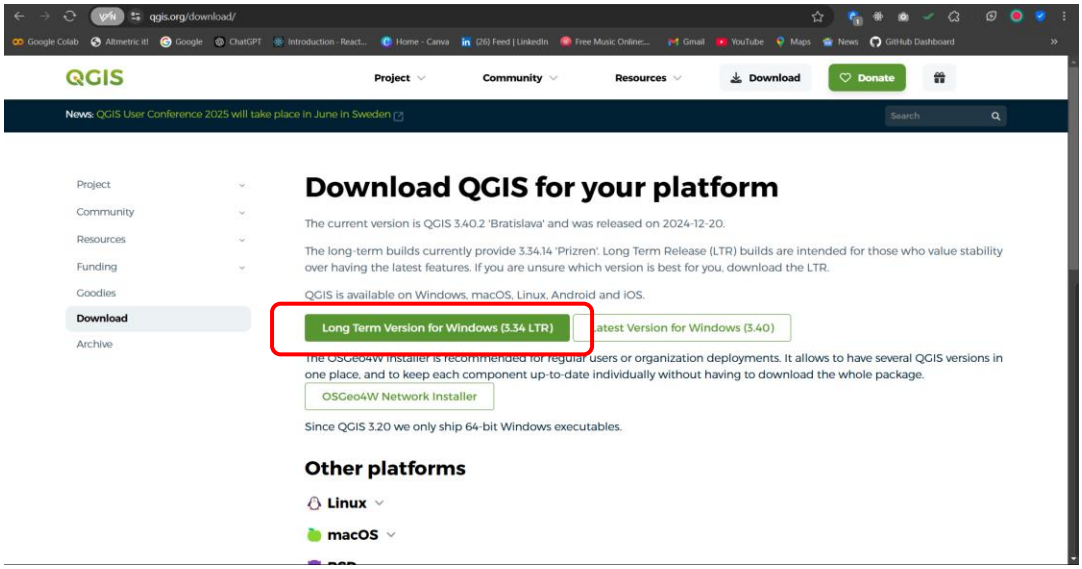
FGIS Practicals

Practical-1: Familiarizing Quantum GIS:

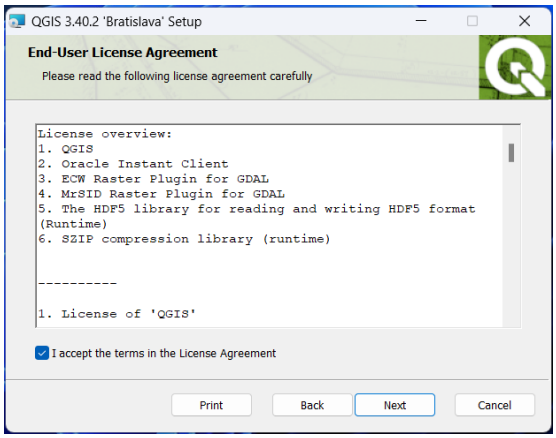
(a) Installation of QGIS.

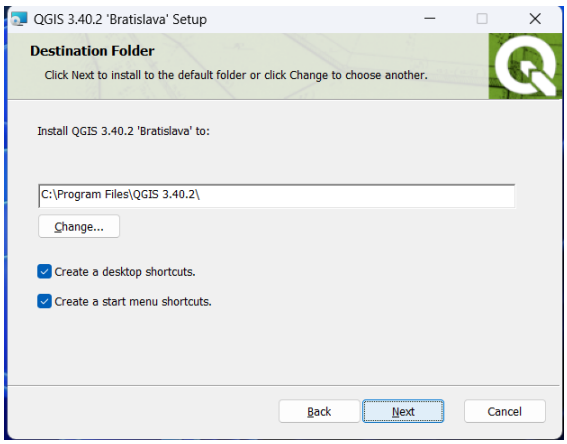
Step 1 : Search from the browser"QGIS software download" or visit :"https://qgis.org/download/".

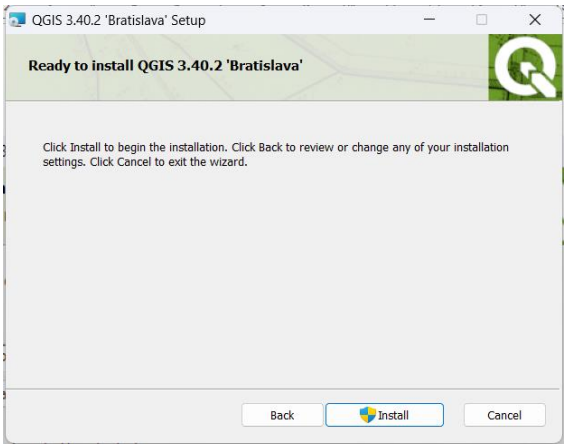
Step 2 : Click on Long Term Version for Windows.



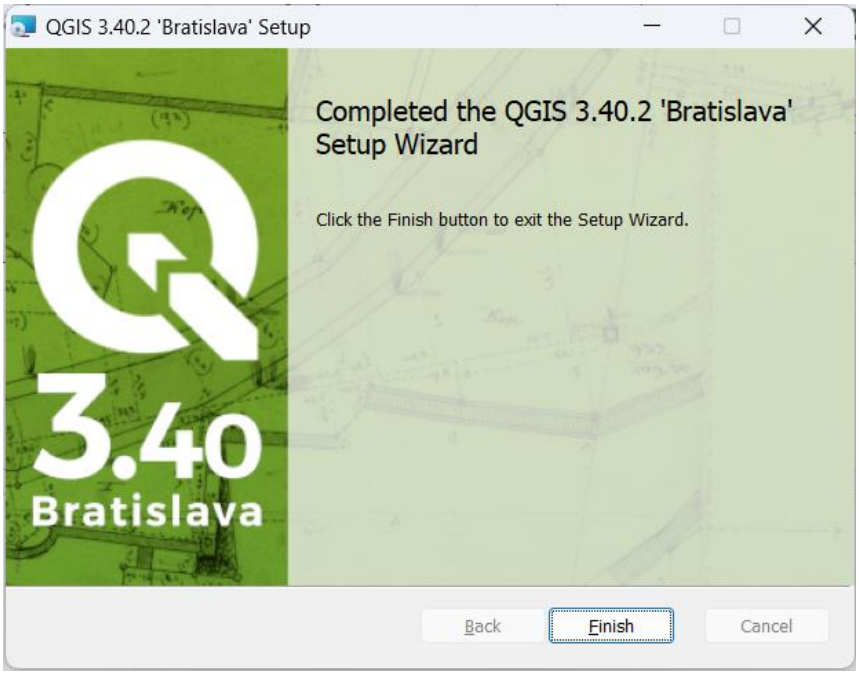
Step3 : This will make a .msi to download with a 1.2GB file space. After downloading a setup wizard will pop up. Follow the below setup till the installation button appears.







Step 4: After installing the software, click on the finish button and your QGIS software will be successfully installed.



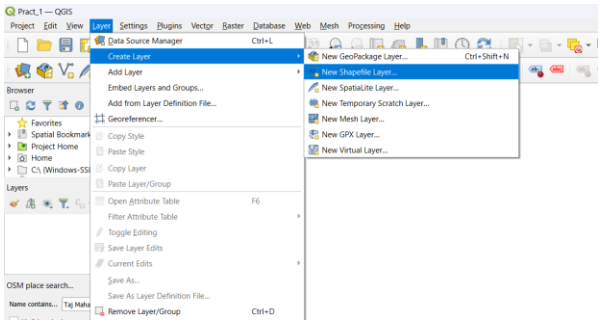
(b) Datasets for both Vector and Raster data,Maps.

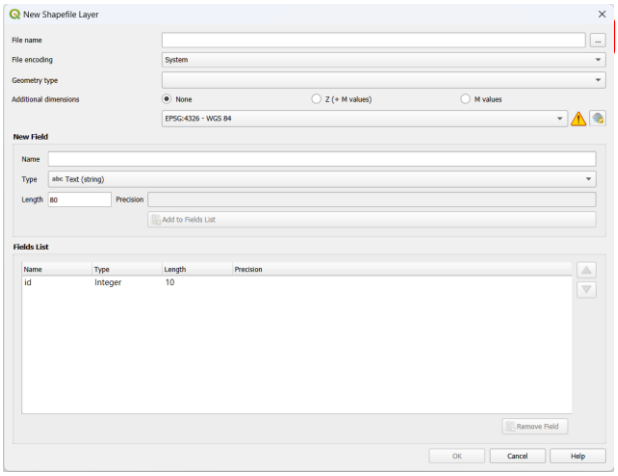
To acquire the related dataset for the respective practicals download the files from "https://drive.google.com/file/d/1R_WOJL6W7q9gAYcq_sNQTCnzqG5B0LTq/view?usp=sharing"

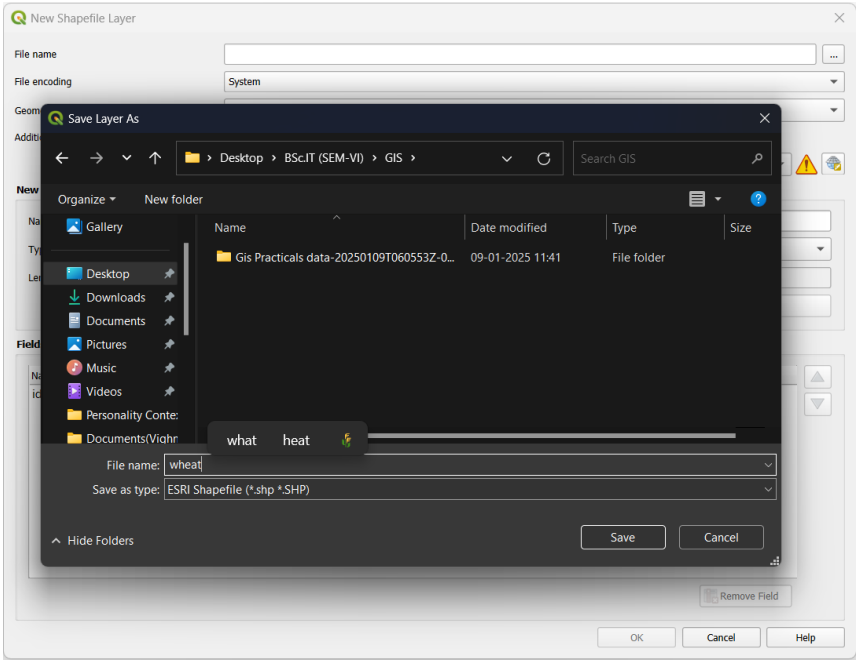
Practical-2: Creating and Managing Vector Data:

(a)Adding vector layers.

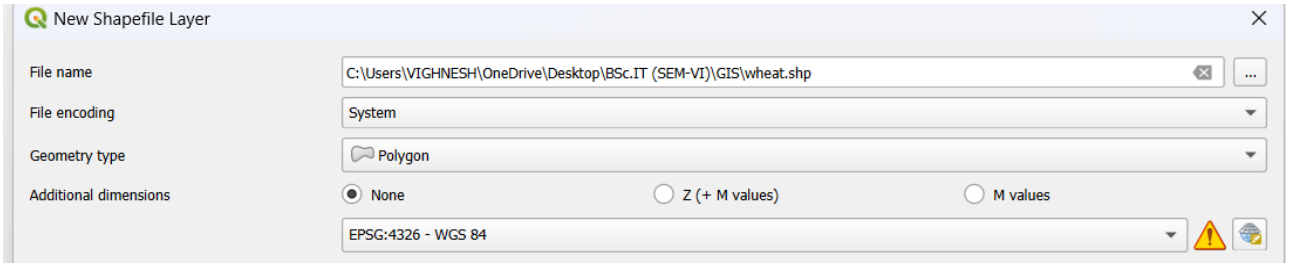
Step 1: Create a new project and save that file into a separate folder. After this, to create a vector layer, click on Layer -> Create Layer -> New Shapefile Layer. A pop up window will appear.



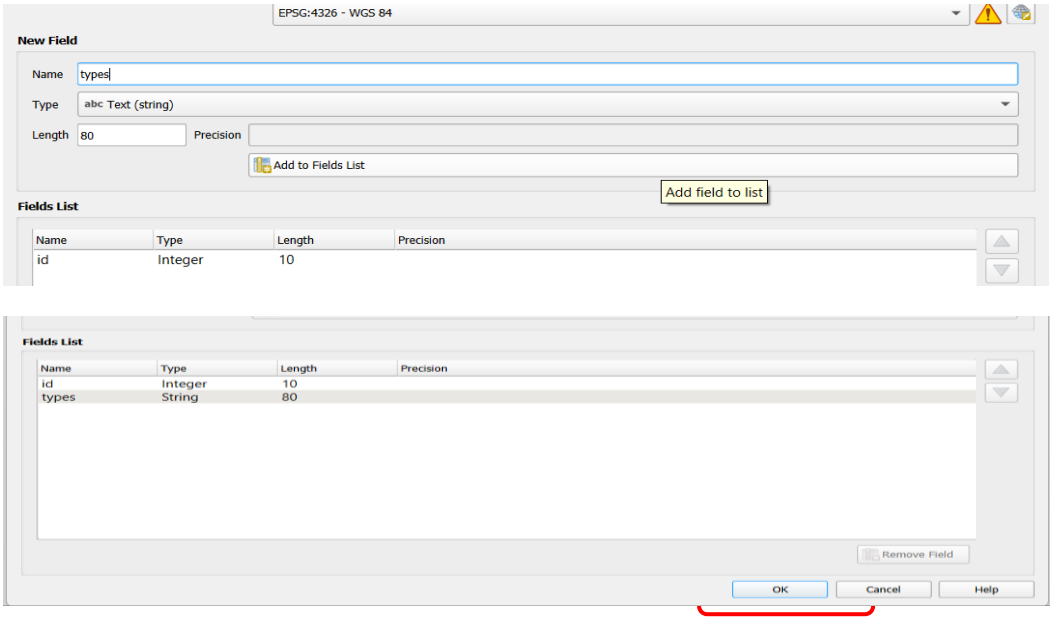




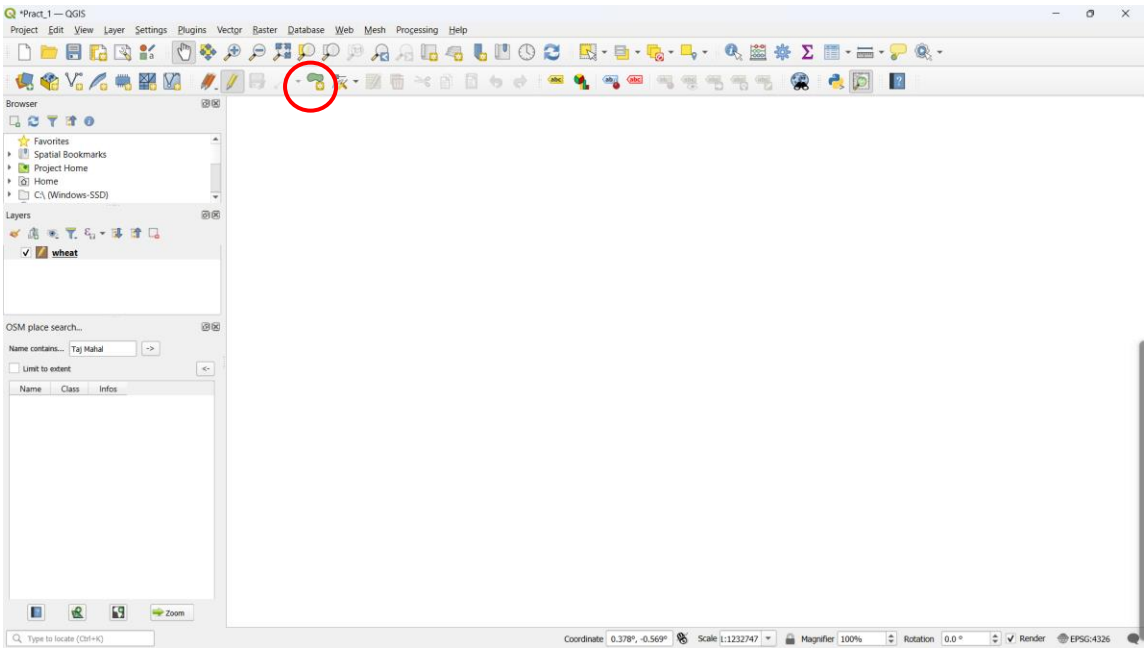
Step 2: Click on the three dots beside the file name and save the layer with the meaningful name. (In this practical, the polygon shape to represent wheat fields is used.)



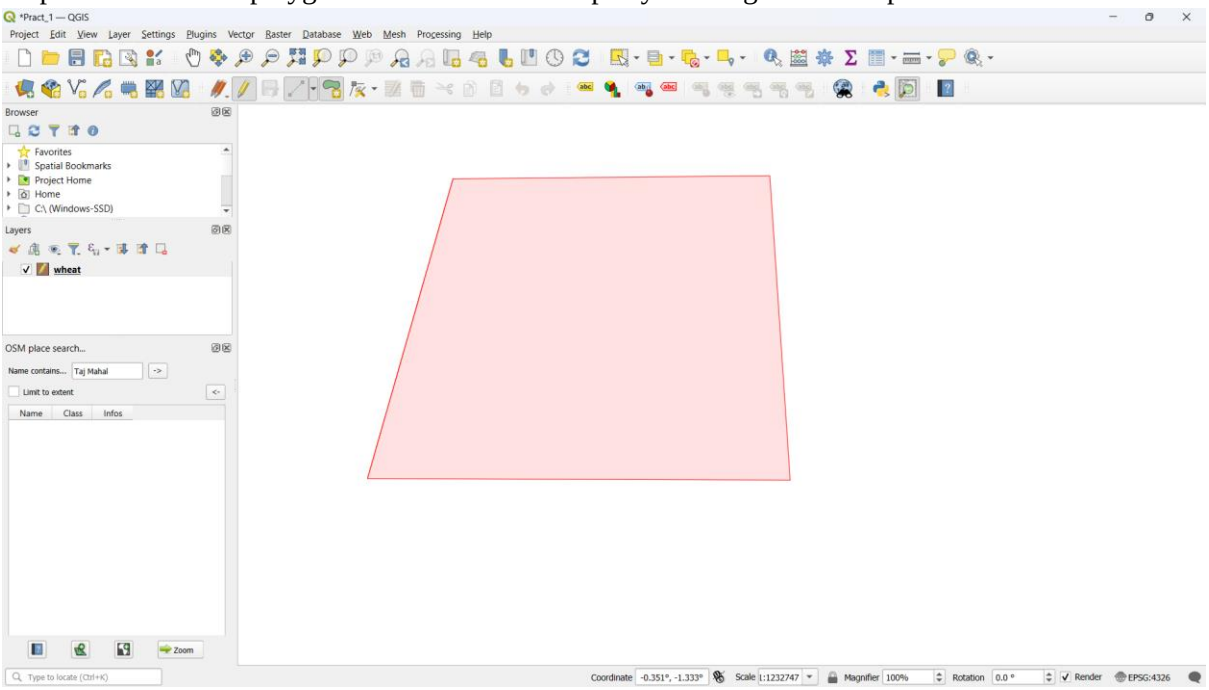
Step 3: Select the Geometry type (in this example:"Polygon").
Step 4:In the New Field Section, give the name which will act as an attribute to the shape and click on the "Add to Fields List". The Fields List table will be updated. Then Click on OK.



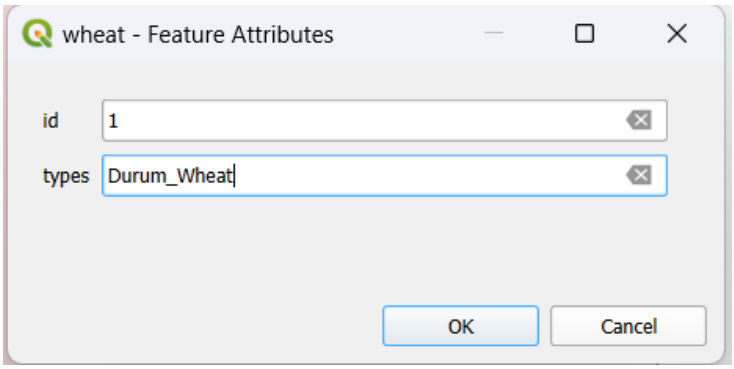
Step 5: From the toolbox click on the yellow pencil icon to enable the polygon making.



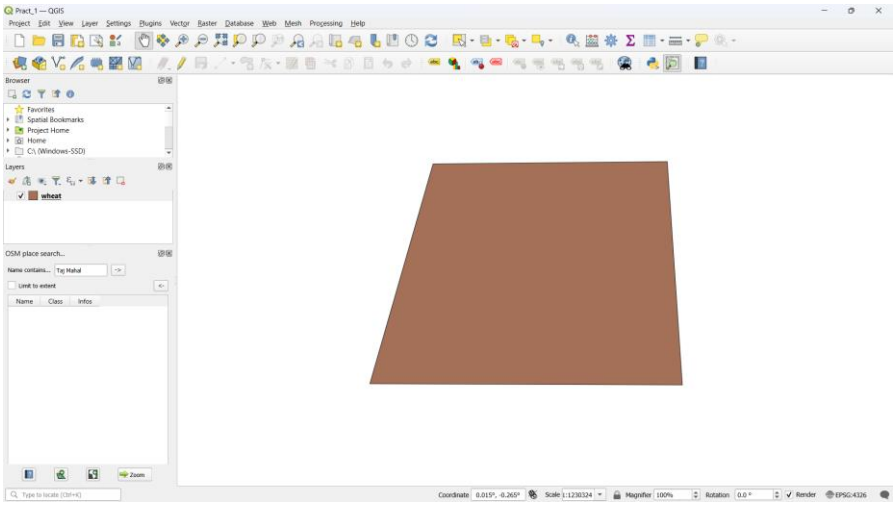
Step 6 : Click on the polygon icon and make a shape by clicking at various points on canvas.



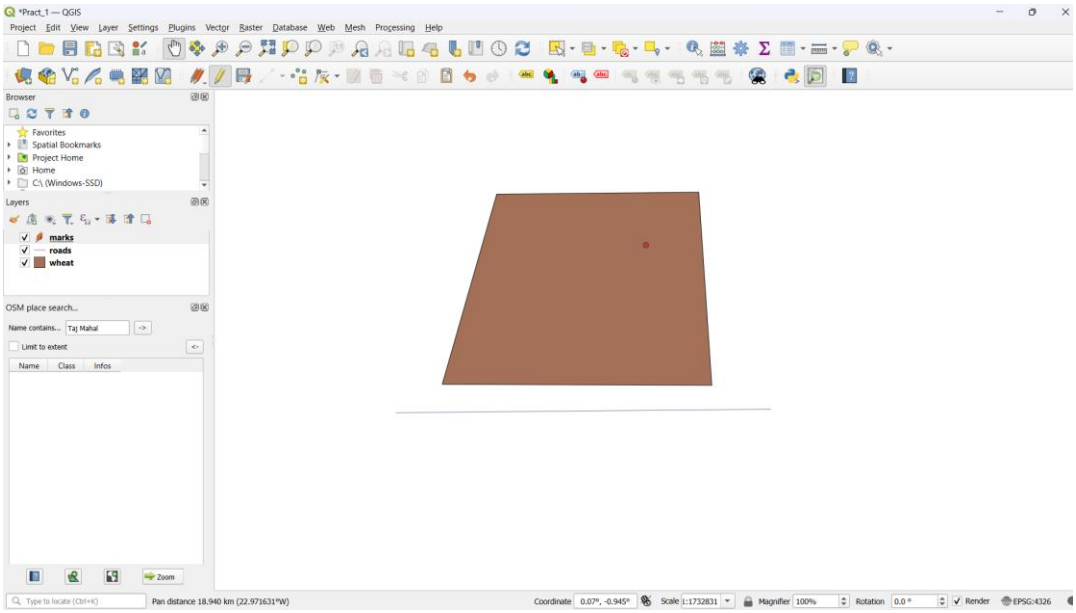
Step 7: Right click on the polygon made and you will be able to see the feature attribute of the polygon. Add the unique id and the name.



Step 8 : Now you will be able to see your polygon shape drawn.

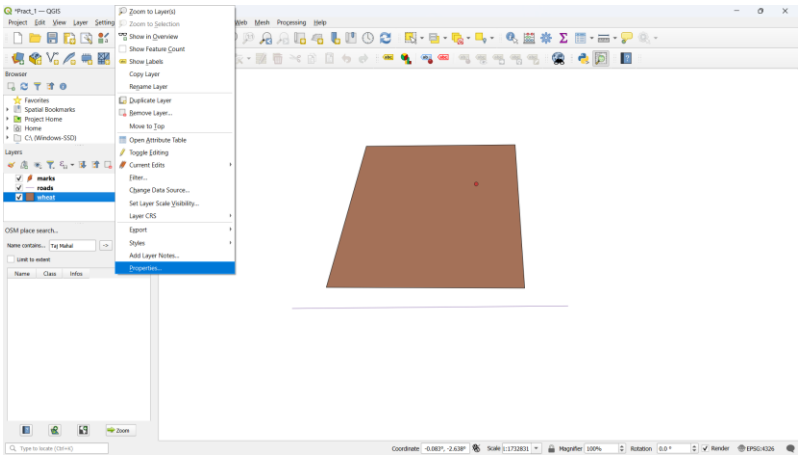


(Now do the same for points and lines).
Final Output:

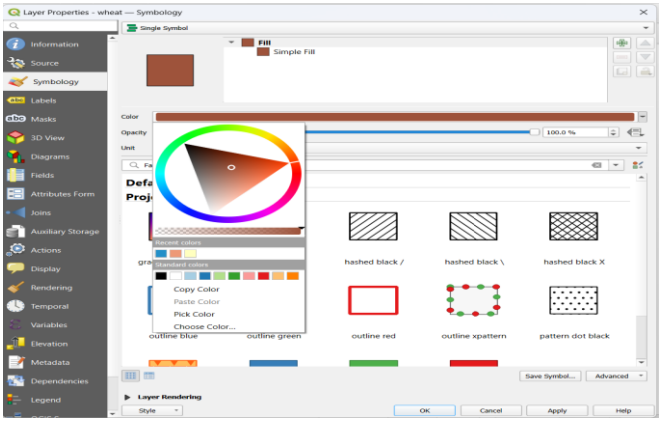


(b)Setting properties.

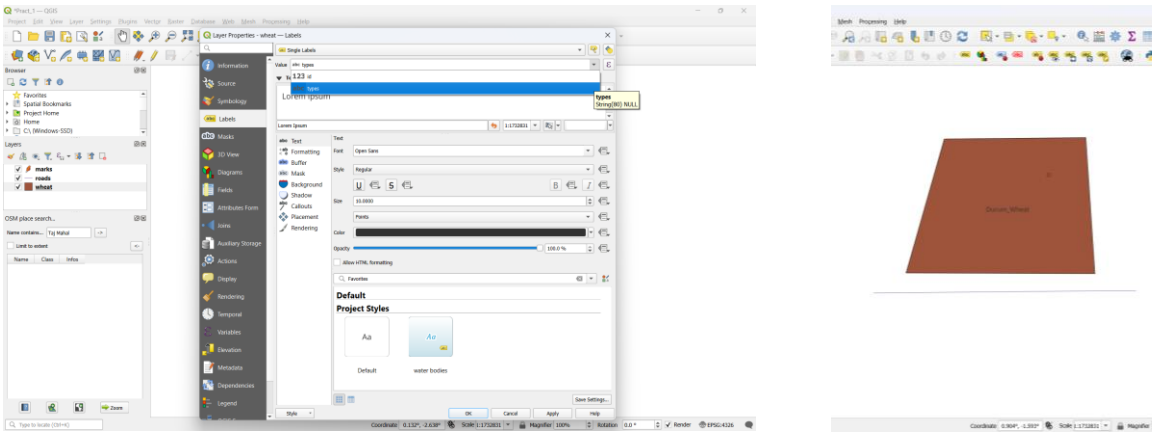
Step 1 : To set the properties of the respective vector layer, right click on the shape from the layers section present on the left side of the pane and select properties.



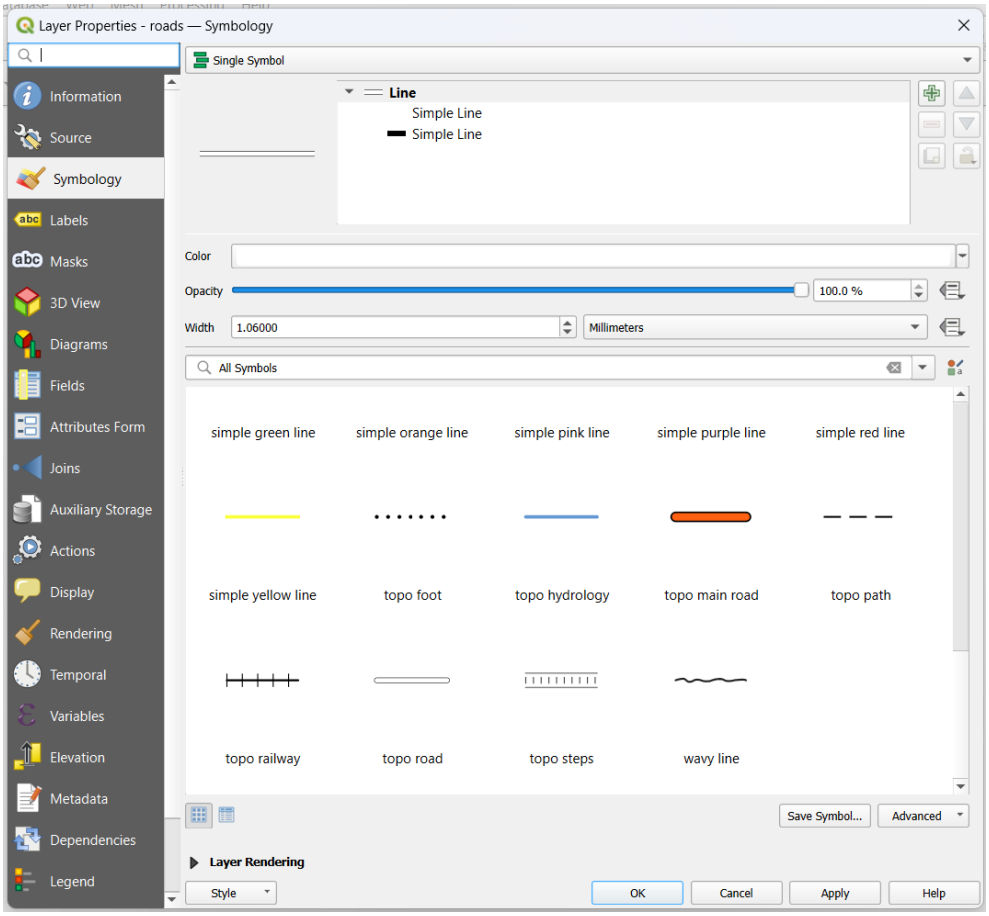
Step 2 : Select the appropriate color according to the requirement by using the color pane provided and click on “OK” button.



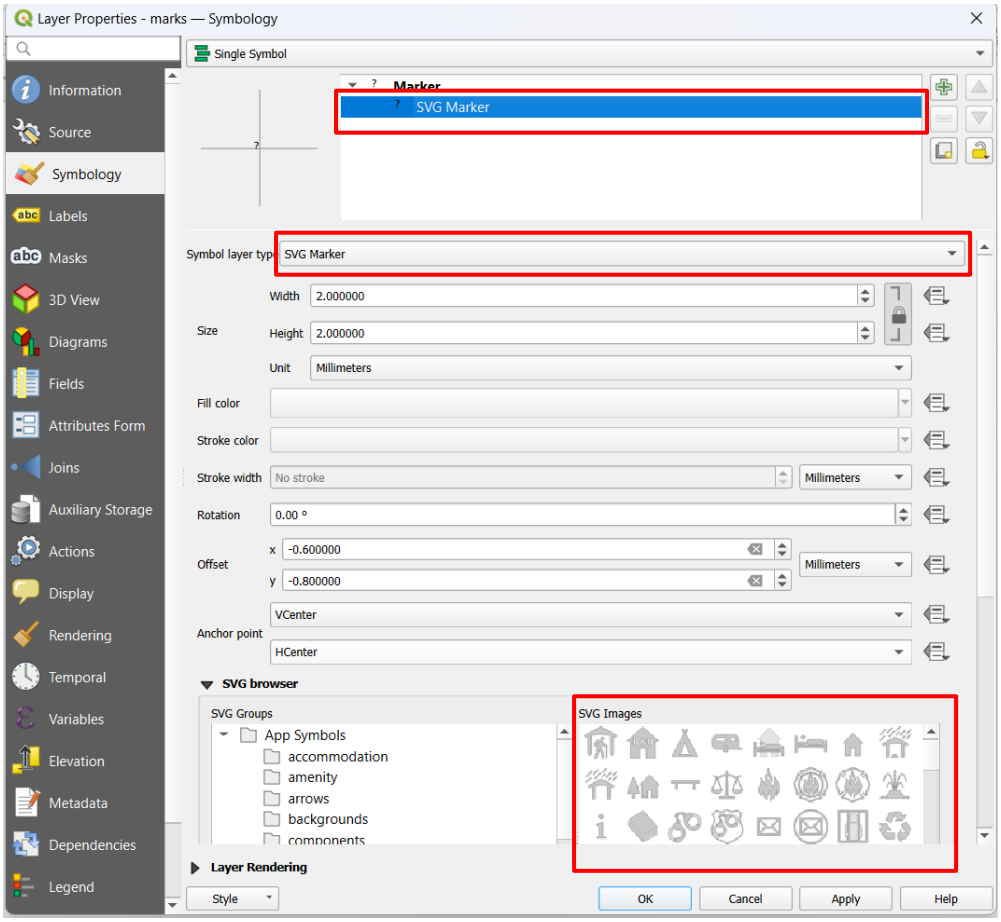
Step 3 : Select the from the Labels section “single label” from the top dropdown box and select the Values as the “types”(the attribute which was selected previously while creating the layer), and click on the OK button. You will now able to see the name of the polygon given in [1-a(Step 7)].



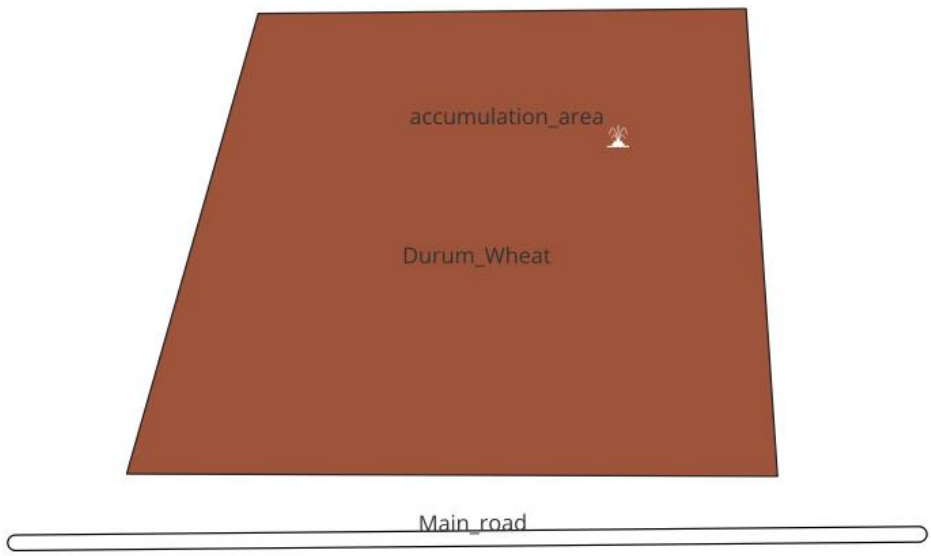
Step 4 : For lines, right click on the line layer -> Properties -> Add with the labels. In Symbology you can select with various predefined symbols available.



Step 5 : For points, follow the same procedure for creating a label. To symbolize a SVG marker go to Simple Marker -> Select symbol type as “SVG Marker” and select the relevant respective svg marker.



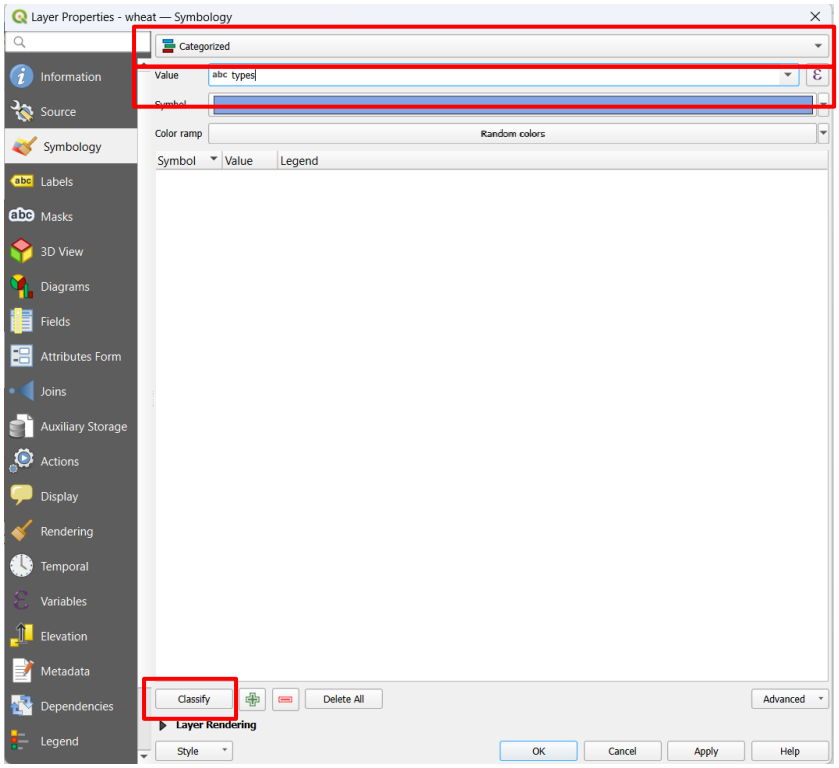
Final Output:



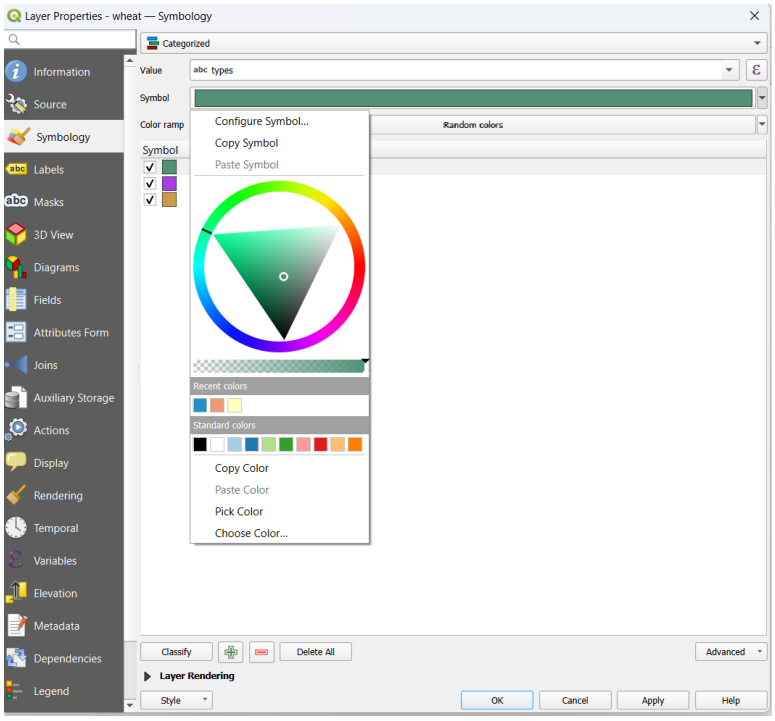
(c)Formatting.

(The Formatting only lies with the proper visual representation of the vector layers.)

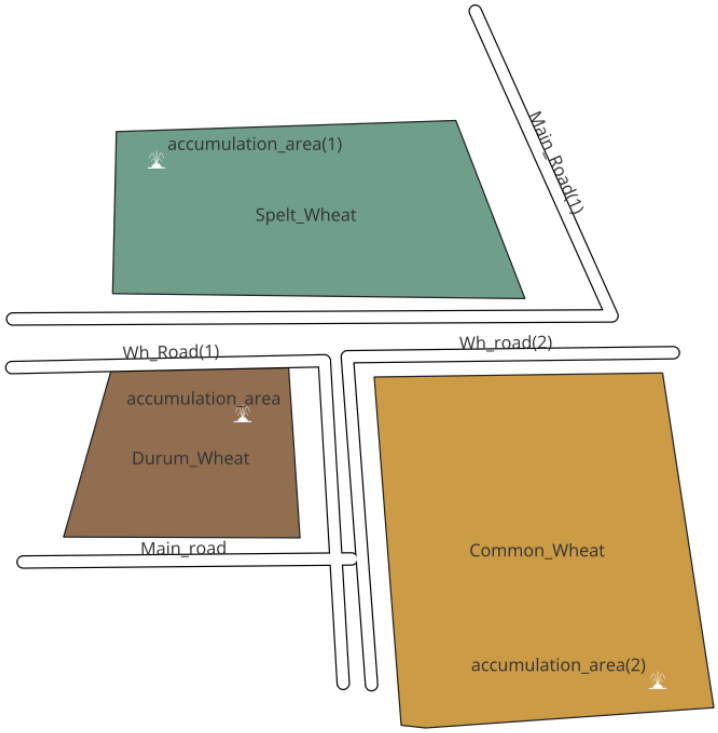
Step 1 : To Create a separate color scheme for the polygon, go to Properties -> Symbology -> Select Categorized instead of Single Symbology -> Choose value as “types” ->Click on Classify.



Step 2 : Now select the symbol and change the color as per requirements and click on “OK”

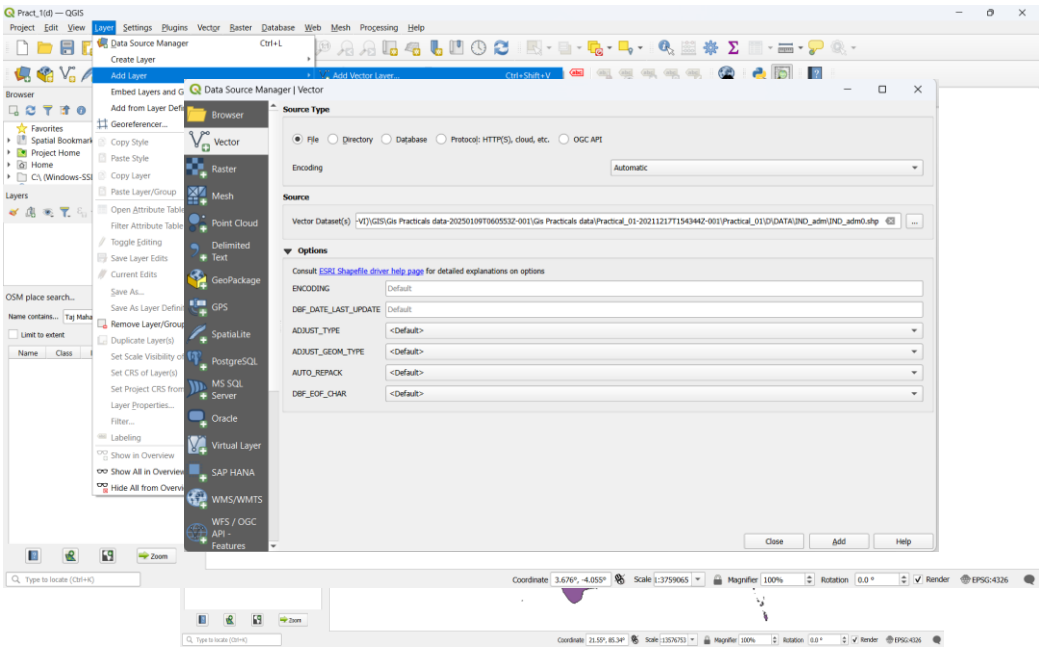


(You will now be able to see the differentiated color scheme. Apply same for lines and points.)
The Final Output:



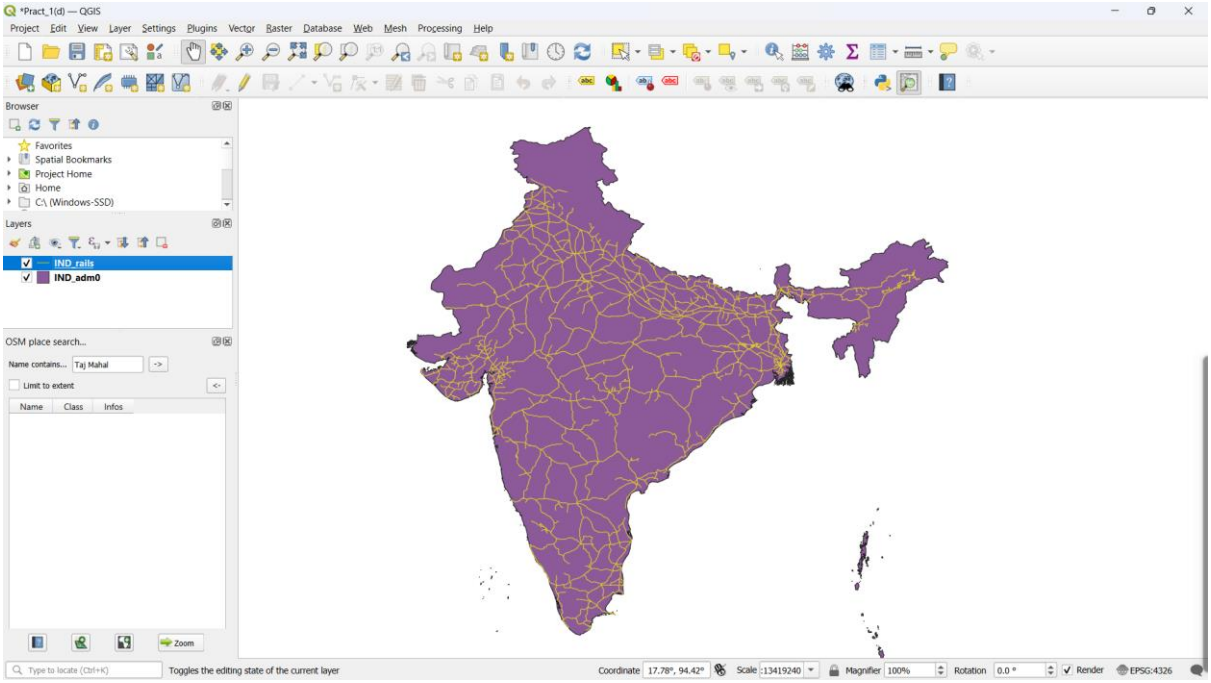
(d)Calculating line lengths and statistics.
(To calculate line, lengths and statistics we will be using the Indian Map and railway line as the vector representation for calculations.)

Step 1 : Create a new project and save with a relevant name. Go to Layer -> Add Layer -> Add Vector Layer.



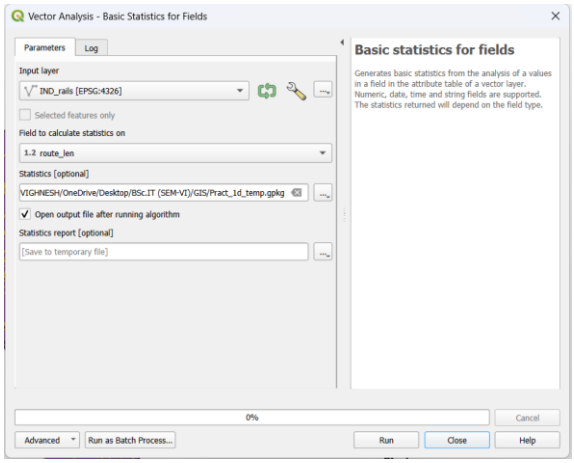
Step 2 : Click on the three dots to select the Vector Dataset. From the drive downloaded dataset, select Practical_01 -> D folder -> DATA folder -> IND_adm folder -> Select IND_adm0.shp file -> and click on Add. You will be able to see the map of India on the Canvas. Change the color of the Map as required.

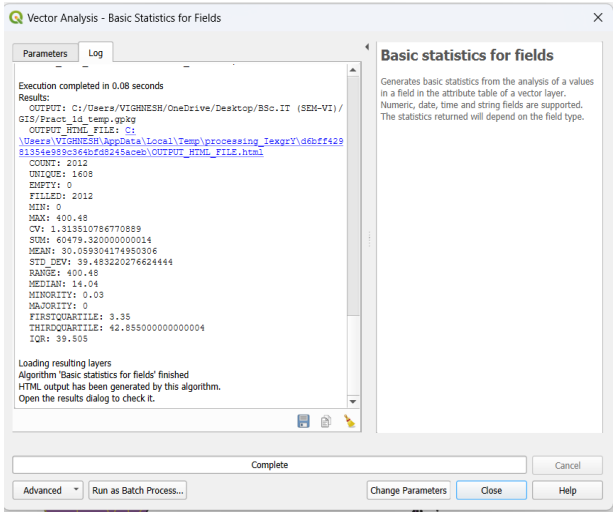
Step 3 : For railway lines, again click on three dots present -> Practical_01 -> D folder -> DATA folder -> IND_rdd -> Select IND_rails.shp file -> Click on Add. You will now be able to see the railway lines successfully placed on the India map.



Step 4 : For calculating line lengths and statistics, from Toolbars, go to Vector -> Analysis Tools -> Basic Statistics for Field -> You will be able to see an analysis pop-up window. Select Input Layer : IND_rails[EPSG:4326] -> Field to calculate statistics on : route_len -> Save this by creating a temp file and then click on “Run”.

(The values of the statistic will be calculated and the Sum value will be: 60479.320000000014)

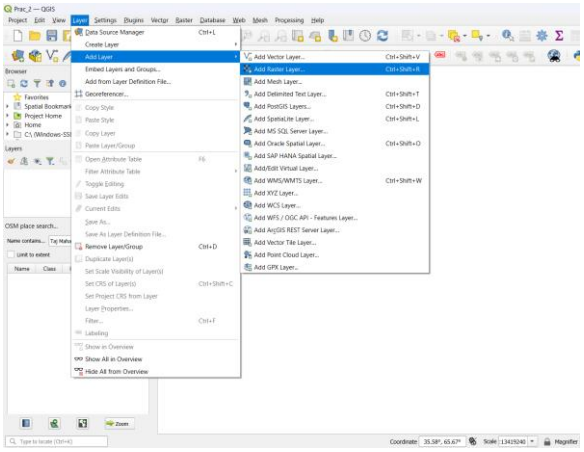


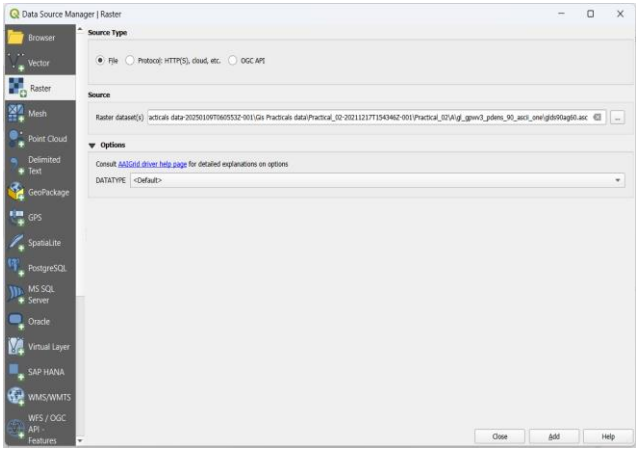


Practical-3: Exploring and Managing Raster data:

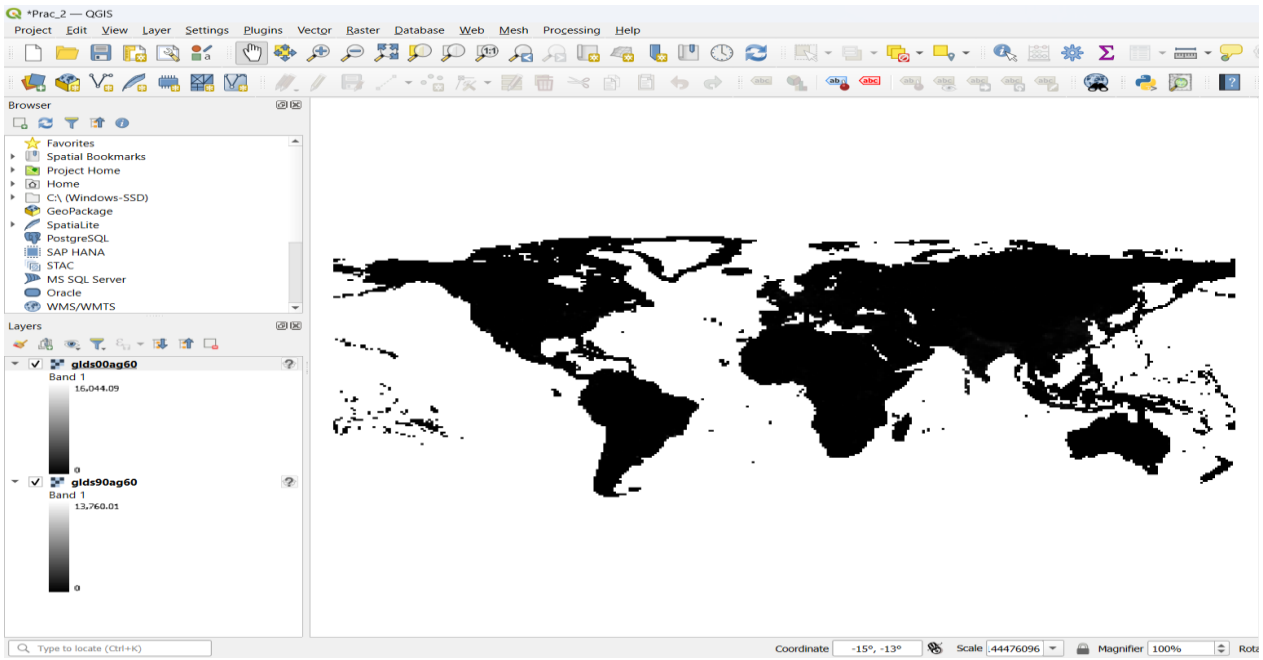
(a)Adding raster layers.

Step 1 : To add a Raster layer, from Toolbar select Layer -> Add Layer -> Add Raster Layer.
From the three dots open the Data Folder -> Practical_2 -> A folder ->
gl_gpwv3_pdens_90_ascii_one folder -> glds90ag60.asc file -> click on Add.

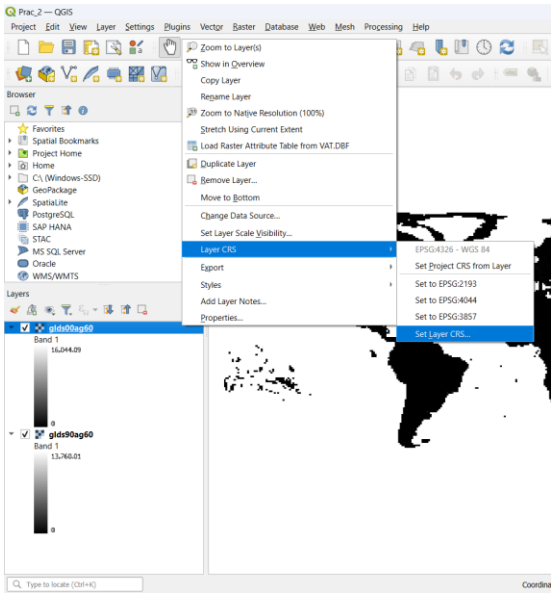


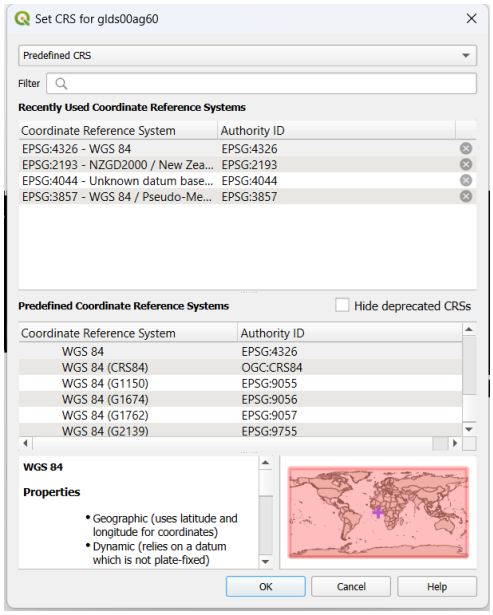


(Add another file from folder : gl_gpwv3_pdens_00_ascii_one ->glds00ag60.asc file. You will then be able to see the below map on the Canvas.)



Step 4: Right click on the Layer created -> Layer CRS -> Set Layer CRS -> Choose EPSG:4326.
(NOTE: Setting CRS to EPSG:4326 will help to interpret that raster layer has longitude and latitude)

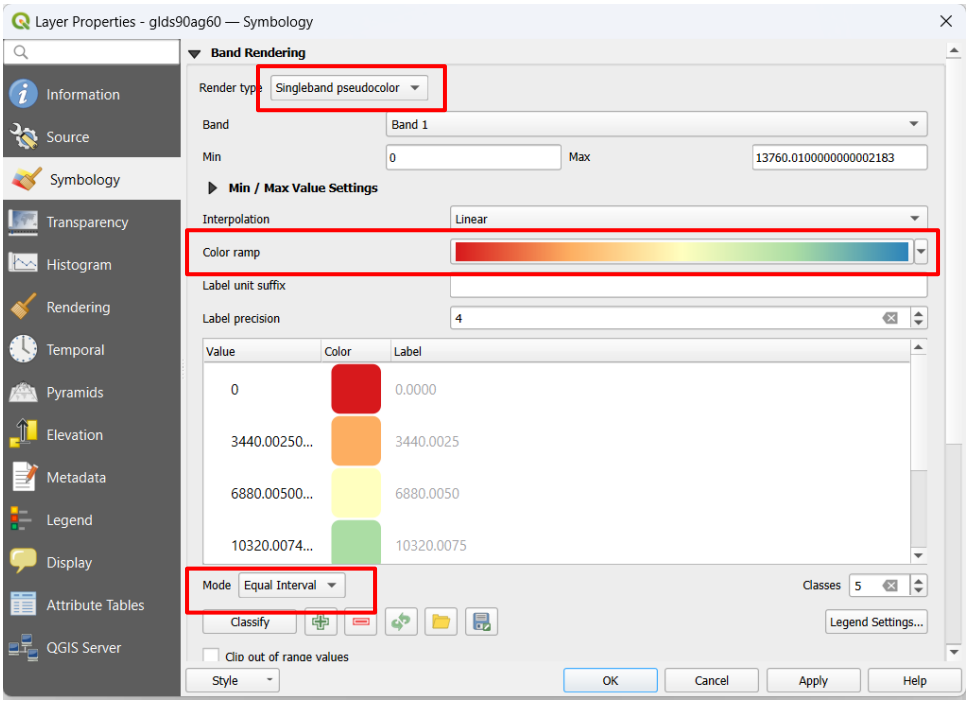




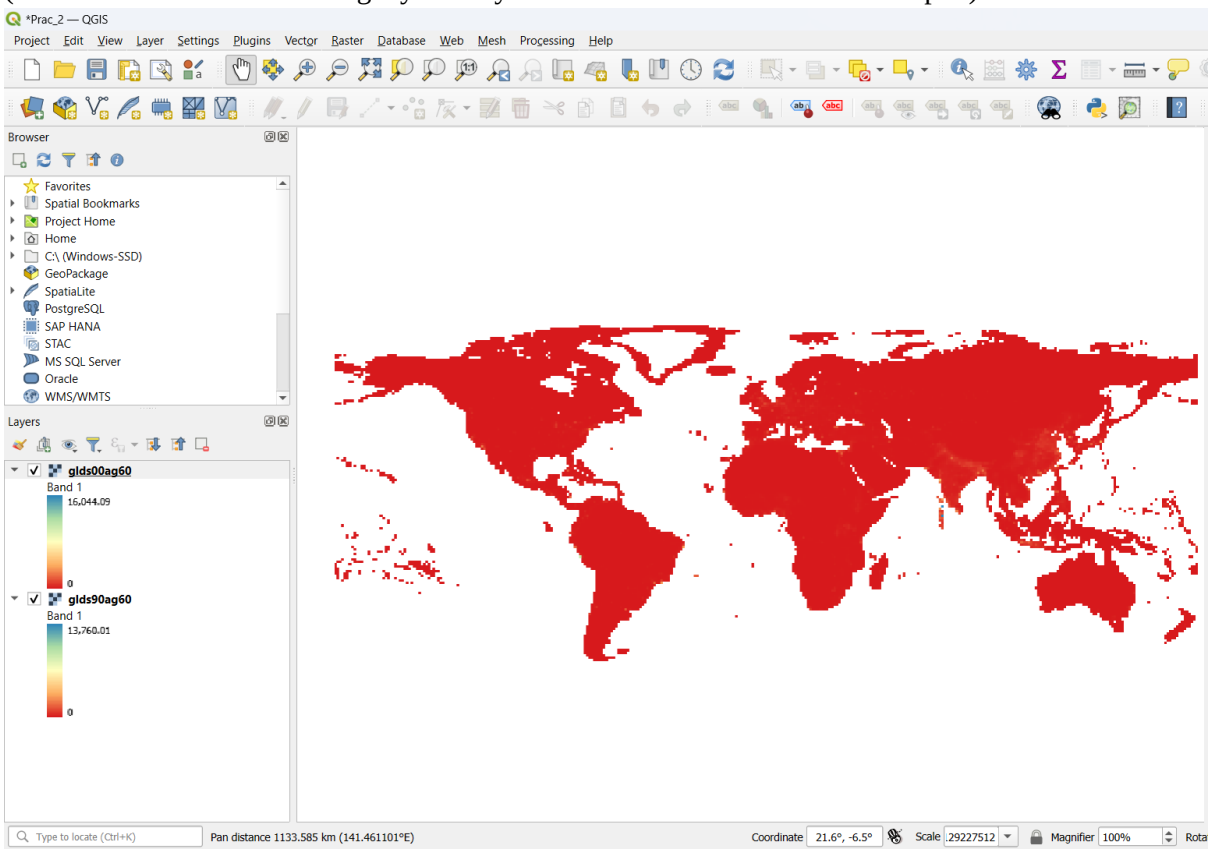
(In this manner you can add the respective layers.)

(b)Raster styling and analysis.

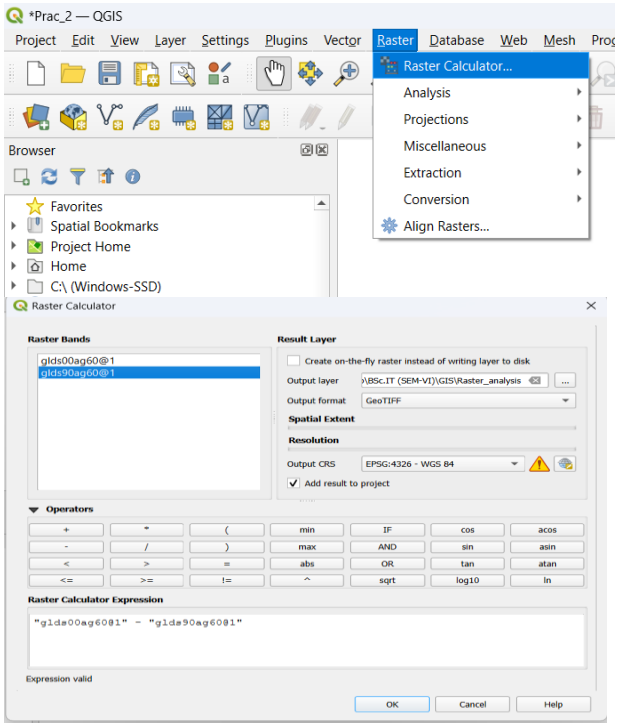
Step 1 : To start with the raster styling, right click on the layer -> properties -> Symbology -> Select the Render type as “Singleband pseudocolor” -> Choose the Color Ramp -> Select the Mode as “Equal Interval” -> Then click on OK.

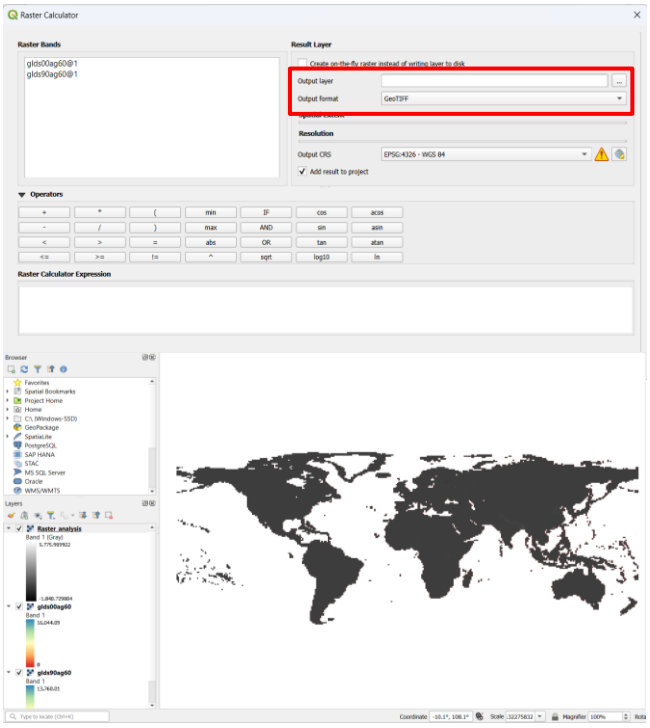


(Do the same for the remaining layer and you will be able to see the below output.)

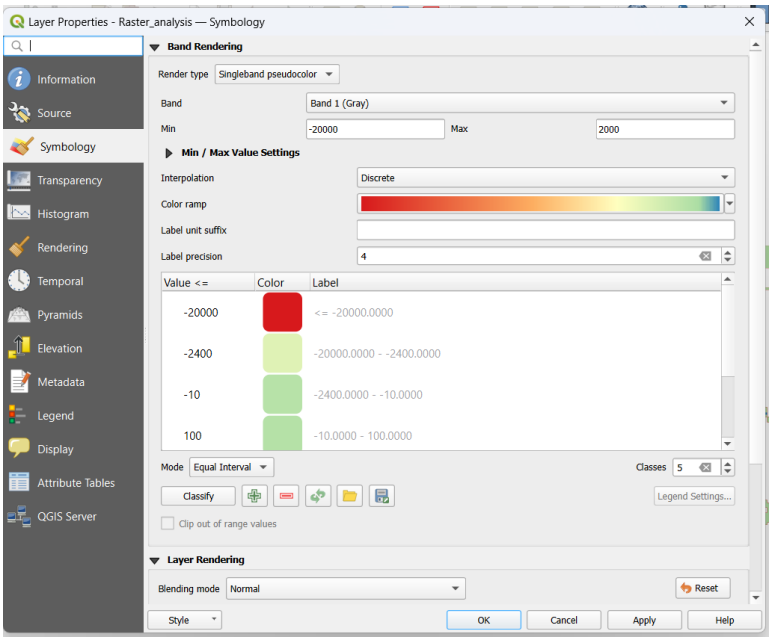


Step 2 : To start with the analysis, from toolbar go to Raster -> Raster Calculator -> A pop window will appear. Save the output layer with the appropriate name. From the Raster Bands double click on the first band -> Select with the "-" operator -> Double click on the second band -> click on OK. You can now see a new layer of map is created.

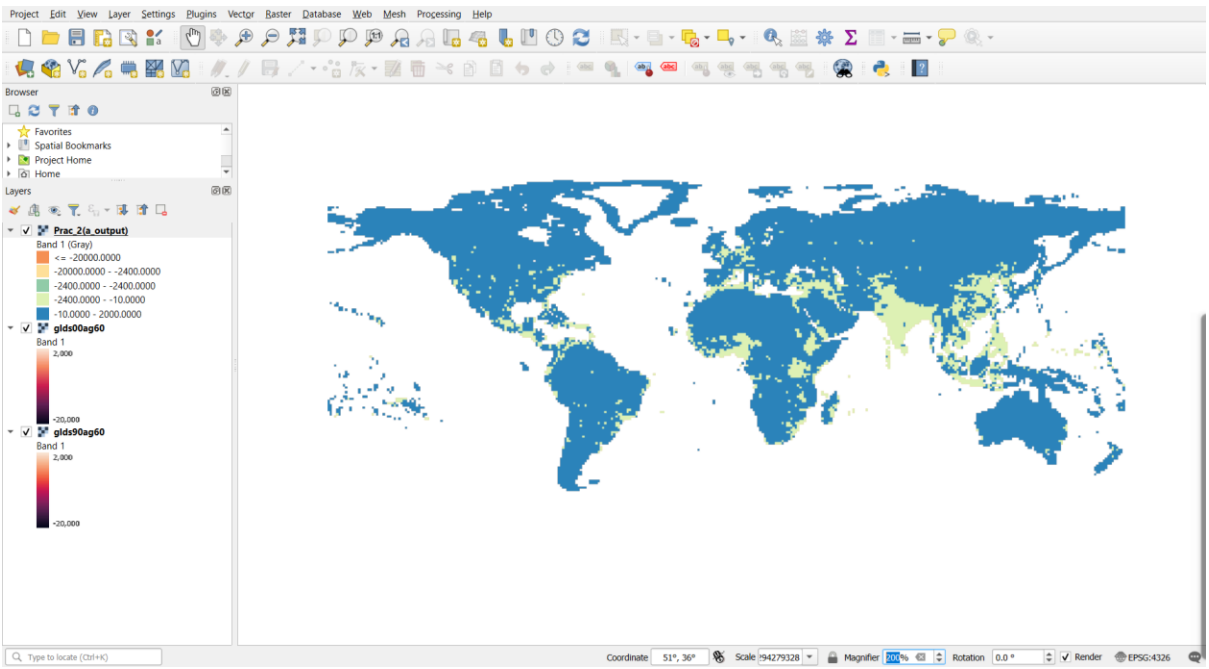




Step 3 : Right Click on the new layer created -> Properties -> Symbology -> Select the Render type : “Singleband Pseudocolor” -> Set the Min & Max values as -20000 & 2000 respectively -> Select the color ramp -> Set the values as done below till “2000” -> Select the Mode as “Equal Interval” -> Click on “Ok”.

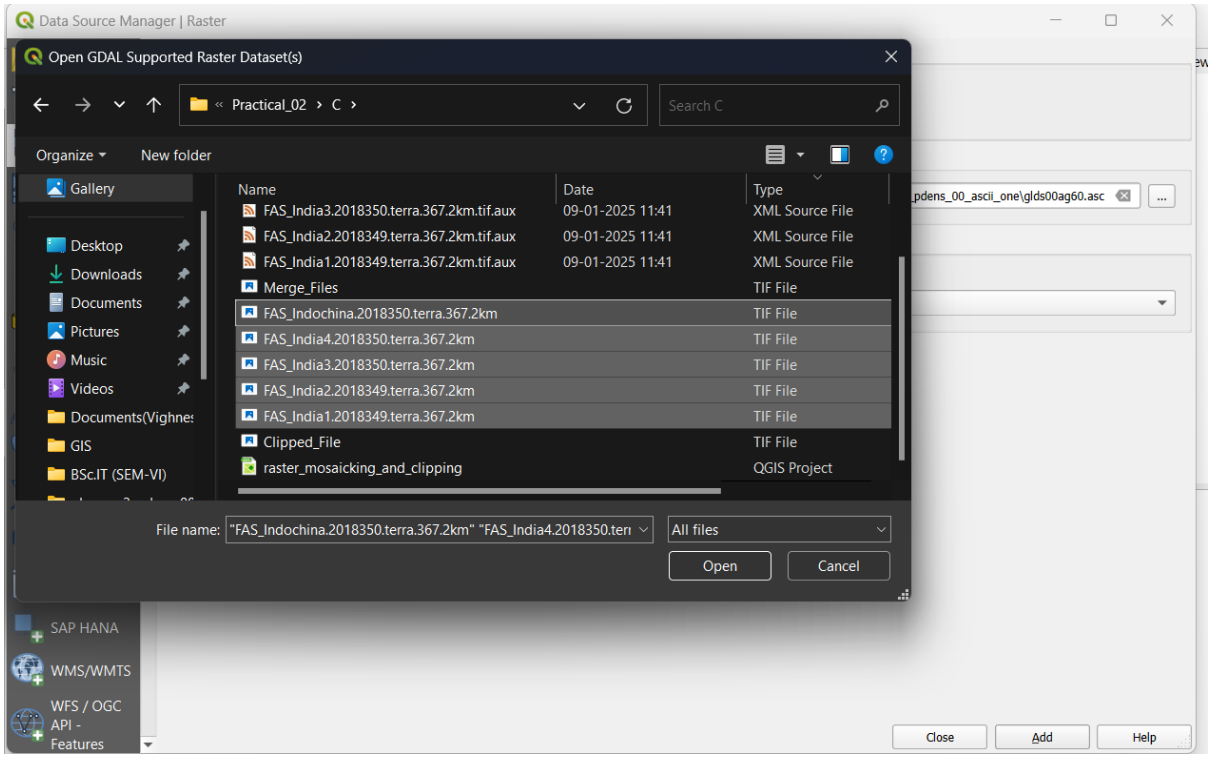


(You will be able to see a differentiated colored graph which overall represents the density of the population of the country.)

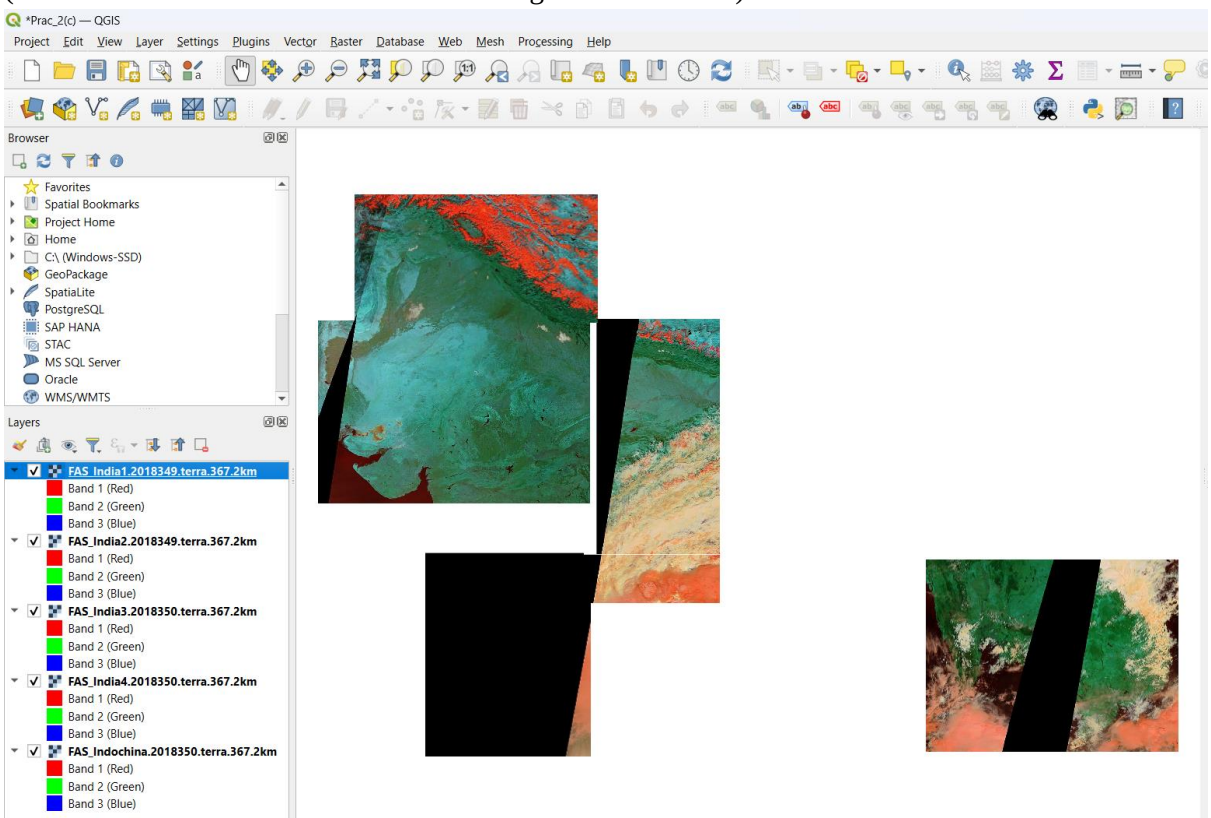


(c)Raster mosaicking and clipping.

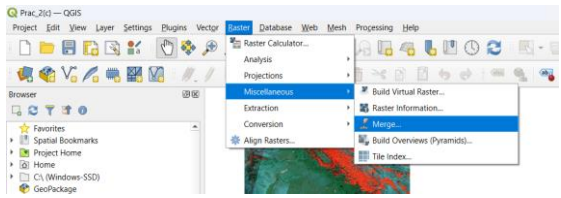
Step 1 : From the toolbar go to Layer -> Add Layer -> Add Raster Layer -> Select FAS_India1 to FAS_India5 & FAS_Indochina tif file -> Click on ADD.

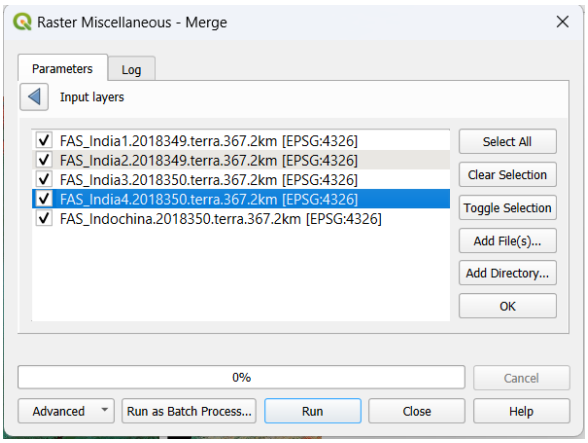


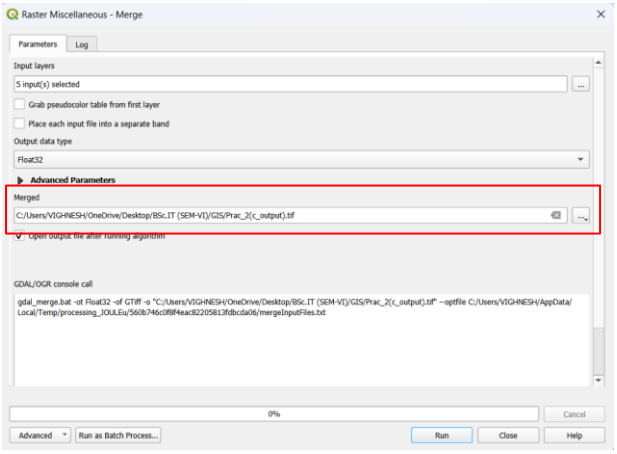
(You will be able to see the below raster images on the canvas)



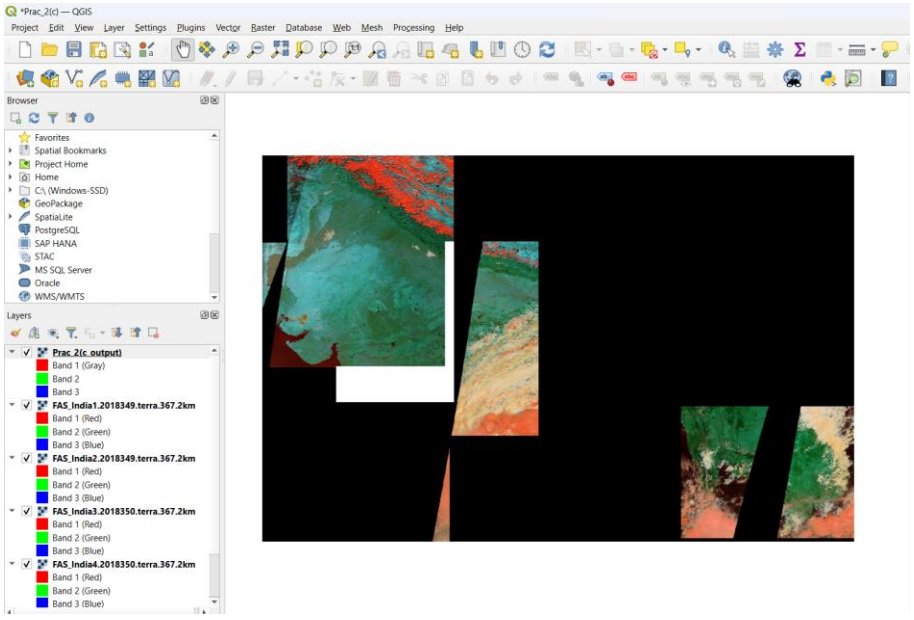
Step 2 : Go to Raster -> Miscellaneous -> Merge -> Select all the input layers -> Click on OK -> Save to file -> Click on Run.



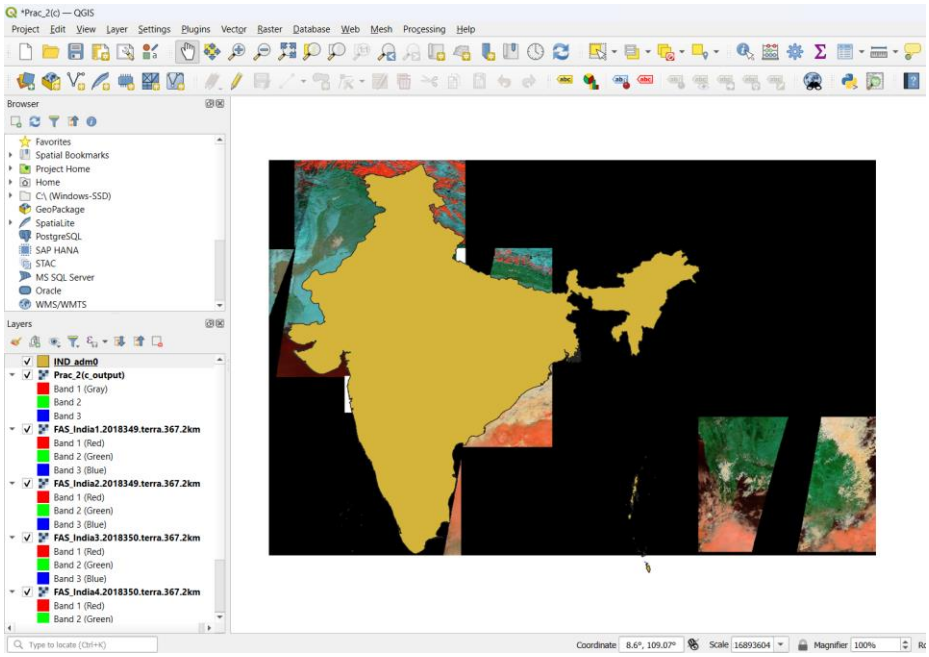




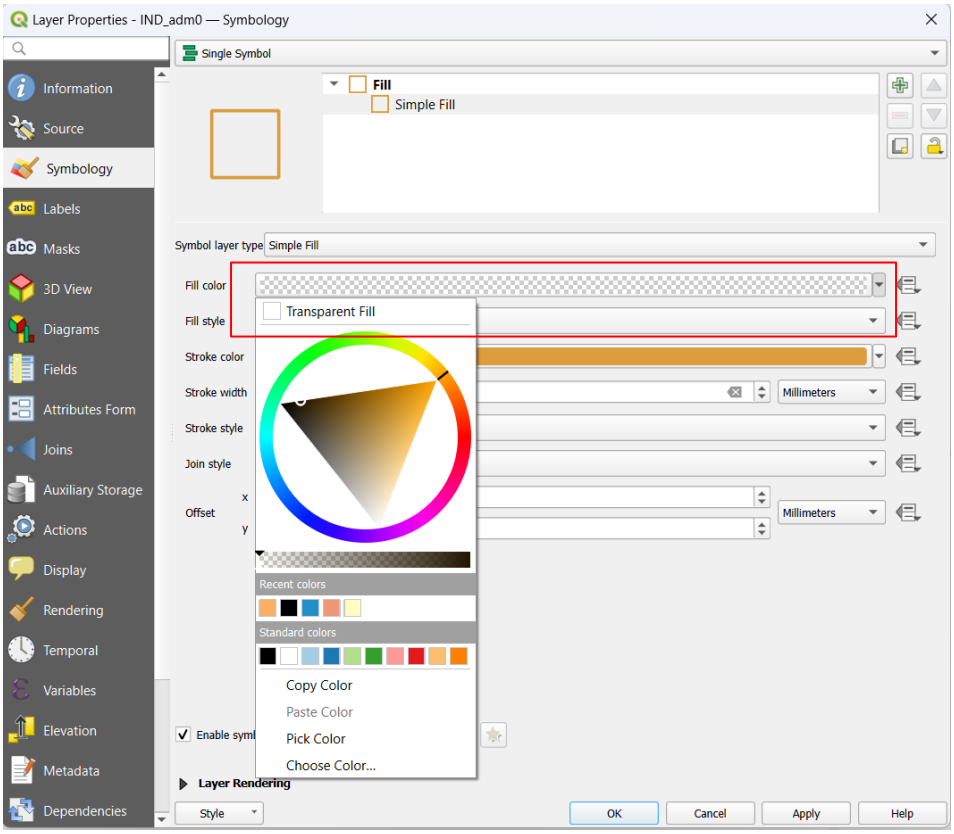
(You will be able to see the raster images placed in Merged format)



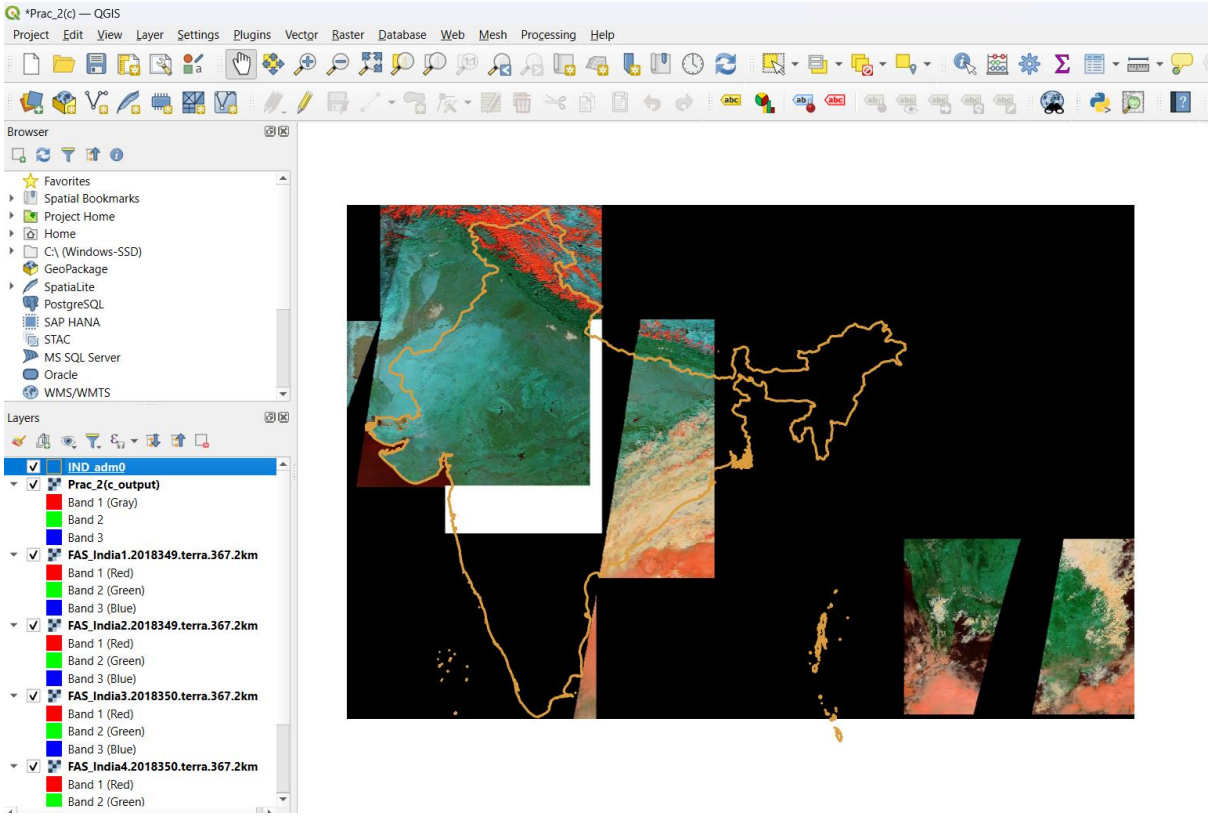
Step 3 : For clipping go to Layer -> Vector Layer -> From the C folder itself select IndiaAdminBoundry -> IND_adm0.shp.
(You will be able to see a map placed above the raster images)



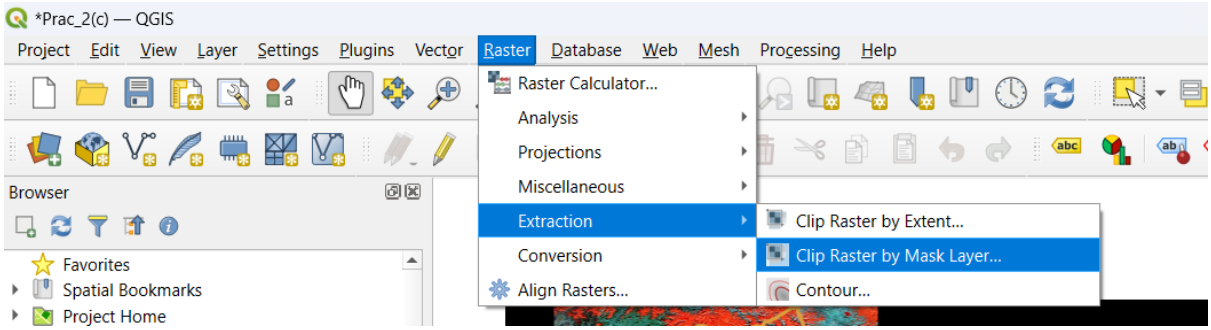
Step 4 : Right click on the vector layer created -> Properties -> Symbology -> Click on the Simple fill -> Choose Fill color to transparency -> Change the Stroke Color -> Click on Ok.



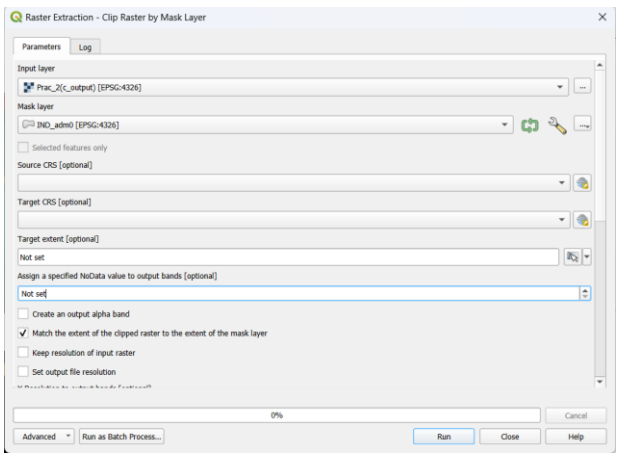
(You will be able to see the following Indian Map has transparency color filled and is now with the borders)

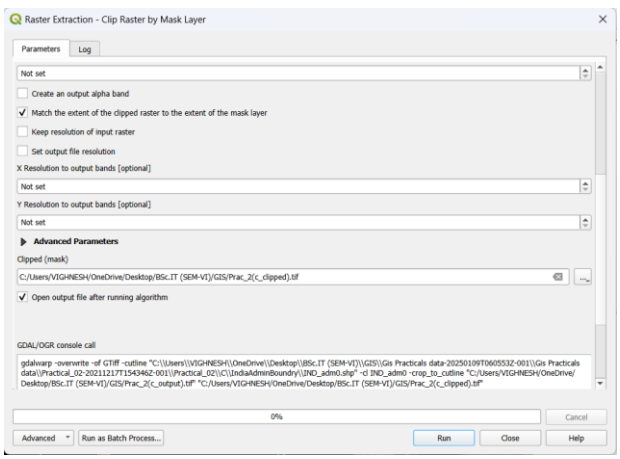


Step 5 : From the Toolbar go to Raster -> Extraction -> Clip Raster by Mask Layer.

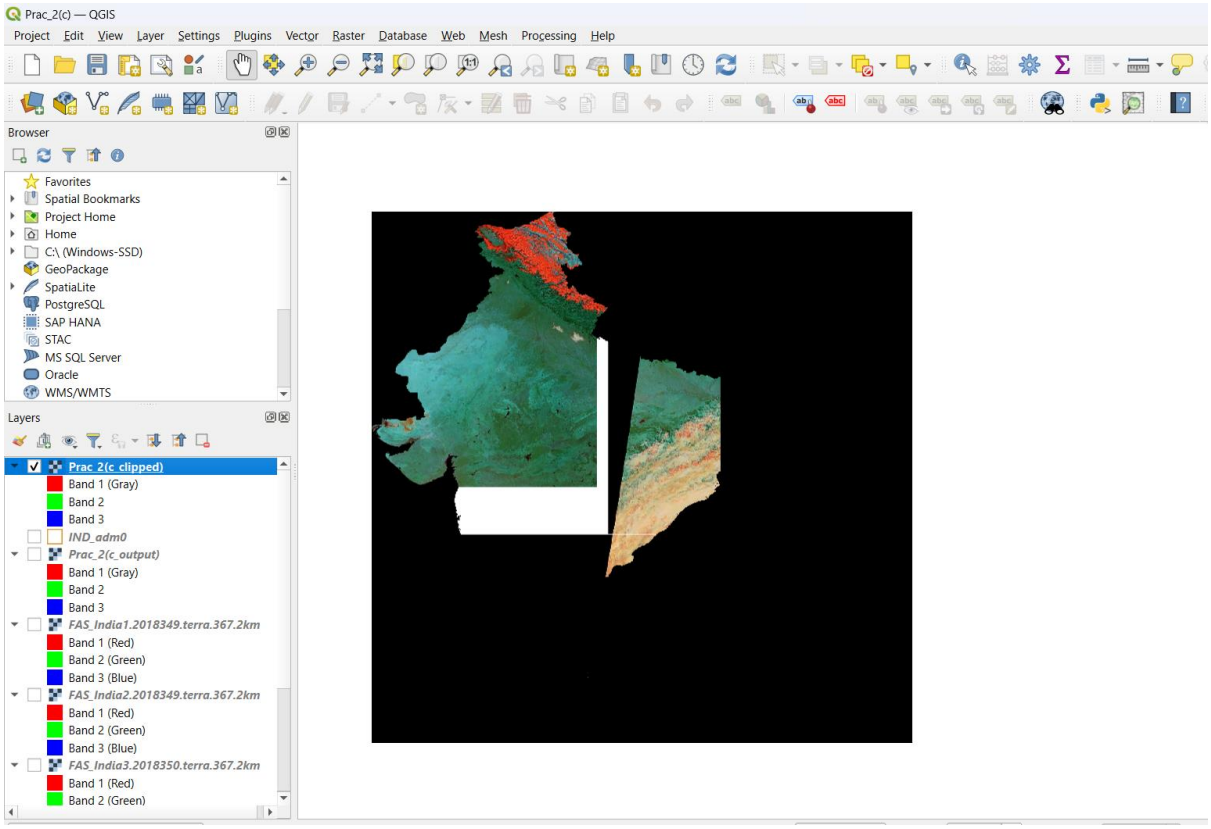


Step 6 : Select the input layer from the layer file created in Step 2. In clipped mask, save the file name and click on “Run”.





(You will now be able to see the clipping done.)

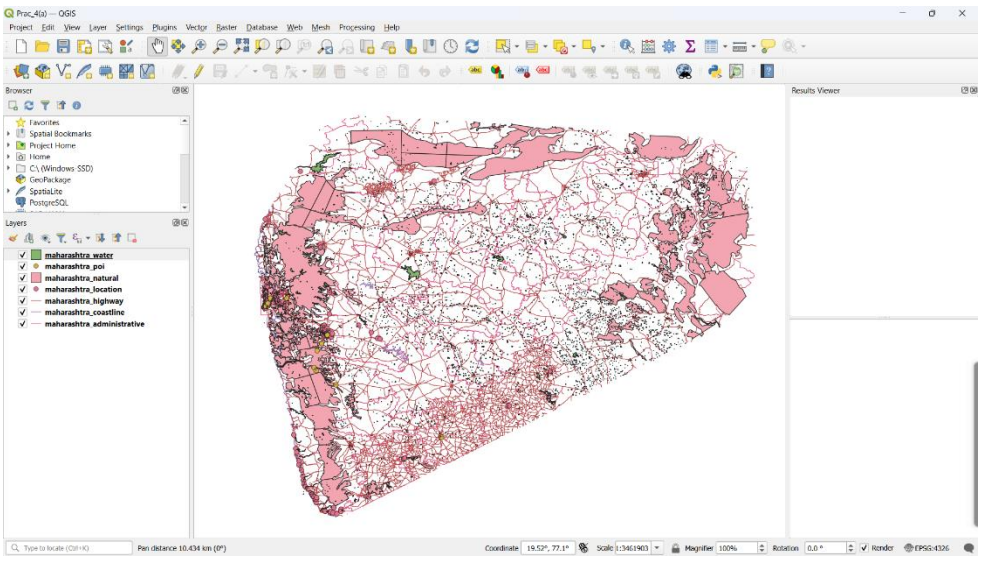


Practical-4:

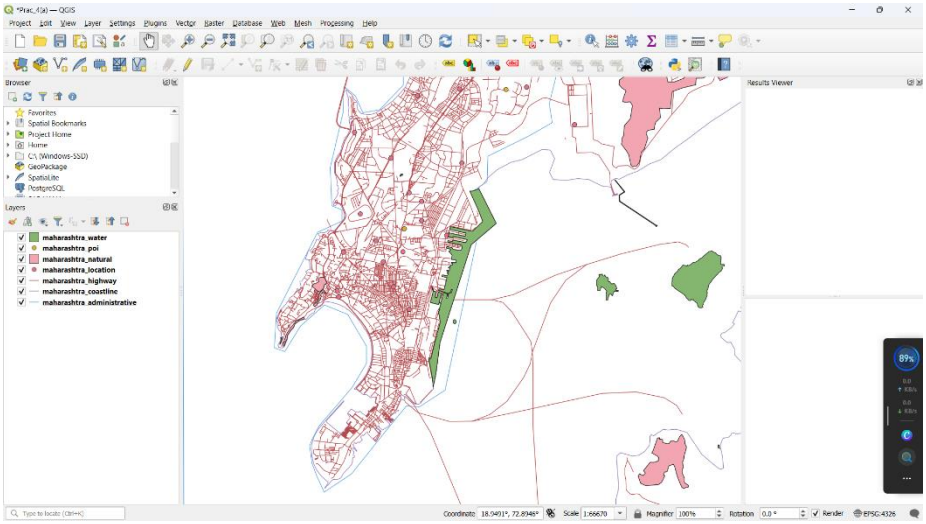
(a) Making a Map and working with attributes.

(For creating a map we will be demonstrating with the Maharashtra's attributable factors in vector file format and then creating with the Mumbai's Map)

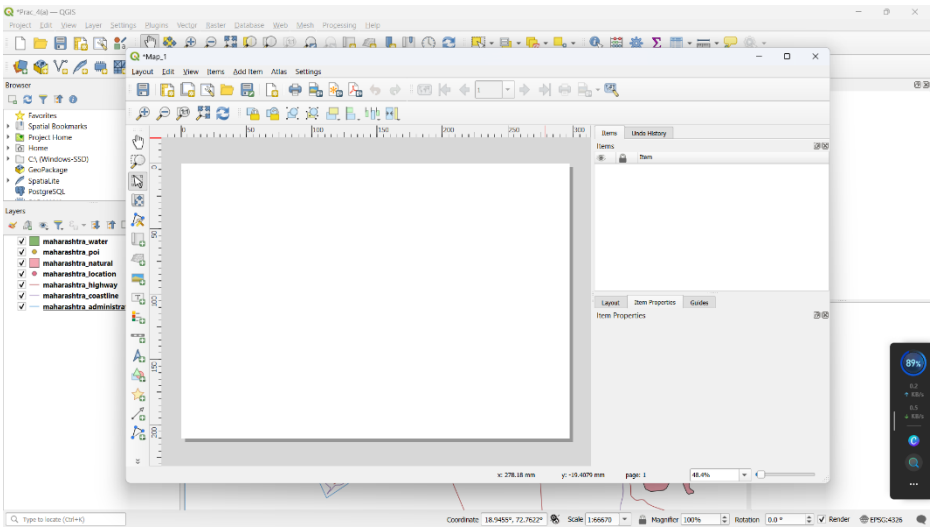
Step 1 : Go to layer -> Add a layer -> Vector Layer -> From the Dataset go to Prac-3 -> A -> import all the .shp files from all Maharashtra named folder.



Step 2 : Zoom into the Mumbai Area.

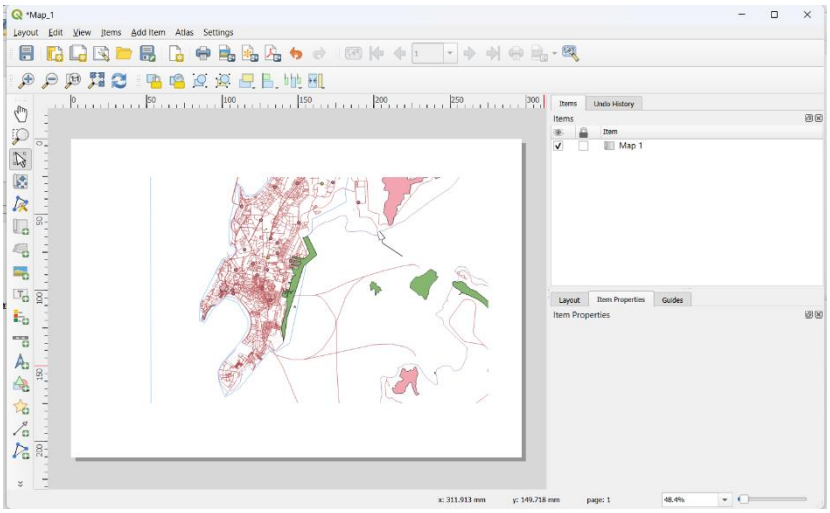


Step 3 : Go to Project -> New Print Layout -> Give a unique name to the Map -> Click on save.
(You will now be able to see a canvas window to make Map)

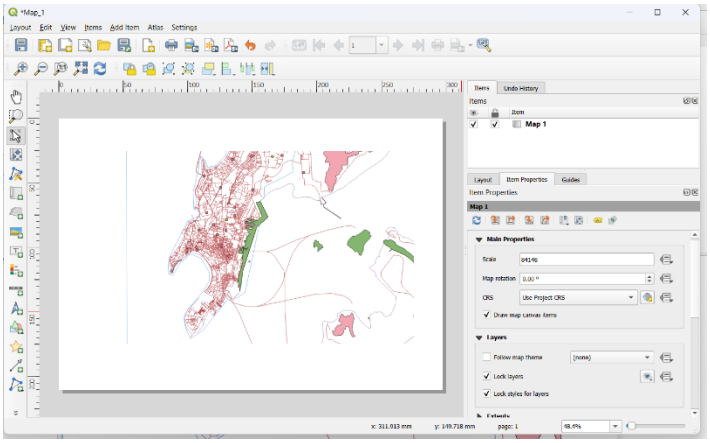


Step 4 : On the canvas window toolbar, go to Add items -> Add Map.
(After clicking move to canvas area and you will be able to a cursor appearing to make map)

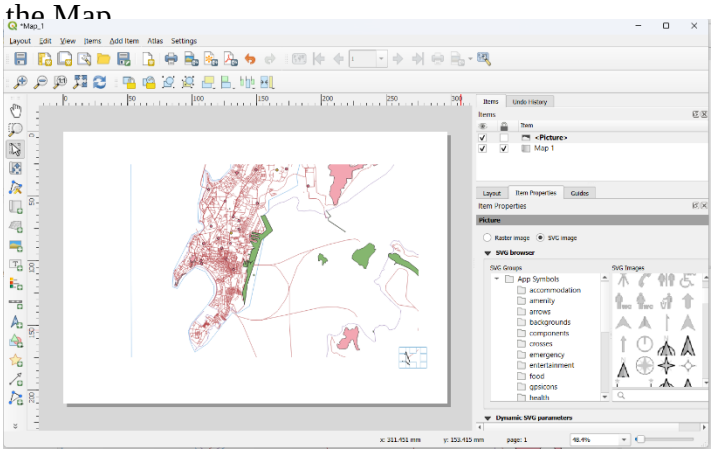
Step 5 : Drag the cursor to from point to point. You will now will be able to zoomed in map of Mumbai)



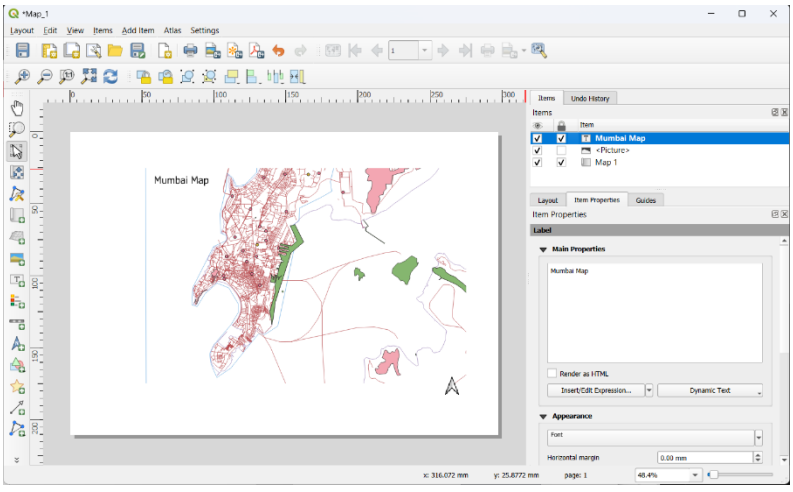
Step 6 : On the Right you will be able to see the Item Properties. In the Layers section -> Check the last two checkboxes.



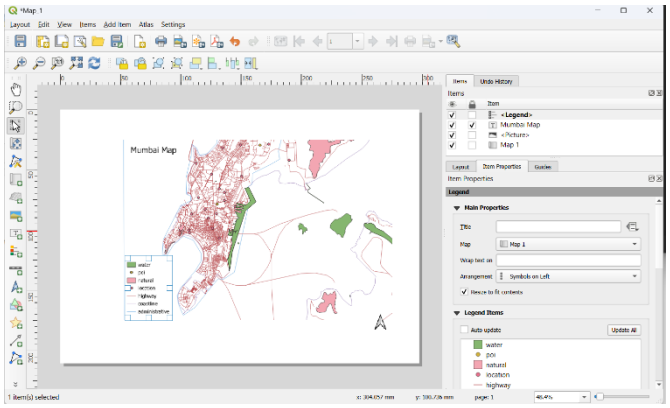
Step 7 : To Make North Mark, go to Add Item -> Add Picture -> Select the section on the map you want to place the image by drag dropping the cursor. -> From the right side you will be able to see several svg images -> Choose the relevant svg mark and you will be able to see the North Mark on the Map



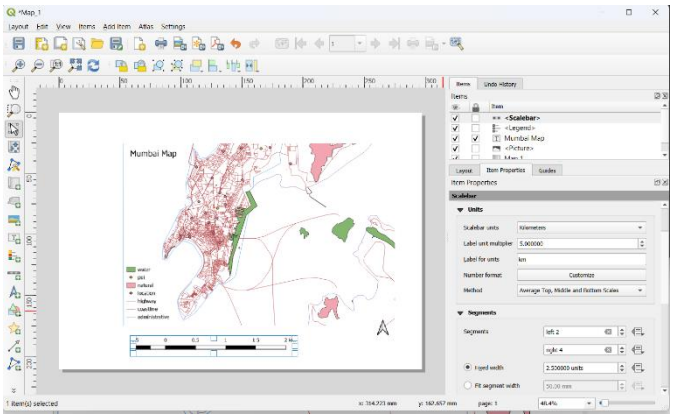
Step 8 : To Add a Label, go to Add Item -> Add Label -> Select the Area on the canvas -> From the right side panel under the Item properties -> Main Properties -> Give the name of the map -> To adjust the font typographies, from the Appearance section -> Click on the font dropdown and adjust the typographies.



Step 9 : To Add a Legend, go to Add Item -> Add Legend -> Select the Area on the canvas -> From the right side panel -> Under the Legend Items section -> Un-tik the Auto Update checkbox -> rename the values by removing "maharashtra" at the beginning for every values by double clicking on it.

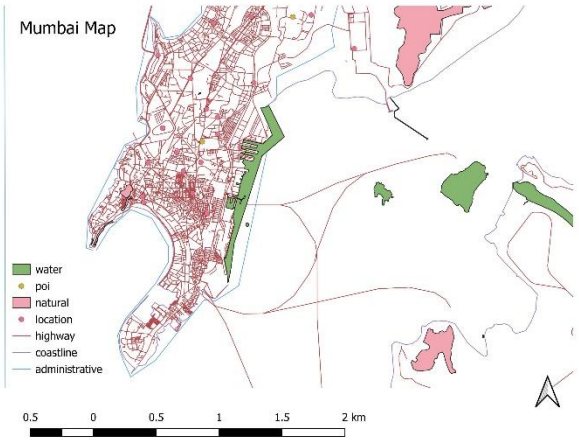


Step 10 : To add a Scale Bar, go to Add Item -> Add Scale Bar -> Select the Area on the Canvas -> From the right side panel adjust the values under Unit section and Segment section as required.



Step 11 : To export this Map, from the toolbar go to Layout -> Export as Image -> Select the image type as Jpeg and Save the map.

(Final jpeg image of the map)

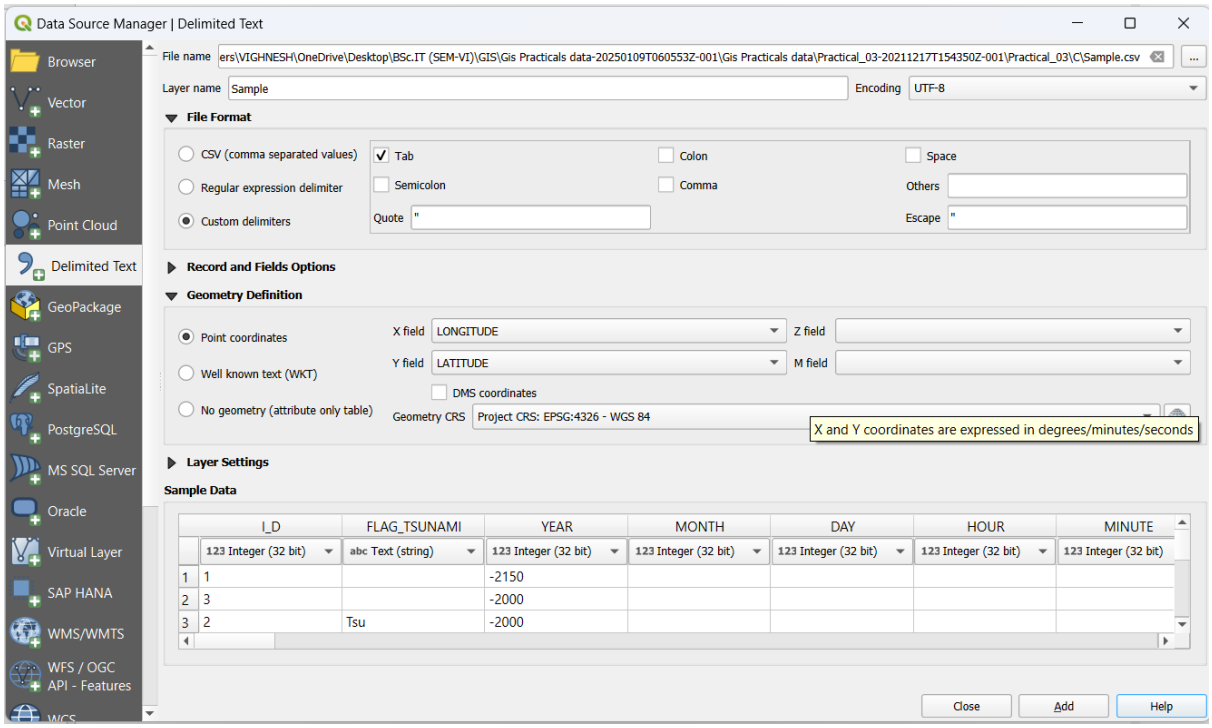


(b) Importing Spreadsheets or CSV files.

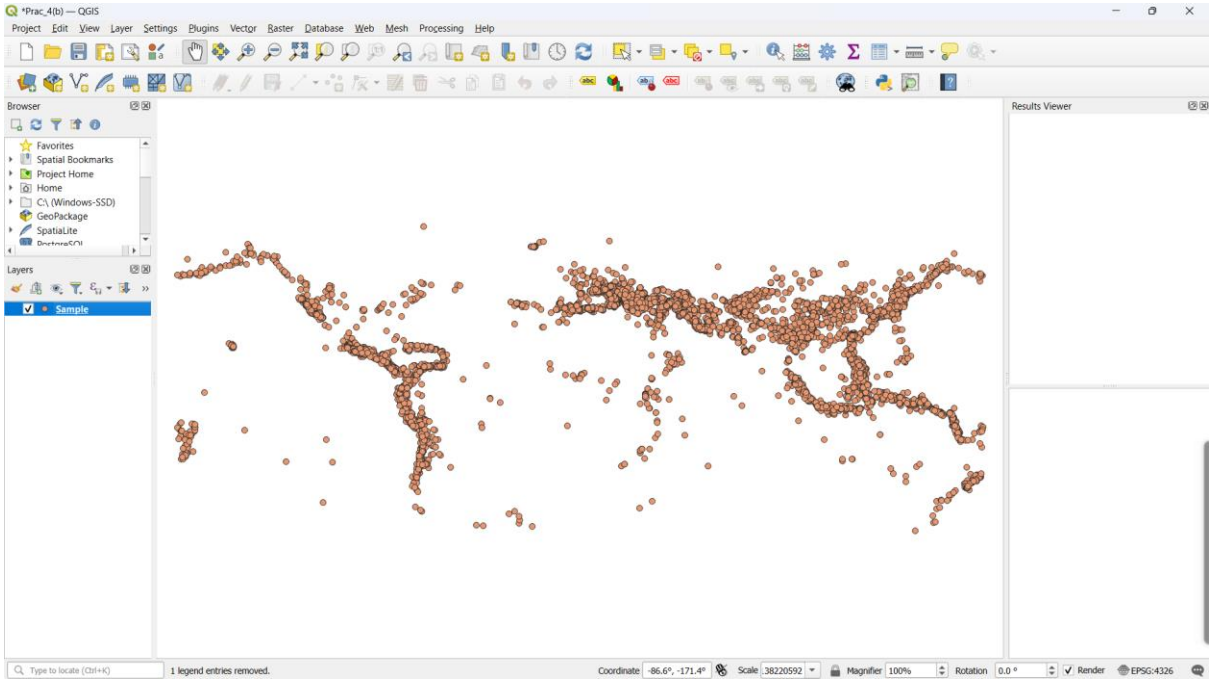
Step 1: To import a spreadsheet/csv file, from the Toolbar go to Layer -> Add Delimited Text Layer -> Now you will be able to see a pop-up window.

Step 2 : From the Dataset go to Practical-3 -> C folder -> Sample.csv

Step 3 :Check the Tab checkbox under the File Format Section -> In Geometry Definition the X-field and Y-field should be LONGITUDE & LATITUDE respectively. -> The Geometry CRS should be EPSG:-4326. -> Click on Add



Final Output:

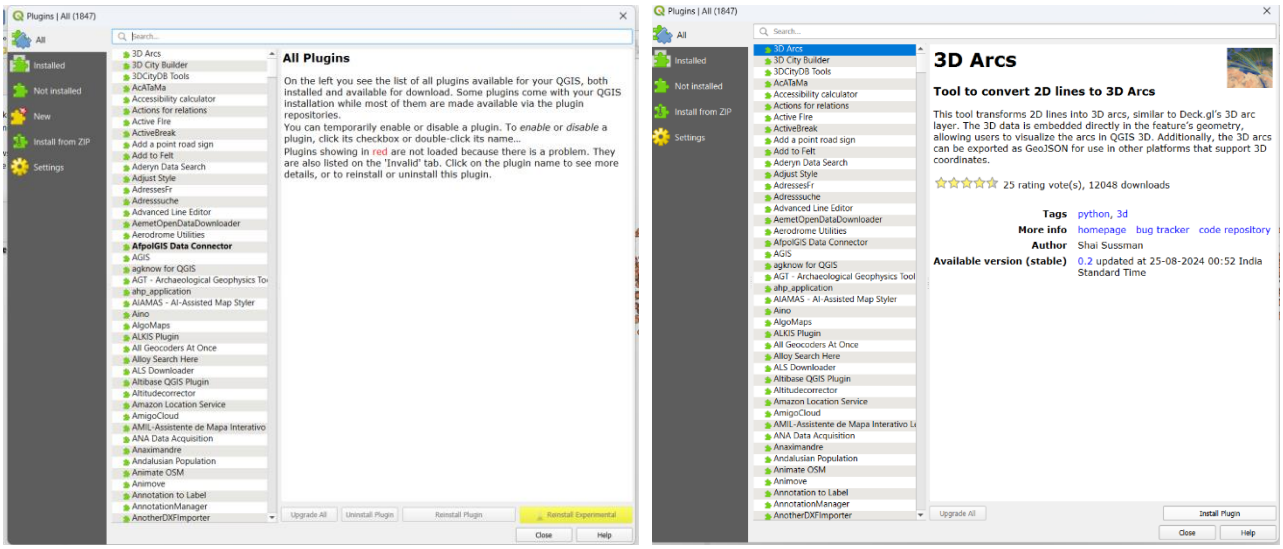


(c) Using Plugins.

Core plugins are already part of the standard QGIS installation. To use these, just enable them.

Step 1: From the Menu Bar Click on Plugins -> Manage and Install Plugins.

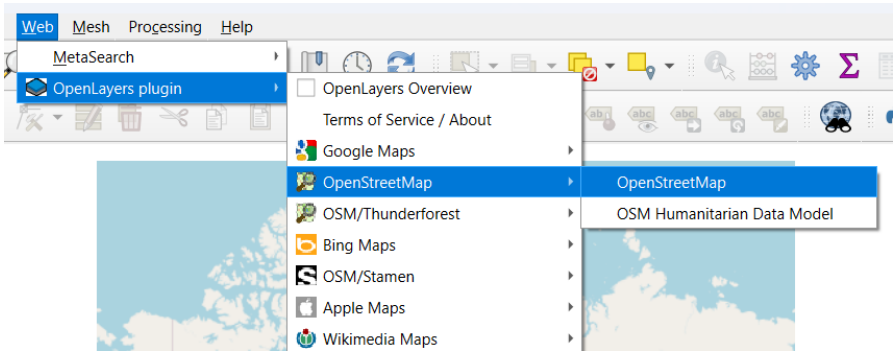
Step 2 : To use any plugins -> Click on the required plugin -> Click on Install



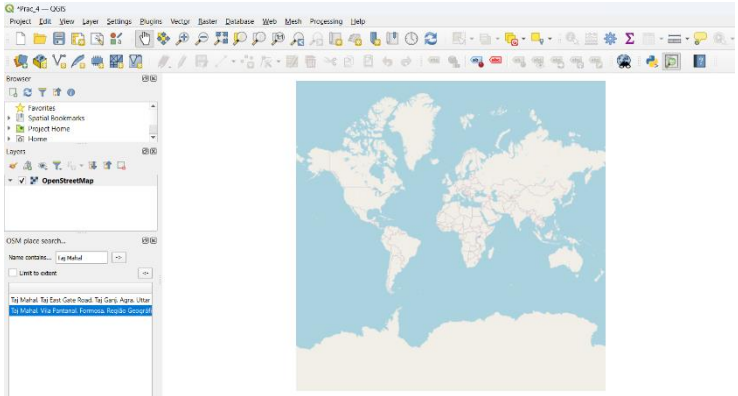
(d) Searching and Downloading OpenStreetMap Data

Step 1: To Download an OpenStreetMapData, go to Plugins and install OpenLayers Plugin and OSM place search plugin.

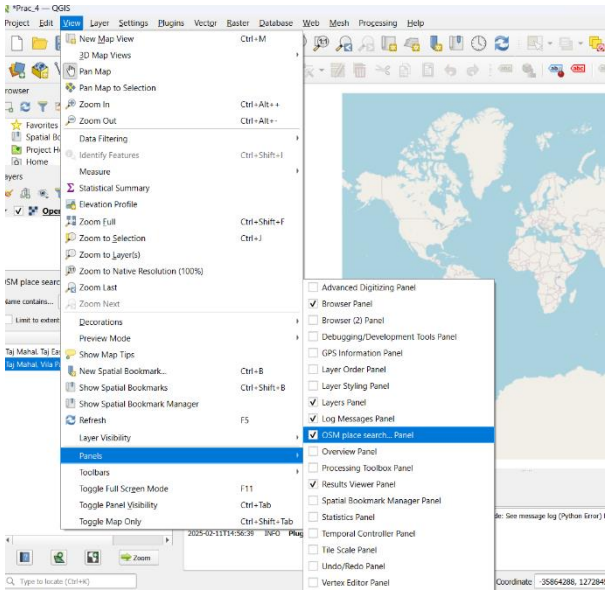
Step 2: Form the MenuBar, go to Web -> OpenLayers plugin -> OpenStreetMap -> OpenStreetMap.



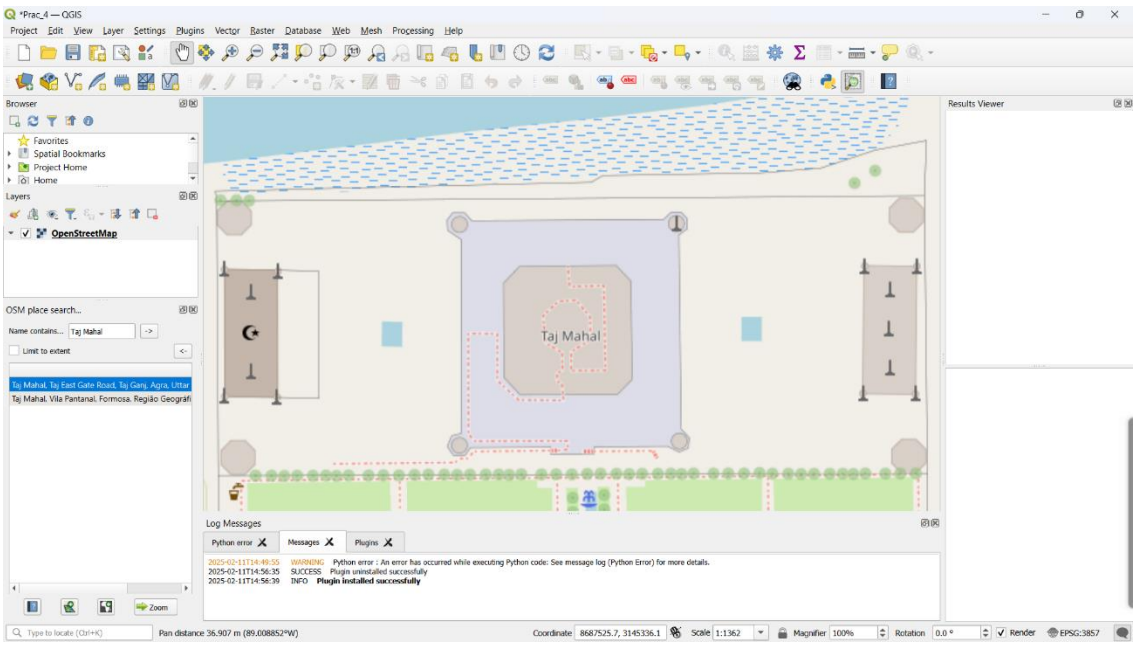
(You will now be able to see a OpenStreet Map.)



Step 3 : Now go to Views -> Panels -> Select OSM place search.



Step 4 : From the left side pane, you will be able to see the OSM place search. Enter your place and click on the button "->". The particular place will be now visible on the screen.



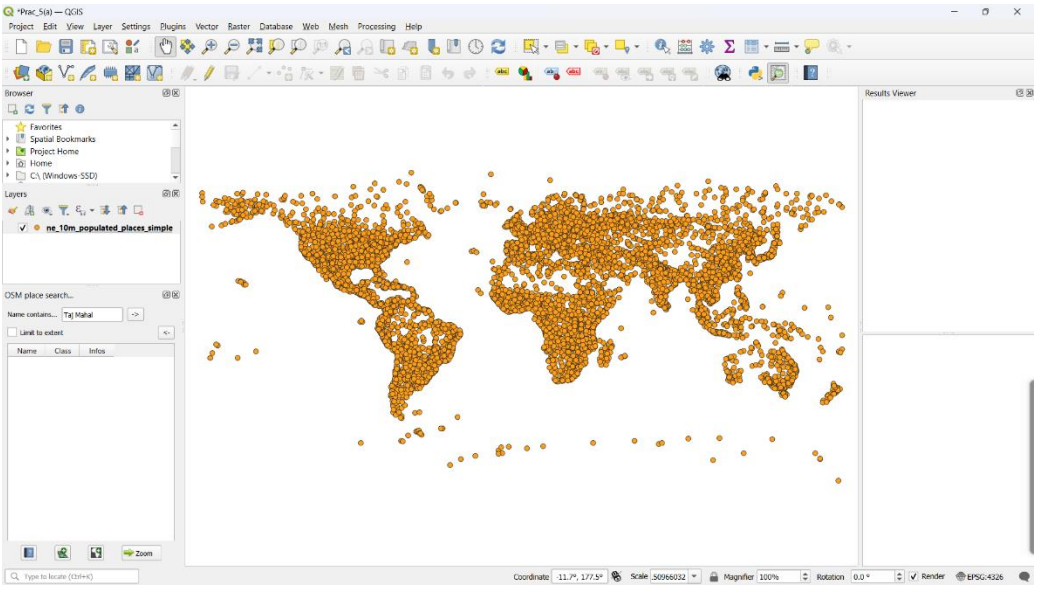
Practical-5:

(a) Working with attributes.

(For working with the attributes, the population factor will be included in this practical)

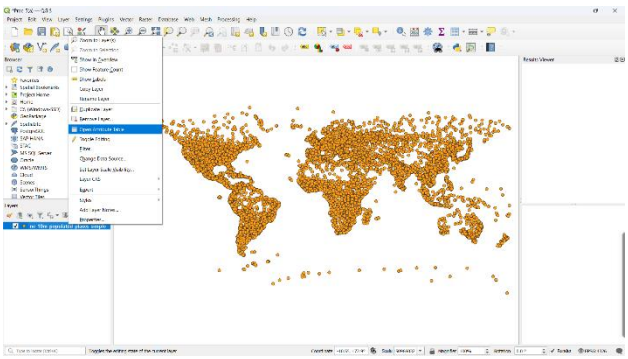
Step 1 : Go to Layer -> Add Layer – Add Vector Layer -> then from the dataset go to Practical_4 -> A folder -> unzip the folder present -> Double click on the "ne_10m_populated_places_simple" folder -> select the "ne_10m_populated_places_simple.shp" file.

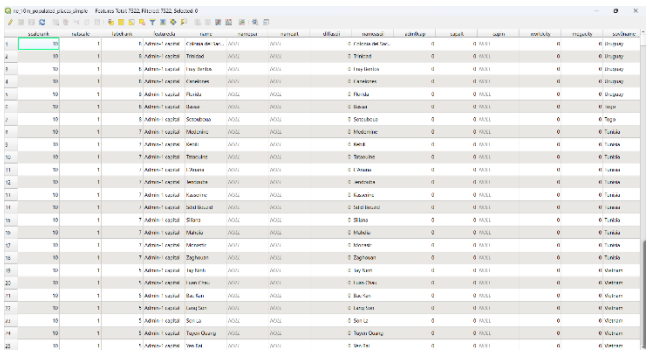
(You will be able to see a vectored format map on the screen.)

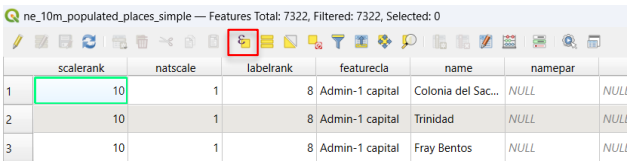


Step 2 : Right click on the vector file -> Click on Open Attribute Table -> You will be able to a set of records in a tabular format. From the Menubar click on the Epsilon Sign present.

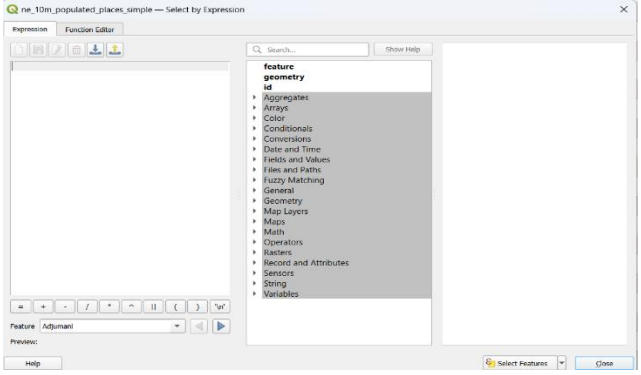
(A Calculative Window will appear on the screen.)



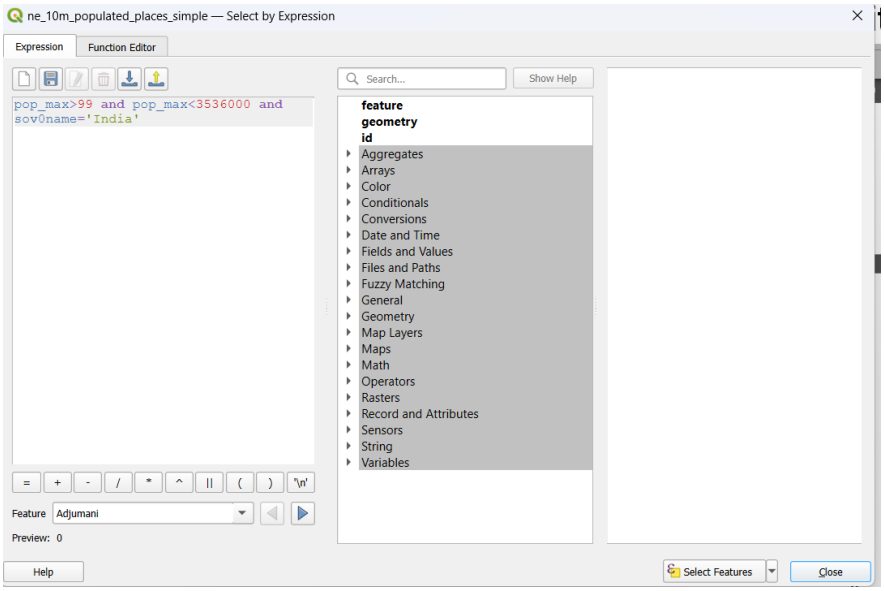




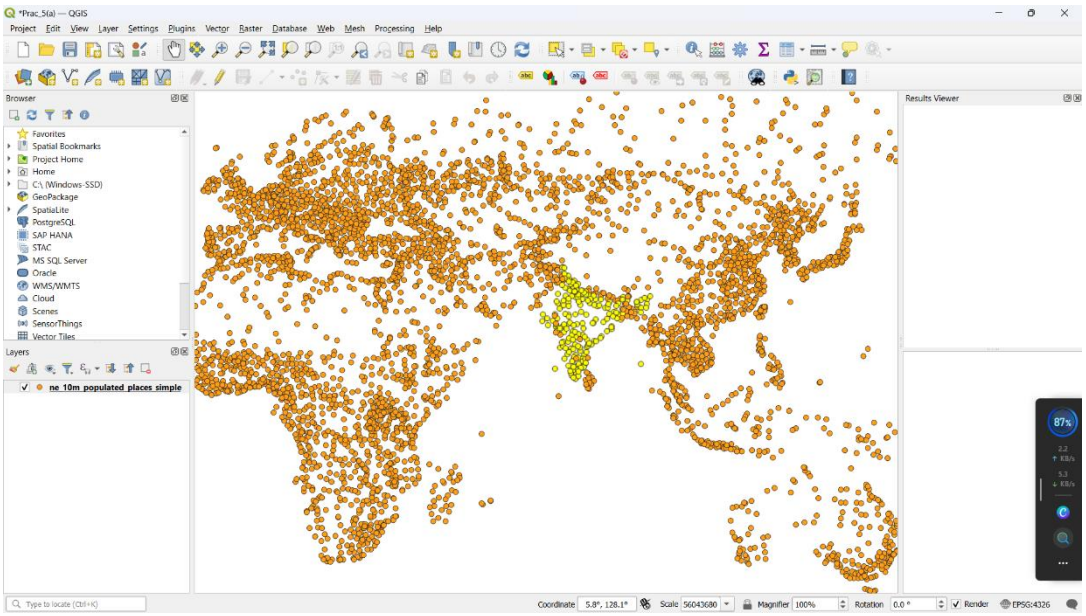
	scalerank	natscale	labelrank	featurecla	name	namepar	
1	10	1	8	Admin-1 capital	Colonia del Sac...	NULL	NULL
2	10	1	8	Admin-1 capital	Trinidad	NULL	NULL
3	10	1	8	Admin-1 capital	Fray Bentos	NULL	NULL



Step 3 : To perform a simple attribute working, add the following expression : “ pop_max>99 and pop_max<3536000 and sov0name='India' ”

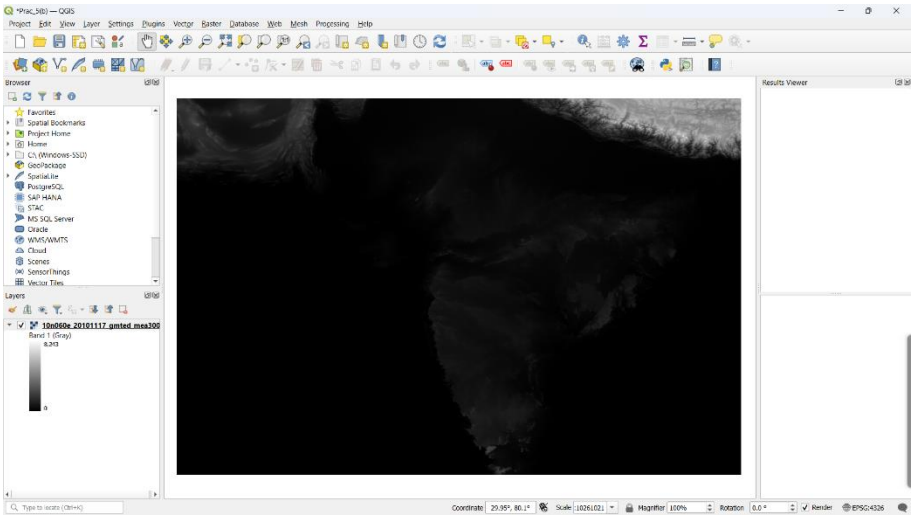


You will now be able to see the highlighted points that relatively corresponds with value expression mentioned above.

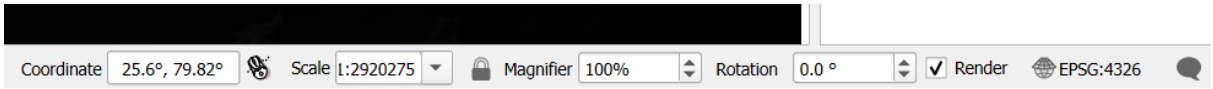


(b) Terrain Data

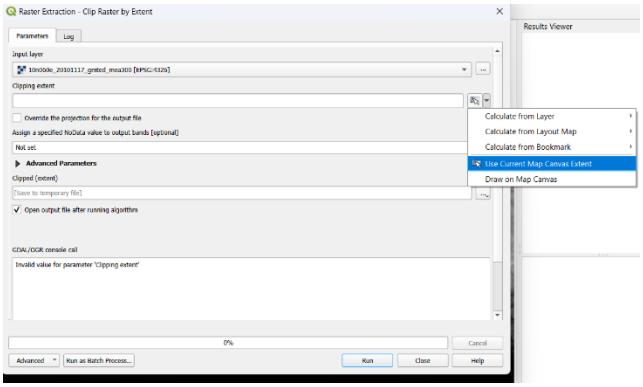
Step 1 : Go to Layer -> Add Layer -> Add Raster Layer -> From the dataset select Practical_4 folder -> DATA folder -> unzip the folder present -> From the GMTED2010N10E060_300 folder Select -> 10n060e_20101117_gmted_mea300 tif file. (The raster image will be appeared on the screen in the following manner)

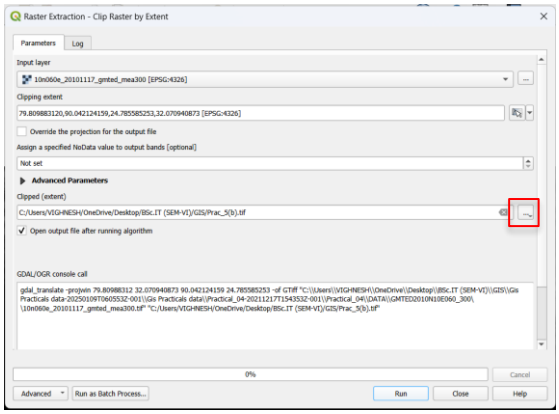


Step 2 : Set the co-ordinates value as " 25.6,79.82" and scale value as : "L:2920275" from the co-ordinate and scale specifications present at the very bottom.



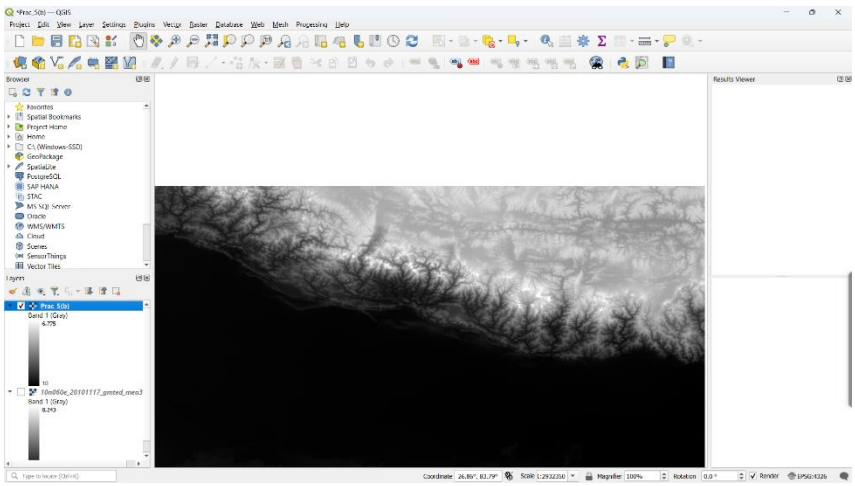
Step 3 : Go to Raster -> Extraction -> Clip Raster by Extent. From the dropdown of Clipping Extent -> Select Use Current Map Canvas Extent -> Save the file with a suitable name and Click on Run.





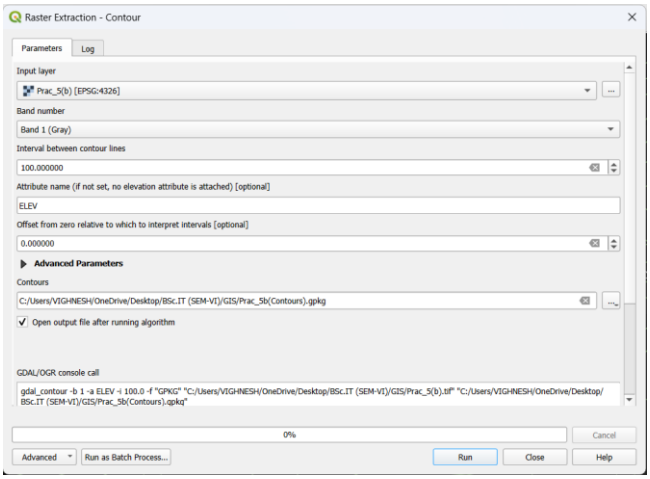
(The clipped raster will be appeared on the screen**.)**

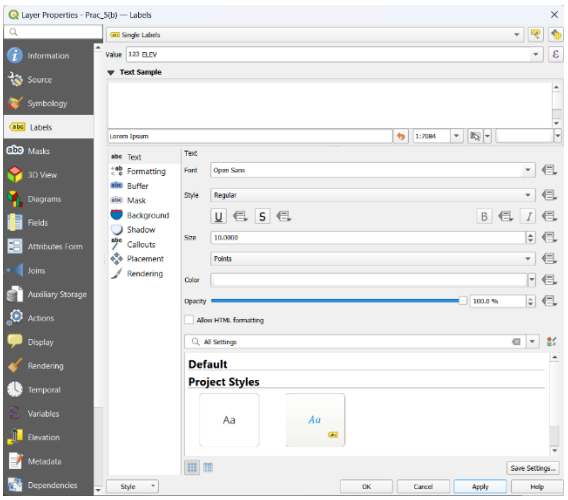
Step 4 : Deselect the original raster and keep the clipped raster image on the screen.



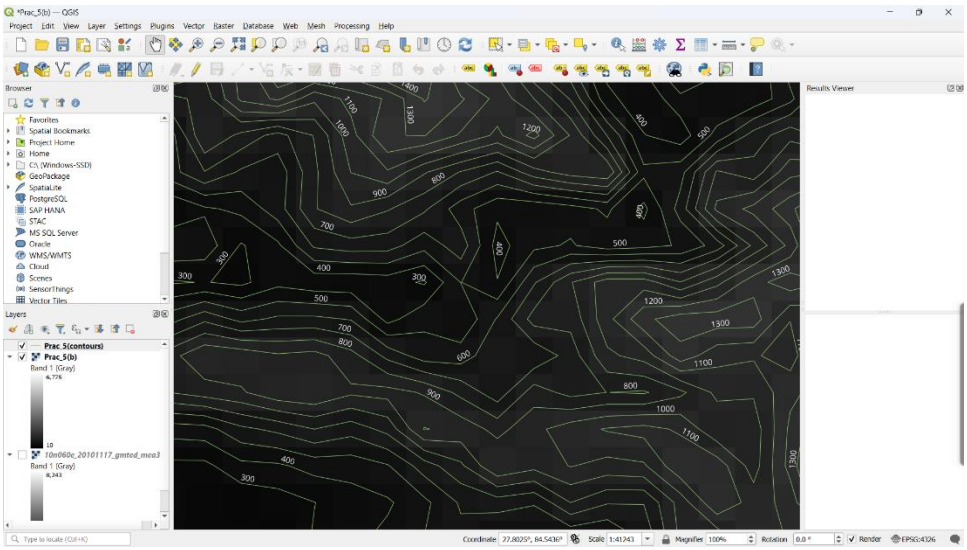
(For Contour Lines)

Step 5 : Go to Raster -> Extraction -> Contour. You will be able to see a dialogue box with the predefined values. Save this contour file and click on Run. Right click on the Contour file formed -> Labels -> Single Labels -> Select column “ELEV” -> Change the color(if required) -> Click on Ok.



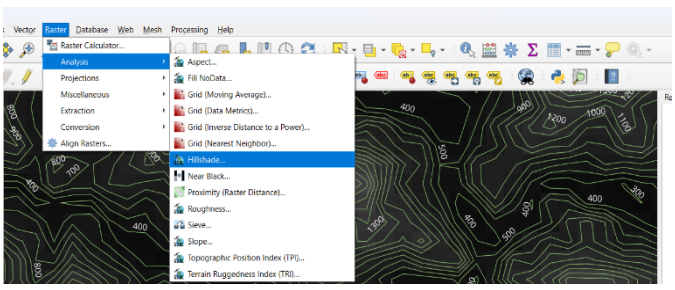


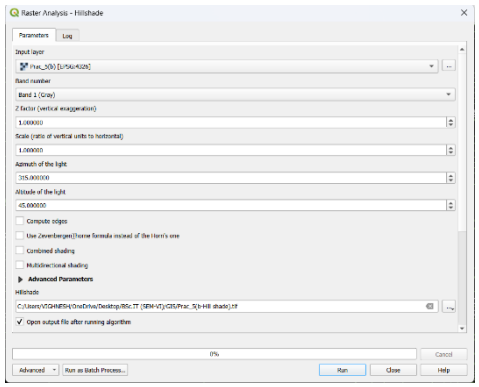
Step 6 : Zoom in to the image generated and you will be able to see the contour lines with their specified elevation values.



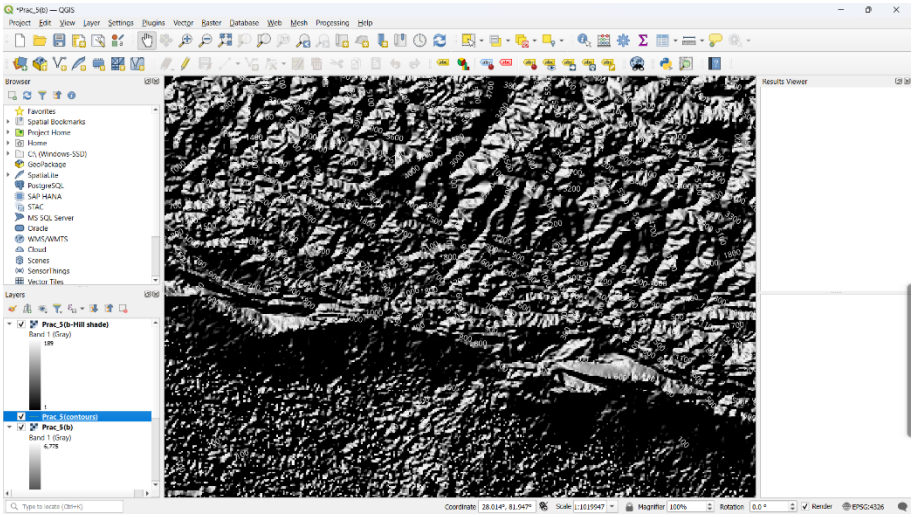
(For Hilly Shade Surface)

Step 7 : Go to Raster -> Analysis -> HillShade. A window will appear -> Select the clipped raster file -> Save the file and click on Run





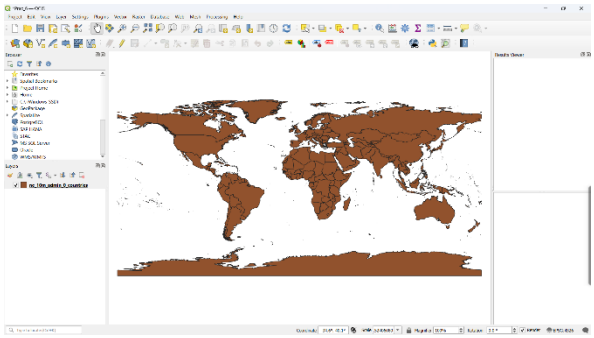
(You will be able to see the below output)



Practical-6:

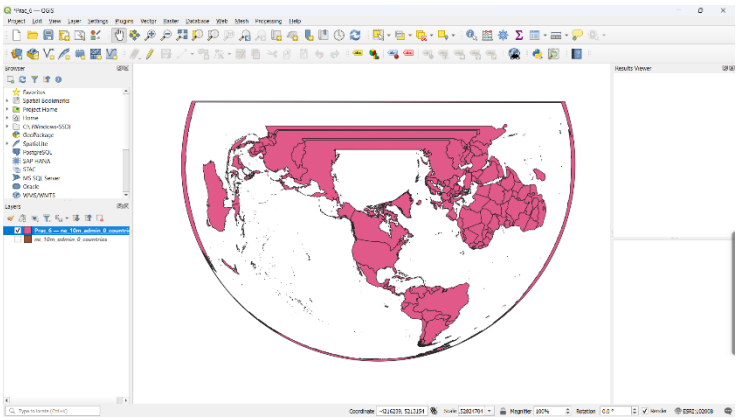
(a) Working with Projections and WMS Data

Step 1 : Go to Layer -> Add Layer -> Add Vector Layer -> From dataset -> Practical_5 -> DATA folder -> ne_10m_admin_0_countries folder -> ne_10m_admin_0_countries.shp file.
(A map will appear on the screen)

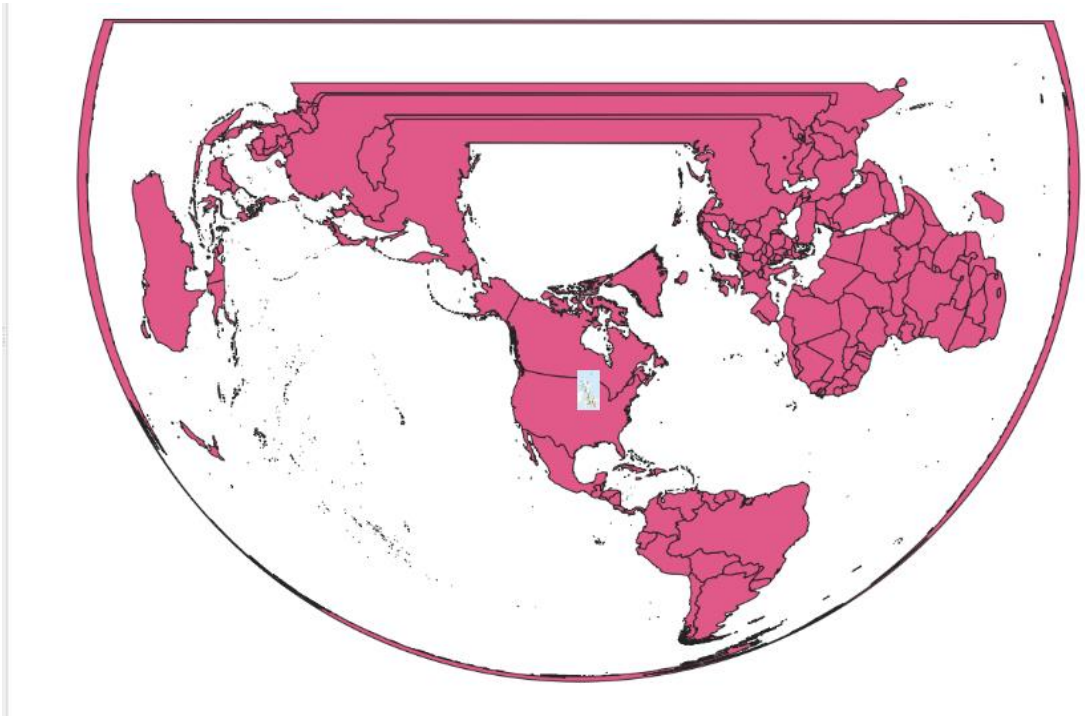


Step 2 : Go to Layer -> Save As -> (A dialog box will appear), Save the file with the suitable name -> Set the CRS as : ESRI :102008 – North_America_Albers_Equal_Area_Conic.-> Click on Ok.

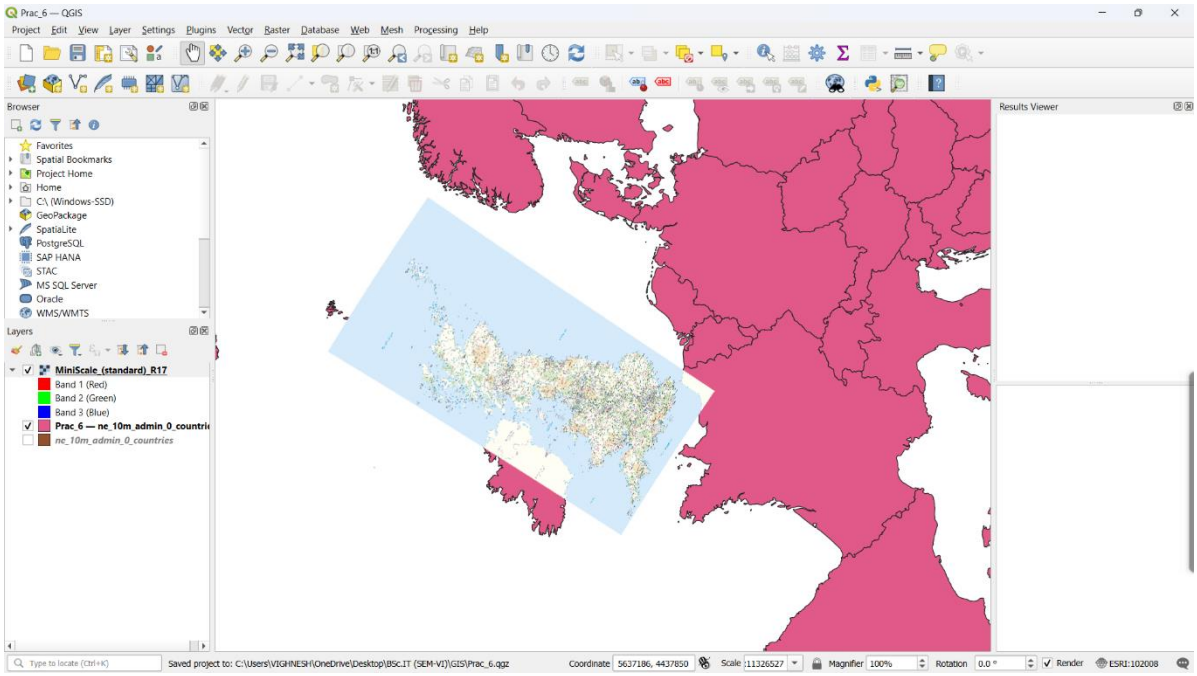
Step 3 : Deselect the original vector file. -> Right click on the new vector file -> Layer CRS -> Set Project CRS from Layer.
(You will now be able to see the conical world map)



Step 4 : Layer -> Add Layer -> Add Raster Layer -> Practical_05->DATA->minisc_gb->minisc_gb->data->RGB_TIF_compressed -> MiniScale_(standard)_R17.tif -> Add
(A Raster Image of Great Britan will appear on the conical map at different location)



Step 5 : Layer -> Set CRS of Layers -> Set the CRS for the current layer as : 27700 -> Click on OK.
(You will now be able to see the raster image is sanctioned at the right place.)



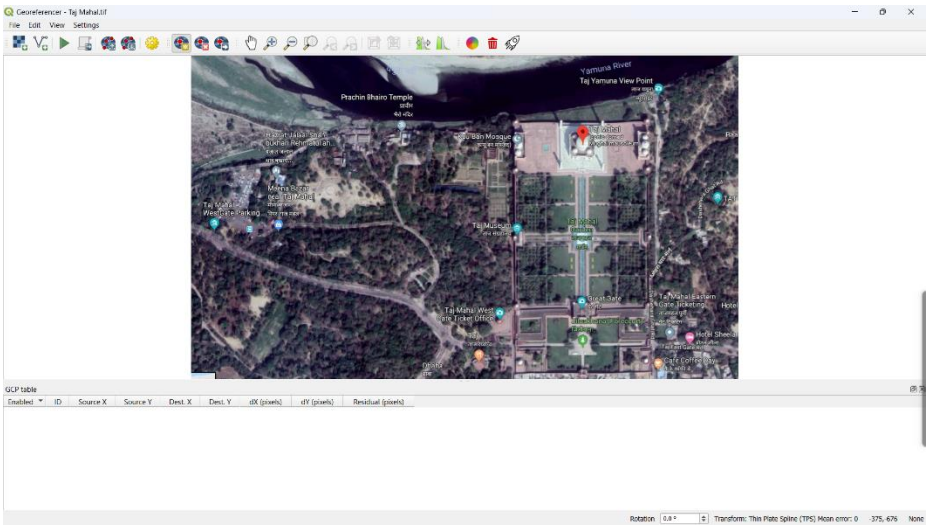
Practical-7:

(a) Georeferencing TopoSheets and Scanned Maps.

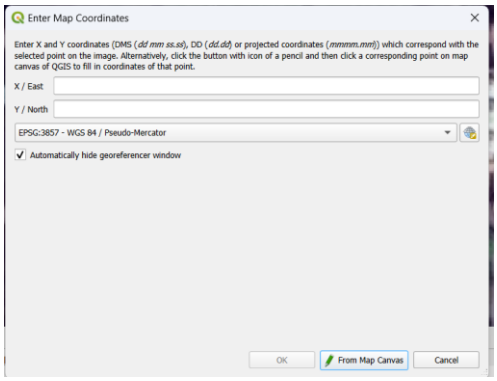
Step 1: Add the OpenStreetMap as done previously in Practical_4(d) -> From OSM place search -> Enter Taj Mahal -> Double click on the India's Taj Mahal.
(You will be able to see the Taj Mahal image placed on the screen).

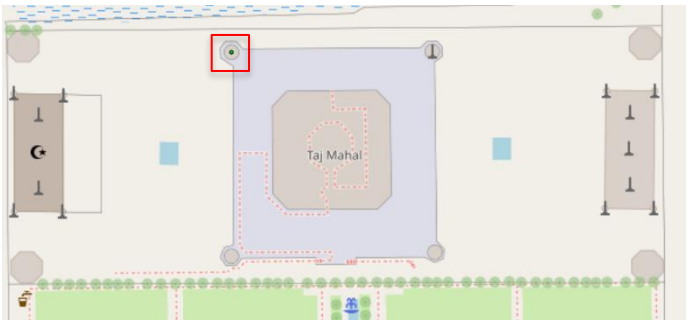
Step 2 : Go to Project -> Properties -> Set the CRS as : 3857.

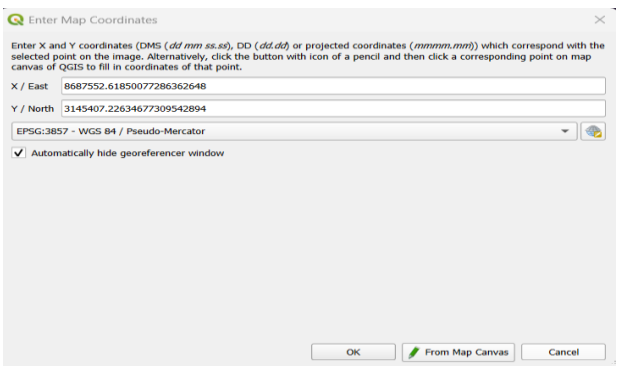
Step 3 : Go to Layer -> Georeferencer -> From the MenuBar -> File -> Open Raster -> from the Practical_6 folder select -> B folder -> Taj Mahal image -> Click on Ok.
(The below output will be visible on the georeferencer window.)



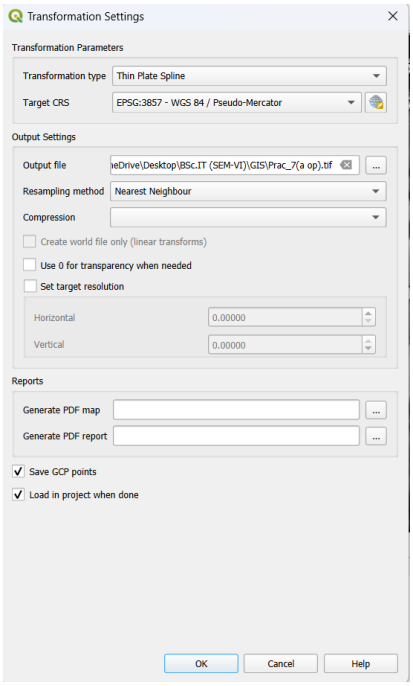
Step 3 : From MenuBar -> Edit -> Add GCP points ->A Cursor will appear on the screen -> Select the required co-ordinates by clicking the cursor on the image -> Select the button "From Map Canvas" -> Place the right point -> Click on Ok. Similarly do for all 4 points



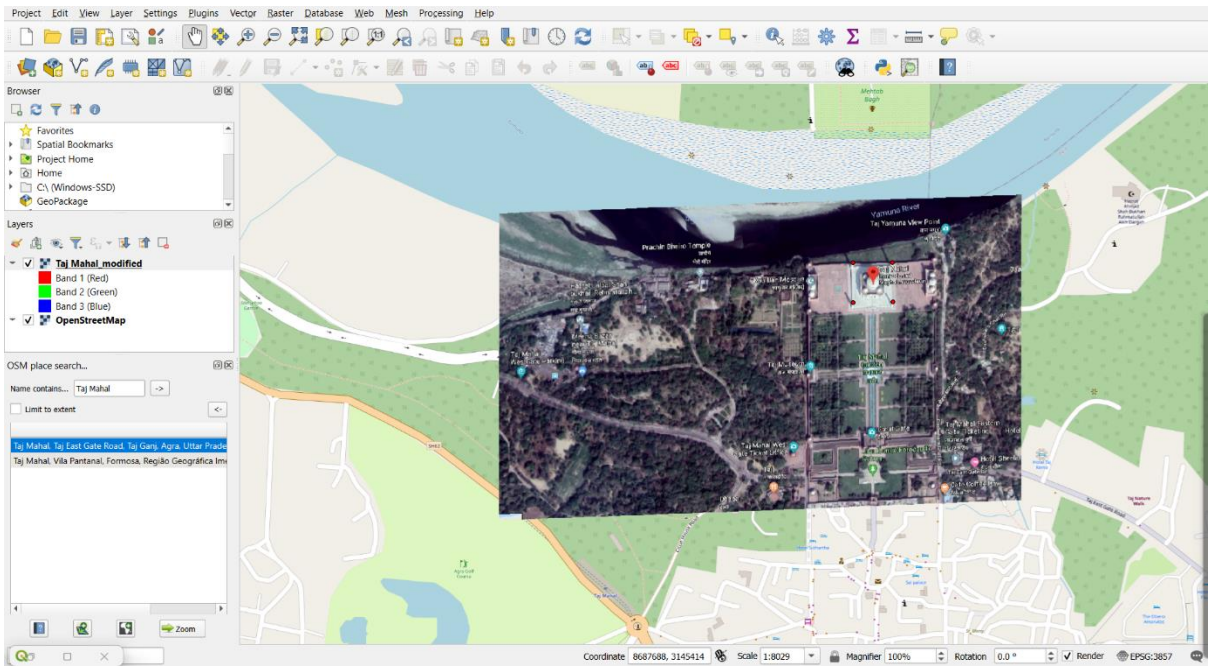




Step 4 : From MenuBar -> Settings -> Transformation Settings -> Select the Transformation Type as “Thine Plate Spline” -> Target CRS : “3857” -> Save the file -> Select “Load in project when done.”



Step 5 : From MenuBar -> File -> Start Georeferncing.
(You will be able to see the below output.)

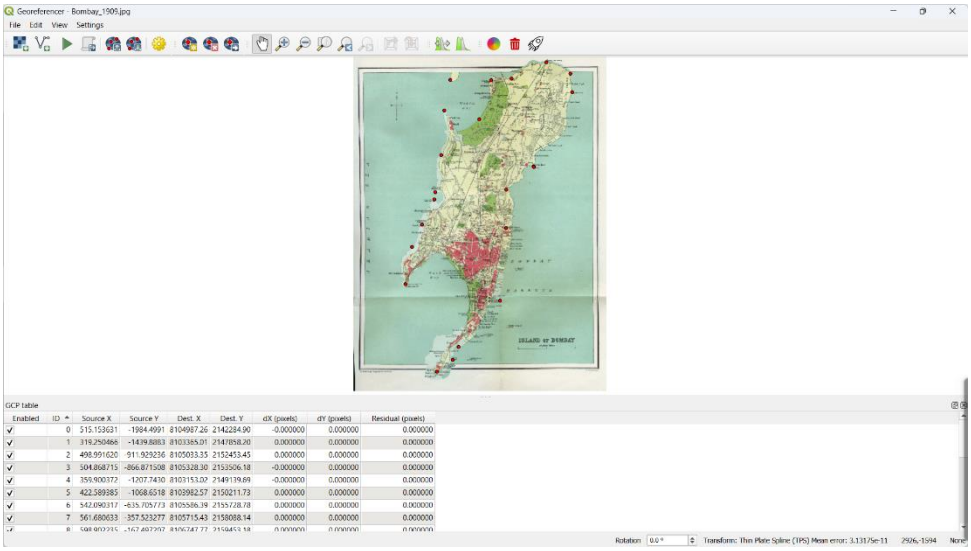


(b) Georeferencing Aerial Imagery.

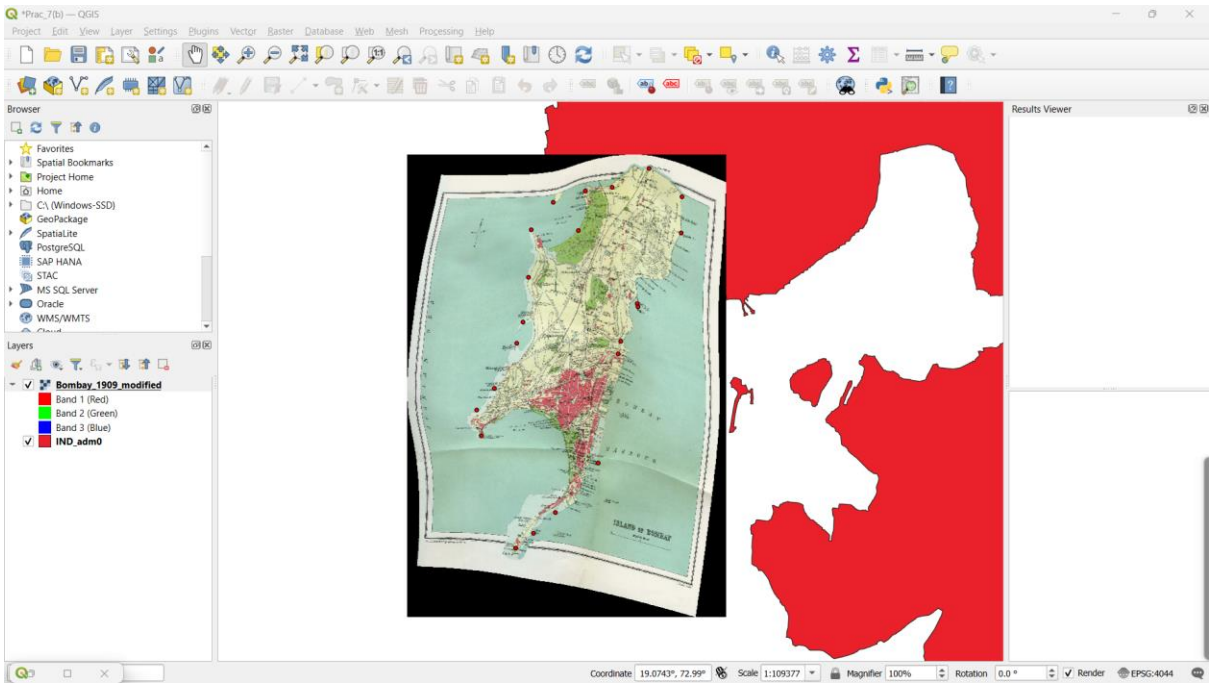
Step 1 : Go to Layer -> Add Layer -> Add Vector Layer -> From the Practical_6 -> A folder -> IND_adm folder -> IND_adm0.shp file.

Step 2 : Go to Layer -> Georeferencer -> From its MenuBar -> File -> Open Raster -> Practical_6 folder -> A folder -> Bombay_1909 file -> Add

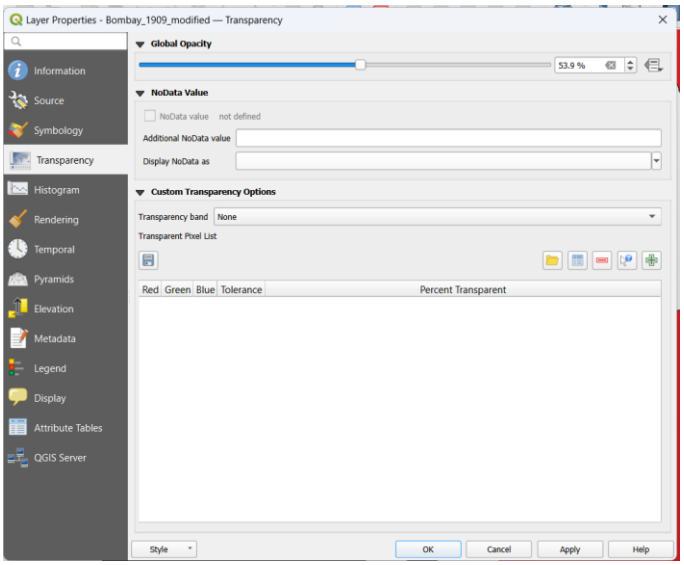
Step 3 : Click on Edit -> Add GCP point -> Select the co-ordinates relatively that will cover whole areas of the map.



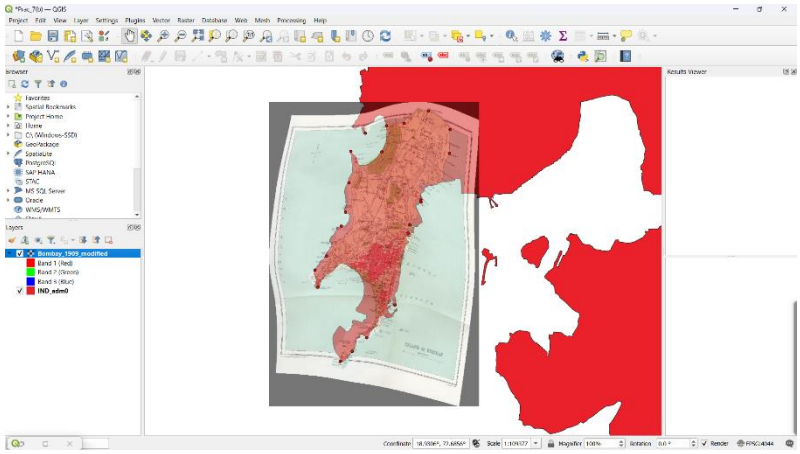
Step 4 : Click on Settings -> Transformation Settings -> Transformation type “Thine Splat Spline” -> Target CRS : “4044” -> Save the File -> Click on OK.
(You will be able to see the below image)



Step 5 : To make it relatively visible with the map, right click on it -> Go to properties -> Transparency -> Adjust the Opacity level - > Click on Ok.

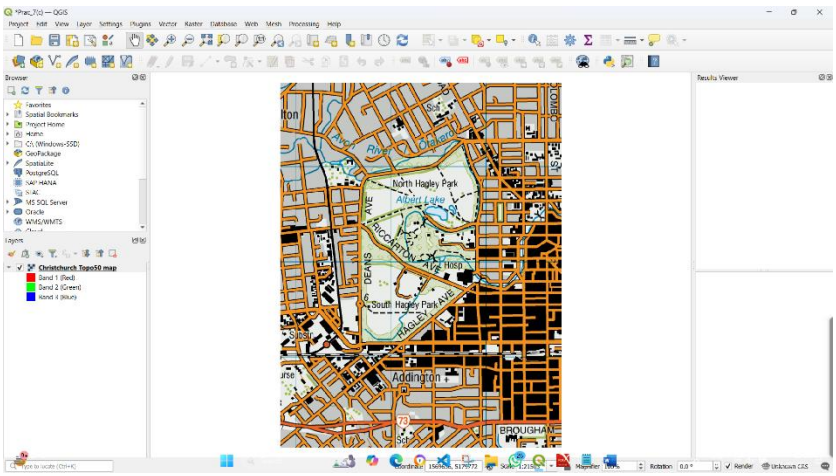


(Final Output)

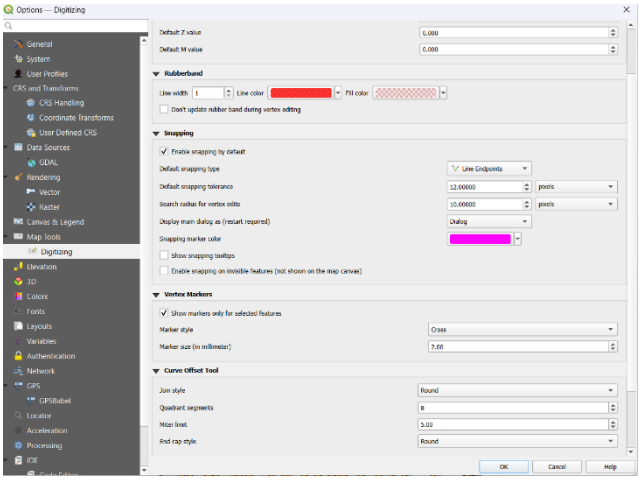


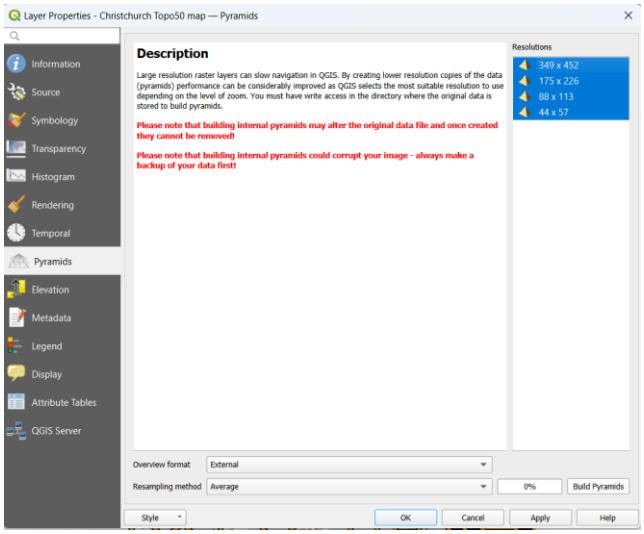
(c) Digitizing Map Data

Step 1 : Go to Layers -> Add Layers -> Raster Layer -> From Practical_6 -> C folder -> Christchurch Topo50 map.tif file -> Click on Add

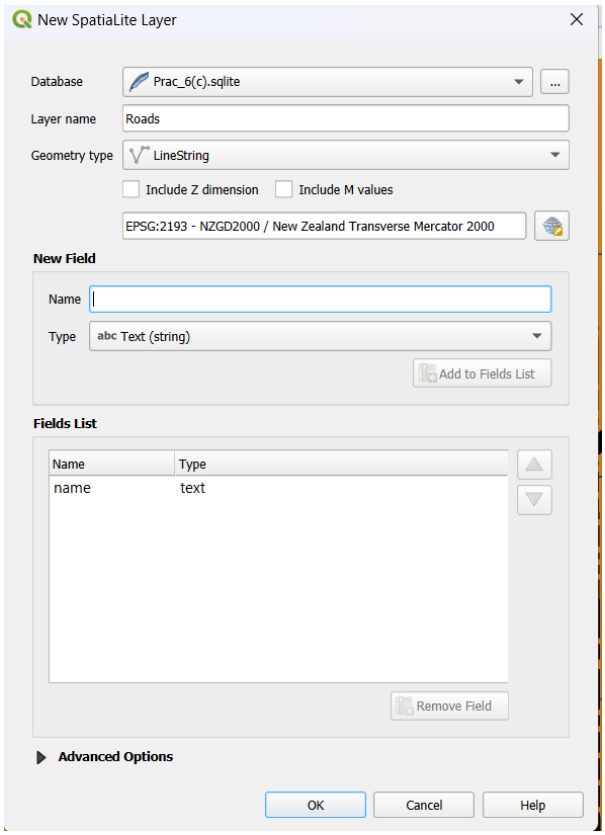


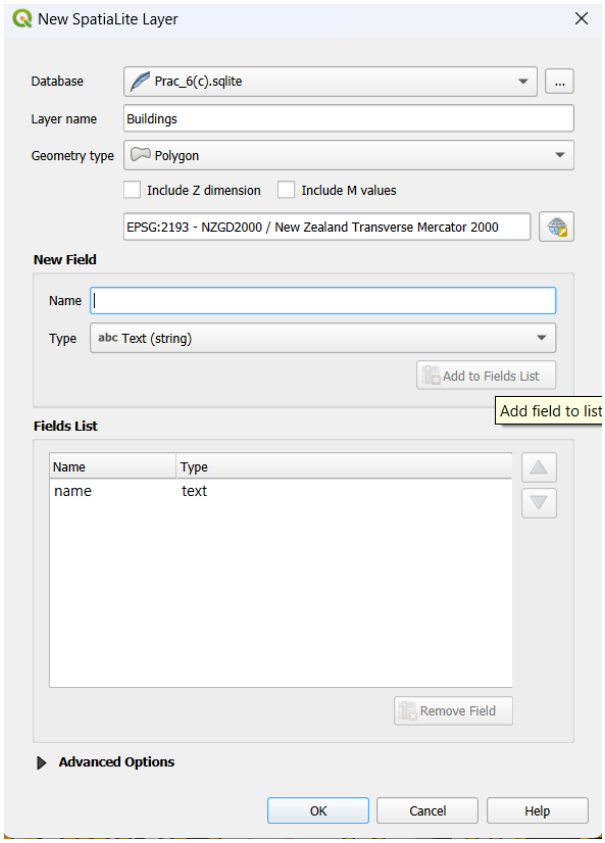
Step 2 : From the MenuBar, go to Settings -> Options -> Digitizing -> Make sure that Default Snapping tool is set to " Line Endpoints."
Step 3 : Right click on Raster Layer -> Properties -> Pyramid -> Select all the resolution -> Build -> Click on Ok.



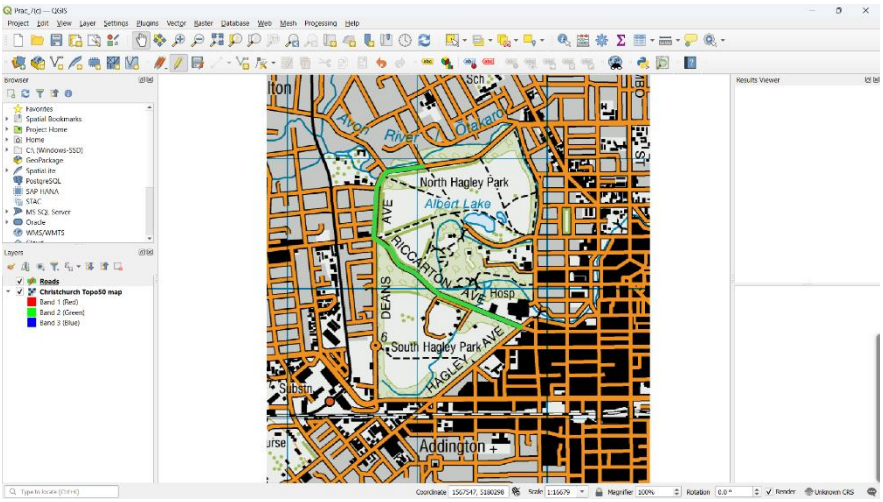


Step 4 : Go to Layer -> Create a Layer -> New SpatiaLite Layer -> (A pop up window will appear), Give the layer name -> Geometry Type -> CRS : 2193 -> Add name in new field -> Add to Field List. (The above one is done for roads layer, similar do for buildings.)

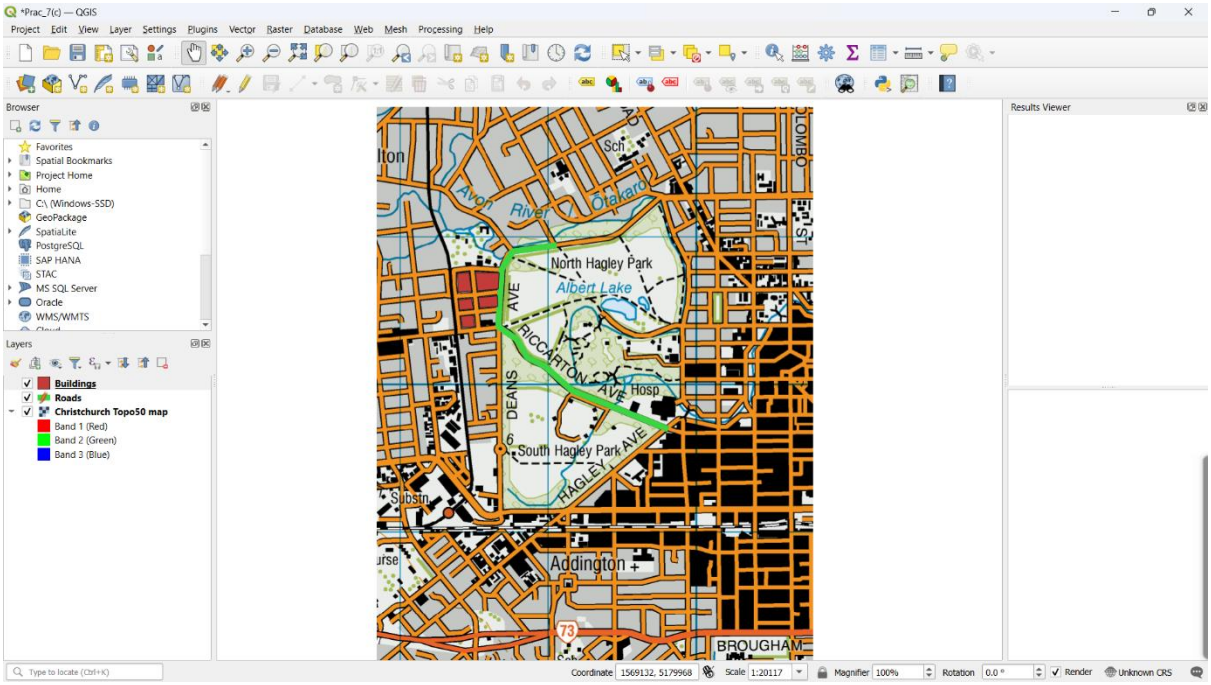




Step 5: Use the toggle button to draw the road -> Markup with the points and make a road -> Give a name to the road -> Right click on the line from the left side -> Properties -> Adjust the color and the width of the line.



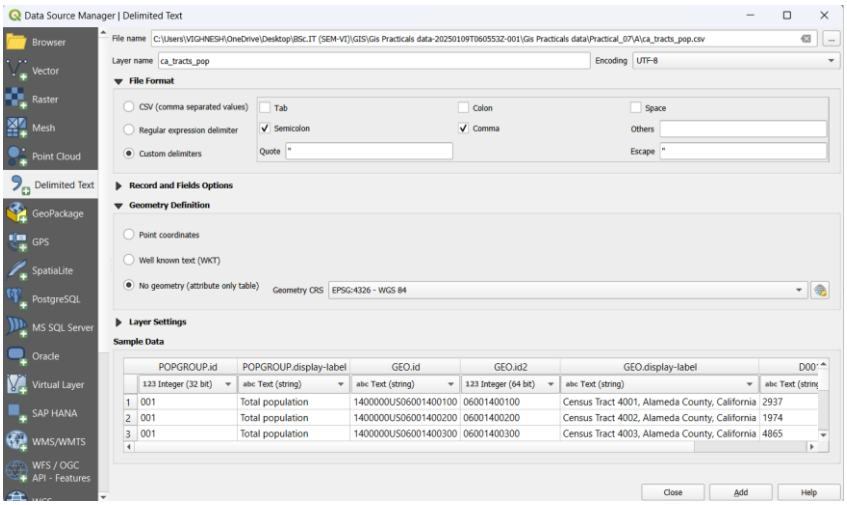
(The above one is done for the roads, similarly do for the buildings and place the shape inside rectangle based empty space)
Final Output :



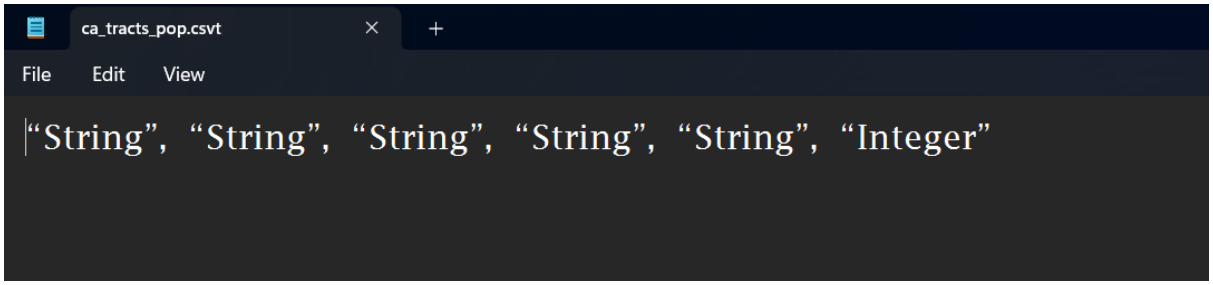
Practical-8: Managing Data Tables and Spatial data Sets:

(a) Table joins.

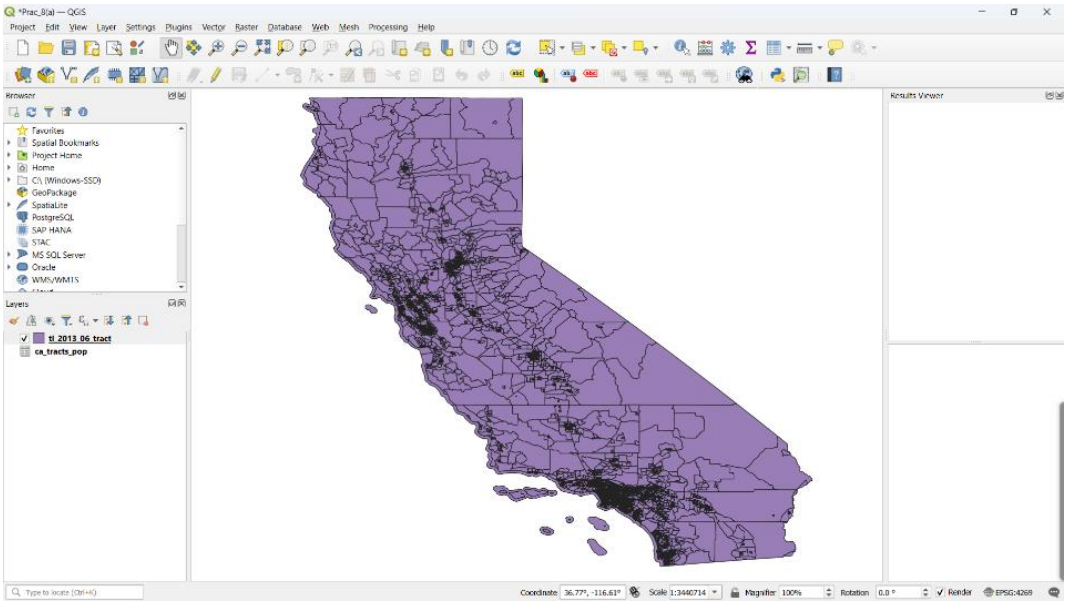
Step 1 : Go to Layer -> Add a Layer -> Add Delimited Text Layer -> From Practical_7 folder select -> A folder -> ca_tracts_pop -> Select (Semicolon, Comma) attributes -> No Geometry -> Add.



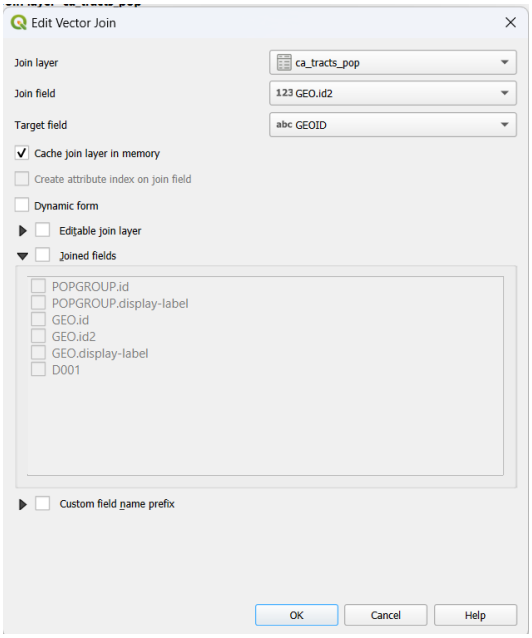
Step 2 : Create a new NOTEPAD file with the file name as “ca_tracts_pop.csvt”. Add the text as : “String”, “String”, “String”, “String”, “String”, “Integer”.

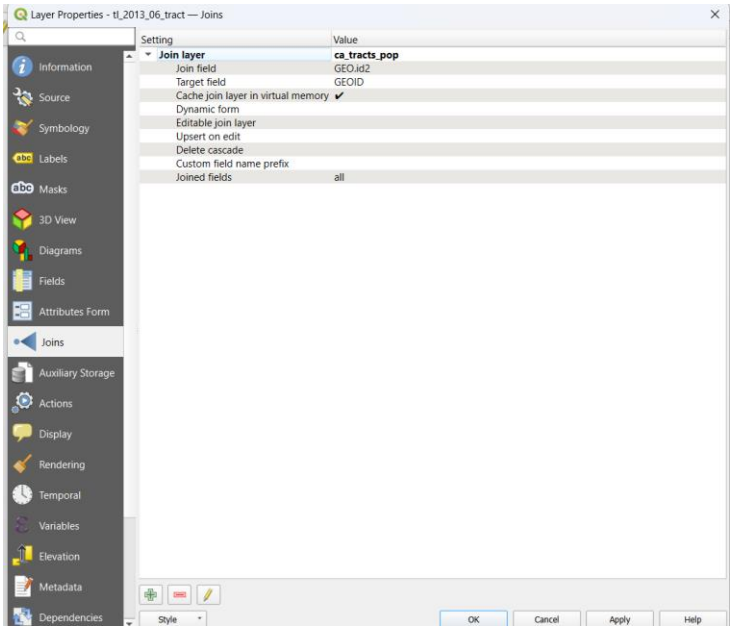


Step 3 : Layer -> Add Layer -> Add Vector Layer -> From Practical_7 folder -> A folder ->tl_2013_06_tract folder -> tl_2013_06_tract.shp file -> Click on Ok.

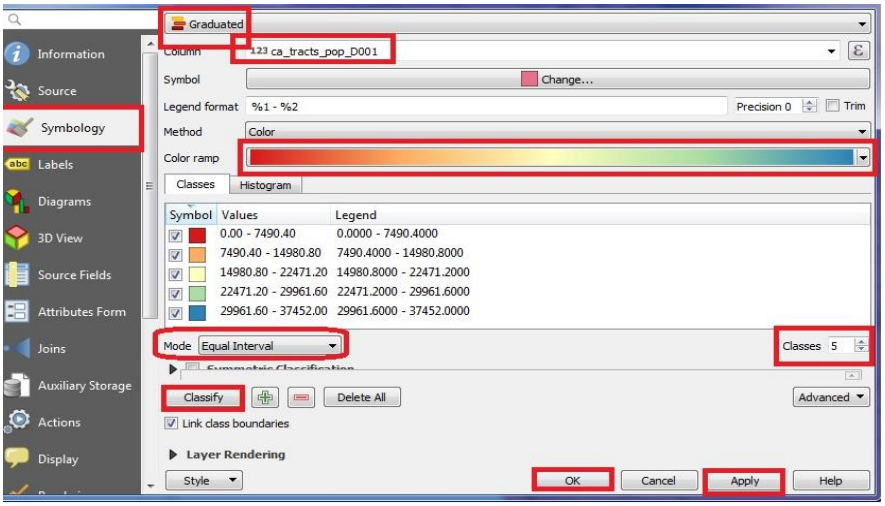


Step 4 : Right Click on the Layer -> Properties -> Joints -> Join Field : “GEO.id2” -> Target Field: “GEOID” -> Ok

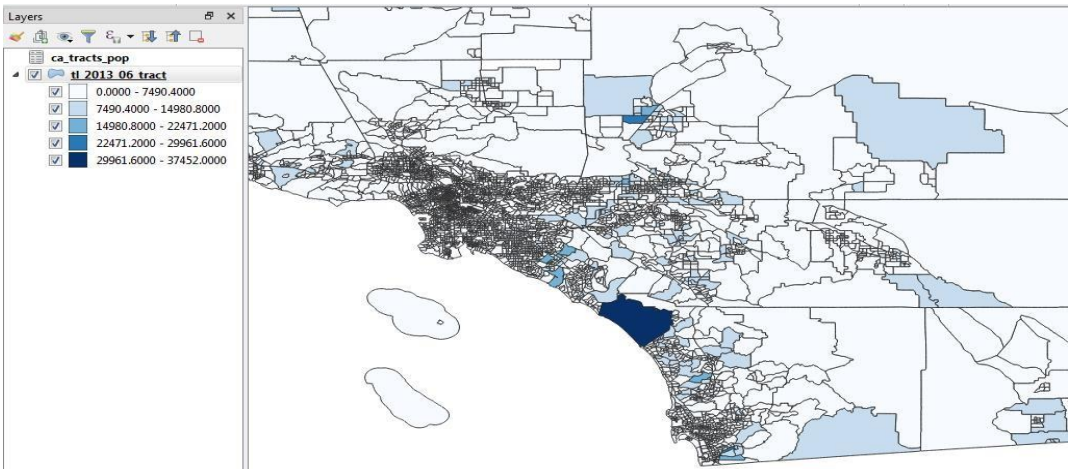




Step 5 : Go to Symbology -> Graduated -> Column : “ca_tracts_pop_D001 -> Equal Interval -> Classify -> Ok.

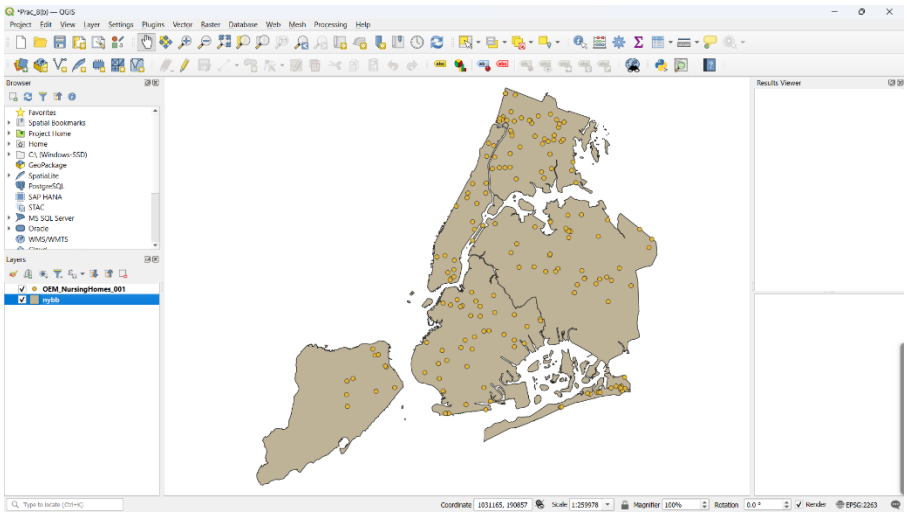


Final output:

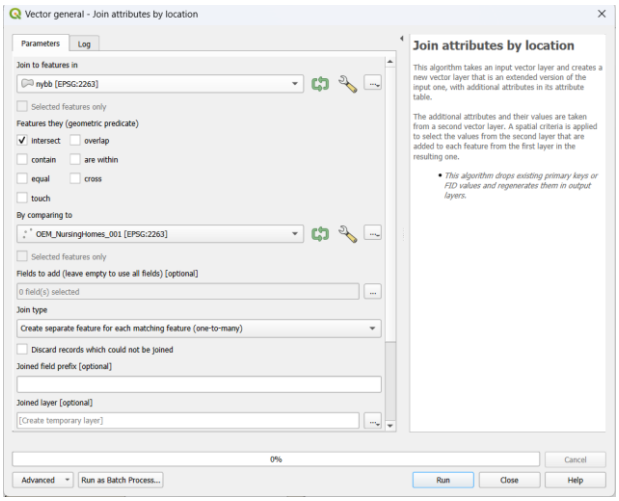


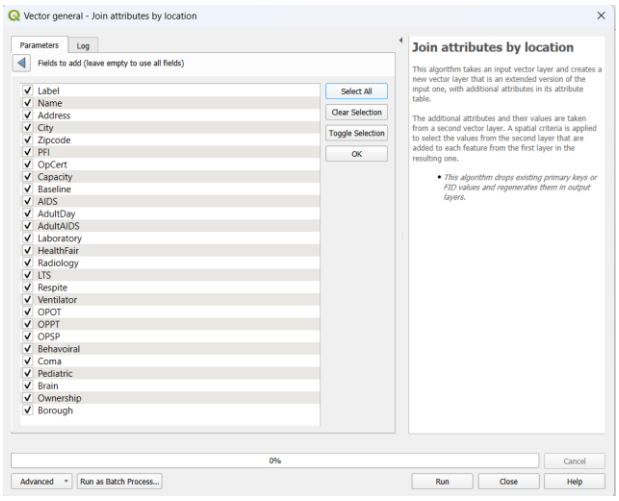
(b) Spatial joins.

Step 1 : Layer -> Add Layer -> Add Vector Layer -> From Practical_7 folder -> B folder -> nybb_12c folder -> nybb_13c_av -> nybb.shp file -> Add. Then also add from OEM_NursingHomes_001 folder -> OEM_NursingHomes_001.shp

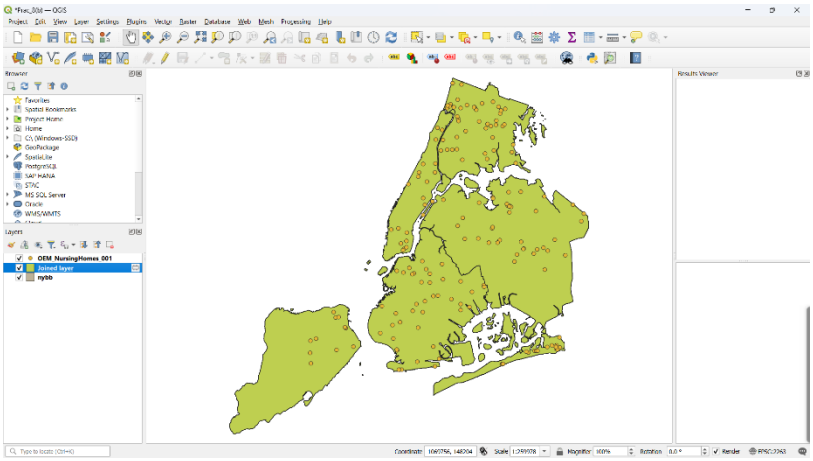


Step 2 : Go to Vector -> Data Management Tools -> Joint Attribute by Location -> Input Layer : nybb -> Join Layer / By comparing : OEM_HursingHomes_001 -> Fields to add (Select all) -> Run.

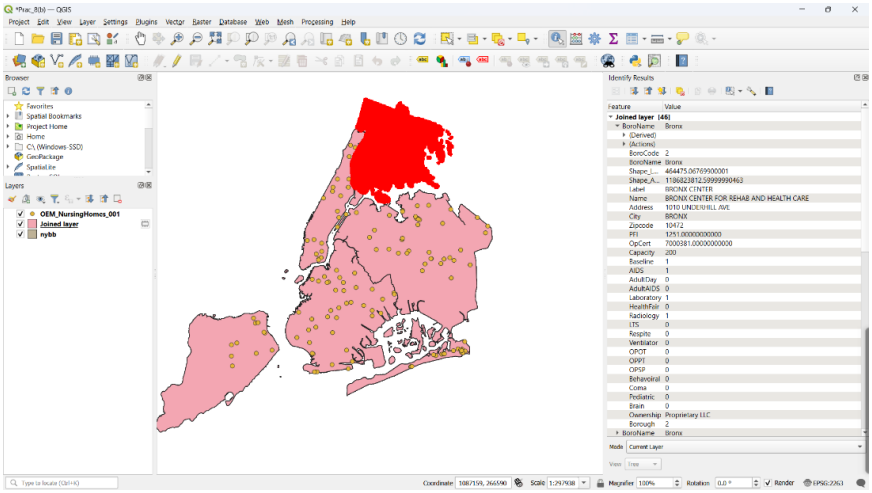




(A Joined Layer file will appear on the screen)



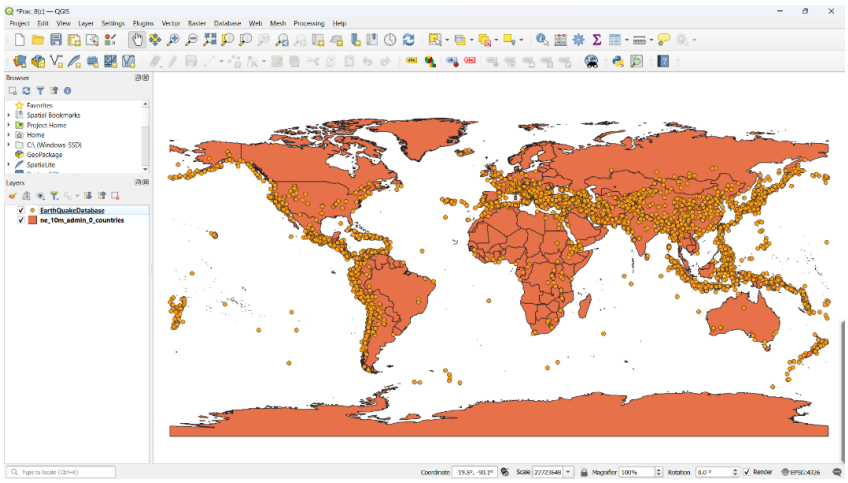
Step 3 : From the toolbox click on the  icon and select the area and you will be able to see the outputs.



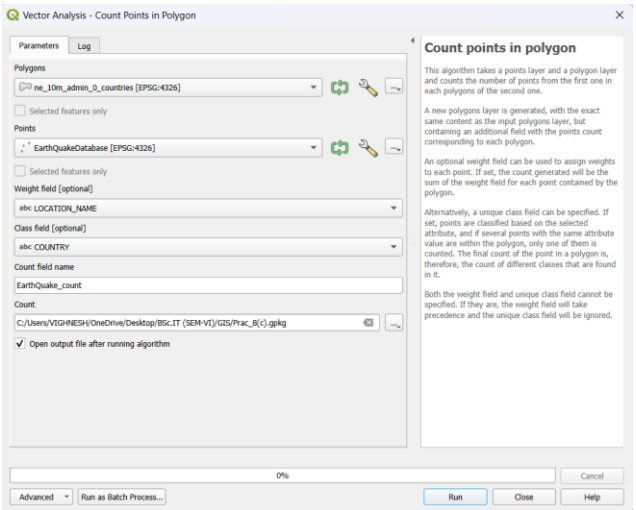
(c) Points in polygon analysis.

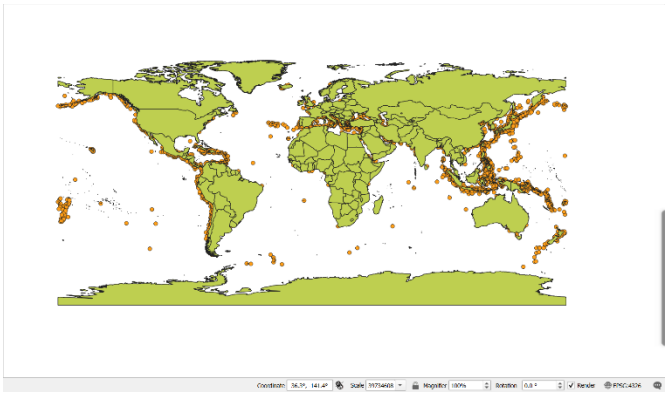
Step 1 : Go to Layer -> Add Layer -> Add Vector Layer -> From Practical_7 Select -> C Folder -> ne_10m_admin_0_countries folder ->ne_10m_admin_0_countries.shp -> Add.

Step 2 : Go to Layer -> Add Layer -> Add Delimited Text Layer -> From Practical_7 Select -> C Folder -> EarthQuakeDatabase.txt -> Tab separated -> Custom Delimiter -> Add.



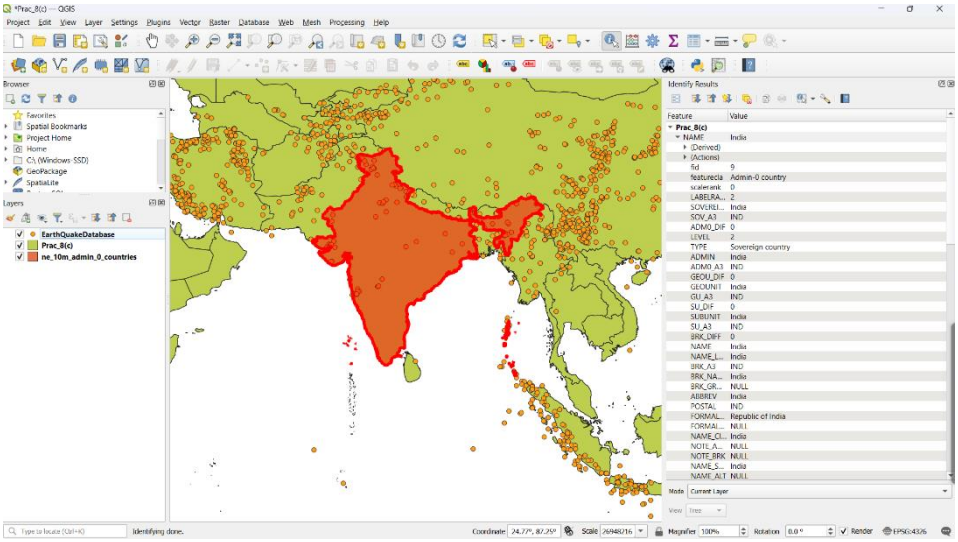
Step 3 : Vector -> Analysis Tools -> Count points in Polygon -> Enter the Below specifications -> Save the file -> Run (A vector will be formed like below)





Step 4 : From the toolbox click on the  icon and select the area and you will be able to see the outputs.

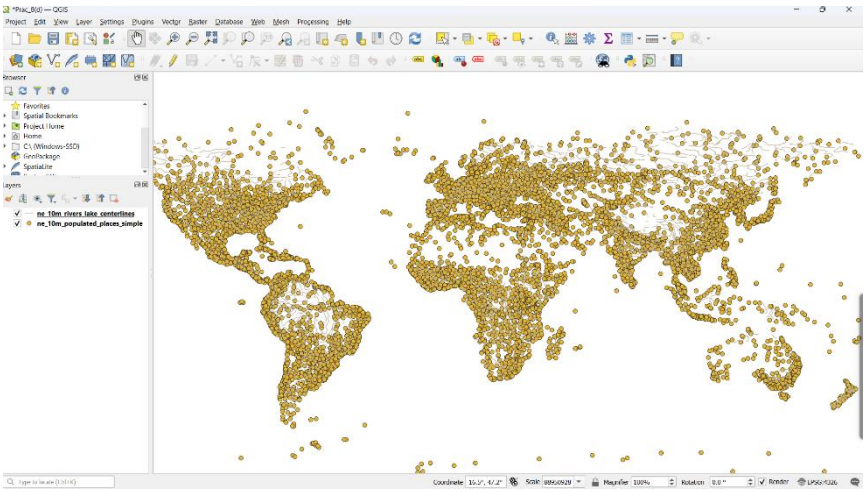
Final output



(d) Performing spatial queries.

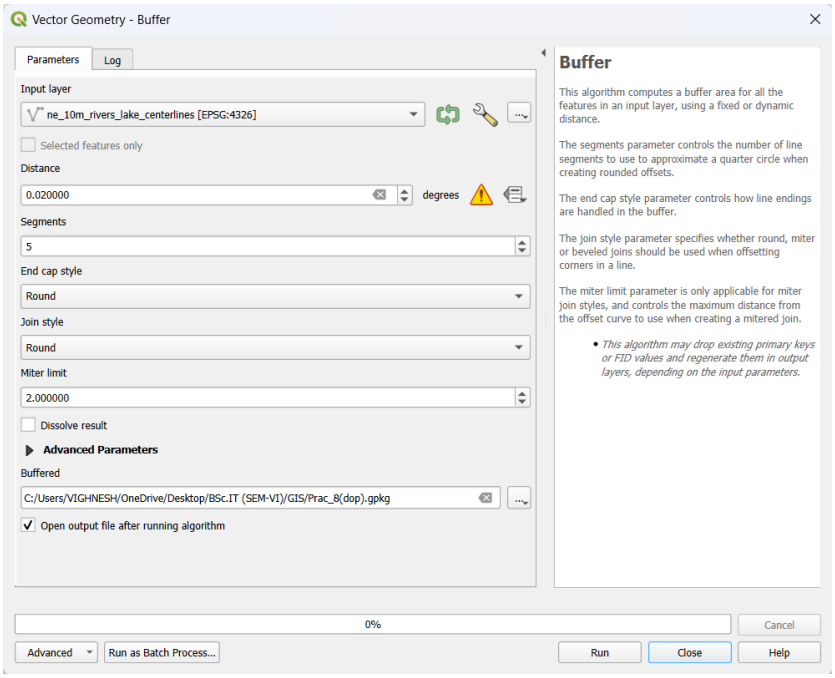
Step 1 : Layer -> Add Layer -> Add Vector Layer -> From Practical_7 -> D folder -> ne_10m_populated_places_simple folder -> ne_10m_populated_places_simple.shp file -> Add. Then also add from ne_10m_rivers_lake_centerlines folder -> ne_10m_rivers_lake_centerlines.shp file

(You will be able to see the following output)

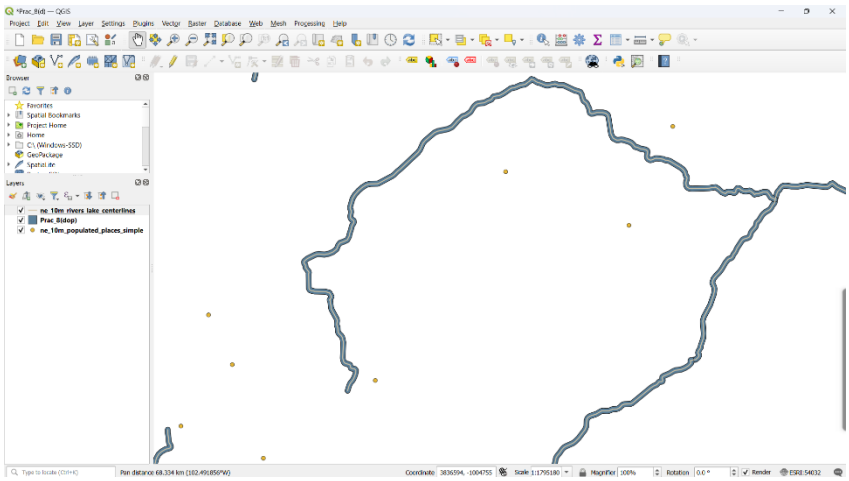


Step 2 : Project -> Properties -> Set CRS “World_Azimuthal_Equidistant EPSG 54032”.

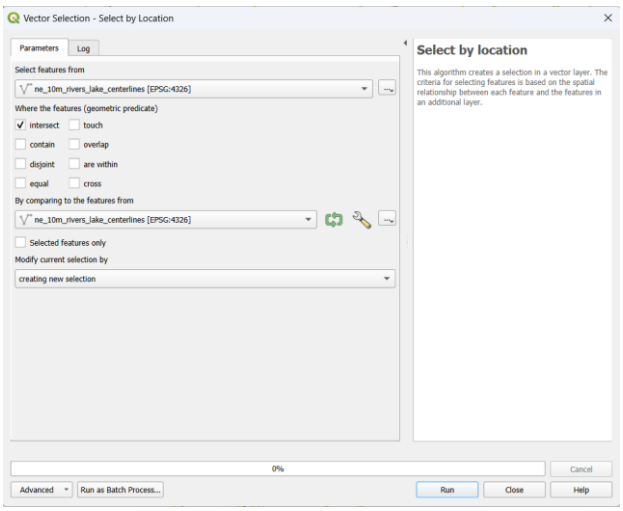
Step 3: Go to Vector -> Geoprocessing Tool -> Buffer -> Fill in the value required values as mentioned below -> Save the file.



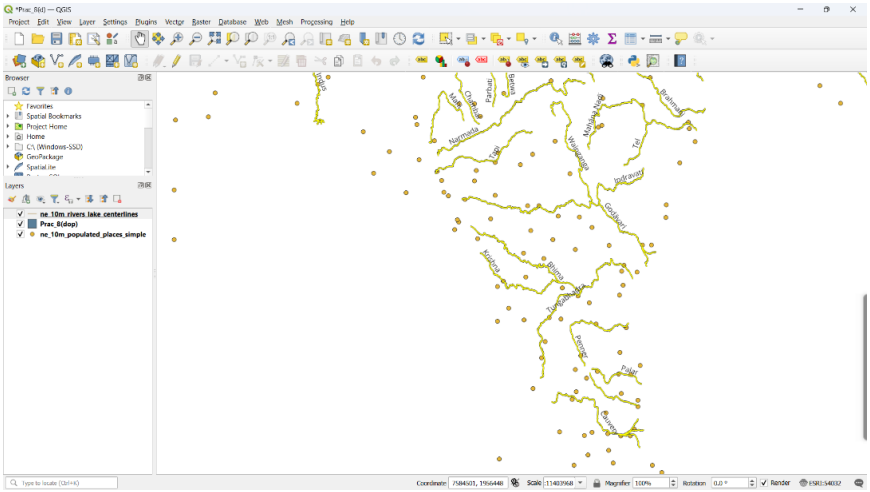
(You will be able to see a buffer is created for the rivers.)



Step 4 : Go to Vector -> Research Tool -> Select By Location -> Include the below specifications.



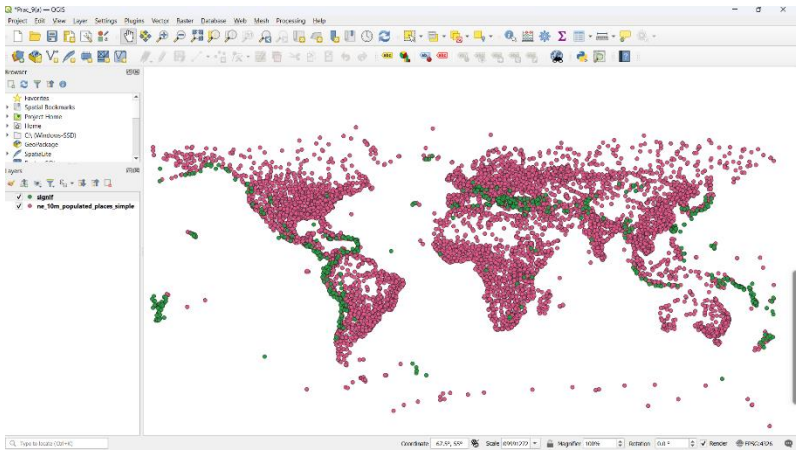
(You will be able to see only those rivers containing a populated place within 2 KM)



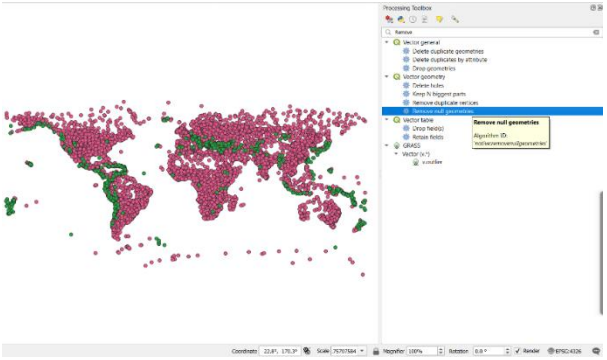
Practical-9: Advanced GIS Operations 1:
(a) Nearest Neighbor Analysis.

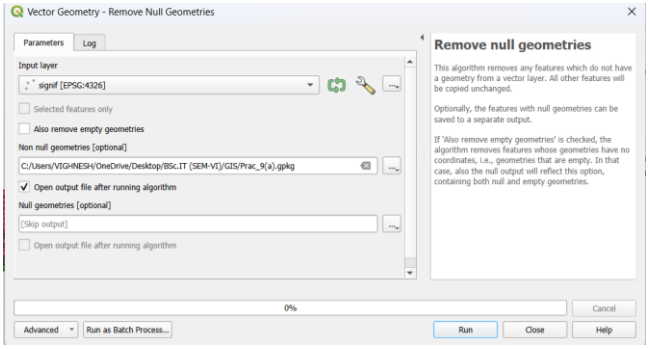
Step 1 : Layer -> Add Layer -> Add Vector Layer -> From Practical_8 -> DATA ->A folder -> ne_10m_populated_places_simple folder -> ne_10m_populated_places_simple.shp file -> Add.

Step 2 : Layer -> Add Layer -> Add Delimited Text Layer -> From Practical_8 -> DATA ->A folder -> signif.txt file -> Tab, Colon,Comma separated -> Add.
(You will be able to see the below output)

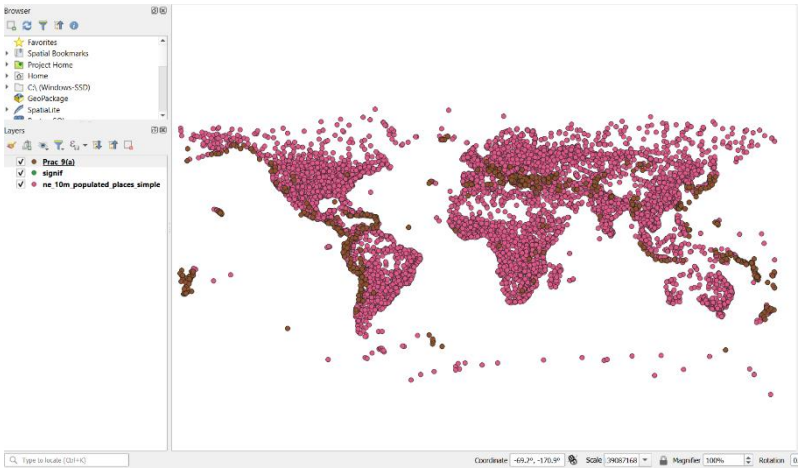


Step 2 : From MenuBar, go to Processing -> Toolbax -> Search Remove Null Geometries and double click on it. -> In the Dialog Box just Save the file and click on Run.

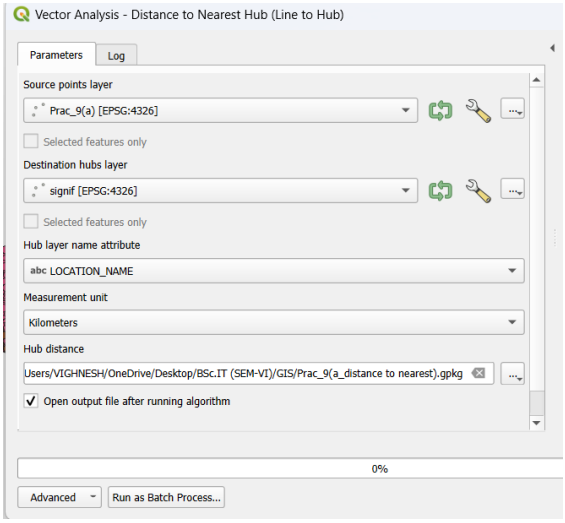


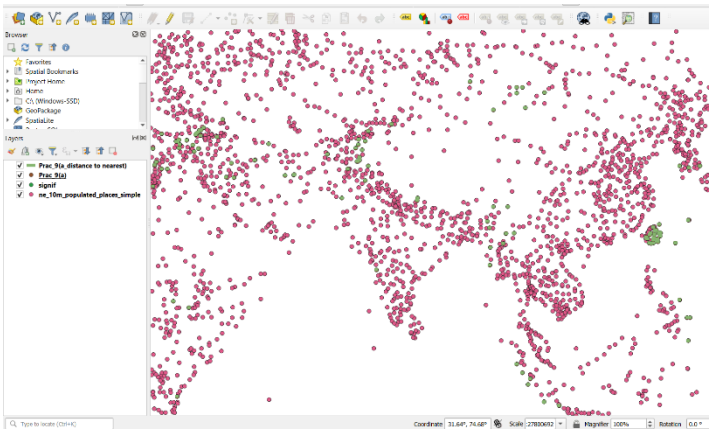


(You will be able to see the following output.)

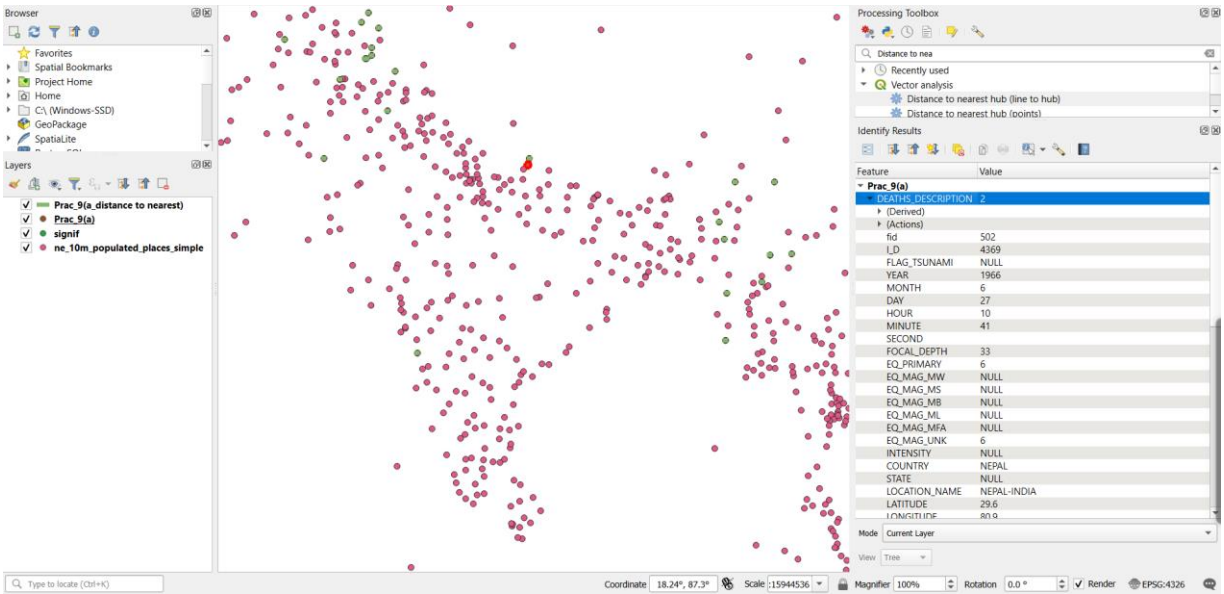


Step 3 : Processing -> Toolbox -> Search and double click on “Distance to Nearest hub(Line to hub)” -> Specify the following values and click on Run.



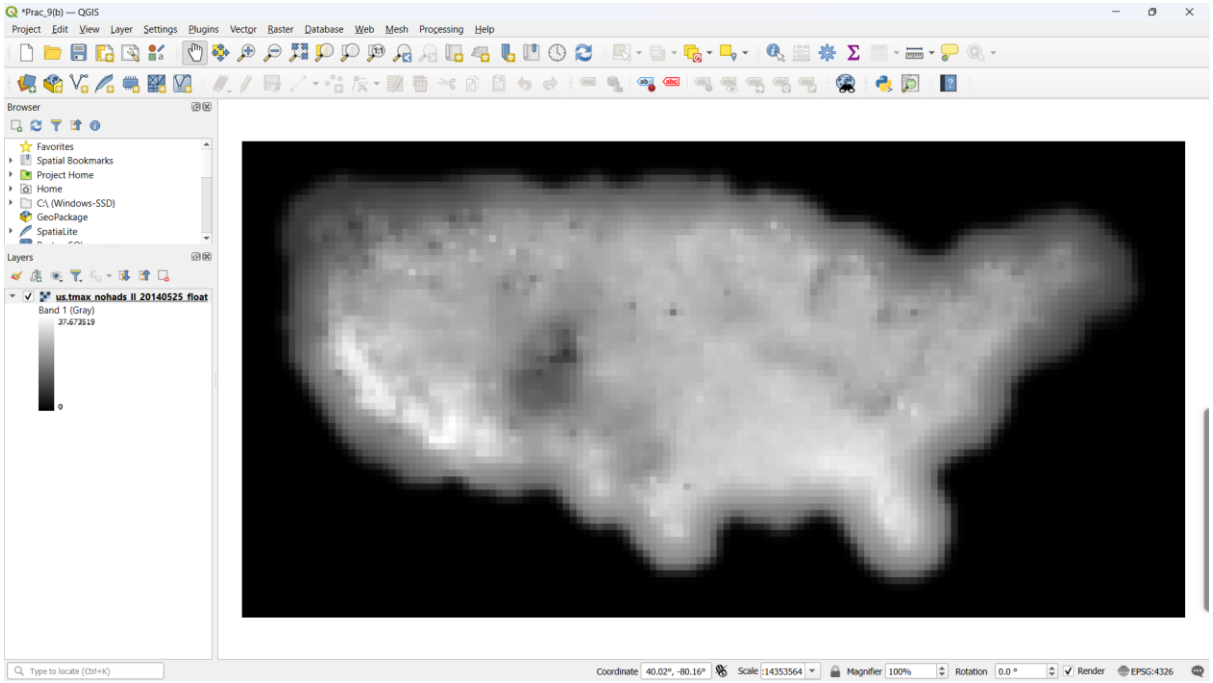


Step 4 : From the toolbox click on the  icon and select the area and you will be able to see the outputs.

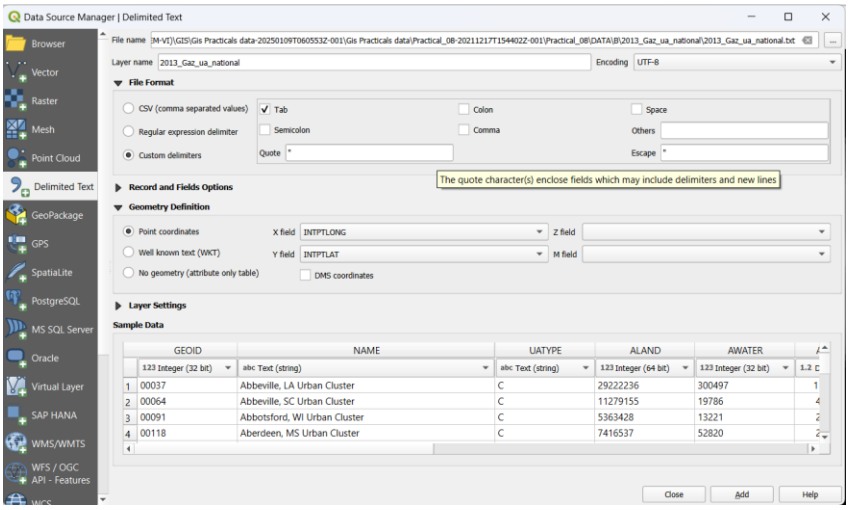


(b) Sampling Raster Data using Points or Polygons.

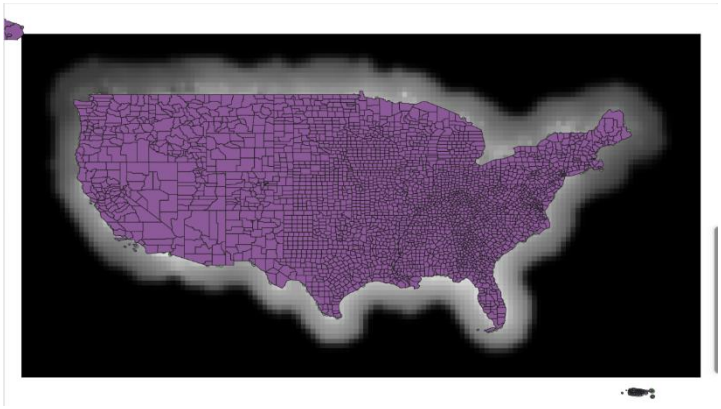
Step 1 : Layer -> Add Layer -> Add Raster Layer -> From Practical_8 -> DATA -> B folder-> us.tmax_nohads_ll_20140525_float.tif file -> Add.(You will see the following image.)



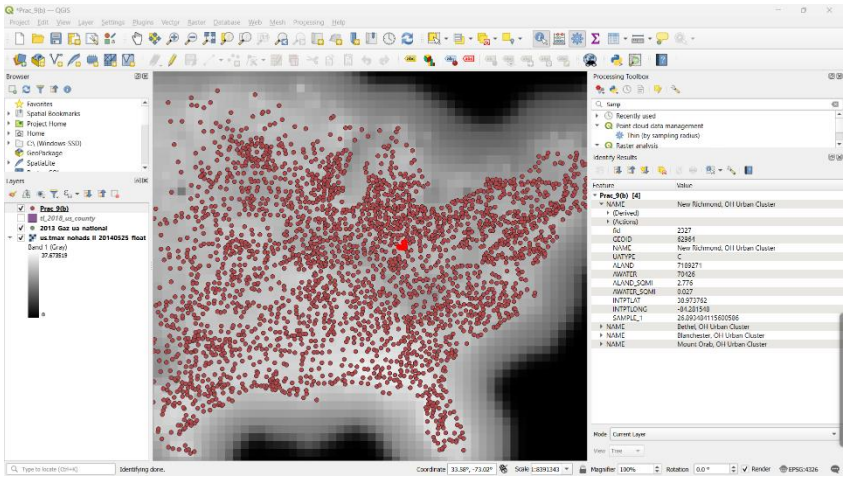
Step 2 : Layer -> Add Layer -> Add Delimited Text Layer -> From Practical_8 -> DATA -> B folder-> 2013_Gaz_ua_national folder-> 2013_Gaz_ua_national.txt file-> Have the below specification and click on Add.



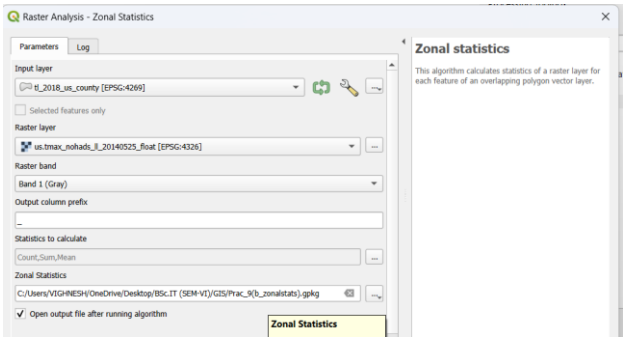
Step 3 : Layer -> Add Layer -> Add Vector Layer -> From Practical_8 -> DATA -> B folder-> tl_2018_us_county folder -> tl_2018_us_county.shp-> click on Add.(You will be able to see the below image)



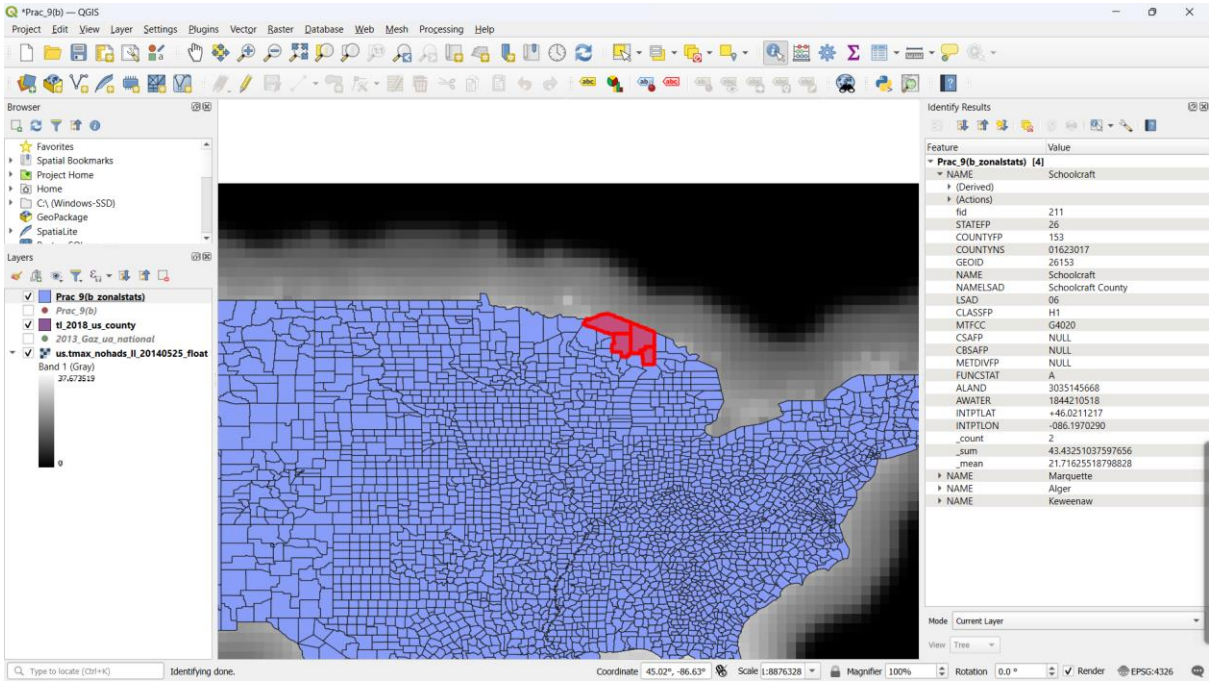
Step 4 : Processing -> Toolbox -> Sample Raster Values -> Save the file -> Run (Deselect the Vector file then use identify feature.)



Step 5 : Processing -> Toolbox -> Zonal Statistics -> Have the below specifications.-> Run(You will be able to a new image map.)

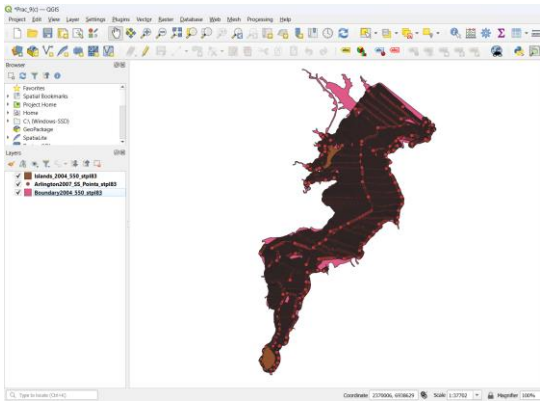


(Deselect the vector points and then perform the following.)
Step 6 : From the toolbox click on the icon and select the area and you will be able to see the outputs.

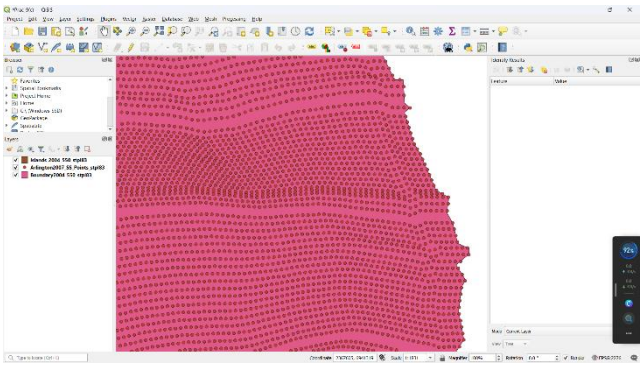


(c) Interpolating Point Data

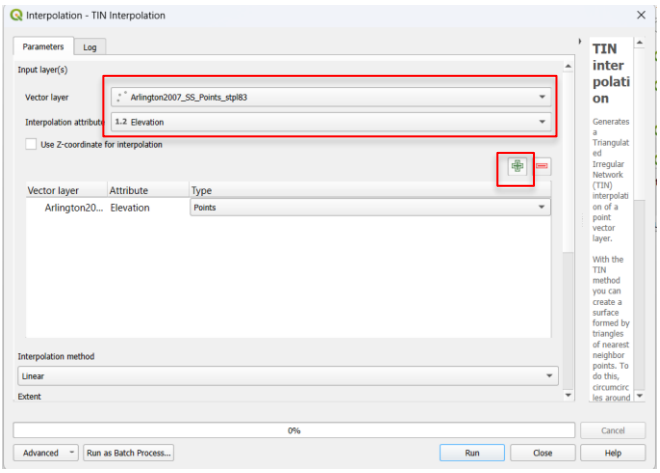
Step 1 : Layer -> Add Layer -> Add Vector Layer -> From Practical_8 -> DATA -> C folder-> Shapefiles folder -> Add : “Boundary2004_550_stpl83.shp, Arlington2007_SS_Points_stpl83.shp, Islands_2004_550_stpl83.shp” files. (You will be able to see the following image on the map)

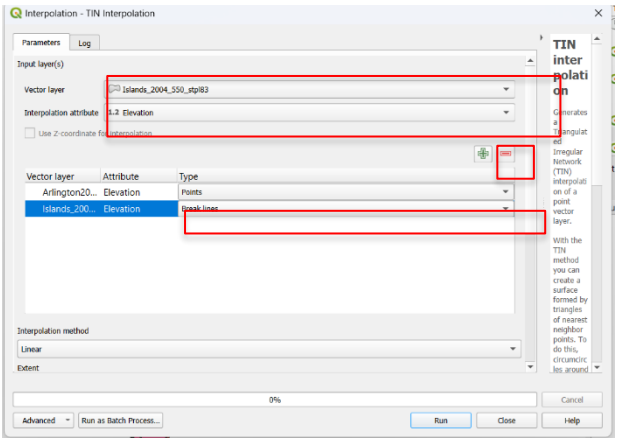


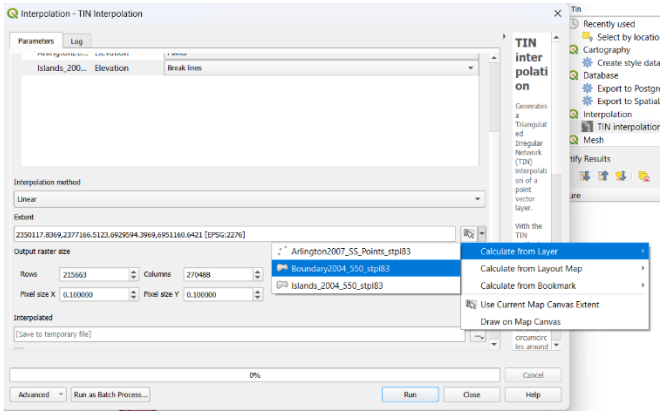
(Zoomed in image of map)

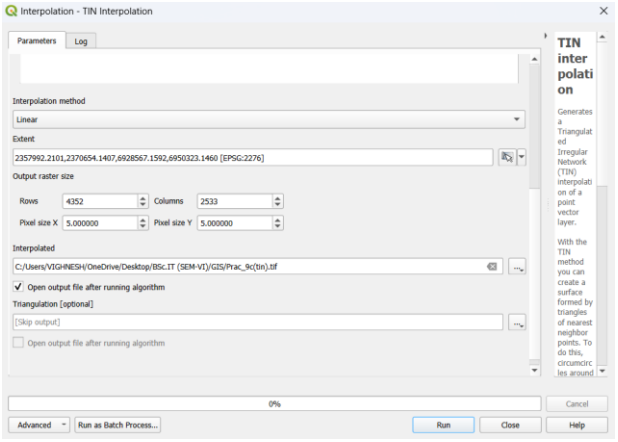


Step 2 : Processing -> Toolbox -> TIN interpolation -> First Add the Vector of Arlington then for Island as shown below. In extent section, select from the dropdown list -> Calculate from layer -> Boundary -> Set the pixel size of X and Y -> Save the file -> click on Run.

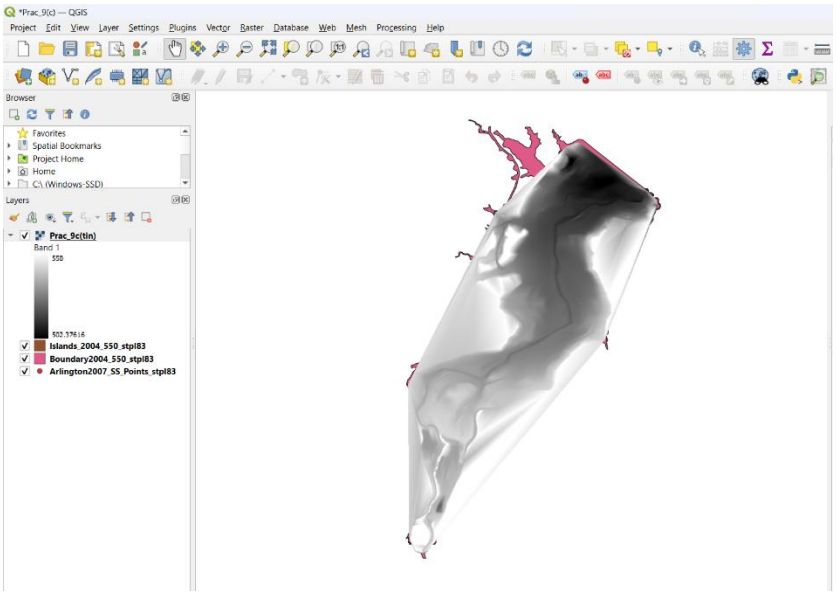




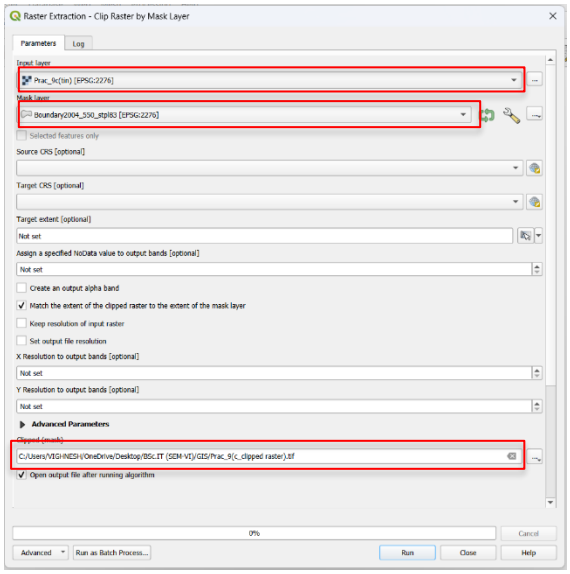


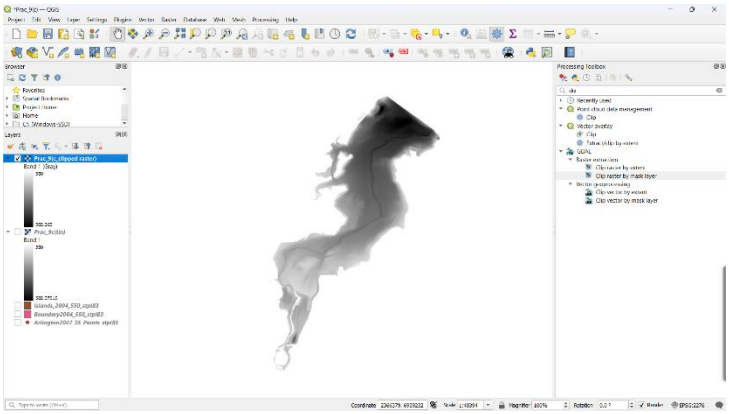


(An elevated tin image will appear on screen)

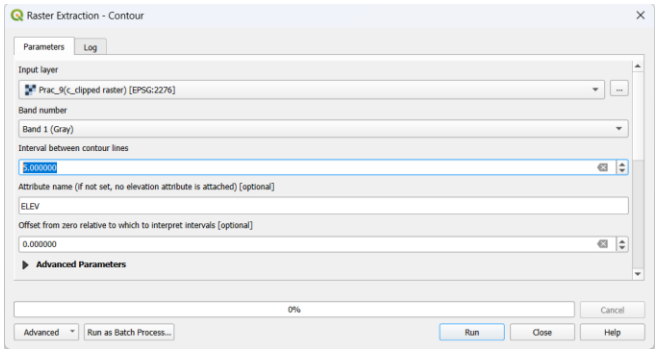


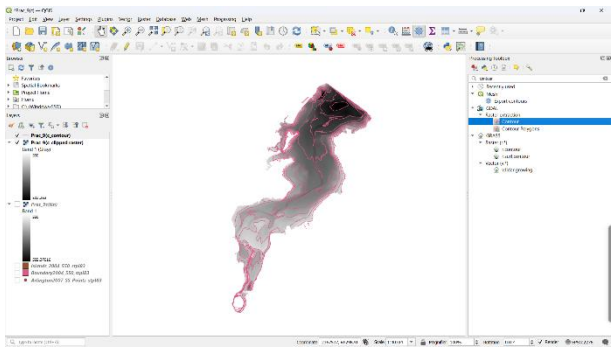
Step 3 : Processing -> Toolbox -> Clip raster by mask layer -> Do the specifications as below -> Save the file and click on Run.(You will now be able to see the clipped raster image)



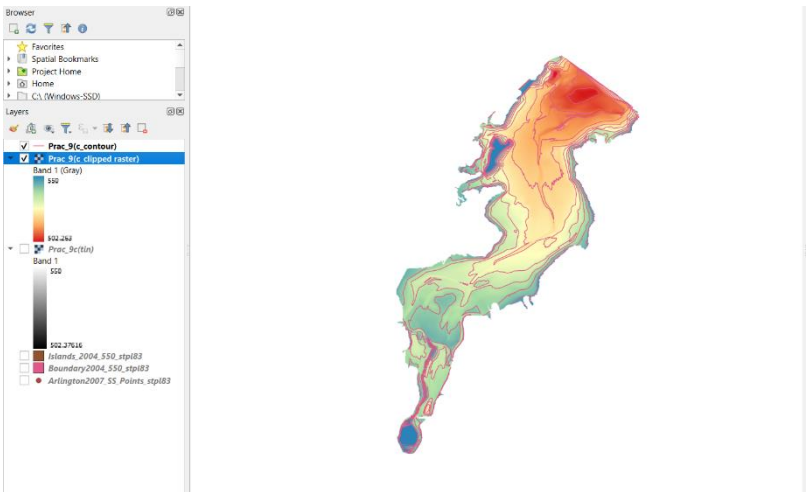


Step 4 : Processing -> Toolbox -> Contour -> Do the specifications as below -> Save the file and click on Run.(You will now be able to see the contour lines appeared on the screen.)

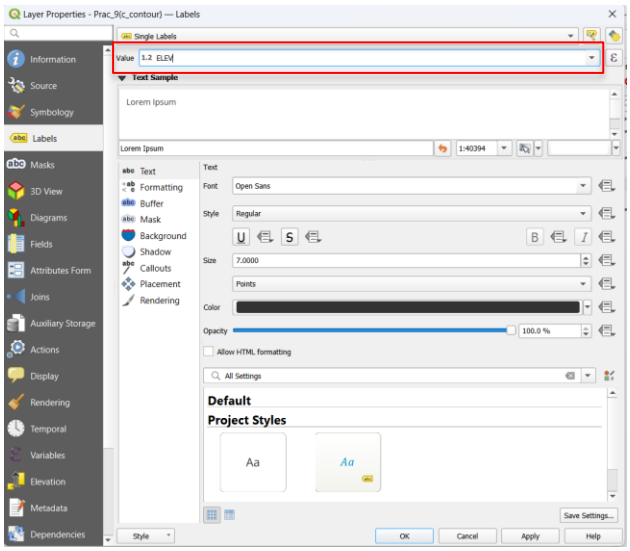


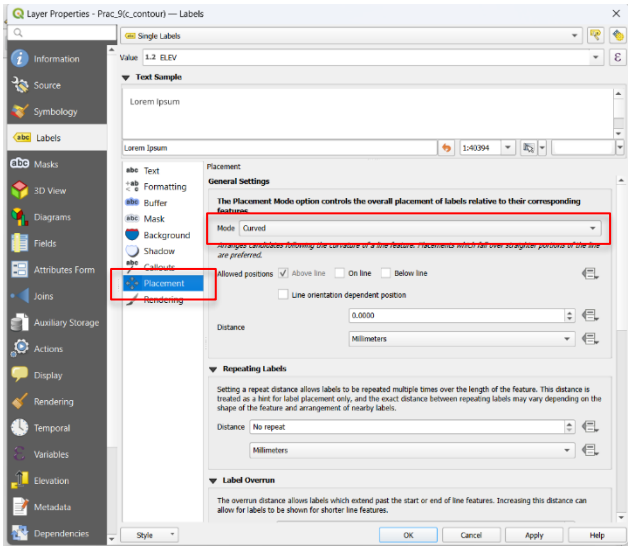


Step 5 : Right click on the Raster image -> Properties -> Symbology -> Singleband Psuedocode -> Interpolation : “Linear” -> Select a suitable Color Ramp -> Mode : “Continous” -> Click on Classify -> Click on Ok.



Step 6 : Right click on the Contour line-> Properties -> Labels -> Single Labels -> Value : “ELEV” -> In Placement -> Mode : Curved -> Click on Ok.





Final Output :