EXTREME VALUE ANALYSIS OF WINDSPEED IN HAMBANTOTA DISTRICT, SRI LANKA

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Nowadays Extreme value theory has emerged as one of the most important statistical areas in several applied sciences such as insurance, risk assessment, telecommunication, geology, public health and day to day living. Extreme wind is one of the major natural hazards that was experienced in the past. This causes significant damages to ecology, electricity, disruption to human activities, injuries and loss of lives. Therefore it is necessary to study the magnitude and frequency of extreme wind speed to get a better understanding of the impact of severe winds.

The main objective of this research is to estimate the return periods and their confidence bands of windspeed (ms^{-1}) data recorded in Hambantota district over the years 2007 - 2012.

Prior to the extreme value analysis, the quality of the data was checked using the graph of the observed values. There was no long term variations were visible. In this analysis two techniques have been applied. Block maxima approach for the monthly maximum and 10 days maximum data and Peak Over Threshold (POT) approach for the entire windspeed data.

First approach is based on the Generalized Extreme Value Distribution (GEV) and it was shown that using the Likelihood Ratio (LR) Test and the diagnostic plots, the Gumbel distribution fits well with the monthly maximums and the 10 days maximum. The second approach is based on Generalized Pareto Distribution (GPD). For the entire windspeed data the possible range of threshold values were identified using the Mean residual life plot and the specific threshold value was identified as 26 ms^{-1} by fitting the poisson process model. To fit the GPD, the data should be independent. Since we have selected the wind speed data above a threshold value, data may have correlation among daily observations. Therefore the declustering method was used to eliminate the dependency. It was found that the Exponential distribution fits well with the declustered windspeed data over the identified threshold value. The parameters of the distributions GEV and GPD were estimated using Maximum likelihood estimation method.

The return levels and their confidence bands of extreme windspeed are calculated at different values of return periods using the identified distributions. Comparing these two methods, the smallest standard error for the parameter estimates were given by the Peak Over Threshold method. The estimated return levels and their confidence bands could be used to prevent hazards due to extreme winds.