Practical Session

GIS for Climate Vulnerability Assessment

Taslim Alade
Institute for Housing and Urban Development Studies (IHS)
Erasmus University Rotterdam

Practical Session Questions

As a project manager for Climate Change department of your city, flood will most likely occur due to continuous torrential rainfall, leading to potential dam breach (The spontaneous release of water from a barrier built to hold back the flow of water), causing rapid flooding, loss of life, damage and destruction of property and forcing evacuation of people and vital resources.

1. List the types of data you would need to generate a flood risk map for the area. Also briefly state what the specific data will be used for.

2. Generate a flood risk map from the Cape city satellite imagery, showing the zones with flood risks – as low, medium and high levels.

For the purpose of rapid response and other vital decision making by stakeholders for action implementation to the affected victims and infrastructure.

3. Assuming the breached dam, flooded different parts of the area, identify the affected roads and their levels of risk

4a. Estimate the number of people to be evacuated by the government from the slum and formal settlement areas separately. Do these different areas have approximate number of people living in each house? Why?

4b. Is the formal settlement areas exposed to the same level of risk as the slum area? Why if yes or no?

4c. Is the informal settlements (slum area) liable to be more or less vulnerable to the flood than the formal settlement area? Assuming the elevation terrain of the slum area is higher than the formal settlement area. Why if more or less?

5. Identify potential open spaces enough to serve as Internally Displaced Persons (IDP) settlements which is away from the flood? State reasons why you chose these open spaces. Are the chosen open spaces enough to accommodate the potential flood victims?

6. Calculate the total length of the road to be mainly affected by the flood in meters.

Take home assignment - Optional

7. Make an approximate budget proposal to the financial department based on the estimation made so far based on the number of houses to be affected with potential number of people living inside. Example to purchase things like tent, blanket, food, water, clothing, mobile toilets, payment of workers/volunteers, temporary clinics, medicine, etc.
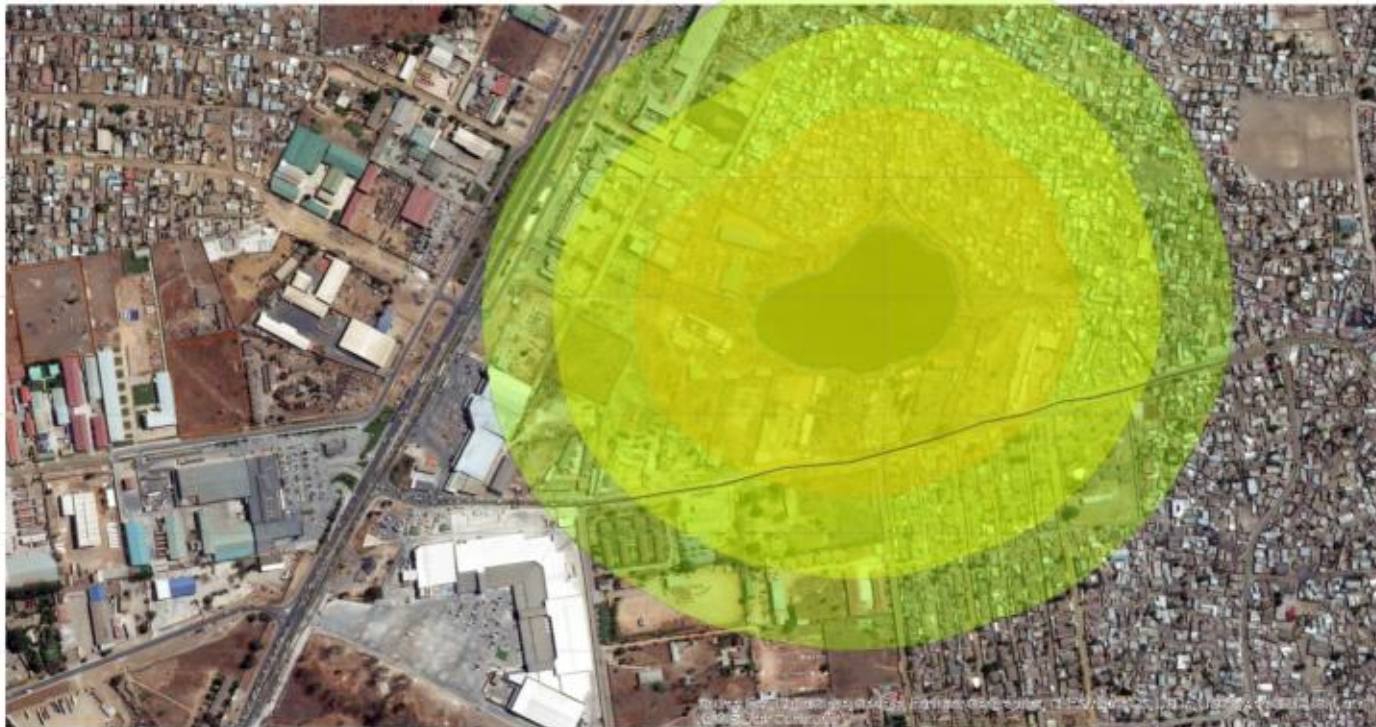
STEPS USING arcGIS

1. Load arcMap

2. Add the Cape image using the add data. Use the projected coordinate systems of world – WGS 1984 world mercator for all data layers.

3. To define the projection of the raster image use arctoolbox – data management tools – projections and transformations – define projection

4. Using the arc catalog, create a shape file for roads using polyline, shape file for buildings, open spaces and cape dam using polygons.

5. Click on editor and start editing. Click on create features to digitize all needed shape files of lines and polygons mentioned in 4.

6. Right click on the data layer on the table of contents and open the attribute table. Click on table and add fields. Stop editing to enable the add field. And start it again to add attribute data to the created fields.

- Use the buffer tool from the arc-toolbox to generate a 1m (high risk), 1.7m (medium risk) and 2.2m (low risk) buffer respectively around the dam polygon layer. The closer the area to the dam, the more liable it is to be impacted by the flood.

- Using the effects layer, adjust the transparency levels of all the 3 buffer zones to see through all.

- Click on view and put it in layout view and then click on insert, to add all map elements needed, such as north arrow, scale, title, e.t.c. Also click on view to add your grids.

- Label data layers as required by right clicking on it and clicking on properties to choose desired parameters for labeling.

- Your map is ready!!!
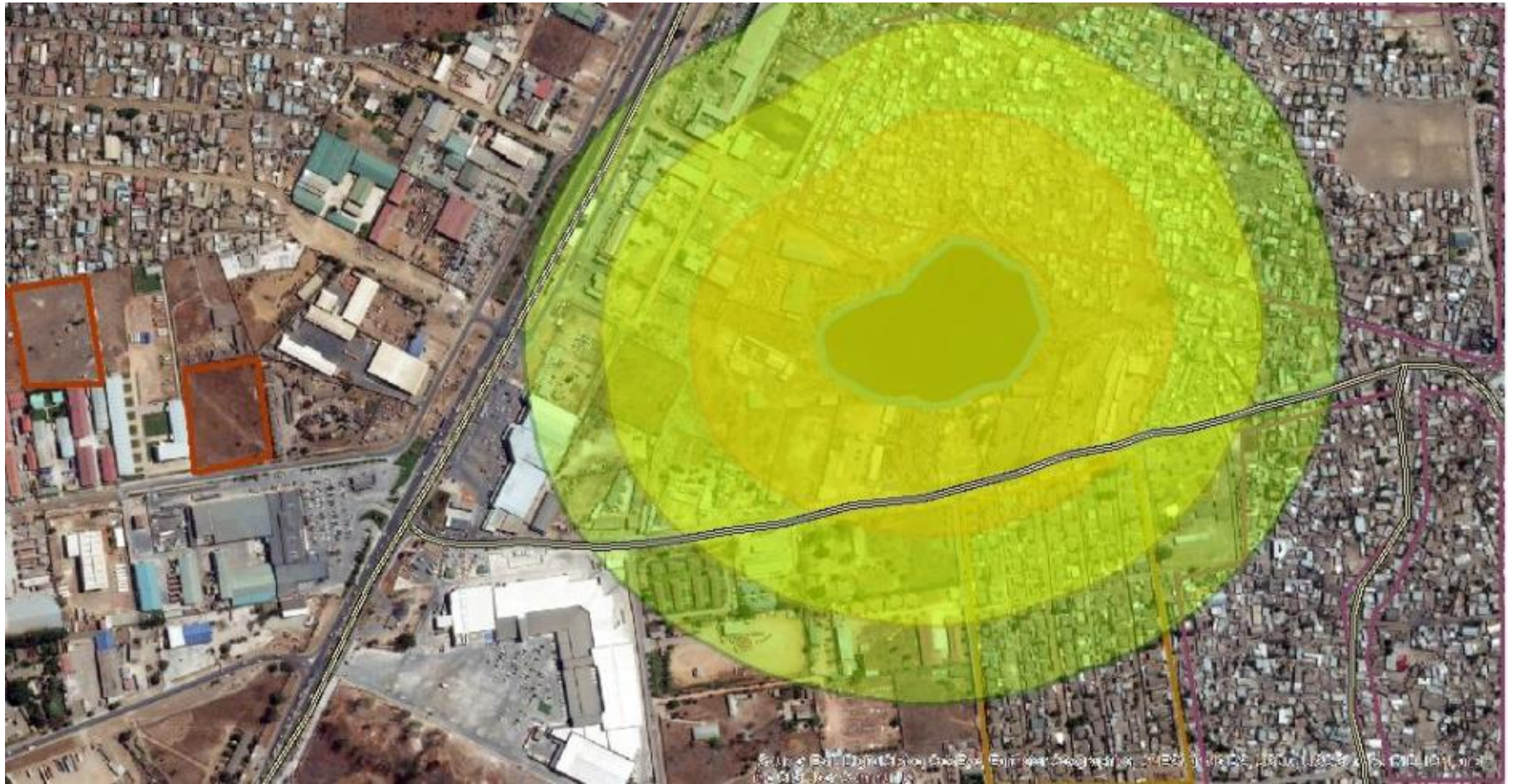
Cape District Flood Risk Map

Legend

Low flood risk	Medium flood risk	Cape Dam
High flood risk	**Cape Image.tif**	
Open Spaces	**RGB**	
Formal Settlement	Red	
Informal Settlement	Green	
Roads	Blue	

0   1.25   2.5   5 Meters

1 inch = 0.25 meters

Follow-up questions using the digital elevation model data

❖ In the organized part of the settlements (formal settlements) with adequate level of adherence to building code of conducts, assuming the slum building are now located at areas of high elevation and the adequately built buildings are located on areas with low elevation and some parts liable to flooding.

❖ What is the probability that the slum settlements will be/not be flooded and why?

❖ What is the probability that the formal settlements will be/not be flooded and why?

❖ Overlaying the image and Digital Elevation Model (DEM) will further provide a Spatial Decision Support System (SDSS) to make accurate decisions based on the flood extent map, DEM, settlement types and information on building standards from the building authorities.
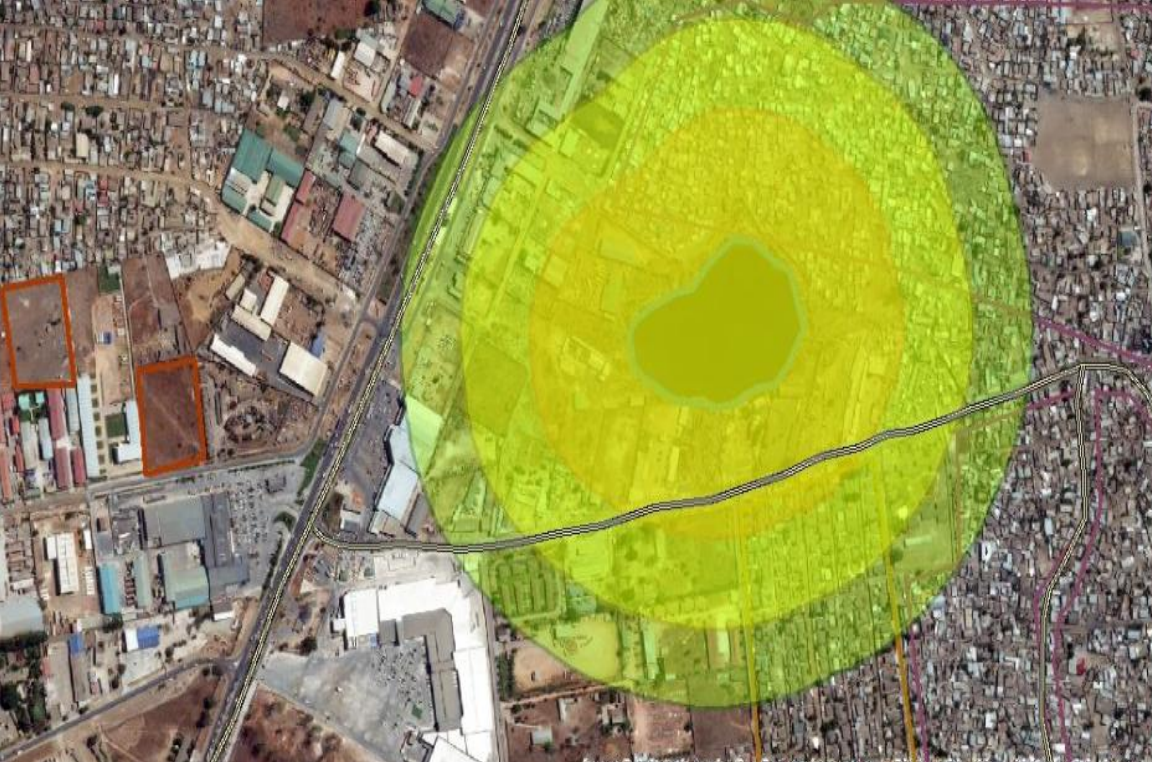
Using this flood risk map generated and DEM data how do you implement the following:

• **Mitigation**

•**Preparation**

•**Response**

•**Recovery**
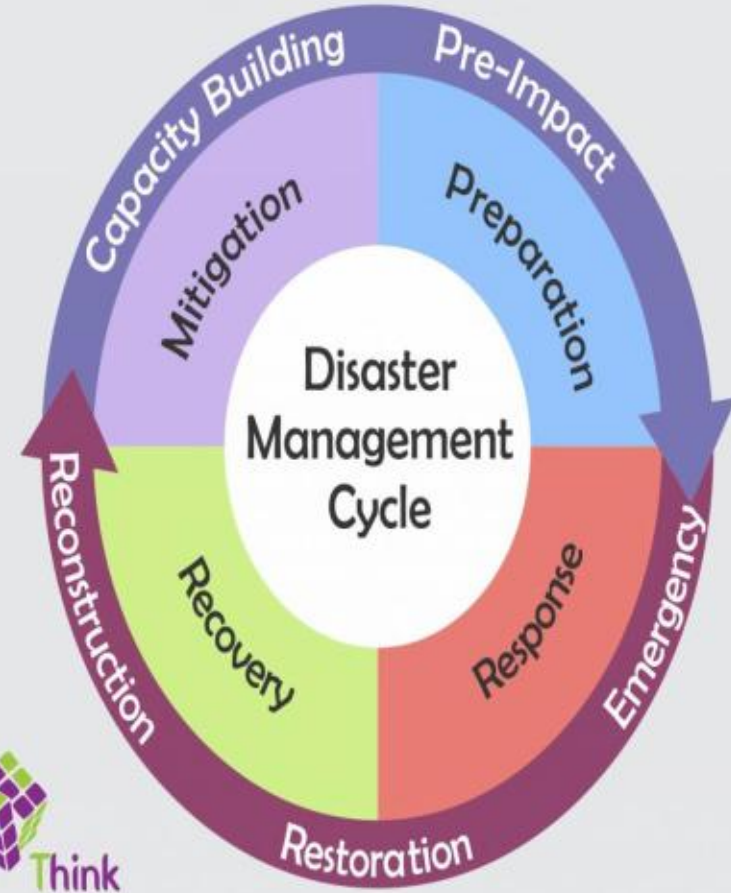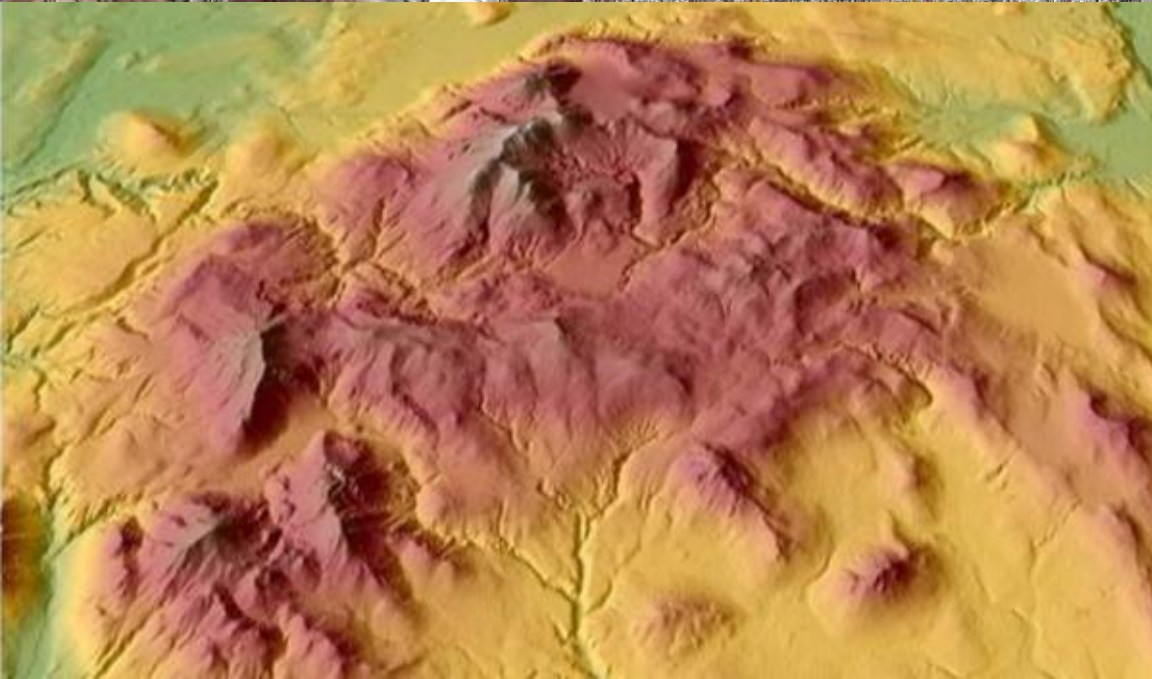
Conclusion

❖ **Some organizations usually complain of inadequate accurate and outdated dated data, but these days the social media can lend a helping hand through the following:**

➢ **Crowd sourcing and social media for both spatial and non-spatial data (socio-economic), such as:**

✓ **geo-tagged tweets, geo-tagged face book pictures of disaster events, geo-tagged pictures from our phones, using the GPS on our phones, and other social media platforms.**

❖ **Being a complex spatial decision problem, the quality of the alternatives that are generated is to a large extent dependent on the quality and coverage extent of the spatial data that is used in the process.**