Geo-Informatics application for flood risk detection in *Manmunai* North, Batticaloa District, Sri Lanka

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1. INTRODUCTION

Floods and droughts are considered one of the most important disasters in the world. (Tsakiris, Bellos and Ziogas, 2010). Floods and droughts are considered one of the most important disasters in the world. Furthermore, flooding is one of the most severe natural disaster hazards in the world. It has socio-economic impact (Patel and Srivastava, 2013). Flood risk has increased in the constructed areas as a result of increasing population and development activities. Solutions should therefore be put forward for those affected by floods in urban areas.(Chen *et al.*, 2021). Globally, storms and floods cause the most devastating disasters and cause the greatest number of deaths and property losses.(Patel and Srivastava, 2013).

In view of this, remote sensing methods are generally very helpful for flood risk mapping because remote sensing systems can carry the earth's surface in various spatial resolutions and contribute less costly.(Schumann *et al.*, 2018). Particularly high-resolution SAR satellites of the last decade are TerraSAR-X, DLR, Radarsat-2, CSA and COSMO-SkyMed, ASI, Sentinel-1, ESA. SAR is a system that can penetrate the cloud and receive information during floods. The good thing is that it is not affected by the weather. (Schumann, Moller, 2015). This will help in greater reliability in flood mapping and fast in flood forecasting and flood model development, and will complement the sample calibration and verification area.(Bates, *et al*, 1997).

Research on flood risk mapping reveals that three factors are required to calculate potential damage or flood risk, height of water level, water velocity, and flood stay time in the area.(Todini, 1999). For a country like Sri Lanka it has become necessary to set up proper mitigation procedures because the country faces severe urban flood risks. However, this evacuation plan would be useful for any other area that could be affected by urban flash floods. Urban areas are more prone to flooding due to human activity than rural areas.(Edirisinghe, Pussella and Vidarshana, 2021).

Flood risk can be viewed in terms of both vulnerability and risk. Flood risk mapping helps in proper planning of flood prone areas. In this way, quick action and planning can be done as soon as it is clearly understood. This helps administrators and planners reduce the risk of flooding. Helps to regulate flood risk areas and activate flood risk zone. These can reduce life and property damage from short-term and long-term flooding. Without technically effective flood risk and risk mapping it would not be possible. Flood risk mapping is an important component of flood mitigation measures and land use planning (Sameem *et al.*, 2017). Separate plans should be developed for each city in developing countries such as Sri Lanka to reduce the risk of floods using such technologies.

2. METHODS

2.1 Study Area

The study area is located in the *Manmunai* North Municipal Council area in the *Batticaloa* District in the middle of the Eastern Province of Sri Lanka. The area is surrounded on three sides by water. To the east is the Bay of Bengal and to the south and west is the *Gall Oya* Ganges. Thus the area has been identified as an area prone to continuous flood risk.

2.2 Method

Geographical data have been used to determine flood risk here. Elevation data from the *Manmunai* area Shuttle Radar Topography Mission (SRTM) 1 Arc-Second Global were obtained from the Internet for this study. Equal height lines were drawn from the obtained data. The slope of the area was then determined. In addition, the Digital Elevation Model of the region was developed. Water bodies were identified from them. In addition, the natural way of drainage was developed in the area. In addition, land use data were analyzed along with rainfall data for the area and the results were obtained through the Weighted Overlay analysis method.

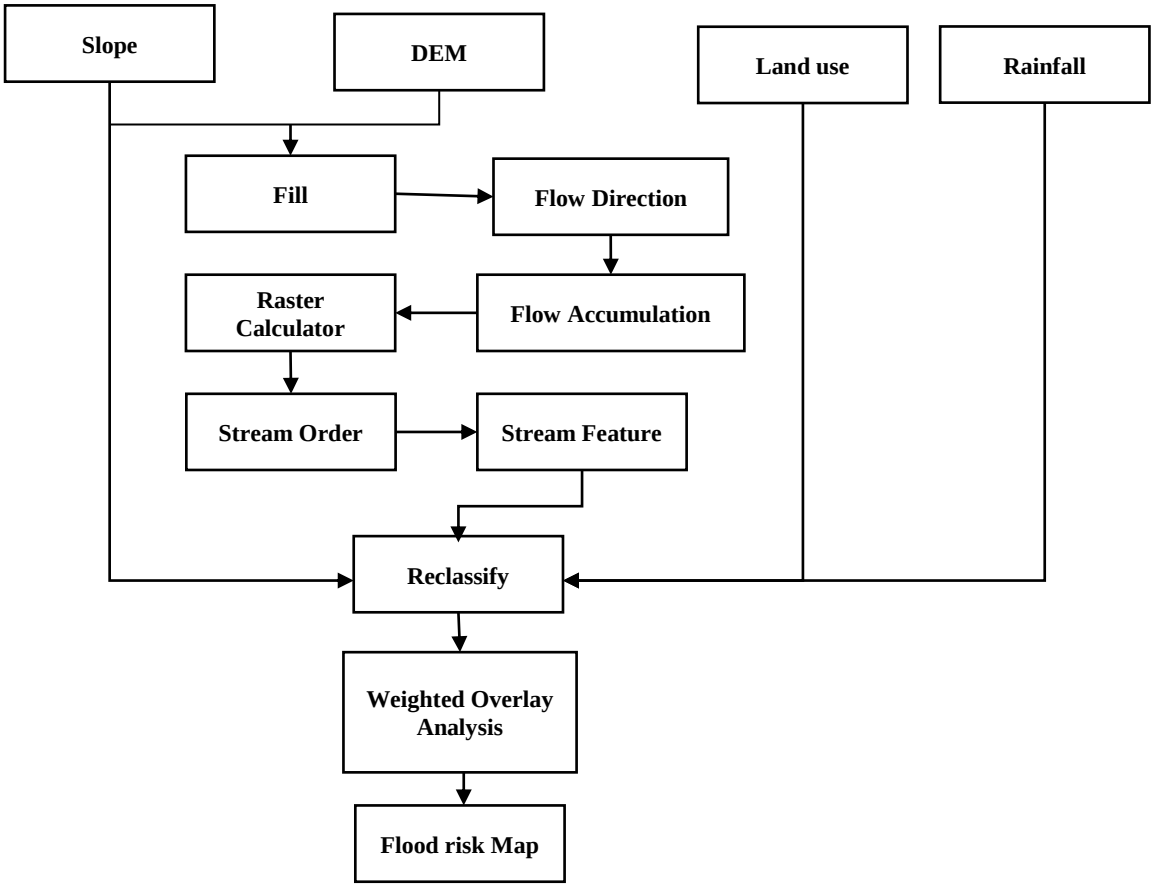


Figure 1- Method (Source: - Created by Author)

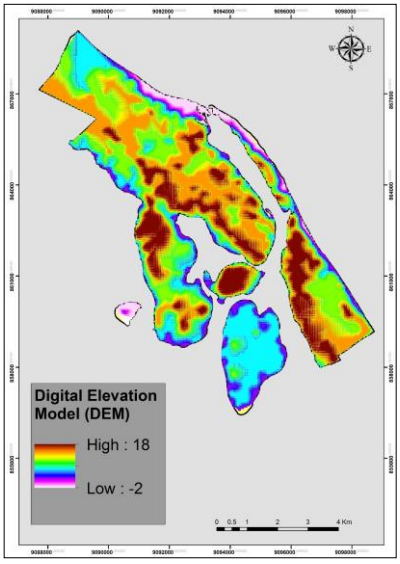
3. RESULTS AND DISCUSSION

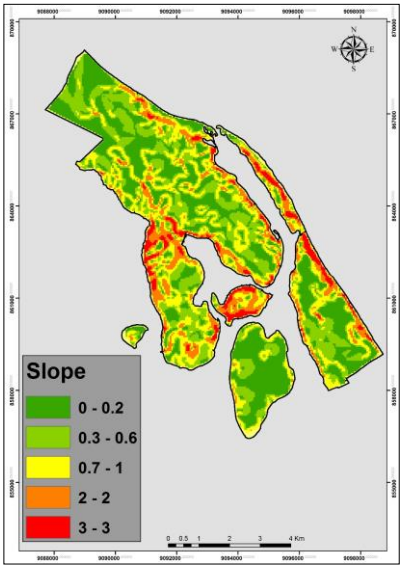
The ground elevation of the area ranges from -2 meters to 18 meters. The area adjacent to the watershed is slightly elevated. The ground elevation of the area ranges from -2 meters to 18 meters. The area adjacent to the watershed is slightly elevated. The slope of the study area is found to be 0 to 3 m. The slope is less in the interior of the area. Buildup Area covers an area

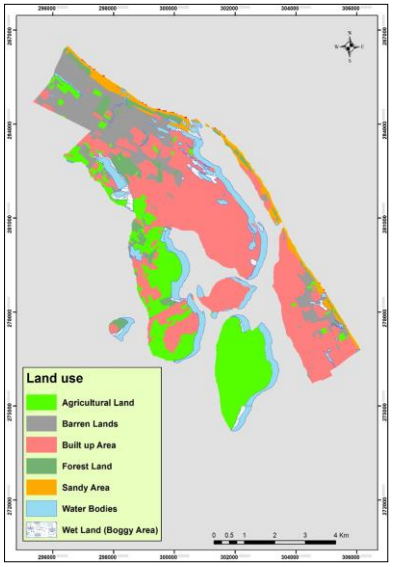
of 41.4% of the area in terms of land use. 21.4 per cent of the area is agricultural land. Other land use features can be considered as follows.

Table 1: Land use cover

No.	*Land use*	*Extant (ha)*	*%*
1	Built up Area	1796.8	41.4
2	Agricultural Land	926.9	21.4
3	Forest Land	190.6	4.4
4	Wet Land (Boggy Area)	88.6	2.0
5	Water Bodies	466.5	10.8
6	Sandy Area	171.2	3.9
7	Barren Lands	695.0	16.0
Total		**4335.6**	**100**



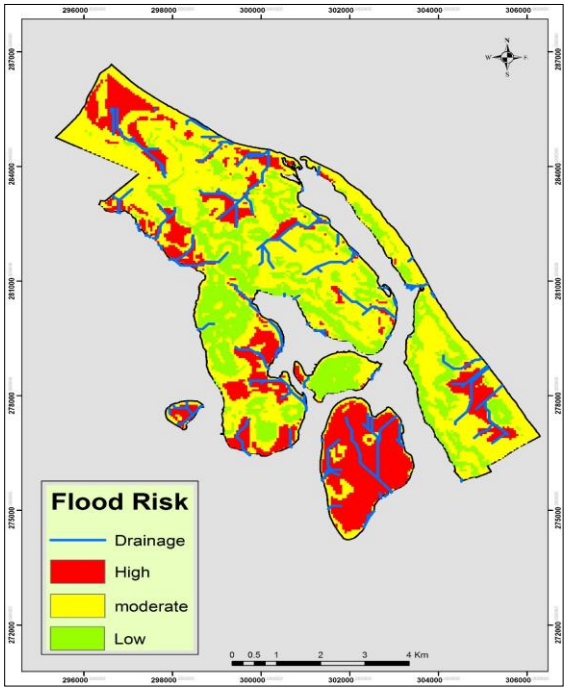




Figrue 2: DEM **Figrue 3:** Slope **Figrue 4:** Land use

(Source :- Computed by Author)

As noted in this survey, the analysis is based on four types of data, with an area of 1009 ha as high risk area, 1914 ha as moderate risk area and 1114 ha as low risk area. Percentage wise, high, moderate and low risk areas are 25, 47, and 28 respectively.



Figrue 5: Flood Risk Area in Manmunai North
(Source :- Computed by Author)

4. CONCLUSION

The area faces an annual 25 percent area flood risk and a 75 percent area low risk area identified. In order to protect 25 per cent of the area from the danger of floods, continuous drainage of river water flowing around the city should be done and an alternative route should be set up to open it when the water level rises. In addition, protection measures should be maintained to reduce soil erosion and flood risk in riverine areas. Geographic information technology plans should be formulated and implemented in the area to reduce the risk of flooding. As a natural city, the risk of flooding can be minimized when drainage systems with proper maintenance are set up in the area with the help of local authorities.

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