

# **Illustrating the conflicts between energy poverty and decarbonisation in the energy transition. A case example in Spain**

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## **Abstract-**

The energy transition required to meet decarbonization goals will change dramatically the type of technologies and energy sources used in our economies, as well as the way we consume this energy. This in turn may have a significant impact on typically low-income, vulnerable consumers, which may not be able to carry out the required investments and fuel changes, or may suffer from higher prices. A multi-criteria, multi-stakeholder long-term energy planning model is used in this paper to evaluate how the sometimes conflicting criteria –such as the increase in total system costs and energy poverty after imposing limits on CO<sub>2</sub> and pollutant emissions– and stakeholders’ preferences interact when trying to achieve 2050 decarbonization objectives for Spain. Our results show a significant degree of conflict between objectives: energy poverty increases when decarbonization advances, and vulnerable households may not be able to achieve a full decarbonization of their demand due to budget constraints. The conflict between atmospheric pollution and the rest of criteria is also highlighted. Finally, the study also shows how the preferences of certain stakeholders groups, i.e., utilities, regulators, environmentalists and academia, may accentuate these conflicts. We conclude that the efforts toward decarbonization must be accompanied by targeted financial support mechanisms, and robust regulatory frameworks to protect vulnerable households. We also emphasize the need to incorporate social equity considerations into energy planning models and the necessity for continuous monitoring and adjustment of energy policies.

**Index Terms-** Energy Poverty, Energy Sustainability, Energy Transition, Multi-criteria Analysis, Scenario Analysis, Energy Justice

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**Citation:**

*Linares, P.; Pérez-Bravo, M.; Rodríguez Matas, A.F.; Romero, J.C. "Illustrating the conflicts between energy poverty and decarbonisation in the energy transition. A case example in Spain", Energy, vol.314, pp.134204-1-134204-11, January, 2025.*