



## Anthropogenic drivers and impacts of urban flooding- A case study in Lower Kelani River Basin, Colombo Sri Lanka

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### ABSTRACT

Flooding is the most frequent natural disaster among the top ranking disasters causing destructive effects on people and property of Sri Lanka. Colombo, the commercial capital of Sri Lanka and surrounding suburban areas were experiencing a significant flood events during the last couple of decades. The intensified anthropogenic activities have accelerated severity and frequency of recent floods. Therefore this study was attempted to investigate the pressure generated by the population on the land by human activities causing frequent and severe flooding in Kolonnawa DS Division, Sri Lanka. A questionnaire survey and focus group discussions were carried out to collect primary data whilst collecting secondary data such as long term annual flood peak records, flood inundation data from different government agencies. The gridded population data was obtained from Oak Ridge National Laboratory (LandSacn) from 2000 to 2018 to examine the population pressure generated from the commercial capital to the study area. GIS and Remote Sensing based spatial analysis such as Change Detection, Normalized Difference Vegetation Index (NDVI), Normalized Difference Built-up Index (NDBI), Zonal Statistics and Concentric Circles were used interactively in data analysis. The results revealed that there is an influence of anthropogenic activities of area on recent flood events, severity and damages. Results of NDVI and NDBI analysis depicted a significant decline in green cover. Marshy lands have decreased by 42% from 2005 to 2017. The study further indicated a conversion of paddy and wetlands in to home gardens from 1972 to 2018 due to suburbanization. The decreasing trend of marshy lands, home gardens and paddy lands occurred due to the population pressure generated from the commercial city. Hence, the results of the study would be useful for policy makers and urban planners in developing future flood mitigation plans in study area.

### 1. Introduction

The geographical settings, geomorphic and climatological conditions of Sri Lanka make the country a natural disaster prone land mass especially for floods and landslides [1]. Floods have been identified as the most frequent natural disaster that affects not only for the economy but also for the social status of the affected areas as well as for whole country. Sri Lanka, being a tropical country receives high rainfall in four main rainy seasons; first inter-monsoon (March and April), southwest monsoon (May to September) second inter-monsoon (October and November) and northeast monsoon (December to February), which are based on the behavior of monsoon and convectional rain [2]. Almost 75% of the annual average rainfall is taken place during the two monsoon seasons; the Southwest and the Northeast, in which 60% of annual average rainfall is occurred from few intense storms [3]. Sri Lanka experienced several flash flood events which caused damages to

human lives and properties in recent past. The depressions over the Bay of Bengal also result in heavy rains in Sri Lanka causing floods in the country especially during the inter monsoon periods. For instance, the extreme flood event which took place in May 2016 due to the cyclone of 'Roanu' led to the loss of 200 lives, direct effected 340,150 people resulting in an economic damage of two billion USD to the country [4,5]. The past records evidence for about 1438 deaths approximately from 1500 flood events in the past five decades in Sri Lanka [6]. High population densities and high economic concentrations in flood-prone areas have further increased the vulnerability of Sri Lanka for adverse flood events.

According to the literature, the first flood event was recorded in 1837 and since then the study area has experienced many flood events causing severe damages to human lives and properties [7]: [8]: [9]. Flood history of Sri Lanka provide more evidence to prove that the frequency of flood occurrence have increased after 1925 and it has dramatically

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