FLOOD FORECASTING IN SELECTED WET ZONE BASINS USING PROBABILISTIC RAINFALL THRESHOLDS

G.P.Y.R. Ganegoda [1, *], R.L.H.L. Rajapakse [1]

[1] Department of Civil Engineering, University of Moratuwa, Moratuwa

Rainfall threshold studies have been carried out in Sri Lanka, yet only to forecast landslides and it has the benefits of not requiring either real-time modelling or real-time runoff data while having the ability to forecast flash floods with significant lead time when combined with the weather forecasts. Previous flood forecasting studies of the rainfall threshold method have been carried out using various hydrological models and techniques based on the background but all commonly followed basic hydrological modelling, generating rainfall patterns/events with subsequent model runs with generated hyetographs.

The selected study regions for the present study are the Baddegama and Ellagawa watersheds which are located in the wet zone of Sri Lanka. Rainfall Runoff Inundation Model (RRI) was selected as the hydrological model since it has been widely used in flood-related research and the input/output files of the RRI model are easily readable and interpretable. A Python script was compiled to generate random rainfall patterns and find the Thiessen averaged cumulative rainfall threshold which led to a two-year return interval flood from each pattern with RRI. A large number of random events with increments of 25 mm rainfall were run until they caused the threshold discharge which was considered as the two-year return period discharge based on past data. From the results, Ellagawa watershed is found to be safe from a two-year return period discharge (778 m^3s^{-1}) up to average cumulative 6-day rainfall of 225 mm and it can be guaranteed that 400 mm from a 6-day storm event will definitely cause flooding. Within the 225 mm and 400 mm range, there is a partial risk. For the Baddegama watershed, those lower and upper bound values were 250 mm and 550 mm for 5-day duration rainfall to cause a two- year return period discharge of 340 m^3s^{-1}. Rainfall threshold and their cumulative risk probability were plotted by sorting selected results from iterations.

Considering the Probability of the Detention (POD) of the previous flood events with derived threshold limits and aid of the past data, the lower limit of the rainfall threshold range for the Ellagawa watershed shows a POD of 100% which means all events would be predicted by the lower limit but it was 87% for Baddegama. Rainfall thresholds representing 50 % of the risk percentages show POD values of 53% and 47% for Ellagawa and Baddegama, respectively.

Keywords: Flood Forecasting, Rainfall Threshold Method, RRI, Ellagawa, Baddegama

*Correspondence: ysndrmt@gmail.com