

Title: Feasibility study of floating solar photovoltaic systems using techno-economic assessment and multi-criteria decision-making method: A case study of Bangladesh

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Abstract: Many developing countries with abundant solar resources and rich history of agriculture, face overpopulation and land shortage issues. Floating solar photovoltaics (FSPVs) do not compete with agriculture for land and offer higher energy potential than land-based photovoltaics (LBPVs). For feasibility and site suitability evaluation of FSPVs, this study proposes an integrated approach of techno-economic assessment (TEA) and multi-criteria decision making (MCDM), based on a case study of Bangladesh. The system advisor model (SAM) was used to conduct TEA, evaluating the potential of nine FSPV sites on a regional scale using ten criteria. Combined compromise solution (CoCoSo) was implemented to determine the optimum site. Bergobindopur lake was ranked top, with the highest energy yield and lowest cost of energy of 1564 kWh/kW and \$0.055/kWh respectively. Case study of Bergobindopur revealed buy-all-sell-all electricity tariff was more profitable than net billing and net metering. Energy generation was found to be influenced by tilt angle and soiling. Sensitivity analyses demonstrated the superiority of FSPVs over LBPVs for varying electricity prices, degradation and discount rates, project durations, and investor's equities. Longer project durations and lower equities resulted in higher profits for investors. The proposed approach contributes to the expansion of FSPV in land-constrained areas.

Keywords: Floating solar photovoltaics (FSPVs), Land-based photovoltaics (LBPVs), Techno-economic assessment (TEA), Multi-criteria decision making (MCDM), Site suitability, Energy potential, System advisor model (SAM)

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