International Conference on New Ideas in MANAGEMENT, ECONOMICS & ACCOUNTING

21 - 23 November 2025 Copenhagen , Denmark

Predicting Environmental Quality in Luxembourg: a Machine Learning Approach

Demet Beton Kalmaz , Jahfaith Ugochukwu Irokanulo

Cyprus Interational University, Cyprus

Abstract

The increase in economic activities of production and distribution has led to an increase in carbon emissions globally. The use of energy sources, especially fossil fuels, is considered a major cause of the rise in global CO2 emission figures. This study applied machine learning in the prediction of CO2 emissions as a proxy for environmental quality in Luxembourg. It utilized GDP, oil, renewable energy, and population growth as features. It also experimented with linear models and random forest and observed that random forest models performed better than both linear regression and ridge regression. The feature importance of the random forest model also showed that economic growth and renewable energy are stronger predictors of carbon emissions in Luxembourg, followed by oil and population growth. This led to the conclusion that policymakers should pay attention to the GDP composition of the country and its energy usage to achieve desired emission levels and environmental quality.

Keywords: Carbon Emissions; Economic Growth; Machine Learning; Random Forest