Abstract

Floods are devastating natural disasters frequently occurring in many river basins such as Gucha-Migori River Basin, Kenya. However, non-structural countermeasures such as hydrologic modelling, flood proofing, and continuous forecasting have not been fully explored and implemented to reduce risk, damage, and vulnerabilities of flood events. The major challenge in flood forecasting is the selection of the relevant probability distribution. The main objective of the study was to forecast flood events in Gucha-Migori River Basin for integrated water resource management. Daily hydrological datasets between 1969 and 2015 were obtained from Water Resources Authority. After the ranking of independent flood events had been achieved, return periods and flood frequencies were computed. The relationship between flood magnitudes and their respective frequencies was through modelling using probability distribution functions (PDFs). The evaluated PDFs include Normal Distribution, Log-Normal Distribution, Gumbel Distribution, and Log-Person Type III Distribution. Coefficient of Determination (R^2), Goodness of Fit test, and Best-Fit Distribution Curve guided selection of the suitable distribution model. The suitable probability distribution model out of the tested four was then applied to predict P-percent annual exceedance probabilities corresponding to specific flood magnitudes. From the results, out of the 132 flood events that occurred in the period 1969 to 2015, only 42 were identified as independent flood events. Based on the frequency analysis, the highest and lowest, and the average and standard deviation of the recorded independent flood events were 423.90, 240.8, 284.80 m^3/s, and 45.54 respectively. It was revealed that the probability of a flood event of a magnitude equal to or exceeding the lowest (240.8 m^3/s) and the highest (423.90 m^3/s) occurring for a particular year were 0.98 and 0.02 respectively. Gumbel distribution curve was selected to be the best fit for the Gucha-Migori River Basin. According to the derived Gumbel's formula, the estimated magnitude for the return period 1.05, 1.11, 1.25, 2, 5, 10, 25, 50, 100, and 200 years were 221.38, 231.92, 245.77, 278.01, 321.39, 350.11, 386.39, 413.31, 440.03, and 466.65 m^3/s. This research provides useful information for enhanced determination of probability occurrence of flood events and thus proper water resources planning and management strategies in the Gucha-Migori river basin.