

THE IMPACT OF ENERGY AND ECONOMIC FACTORS ON CARBON EMISSIONS IN INDONESIA

By Amellya Yunita Syari

Abstract

Carbon emission have become a major challenge to achieving sustainable development in Indonesia. Economic growth continuously increases energy demand and my intensify environmental pressure. This study aims to analyze the effect of alternative and nuclear energy, fosil energy consumption, electricity consumption, and gross domestic product on carbon emissions in Indonesia and to examine the Environmental Kuznets Curve (EKC) hypothesis. This study uses annual time series data for Indonesia from 1990 to 2024 obtained from the World Bank and Our World in Data. The study applies the Vector Error Correction Model (VECM) to analyze both short-run and long-run relationships among variables. The results show that, in the short-run only GDP and GDP2 significantly affect carbon emission. In the long-run, alternative and nuclear energy has a positive and significant effect, electricity consumption has a negative and significant effect, while fossil energy consumption has no effect on carbon emissions. Furthermore, GDP has a positive and significant effect, whereas GDP2 has a negative and significant effect on carbon emissions. These findings confirm that the relationship between economic growth and carbon emissions in Indonesia follows the Environmental Kuznets Curve (EKC) pattern.

Keywords: *Carbon Emissions, Alternative and Nuclear Energy, Fossil Energy Consumption, Electricity Consumption, Environmental Kuznets Curve, VECM.*

DETERMINASI FAKTOR ENERGI DAN EKONOMI TERHADAP EMISI KARBON DI INDONESIA

Oleh Amellya Yunita Syari

Abstrak

Peningkatan emisi karbon menjadi salah satu tantangan utama dalam mencapai pembangunan berkelanjutan di Indonesia. Pertumbuhan ekonomi yang terus meningkat mendorong kebutuhan energi yang lebih besar dan berpotensi meningkatkan tekanan terhadap lingkungan. Penelitian ini bertujuan menganalisis pengaruh energi alternatif, konsumsi energi fosil, konsumsi daya listrik, serta Produk Domestik Bruto (PDB) terhadap emisi karbon di Indonesia dan menguji keberadaan hipotesis *Environmental Kuznets Curve* (EKC). Penelitian ini menggunakan data *time series* tahunan Indonesia periode 1990–2024 yang diperoleh dari *World Bank* dan *Our World in Data*. Penelitian menerapkan metode *Vector Error Correction Model* (VECM) untuk menganalisis hubungan jangka pendek dan jangka panjang antar variabel. Hasil penelitian menunjukkan bahwa dalam jangka pendek hanya PDB dan PDB^2 yang berpengaruh signifikan terhadap emisi karbon. Dalam jangka panjang, energi alternatif berpengaruh positif signifikan, konsumsi daya listrik berpengaruh negatif signifikan, sedangkan konsumsi energi fosil tidak berpengaruh terhadap emisi karbon. Selain itu, PDB berpengaruh positif signifikan dan PDB^2 berpengaruh negatif signifikan terhadap emisi karbon. Hasil tersebut membuktikan bahwa hubungan antara pertumbuhan ekonomi dan emisi karbon di Indonesia mengikuti pola *Environmental Kuznets Curve* (EKC).

Kata kunci: Emisi Karbon, Energi Alternatif, Energi Fosil, Konsumsi Daya Listrik, *Environmental Kuznets Curve*, VECM.