

## Abstract

**Objective:** To estimate the hydrological drought frequency for upper Tana River basin in Kenya using absolute Stream flow Drought Index (SDI) and modified Gumbel technique. The frequency of drought event of a defined severity for a defined return period is fundamental in planning, designing and operation of water storage systems in the basin. **Materials and Methods:** Based on a 41-year (1970-2010) stream flow data, hydrological droughts of 2, 5, 10, 20, 50, 100, 200, 500 and 1000-year return periods are evaluated based on the stream flows, Stream flow Drought Index (SDI) and a simplified mathematical model for hydrological drought estimation which is formulated using Gumbel's technique. **Results:** The absolute SDI increases while the magnitude of the stream flow decreases with return period. The minimum and maximum drought events were exhibited in gauge stations 4AC03 and 4CC03 with absolute SDI ranging from 0.667 to 1.265 and 1.213 to 2.42, and corresponding stream flows of 4.341 to 2.719 and 18.246 to 1.021m<sup>3</sup>/s for a 2 and 1000-year return period respectively. **Conclusion:** A simplified mathematical model for estimating hydrological drought event that uses mean flows of the annual minimum and average of the first three minimum stream flows as input variables is formulated for different return periods for the river basin.