IBIMA Publishing
Communications of International Proceedings
https://ibimapublishing.com/p-articles/45NRG/2025/4516625/
Vol. 2025 (18), Article ID 4516625

Biomass As an Instrument of Sustainable Energy Transition in Poland*

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* Presented at the 45th IBIMA International Conference, 25-26 June 2025, Cordoba, Spain

Abstract

Poland's transition towards a low-emission electricity system constitutes a central element of national climate policy and EU decarbonisation objectives. While wind and photovoltaic energy have expanded rapidly, the role of biomass—essential for system stability and the circular use of resources—remains insufficiently examined in empirical analyses. Existing literature focuses primarily on technological potential and regulatory frameworks, lacking an assessment of biomass trends in relation to other generation technologies. This study addresses that gap using harmonised data from Statistics Poland (GUS), the Energy Regulatory Office (URE), and the Energy Instrat platform, covering electricity production and installed capacity across hard coal, lignite, natural gas, biomass, photovoltaics, and wind. Average annual growth rates for capacity and generation were calculated, year-on-year Pearson correlations estimated, and linear extrapolations to 2025 performed to assess investment efficiency and the pace of decarbonisation. Results indicate a 15-percentage-point decline in the fossil-fuel share, over 600-fold growth in photovoltaic capacity, and a doubling of wind, both demonstrating high conversion efficiency (R = 0.76–0.85). Biomass exhibited stable generation (~730 GWh), moderate capacity growth (compound annual rate ~5%), and a lower correlation coefficient (R = 0.68), suggesting that logistical and regulatory constraints limit its full potential. This study offers a data-driven contribution to energy transition literature by empirically situating biomass development within the broader dynamics of Poland's evolving power mix. The findings underline the importance of differentiated policy support to unlock underutilised capacities and accelerate a balanced, multi-source energy transformation.

Keywords: renewable energy, biomass, decarbonization, Poland, energy transition

Cite this Article as: Arkadiusz WEREMCZUK Vol. 2025 (18) "Biomass As an Instrument of Sustainable Energy Transition in Poland " Communications of International Proceedings, Vol. 2025 (18), Article ID 4516625, https://doi.org/10.5171/2025.4516625