ID 785

Harnessing Wave Energy for Sustainable and Resilient Power Generation in Sri Lanka: A Feasibility Study

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Sri Lanka is experiencing an annual growth in electricity demand of approximately 5-6%, necessitating the development of new power plants to accommodate this increase. With the majority of the country's rivers already utilized for hydroelectric power, the focus has shifted towards thermal and diesel power plants, despite their considerable environmental impacts. Although Sri Lanka has optimized conventional renewable energy sources, such as solar and wind, non-conventional sources remain underexplored. Among these, wave energy presents significant, yet largely untapped potential.This paper investigates current wave energy harnessing technologies, evaluates criteria for selecting optimal locations and devices, and assesses the associated environmental impacts. A comprehensive new design and mathematical model is proposed, tailored to Sri Lanka's specific technical, environmental, social, and economic conditions. This model aims to advance sustainable and resilient power generation systems by integrating modern technological advancements and addressing the increasing demand for clean energy.The study contributes to the development of a more sustainable energy sector in Sri Lanka, providing insights into the feasibility of wave energy as a viable alternative. It seeks to align with global trends in clean energy while addressing local energy needs and environmental concerns, offering a path towards a more resilient and eco-friendly power infrastructure.

Keywords: *renewable energy, power generation, non-conventional sources, wave energy, sri lanka*