

Statistical Modelling of Recent Changes in Extreme Rainfall in Botswana

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ABSTRACT

The study aims at modelling of extreme rainfall events using 35 years of data (1980-2014) at 11 synoptic stations in Botswana in order that decision makers can make informed decisions to avoid or at least reduce rainfall related damage to life and property. For this, Extreme Value type 1 distribution (EV1) Model was used together with two parameter estimation procedures viz: the method of moments (MOM) and the method of probability weighted moments (PWM) and quantiles estimated for some chosen return periods such as: 10, 20, 35, 50, 100 and 200-years at each of the synoptic stations. Quantiles for 35year return period were compared with the observed maximum rainfall data at each station to ascertain the accuracy of the two chosen methods of parameter estimation. Hence the results showed that PWM parameter estimation was more accurate than the MOM parameter estimation and as such the PWM was used in the analysis of the results. Based on the results, there was increase in extreme rainfall between 1980 to 1996 and 1997 to 2014 for 10, 20, 50, 100, and 200 return periods. The average increase in extreme rainfall across the country ranges from 11% to 13% showing that the extreme rainfalls will have a greater impact in the long term than in the short term. Also looking into the regional analysis, the north, east, south, west and central regions have an average increase range of 15.5 - 17.6%, 14.1- 21.3%, 2.3% - 6.5%, 17.3 -18.4% and 7.2 - 8.9% respectively showing that there is high increase in maximum rainfall intensities in the northern, eastern and western region than on the southern and central region of Botswana.

Keywords: Extreme value theory, Gumbel (EV1) distribution, Extreme rainfall, Return period