



ID: 732

## Decarbonizing Development: Integrated Renewable Energy Models for Climate-Smart Transitions in Emerging Economies

Muhammad Yasir Naeem<sup>1\*</sup>, Batuhan Selamoglu<sup>2</sup>, Abdol Ghaffar Ebadi<sup>3</sup>, Mesut Selamoglu<sup>4</sup>

<sup>1</sup>Department of Agronomy, Animals, Food, Natural Resources and the Environment (DAFNAE), University of Padua, Italy

<sup>2</sup>Department of Electrical and Electronics Engineering, Institute of Life Sciences, Mersin University, Mersin, Turkiye

<sup>3</sup>Department of Agriculture, Jouybar branch, Islamic Azad University, Jouybar, Iran

<sup>4</sup>Osmaniye Korkut Ata University, Bahce Vocational School, Management and Organization, Osmaniye, Türkiye

\*Corresponding Presenter's Email: yasir.naeem91@yahoo.com

### Abstract

Achievement of global sustainability goals requires an immediate transition from fossil fuel-based energy systems to integrated renewable energy systems. This mini-review addresses the design principles, design considerations, and implementation strategies for integrated renewable energy systems—solar, wind, biomass, and small-scale hydropower—in the context of the emerging economies. It emphasizes how decentralised models, energy storage technologies, and hybrid grids can eradicate energy poverty and reduce greenhouse gas emissions. Key technological synergies are explored, such as solar-bioenergy coupling, optimization of the energy-water nexus, and AI applications to grid management. The review considers socio-economic factors such as financing models, gendered access to energy, and local capacity development. Policy settings and global cooperation are considered as the driving forces for sustainable transitions. Through the integration of renewable technologies that are appropriate to local resources and needs, new economies can promote simultaneously economic growth, energy security, and environmental integrity.

**Keywords:** *Integrated renewables, Energy transition, Decentralized systems, Climate-smart development, Sustainable energy policy, Emerging economies*

