ABSTRACT

This study aims to analyze the effects of renewable energy, Gross Domestic Product (GDP), carbon dioxide (CO_2) emissions, and urban population on the ecological footprint in the Asia-Pacific region during the period 2014–2024. The ecological footprint is an important indicator for assessing environmental quality, as it reflects the extent of land area affected by human activities. This study employs a quantitative approach using panel data regression analysis. The research data were obtained from official sources, including the Global Footprint Network, the Energy Institute, and the World Bank, and were processed using EViews 12 software.

The results of the Chow test and Hausman test indicate that the Fixed Effect Model (FEM) is the most appropriate estimation model. The regression results reveal that renewable energy has a negative and statistically significant effect on the ecological footprint, while GDP and carbon dioxide emissions have positive and statistically significant effects on the ecological footprint. Urban population has a positive but statistically insignificant effect on the ecological footprint, suggesting that urban population growth is not always a determining factor in increasing the ecological footprint. Simultaneously, the four independent variables significantly influence the ecological footprint, with an R^2 value of 0.998984, indicating that the model is capable of explaining approximately 99% of the variation in the ecological footprint.

This study finds that the use of renewable energy plays an important role in reducing the ecological footprint, whereas GDP, carbon dioxide emissions, and urban population tend to increase the ecological footprint, although the effect of urban population is not statistically significant. These findings are consistent with the IPAT Theory (Impact of Population, Affluence, and Technology), which explains that environmental degradation is driven by population, affluence, and technology. Therefore, more environmentally sustainable development efforts are required to achieve a balance between economic growth and environmental preservation.

Keyword: Ecological footprint, Renewable Energy, Gross Domestic Product, Urban Population, Panel Data Regression