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Floods and Land Use Land Cover Changes in the Kalu River Basin: A Call to Action

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Abstract

Floods are one of the most common natural disasters worldwide. Apart from rainfall, Land Use Land Cover (LULC) changes too are a main contributory factor for floods. This study attempted to understand the link between floods and LULC changes in Kalu river basin, which is the second largest river basin and an area that experiences recurrent floods in Sri Lanka. We studied peak water levels, number of flood events, changes in land use types and impacts in rapidly urbanizing two districts, Rathnapura (upper basin) and Kalutara (lower basin) during 2001-2020. The satellite images (LANDSAT) were obtained for 2001, 2009, 2015 and 2020 and land use classification was done using ArcGIS and Remote Sensing Tools. Main land use types and their transformations were investigated and ground-truthing was carried out. Accordingly, the main types of land uses identified were Natural Vegetation and forests (NV), Settlements (ST- housing and industrial lands), Cultivated Lands (CL), Water Bodies (WB) and Bare Lands (BL). The results indicated that the most drastic change was found in the natural areas (NV) and they have diminished while the lands with anthropogenic impacts (ST, CL and BL) have increased across years. The NV had occupied the highest land area in 2001 (42.4%) and has reduced by 14.2% by 2020. The ST and CL have increased by 8.6 % and 5.2% respectively. The monthly rainfall of Rathnapura and Kalutara (Source: Department of Meteorology, Sri Lanka) has increased with time, which is a main reason for the increasing peak water levels of these areas (Source: Department of Irrigation, Sri Lanka). However, a significant correlation also exists between the change of the settlement area with the peak river water levels in the lower basin ($p=0.03$, $R^2=99\%$; regression analysis). Rathnapura has experienced 3 major floods (floods above the high water alert level) from 2001-2020, while 16 major floods have occurred in Kalutara. During the major flood in 2017, the number of child deaths in Rathnapura was 14 while in Kalutara it was 24. Accordingly, the LULC changes of the whole basin along with rainfall seem to influence on the severity of floods in Kalutara more, as it is located in the lowest elevation level. When natural lands are transformed to anthropogenic-impacted areas with disturbances to the water cycle, increased impervious surfaces, reduced water storage capacities and loss of natural drainage, the flood risk tends to increase. Proactive approaches including proper land use planning and rainwater storage are urgently needed as the climate change too would trigger more floods. Thus, the flood mitigatory actions, especially, in the lower river basin should be a priority to ensure resilience and sustainability.

***Keywords**:* Kalu river basin, Land Use Land Cover (LULC) changes, Floods