395

Economic Growth, Energy Mix and CO_2 Emissions: Island-by-Island Environmental Kuznets Curve Evidence from the Azores

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Extended Abstract

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Abstract Summary

The paper studies the economic growth–CO_2 emissions nexus in the Azores using an island-by-island Environmental Kuznets Curve (EKC) approach. Given the archipelago's "double insularity" and the fact that each island operates an isolated electricity system with distinct GDP, population, generation mix, and consumption patterns, aggregate analyses may conceal key intra-regional differences.

Emissions vary substantially across islands: São Miguel and Terceira are the largest emitters in absolute terms, while several smaller islands show higher carbon intensity. Renewable penetration is highly uneven, ranging from 0.3% in São Jorge to 60.4% in Graciosa, and renewable portfolios differ between dispatchable (geothermal, hydropower) and non-dispatchable (wind, solar) sources.

Using a macro panel dataset covering the nine islands over 2006–2022, preliminary Fixed Effects estimates indicate significant island-specific heterogeneity in baseline emissions. In the pooled specification, the linear income term is negative and the squared term positive, suggesting a U-shaped income–emissions relationship. Because a common-slope FE model may mask heterogeneous environmental responses, subsequent analysis allows island-specific EKC coefficients. The empirical strategy combines quadratic and cubic EKC specifications with structural determinants—generation mix and sectoral electricity consumption—to inform more effective, territorially differentiated energy and climate policies for small island systems.

Presenting Author Biography

Ana Brasão holds a PhD in Economics from Nova School of Business and Economics. She is an Associate Professor and Director of the School of Economic Sciences and Organizations at Lusófona University – Lisbon University Centre, where she also serves as Director of the Bachelor’s and Master’s programmes in Economics. She is a researcher at Intrepid Lab – CETRAD. Her research interests include fisheries management, energy economics, sustainable development goals, environmental economics, natural resources economics, and maritime transportation.