

Comparison of Artificial Neural Networks and GIS Based Solar Analysis for Solar Potential Estimation

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Nowadays, estimation of solar potential plays an important role in planning process for sustainable cities. The use of solar panels, which produces electricity directly from the sun, has become popular in accordance with developing technologies. Since the use of solar panels enables the users to decrease costs and increase yields, the use of solar panels will be more popular in the future.

Production of electricity is not convenient for all circumstances. Shading effects, massive clouds and rainy weather are some factors that directly affect the production of electricity from solar energy. Hence, before the installation of solar panels, it is crucial to conduct spatial analysis and estimate the solar potential of the place that the solar panel will be installed. There are several approaches to determine the solar potential.

Examination of the applications in the literature reveals that the applications conducted for determining the solar potential are divided into two main categories. Solar potential is estimated either by using artificial neural network approach in which statistical parameters such as the duration of sun shine, number of clear days, solar radiation etc. are used, or by spatial analysis conducted in GIS approaches in which spatial parameters such as, latitude, longitude, slope, aspect etc. are used. In the literature, there are several studies that use both approaches but the literature lacks of a study related to the comparison of these approaches.

In this study, Karadeniz Technical University campus has been selected as study area. Monthly average values of the number of clear sky days, air temperature, atmospheric pressure, relative humidity, sunshine duration and solar radiation parameters obtained for the years between 2005 and 2015 will be used to perform artificial neural network analysis to estimate the solar potential of the study area. The solar potential will also be estimated by using GIS-based solar analysis modules. The results of both approaches will be compared to reveal the advantages and disadvantages of both approaches.

Keywords: Artificial neural network, GIS, Solar potential analysis, Solar radiation, Modelling