climate change threats, the region’s continued use of carbon-intensive energy for industrial operations presses the need for SDG 13—Climate Action. A unified policy focusing on energy efficiency, sustainable industrial growth, and a structured framework for FDI can align the region’s development with global sustainability objectives.

In light of the above, we aim to provide a comprehensive empirical analysis of the long-term and short-term causality between key market-induced factors and GHG emissions, thereby informing more effective policymaking in sustainable development for African economies.

**Research Approach**

Our twenty-five sampled economies were classified into four categories—high, moderate, emerging and lower—based on their industrial output. The share of energy usage from hydropower and their national income in the classification provided further insight into how market-induced factors impact industrial growth in the region. Using the four categories, we categorised the sampled economies based on their industrial output using the share energy usage from hydropower and their national income to understand how the market-induced factors impact their industrial growth.

We employed a Panel (vector error correction model) VECM to assess long-term stability and short-term shifts in GHG emissions, with financial development and renewable energy consumption as the cointegrating vectors. Using the comprehensive methodological approach of VECM, we analysed the cyclic adjustments between financial development, renewable energy, and greenhouse gas emissions in these economies. In our applied study, the VECM approach was conducted by the following steps: (1) Stationarity test: all the series must be stationary at I(1). (2) Determine the optimal lag length for the model. (3) Cointegration test showing the endogenous variables are cointegrated. (4) Estimate VECM (Athanasopoulos et al., 2010).We found evidence of long-run causality between financial development, renewable energy, and GHG emissions, indicating that improvements in these sectors could be instrumental for emissions reduction in the long term.

**Discussions**

Overall, the study reveals a robust long-run relationship, with financial development and renewable energy acting as stabilising forces in GHG emissions. Conversely, our findings show a need for more short-run causality from these factors, suggesting that policy interventions may not yield immediate results but are essential for long-term sustainability. A distinct contribution was identifying sectoral factors, such as employment and industrial performance, significantly influencing emissions levels. The result of our study brings a new perspective to the understanding of the relationship between market-induced factors and GHG emissions in African economies.

**Conclusions**

The research also offers valuable policy insights tailored to countries with varying degrees of industrial output, filling an existing gap in the literature concerning the African context. The policies address each economy’s challenges with the potential of balancing their growth strategies with environmental consequences in view. Countries with high industrial output would benefit from advanced policy instruments such as carbon pricing and green finance, while those with moderate output could make strides through tax incentives for renewable energy and stricter emissions monitoring. Emerging economies require a foundational regulatory structure and skill development in green technologies, whereas lower-output countries could benefit from grassroots initiatives and accessible credit facilities for green projects. These findings are instrumental for national and regional policymakers, helping them align development objectives more closely with environmental sustainability, like expanding and utilising hydropower.

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