ANALYSIS OF THE IMPACT OF ECONOMIC AND ECOLOGICAL FACTORS ON CARBON EMISSIONS IN THE ASEAN-8 REGION

By Kayla Aliphia Purnomo

Abstract

Economic growth, rising energy demand, and industrial expansion in ASEAN have intensified environmental pressures through increasing carbon emissions. This study examines the effects of GDP per capita, electricity consumption per capita, industrial value added, and forest-covered land area on carbon emissions in eight ASEAN countries (ASEAN-8) during 1997–2024. The analysis employs panel data using the Random Effects Model (REM) estimated through Feasible Generalized Least Squares (FGLS). To address multicollinearity, mean-centering was applied to the GDP variables. The results indicate that all independent variables jointly have a significant effect on carbon emissions, with the model explaining 98.11% of the variation in emissions. Partially, the squared GDP term has a negative but insignificant effect, suggesting that the Environmental Kuznets Curve (EKC) hypothesis cannot be empirically confirmed in ASEAN-8. These findings suggest that effective carbon mitigation in ASEAN requires integrated policies focused on accelerating the transition to clean energy, promoting low-carbon industrial development, and strengthening sustainable forest management.

Keywords: *Carbon Emissions, Economic Growth per Capita, Electricity Consumption per Capita, Industry Value Added, Forest Covered Land Area, ASEAN-8.*

ANALISIS PENGARUH FAKTOR EKONOMI DAN EKOLOGIS TERHADAP EMISI KARBON DI KAWASAN ASEAN-8

Oleh Kayla Aliphia Purnomo

Abstrak

Pertumbuhan ekonomi, peningkatan konsumsi energi, dan ekspansi aktivitas industri di kawasan ASEAN turut meningkatkan tekanan lingkungan melalui kenaikan emisi karbon. Penelitian ini bertujuan menganalisis pengaruh PDB per kapita, konsumsi energi listrik per kapita, *industry value added*, dan luas lahan yang tertutup hutan terhadap emisi karbon di delapan negara ASEAN (ASEAN-8) periode 1997–2024. Penelitian menggunakan data panel dengan pendekatan *Random Effect Model* (REM) dan estimasi *Feasible Generalized Least Square* (FGLS). Permasalahan multikolinearitas diatasi melalui *mean-centering* pada variabel independen. Hasil penelitian menunjukkan bahwa seluruh variabel independen secara simultan berpengaruh signifikan terhadap emisi karbon dengan kemampuan model menjelaskan variasi emisi sebesar 98,11%. Sementara itu, PDB kuadrat berpengaruh negatif namun tidak signifikan sehingga hipotesis *Environmental Kuznets Curve* (EKC) belum dapat dibuktikan secara empiris. Temuan ini mengindikasikan pentingnya transisi energi bersih, transformasi industri rendah karbon, dan pengelolaan hutan yang berkelanjutan untuk mendukung pembangunan yang lebih ramah lingkungan di ASEAN.

Kata kunci: Emisi Karbon, PDB per Kapita, Konsumsi Energi Listrik per Kapita, *Industry Value Added,* Luas Lahan yang Tertutup Hutan, ASEAN-8.