THE IMPACT OF URBANIZATION ON ENERGY CONSUMPTION: A COMPARATIVE ANALYSIS OF SELECTED DEVELOPING COUNTRIES

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Abstract

Urbanization has emerged as a critical determinant of energy consumption patterns, particularly in developing economies experiencing rapid economic and demographic transitions. This study investigates the relationship between urbanization and energy demand through a comparative analysis of four rapidly urbanizing South and Southeast Asian nations: Sri Lanka, India, Bangladesh, and Vietnam. Covering the period from 1990 to 2023, the research employs advanced panel data econometric techniques to provide robust empirical evidence on how urban expansion influences energy use in these developing contexts. The analysis utilizes both fixed-effects and random-effects models to account for country-specific heterogeneity while examining the core relationship between urbanization and total energy consumption. To isolate urbanization's distinct impact, the study controls for several key variables: GDP per capita, industrial and services value-added, and renewable energy adoption (indicating sustainability efforts). The empirical results demonstrate that urbanization exerts a statistically significant positive effect on energy consumption across all sample countries, though the effect size varies considerably. Notably, the energy-urbanization elasticity is highest in Vietnam and lowest in Sri Lanka, reflecting differences in urban infrastructure quality and industrial composition. The study finds that industrialization acts as an amplifying factor, while greater renewable energy penetration serves as a moderating influence on urban energy demand. These findings carry important policy implications for sustainable development in the Global South. The results suggest that urban planning strategies should prioritize energy-efficient infrastructure development and accelerated renewable energy adoption to mitigate the environmental impacts of rapid urbanization. Furthermore, the country-specific variations highlight the need for tailored policy approaches that consider national economic structures and urbanization trajectories. This study contributes to the broader literature on urban energy systems by providing comparative, empirically grounded insights from four key Asian emerging economies.

Keywords: urbanization, energy consumption, panel data analysis, developing asia, sustainable development, energy policy