Solar irradiation estimation with neural network method using meteorological data in Indonesia

Meita Rumbayan, author

Abstrak

The objective of this study is to determine the solar energy potential in Indonesia using artificial neural networks (ANNs) method. In this study, the meteorological data during 2005 to 2009 collected from 3 cities (Jakarta, Manado, Bengkulu) are used for training the neural networks and the data from 1 city (Makasar) is used for testing the estimated values. The testing data were not used in the training of the network in order to give an indication of the performance of the system at unknown locations. Fifteen combinations of ANN models were developed and evaluated. The multi layer perceptron ANNs model, with 7 inputs variables (average temperature, average relative humidity, average sunshine duration, longitude, latitude, latitude, month of the year) are proposed to estimate the global solar irradiation as output. To evaluate the performance of ANN models, statistical error analysis in terms of mean absolute percentage error (MAPE), mean absolute bias error (MABE) and root mean square error (RMSE) are conducted for testing data. The best results of MAPE, MABE, RMSE are found to be 7.4%, 1.10 MJ/m2 and 0.17 MJ/m2 respectively as 7 neurons were set up in the hidden layer. The result demonstrates the capability of ANN model to generate the solar irradiation estimation in Indonesia.