

IITB-ISRO-AICTE MAPATHON 2020

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Problem Statement: Flood Maps

Objective:

1. To identified factors responsible for flood hazard & vulnerability in Pune district.
2. To apply techniques for reclassification of the datasets & mapping them based on weights of each factor
3. To explore open source QGIS software and its plugging.

Outcome:

1. To prepare flood Hazard map, Vulnerability map & Risk Map of Pune district, Maharashtra, India.
2. To predict the risk area in case of flood in Pune
3. To help administrator/government to plan for disaster management.

Methodology:

Study area: Pune district in the state of Maharashtra, India.

Rainfall in study area selected i. e. Pune district is unpredictable, in tune with the Indian monsoon.

Data Source: Data is collected ISRO Bhuvan.

Sr. No	Data	Source	Original data	Original data spatial resolution	Time period	Final Data	Final data spatial resolution
01	Study area boundaries	https://static.fossee.in/mapathon/Mapathon2020_Data/	Polygon	---	NA	Vector	--
02	Digital Elevation Model (DEM)	CartoDEM - ISRO (https://bhuvan.nrsc.gov.in/bhuvan_links.php)	TIFF	0.000277777778 m	2005-2014	Raster	30 m
03	Soil (Loamy and Clay)	NISC https://bhuvan-app1.nrsc.gov.in/2dresources/bhuvanstore.php	ASCII, Band Sequential (BSQ)	5Km * 5Km	01/02/2016	Raster	30 m
04	Population	https://www.worldpop.org/	TIFF	0.00083*0.00083 m	2020	Raster	30 m
05	LULC	https://bhuvan-app1.nrsc.gov.in/2dresources/bhuvanstore.php	TIFF	24m	2009-2016	Raster	30 m

Technique/Method/Process:

Remote sensing (RS) based satellite data processing of RESOURCESAT LISS-3 datasets were used to derive Land Use Land Cover (LULC) map. Which includes downloading of required toposheets from BHUVAN, SCP Plug-in installation in QGIS, Band set process (Band composition), Band Processing-PCA method to take training sample and do classification, Projection, Resampling and Reclassification.

Cartosat Digital Elevation Model (CartoDEM) which is a National DEM developed by the Indian Space Research Organization (ISRO) was used to model the slope of study area, and also river stream by using SAGA tool.

Two types of soils are identified in study area, which are Clay and Loamy. Clay soil is comprised of very fine mineral particles and not much organic material. The resulting soil is quite sticky since there is not much space between the mineral particles, and it does not drain well at all. Loam is soil composed mostly of sand, silt, and a smaller amount of clay. Soil data was downloaded from Bhuvan and different processes are performed to get a soil map such as clip, Resampling, projection etc

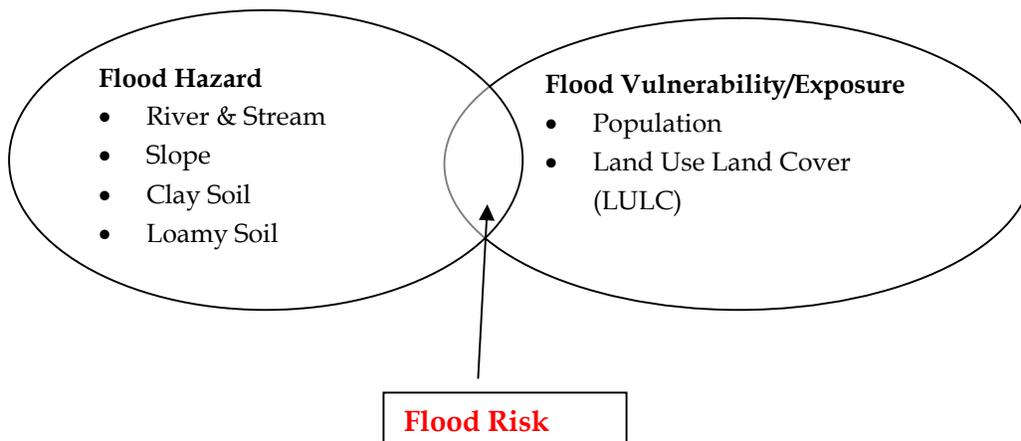
Population density data was downloaded and used to derive the density map of study area by different processes to get a density map such as clip, Resampling, projection etc

Flood Hazard map is created from four layers and they are Slope, River stream Euclidian, Clay and Loamy Soil. Proximity distance Raster calculator tool was used to apply different weightage according to literature survey of each layer.

Flood Vulnerable map was created from Land Use LC and Population density layer by applying different weightage according to literature survey of each layer.

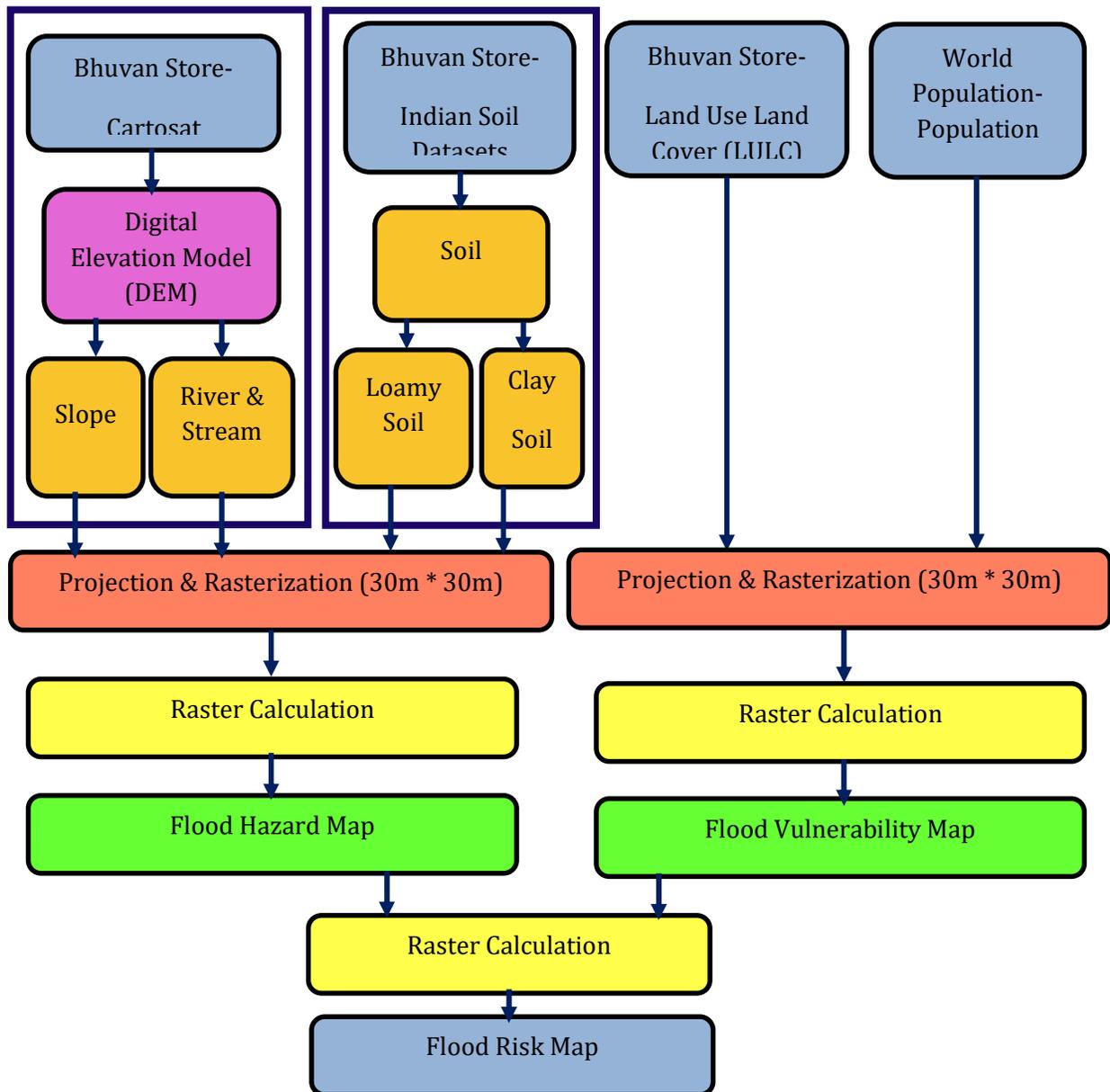
Finally Flood Risk map was created by doing raster calculation on Flood Hazard Map and Flood vulnerable map.

Conceptual Framework



Steps to create flood risk map:

- 1) Identify map goal
- 2) Identify and create data layer
- 3) Process data layer
- 4) Integration



A. Preparation of Hazard Map:

Factors Considered for creating hazard map were:

1. River & Stream
2. Slope
3. Clay Soil
4. Loamy Soil

Raster Calculation:

- Use raster calculator to get the Hazard Map:
 $\text{River Stream} * 40 + \text{Slope} * 30 + \text{Loamy Soil} * 10 + \text{Clay Soil} * 20$
- This will give us raster layer of hazard map which needs to be reclassified into five classes as **Very High Hazard, High Hazard, Medium hazard, Low Hazard, Very Low Hazard**

B. Preparation of Vulnerability Map:

Factors Considered for creating Vulnerability map were:

1. Population
2. Land Use Land Cover

Raster calculator:

- Use raster calculator to get the Vulnerability Map
Population * 50 + Land Use Land Cover * 50
- This gives us raster layer which is reclassified into four classes, **High vulnerable, Medium vulnerable, Low vulnerable and Very Low vulnerable**

C. Flood Risk Map

To produce to Flood risk map we overlay the Hazard Map and Vulnerability map using raster calculator giving a weightage of 40 and 60 to both the raster layers respectively.

The output raster is reclassified into four classes as **High Risk, Moderate Risk, Low Risk and Very Low Risk** for Flood.