

(ID 236)**Efficiency Comparison of Floating, Ground, and Rooftop Solar Systems: Environmental and Social Impacts of Floating Solar Grids****Rajakpaksha, R.U.H.K.R.^{1*}, Chandrathilake, G.G.T.¹, Karunarathne, R.R.²***¹Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Nugegoda, Sri Lanka**²Sri Lanka Sustainable Energy Authority, Sri Lanka***himarshakaushan@gmail.com***Abstract**

The global fossil fuel shortage and environmental concerns underscore the imperative for transitioning to renewables. Developing nations like Sri Lanka are prioritizing green technologies, notably solar energy, to bridge the gap between current usage and its substantial potential. This study compares technical efficiency among floating, ground, and rooftop solar in Sri Lanka. Analyse local perceptions of floating solar. Assess the environmental impact and sustainability of floating solar systems in Sri Lanka. This study compares the energy production efficiency of floating solar, ground solar, and rooftop solar systems in Sri Lanka. This study compares the technical efficiency of floating, ground-mounted, and rooftop solar systems. Kilinochchi, chosen for floating solar, a nearby ground solar site facilitates a direct comparison, and Mass Vidiyal in Kilinochchi represents rooftop solar. The study strategically gathers data from inverters to assess performance metrics. The goal is a representative analysis, minimizing solar irradiance variations for accurate comparisons. Conducting a literature review to analyse the environmental impact of floating solar systems, drawing insights from past published research papers, and A socio-economic survey was conducted among the local community to assess the socioeconomic viability of a proposed floating solar plant near Chandrika Lake. The survey considered factors such as job creation, local employment opportunities, skill development, and alignment with national energy policies. Floating solar systems were found to have the highest energy generation capability and efficiency, followed by rooftop solar systems, while ground-mounted solar systems had lower energy output. The advantages of floating solar systems over ground-mounted systems were significant (43.69% advantage) and outperformed rooftop solar systems (30.81% advantage). According to the survey, stakeholder engagement and mitigation measures were identified as crucial, considering concerns related to water quality, safety, fisheries, agriculture, and the aesthetic value of the lake This study highlights technical efficiency, socioeconomic viability, and environmental impact of solar systems in Sri Lanka, emphasizing responsible deployment. While floating solar exhibits energy efficiency, addressing altered water flow and aquatic habitat concerns through mitigation measures is crucial for sustainable implementation.

Keywords: Solar energy, Floating solar, Environmental impact, Social impact, Renewable energy