

ASSIGNMENT 11

Step 1: Download DEM & LULC Data from Google Earth Engine (GEE)

1. Use the coordinates: **Latitude, Longitude**.
2. Export:
 - **DEM**
 - **LULC**
3. Export data as .tif to Google Drive and downloaded it.

Step 2: Delineate Pandu River Watershed in QGIS

1. Load world map with osm.
2. Load the DEM in QGIS.
3. Reprojected and subset our dem.
4. Use Fill sinks tool (Processing Toolbox → SAGA NEXT GEN → Terrain analysis-Hydrology → Fill Sinks wang liu) to preprocess DEM. SLOPE=0.01
5. Use Strahler Order tool (Processing Toolbox → SAGA → Terrain Analysis – Channels → Strahler Order) To assign a hierarchical order to the stream. If stream order matches actual channel then it will opted for further calculation.
6. Use Channel network and Drainage Basin tool (Processing Toolbox → SAGA NEXT GEN → Terrain analysis-Channel → Channel network and Drainage Basin) for flow accumulation, to create basins and channel in catchment. Threshold = 8
7. Define the outlet point.
8. Use Upslope Area tool (QGIS → Processing Toolbox → SAGA → Terrain Analysis – Hydrology → Upslope Area) To compute the contributing area to outlet.
9. Clip all feature for contributing area like DEM, CHANNEL, BASIN

Step 3: Clip LULC Raster to Watershed

1. Load your LULC .tif raster.
2. Use Clip raster by mask layer tool.
 - Input: LULC raster
 - Mask: Watershed boundary
 - Save as LULC_Clipped.tif

Step 4: Convert Raster to Polygon

1. Use Raster to Vector tool.

- Input: Kanpur_LULC_Clipped.tif
 - Field: DN (land cover classes)
2. Name the output: LULC_PANDU_VECTOR.shp.

Step 5: Add Area Column

1. Open Attribute Table of LULC_PANDU_VECTOR.shp.
2. Toggle Editing → Field Calculator:
 - New Field: area_ha
 - Formula: \$area / 10000 (for hectares)

Step 6: Calculate Area by Land Class

1. Search “Statistics by Categories” in the Processing Toolbox.
2. Input:
 - Layer: LULC_PANDU_VECTOR.shp
 - Category Field: DN
 - Value Field: area_ha
3. Output → Save as CSV: LULC_Stats.csv

Step 7: Calculate Percentage in QGIS

1. Open CSV as a layer (Layer → Add Layer → Add Delimited Text Layer).
2. Open Attribute Table → Field Calculator:
 - New Field: percentage
 - Formula: "sum" / total_area * 100
 - Replace total_area with the sum.

Step 8: Add LULC Class Names

1. Add a new field: LULC_TYPE.
2. Manually assign values based on your LULC classification (e.g.):

Step 9: Dam Simulation & Volume Estimation

1. Use **Raster Surface Volume** tool:
 - Input: Clipped DEM (use raster calculator to mask DEM with inundation extent).
 - Method: below a reference level (115 m HFL).---- **115 adopted because lowe maximum elevation than 150.**
 - Output: Save volume table and HTML report.

2. Note values:

- Volume (m³)----- MCM
- Pixel Count
- Total Inundated Area (m²) ----- ha

Step 10: Create Maps in Layout Manager

For each map (LULC, Stream, Flood):

1. Go to Project → **New Print Layout**.
2. Add Map Frame → Adjust to region of interest.
3. Add Elements:
 - North Arrow
 - Scale Bar
 - Legend
 - Title
 - Labels
4. To add **LULC table from Excel**:
 - Save Excel as CSV.
 - Import CSV as a **Layer** or take a **screenshot** and add as **Image**.

MAPS ARE ATTACHED IN ZIP FILE.