EVALUATION AND ASSESSMENT OF SOLAR ENERGY OVER WATER BODIES OF UTTARAKHAND

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Abstract: This study aims to find the solar potential of majority of the lakes, reservoirs and canals in Uttarakhand, India. Since the non-renewable sources of energy are getting depleted and the population is increasing day by day, there is a need for India to divert from non-renewable to renewable and cleaner sources of energy to meet the increasing energy demands of people and also to promote a healthier environment as fossil fuels produce harmful gases. This study therefore aims to find the solar potential of water bodies in Uttarakhand and energy consumption per capita of the state to check if the floating solar panels on the said water bodies can meet the increasing energy demand of the state. Geographic Information System (GIS) has been used to digitize the said water bodies and find their area and perimeter. Parameters like Global Horizontal Irradiance (GHI) on horizontal and tilted surfaces have been obtained for the estimation of solar insolation. The Heliosat-4 model has been used in CAMS McClear model for evaluating GHI of these places with latitudes and longitudes being the inputs. To account for the accuracy of these values, they have been compared with the results obtained from the data available on the website of NASA. Also, a SMARTS model has been used to compare the values obtained from the CAMS McClear model. Maps showing the variation of solar insolation over these water bodies have been plotted on the basis of the calculated GHI values. Further, the energy consumption per capita of the state has also been calculated and the impact of installing floating solar panels on the aquatic life of water bodies has been considered. It has been found that the average GHI of the water bodies is approximately in the range of 4.5-6.5 $kWh/m^2/day$.

Keywords: Global Horizontal Irradiance, Tilt angle, Solar Energy, GIS, Remote Sensing