

The green-on-green debate around renewable energy siting. Resource productivity, population density and environmental trade-offs in wind and solar plants.

Patxi Elizalde, Enrique San Martín
UNED, Madrid, Spain

Extended Abstract

[Download file](#)

Abstract Summary

As countries accelerate the energy transition, the “green-on-green” conflict between climate change mitigation and environmental conservation intensifies. This study employs high-resolution spatial data analysis and econometric techniques in order to i) assess whether current wind and solar renewable energy (RE) deployment is in line with environmental objectives and ii) to analyze the relationship between RE siting, environmental vulnerability zones, population density and natural resource productivity. Methods are applied to a case study of four regions in Spain. The findings reveal a fundamental asymmetry of resource productivity scarcity: while solar energy exhibits high spatial elasticity, allowing it to be sited in anthropized or peri-urban areas without significant yield loss, onshore wind energy is geographically constrained to certain topographic features with high environmental vulnerability. Based on these results, a technology-specific spatial governance framework is proposed. For solar, policy should prioritize avoidance of environmentally vulnerable sites by steering development toward peri-urban zones. For wind, steering siting towards anthropized areas where the resource productivity is sufficient should be accompanied by local property schemes to avoid social rejection. Where avoidance is not possible, a “productivity-for-protection” scheme is suggested, making access to high-yield sites contingent upon developers adopting advanced protection technologies and funding natural restoration actions. Policies that consider the technology-specific spatial reality will contribute to an energy transition that remains both environmentally respectful and socially legitimate.

Presenting Author Biography

Patxi Elizalde is a PhD candidate at UNED, where his research focuses on the socio-economic factors driving the adoption of renewable energy technologies, with a specific emphasis on rooftop solar and energy communities. He holds an International Degree in Economics and Business Administration from the Public University of Navarre (UPNA) and a

Master's in Economic Research from UNED. Beyond academia, Patxi brings five years of specialized working experience in the industrial rooftop solar sector, providing a unique, practical perspective on the energy transition.