Assessing the linkage between streamflow and rainfall in the headwater streams of the Kathmandu Valley

Abstract—Headwater streams are the capillaries of streams networks, that are generally present in the outskirts of developed areas and are near natural land uses in the Kathmandu Valley (Valley). Headwaters are generally clean and pure, thus Kathmandu Upatyaka Khanepani Limited (KUKL) has been tapping headwater streams and springs and is supplying fresh water to the entire Valley's population. The rapid population growth coupled with unplanned urban sprawl has resulted in the channelization, diversion, pollution, and at worst scenario complete destruction of these streams. Therefore, the baseline data regarding streamflow alteration is crucial for the better management/protection of the streams. The present study intends to understand the spatio-temporal variability of streamflow in the headwaters of the Valley and determine the influence of rainfall on streamflow. For this study, 14 different sites from the headwaters of the Valley were selected. United States Geological Survey mid-section method for discharge measurements was performed with a SonTek FlowTracker Acoustic Doppler Velocimeter for the period of two years (20182019) and all the data were recorded using an android application called Open Data Kit (ODK) Collect. The rainfall data from the 18 different rainfall stations of the Valley for the same period was obtained from the Department of Hydrology and Meteorology (DHM). In order to accomplish the objectives, the data collected were subjected to GIS-based analysis. The results showed that streamflow ranges from 0.00079 to 4.4487 m3/s and almost identical trends were observed in both years. The correlation between streamflow and rainfall was moderately positive i.e, 0.4044. Furthermore, in the northern and eastern parts of the Valley, both the rainfall and streamflow were comparatively higher. The results of this study might provide valuable insights regarding the present scenario of headwaters of the Valley.

Keywords—headwater streams, streamflow, and rainfall