Project
Flood Risk Modelling

Code/Model

Qgis project for the model is put in the link Final_project with deliverables attached separately in zip file.

Inference

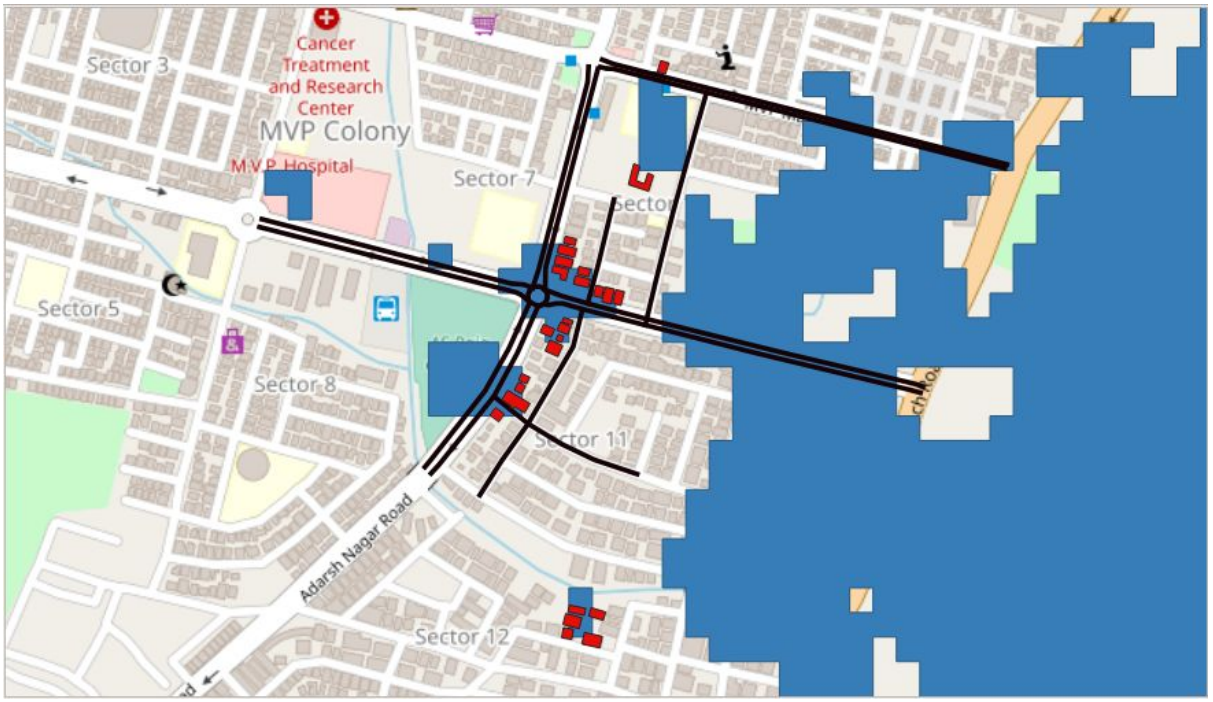
1. Vulnerability Model: By finding the elevations of the land with buildings and vegetation, we analysed what areas are vulnerable to floods.
2. Also by analysing the extent of damage that can be caused with respect to depth (i.e. Demand-Depth Curves), the vulnerability of the particular area\zone is explained.
3. The Damage is calculated in term of the area getting affected.
4. Exposure Model: We found the buildings and landcover which are exposed to Floods.
5. Hazard Model: Flood maps, Depth elevation model the level of the water table is estimated, from which hazard is analysed.
6. The above models are used for the estimation of consequences of floods which occur.
7. By taking the probability of occurrence of flood in Visakhapatnam, we have analysed the risk of a flood.
8. The probability of flooding is taken from the historical analysis of the occurrence of coastal floods.

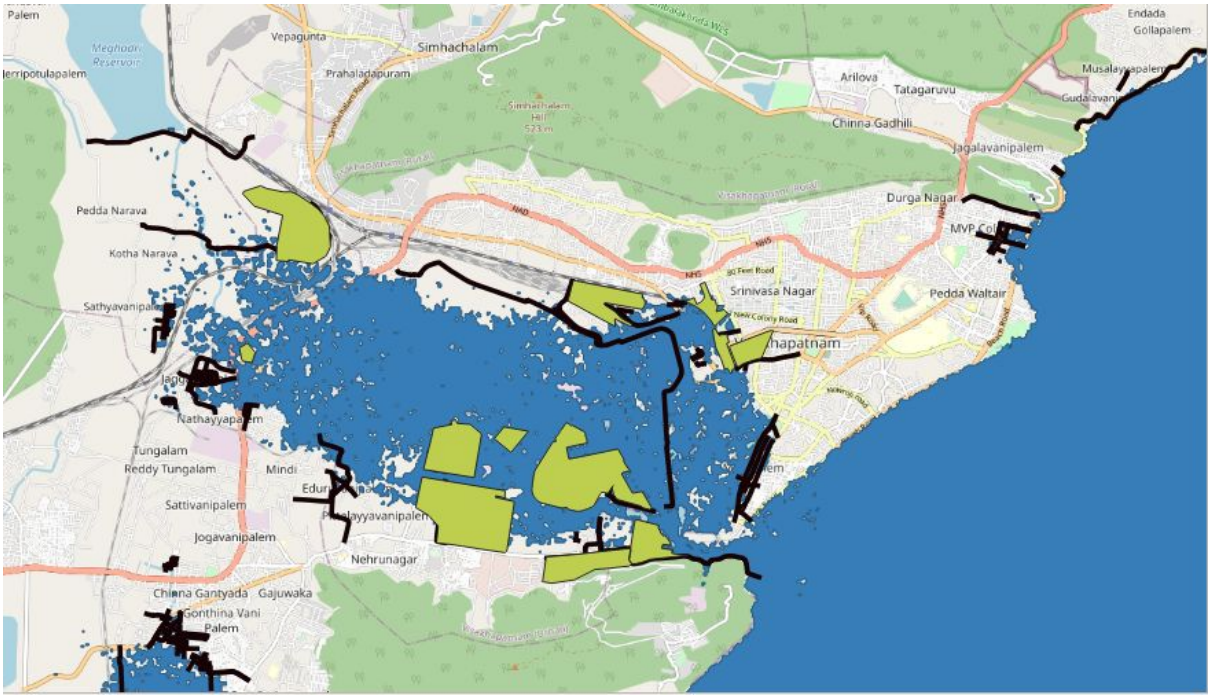
All the above, Are done in consideration of flooding from a coastal area. We know that Visakhapatnam, being coastal region is more prone to coastal floods.

Validation

The given model, Predicted the exposure/receptors with good accuracy:

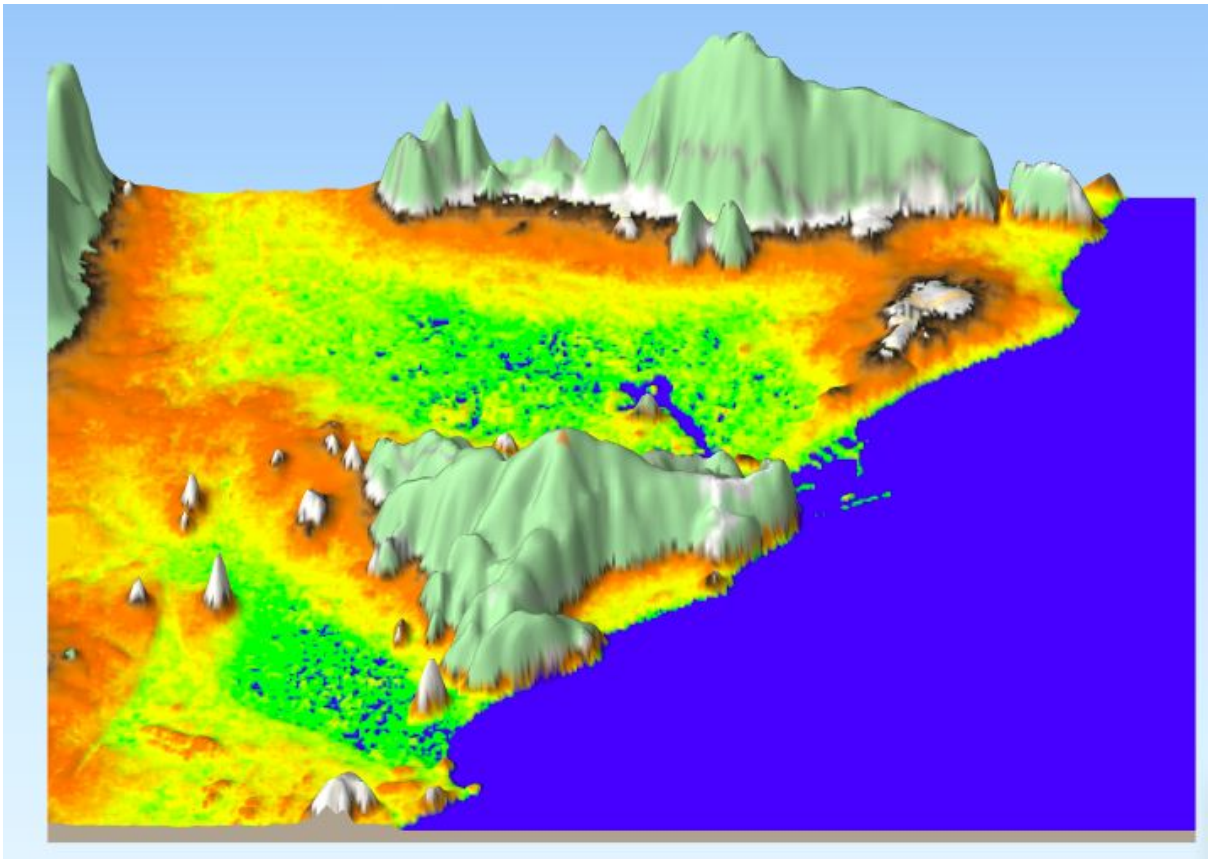
Having found these areas by analysis both floods and the areas in/around coastal region.





All the buildings/landcover in low-lying areas of the coastal region are found as receptors.

Hazard model also gave the areas appropriate areas, which are prone to floods:



This 3D model gives the level of each area. The zoning according to the level gives us the areas, which are in danger of getting flooded.

Levels: colours with there elevations. (Green: low-lying areas, Black: elevated areas)

Value	Color	Label
102.6		102.6
223.2		223.2
343.8		343.8
464.4		464.4
585		585

Additional work asked:

Probability Model:

We went wrong in finding the probabilities for the area due to Coastal flooding (took the probabilities according to river flooding)

We were asked to correct the probability module according to coastal flooding in our model.

Idea proposed:
Probability of coastal flooding takes into consideration of storms, tides, and sea-level rise. A statistical approach based on patterns of historical extreme water levels superimposed with projected sea-level rise should be done. We need complete available hourly local historical records of sea surface heights to estimate water height “exceedance probabilities”. This can provide us with Annual Exceedance Probability. With these probability distributions of flooding, we can have cost-efficient coastal planning.

We found data for coastal lines of Finland and other places in some research papers. The information about sea-level variations is not available online for coastal lines of Visakhapatnam. Therefore, we were not able to recreate the probability module.

However, we can get the probability of coastal flooding from past years from historical analysis and put in the model.

References

Flood Risk Assessment in QGIS - CUOSG

Climate Resilient infRastRuCtuRe seRviCes

(PDF) Estimating Floodwater Depths from Flood Inundation Maps and Topography

(PDF) An Overview of Flood Vulnerability Mapping: Strategy for Disaster Risk Reduction in the Niger Delta Region, Nigeria

FLOOD ANALYSIS OF RESERVOIRS IN VISAKHAPATNAM DISTRICT BY USING PROBABILITY METHODS

APPROACHES FOR OBTAINING DESIGN FLOOD PEAK DISCHARGES IN SARADA RIVER