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Comparison of Flood Prediction Models for River Lokoja, Nigeria

Johnson Fasinminrin, Ayorinde Olufayo

Federal University of Technology, Department of Agricultural Engineering, Nigeria

Abstract

Flood estimation is one of the major aspects of hydrologic designs and is vital in planning for flood regulation and protection. This research work was aimed at comparing prediction models for forecasting flood occurrences in River Lokoja, in Kogi State Nigeria. Relevant climatic data such as rainfalls, flood discharges and river stages of 24 years duration (1980 — 2003) were collected from Lower Niger River Basin Authority based in Lokoja. Variations in rainfall distribution were analysed and five plotting positions: California, Cunnanae, Grigortons, Hazens and Weibull were used to compute the return periods for the observed flood discharges. Flood magnitudes and the corresponding return periods were plotted by fitting the used plotting positions into the Log-Pearson Type III distribution. The derived prediction equations (models) from the plots of discharge against return periods were used to forecast flood magnitudes for 5, 10, 15, 20, 25, 50, 100, 200, and 500 years return periods. Results showed that the highest rainfall occurred between the months of August and September. Standard deviation, skew and variance of rainfall were 83.28, 0.287 and 6935.13 respectively. The rating curve for River Lokoja showed that an exponential relationship exists between the river stage and the associated discharge with reasonably high coefficient of correlation (0.09). Plot of river discharge against the return period showed that the maximum flood discharge (2.39×104 m^3s^{-1}) had a 25 year return period using the Weibull's distribution. Derived prediction equations (models) gave flood magnitudes of 2.60×104 m^3s^{-1}, 2.56×104 m^3s^{-1} for a return period of 50 years using the Weibull, Grigorton and California plotting positions respectively. These results are very useful in predicting magnitudes of flood occurrences and their effects on Lokoja metropolitan city.

Keywords: Discharge, flood, rainfall, rating curve, Return period

Contact Address: Ayorinde Olufayo, Federal University of Technology, Agricultural Engineering, P. M. B. 704, 341000 Akure, Nigeria, e-mail: ayo_olufayo@yahoo.com