EXTREME RAINFALL AT MALAYSIA'S HIGHLANDS

DISEDIAKAN OLEH :

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1. Letter of Report Submission

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Prof.,

LAPORAN AKHIR PENYELIDIKAN :
'EXTREME RAINFALL AT MALAYSIA'S HIGHLANDS'

Merujuk kepada perkara di atas, bersama-sama ini disertakan 2 (dua) naskah Laporan Akhir Penyelidikan bertajuk '*Extreme Rainfall at Malaysia's Highlands"* oleh kumpulan penyelidik dari Fakulti Kejuruteraan Awam untuk tindakan pihak Prof.

Sekian, terima kasih.

Yang benar,

PROF. MADYA IR. DR. AMINUDDIN MOHD BAKI
Ketua Projek Penyelidikan

5. Report

5.1 Proposed Executive Summary

Many of the extreme rainfall events led to flash-flooding and consequent loss of life and substantial property damage. Therefore there is an urgent need to be able to forecast this event accurately Gumbel distribution is among the common probabilistic models used in hydrological extremes especially in the case of modelling rainfall extremes. This has been especially the case in modeling rainfall extremes. It is a well known that an estimation of extreme rainfall is very important for major hydraulic structure designs.

In this study peak over threshold extreme rainfall series have been proposed as an alternative to annual maximum rainfall series in extreme rainfall analysis. A peak over threshold series consists of all the peaks above a certain threshold, whereas an annual maximum rainfall series contains only the maximum rainfall of each year. It has been argued that peak over threshold method uses more information about extreme rainfall because it works with more elements than the annual maxima series method.

In this project, the data used were obtained from Department of Irrigation and Drainage Malaysia. The area used as a case study covered a selected area of Malaysia's highland such as Bukit Peninjau at Pahang, Ladang Boh at Cameron Highland, Gunung Brinchang at Cameron Highland, Genting Sempah at Wilayah Persekutuan and Bukit larut at Perak.

The data were extracted using annual maxima and peak over threshold methods and then fitted with Gumbel and Pareto distributions. The return periods were calculated and compared. The obvious advantage of such models over an annual maxima approach is that, by making more of the data in any given time and furthermore, the precision of estimates and return levels can be greatly improved.

From the analysis most of the data shows that the return period becomes smaller as the level of threshold becomes larger, i.e. reducing the number of exceedances. Besides, the parameters estimated also shows decreasing with the increasing of number of threshold Furthermore, the quantile plot obtained for each station shows a good fit for both Gumbel distribution and Pareto distribution except for Genting Sempah and Gunung Brinchang which shows a poor fit for both distributions. It can be conclude that data series for both stations are not suitable to be fitted in Gumbel and Pareto distribution.

5.2 Enhanced Executive Summary

There are two approaches can be used to extract rainfall for statistical analysis. The first method is by using annual maxima series which employs the largest rainfall in each year, regardless of whether the second largest flood in the same year has exceeded the annual maxima flood of other years. The series length is equal to the number of years of recording. The other method is by using partial duration series where all the peak above a certain level (x_o) are selected. It can be also argued that the partial duration series method is better than annual maxima as it provide more information about the rainfall and therefore it is more physical relevence. However, it is quite challenging to model the distribution of the annual number of exceedances of extreme rainfall events. Despite these advantages, the partial duration approach is still not widely used. This is probably due to some problems and the lack of an accepted methodology for selecting the critical level x_o. This is a very important problem as several important features of the modelling are highly sensitive to the value selected. The experience from this research suggests that by rising the threshold level (x_o), reduces the variability but increase the error of the model.