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**STATISTICAL ANALYSIS OF TOTAL SOLAR RADIATION IN
COLOMBO, SRI LANKA**

A PROJECT REPORT PRESENTED BY

MADARA PAMODINI WICKRAMASINGHE

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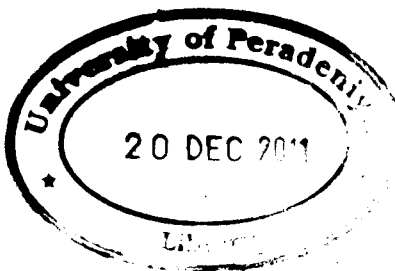
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Madara Pamodini Wickramasinghe

Postgraduate Institute of Science

University of Peradeniya

Peradeniya

Sri Lanka

To develop solar-based technologies, it is important to have long-term readily available solar radiation data. Measuring solar radiation is difficult due to the cost and complexity of standard apparatus. However, sunshine hours can be measured easily. Therefore, in this study our objective is to develop statistical models to predict average daily, weekly and monthly solar radiation using respective sunshine duration and fitting distributions for each month separately. Daily solar radiation (MJ/m^2) and the respective sunshine duration (Hours) data collected by the Department of Meteorology, Sri Lanka, for Colombo from 1997 to 2007 were used for the analysis. Ordinary Least Square (OLS) method was used to develop the models. To use the OLS method the variables should be stationary. Augmented Dickey Fuller and Phillips-Perron tests ($P < 0.001$) suggest the stationarity of the respective variables, which allows us to use OLS method. Fitted models explains 99% ($R^2=0.99$) of the variation of data.

The F-test confirms that fitted models are significant ($P\text{-value} < 0.05$) and the t-test confirms the significance of model parameters ($P\text{-value} < 0.05$). Residual analysis reveals that each of the models satisfies underlying assumptions for residuals. The average percentage deviation suggest that developed models could predict the daily average solar radiation with 90.92% accuracy , weekly average daily solar radiation with 90.79% accuracy and monthly average daily solar radiation with an accuracy of 90.79% for the validation data set.

Distributions were fitted for solar radiation data for each month separately. January and June months showed Johnson SB distribution. February , April, July, August, September, October, November months have four parameter Dagum distribution , March and December months have Burr(4P) distribution , and the month of May has a underlying distribution of Beta. However, all the above-mentioned distributions are negatively skewed indicating that most of the days have high solar radiation in Colombo.