Assessing Role of Climate and Land Use/land Cover on Flood Risk Using a Fusion of Ground Surveys and Remotely Sensed Imagery – the Case of Pinga Oya in Sri Lanka

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SUMMARY

Pinga Oya (PO) is a tributary reaching the mid-stream of the Mahaweli river, which is the largest river in Sri Lanka. Parts of PO has recorded multiple flooding incidents in past decades during high rainfall events. The most recent flood was recorded on the 25th of December 2022 following a storm event. The inundation was distributed mainly along Kandy - Jaffna (A9) trunk road from Akurana to Katugastota disrupting a critical artery for 4 hours. Major impact was observed in Akurana town and its periphery. In some area's inundation was raised up to 9 feet above the road level.

Over the last decades, rising population density, constructions on the river margins, filling up of overflow areas and land use change in the Pinga Oya catchment (83km2) were identified. Of these factors, land cover change has a significant impact on increasing the flood frequency in rapidly urbanizing areas. Land cover changes from natural vegetation into impermeable surfaces caused to alter the natural drainage flow and reduce infiltration capacity. Thus, it increases surface runoff and that led to flooding. Floods are associated with several socio-economic and environmental issues such as rapid spread of waterborne diseases, disruption of transportation and communication systems, property damages and loss of lives.

Time series analysis was performed using Landsat 8 OLI/ TIRS images using Support Vector Machine (SVM) classification to identify the land cover changes from 2015 to 2022.Rainfall analysis was done during the period of 1978-2022 with the precipitation data obtained from the meteorological department, Sri Lanka. Flooded area was identified by a field data collection. Built up area shows a significant increment by 25% while the vegetation surface has decreased. The number of bridges across the Pinga Oya has increased up to 43 in 2019, which was 19 in 2003 in Akurana GN division. The final aim of this study is to identify the impacts of land cover changes on

flash floods in the Akurana area. Surveyors and spatial data analysts can provide quantification that is needed to help differentiate the respective roles of urbanization and climate change for supporting flood risk mitigation. These issues can be addressed integrating land surveying, remote sensing, GIS, climatic and hydrological analyses to mitigate future hazards amidst the climate crisis.