EXTREME VALUE ANALYSIS OF WIND SPEED

IN PUTTALAM, SRI LANKA

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Geographically, there is a possibility of having high wind speeds in Puttalam. This can cause damages to man-made structures such as bridges, wind-turbines, buildings, radio masts, etc. Therefore assessment of wind speed is utmost important to prevent from such disasters to some extent.

Daily wind speed (kmh^{-1}) data for Puttalam from January 2007 to April 2014 was used in the analysis. "Extremes" package in R software was used for the data analysis. In this research, we present three different methods for extreme value analysis, Block Maxima approach and r^{th} Largest Order Statistic approach, which are based on Generalized Extreme Value distribution and Peak-Over-Threshold method, which is based on Generalized Pareto Distribution. Parameter estimation was done using Maximum Likelihood method. According to the Block Maxima method the data fitted well with the Weibull distribution. Considering the parameter estimates and the return level plots for different values of r ,the best value of r was identified as 4. The Joint Generalized Extreme Value distribution of 4th Largest Order statistic was fitted well with the data. According to Peak-Over-Threshold method, using the Mean residual life plot, threshold stability plot and diagnostic plots the best threshold value was found as 12.25 kmh^{-1}. Declustered data were used in the analysis ensuring the independence among neighborhood extremes. The best distribution was identified as the Beta distribution. Further, a comparison study was carried out with the Block maxima method that has been used in the literature using "Easy-fit" software. Also the method has been extended to compare with the Peak-Over-Threshold method. Results showed that the Johnson SB distribution and the Generalized Pareto distribution were the best fitted probability distributions for monthly maximum wind speed and daily wind speed above the threshold of 12.25 kmh^{-1} respectively. Using the identified distributions return levels and their 95% confidence bands were obtained. The 100 month return level using both Block Maxima and r^{th} Largest Order Statistic methods were 17.99 kmh^{-1} and 17.76 kmh^{-1} respectively where as in Peak-Over-Threshold method the 100 year return level was 18.11 kmh^{-1}. The 100 month return level for the Johnson SB distribution was 17.09 kmh^{-1} and for the Generalized Pareto distribution, 17.86 kmh^{-1} was the 100 year return level.