VALIA COLLEGE

OF ARTS, COMMERCE & SCIENCE

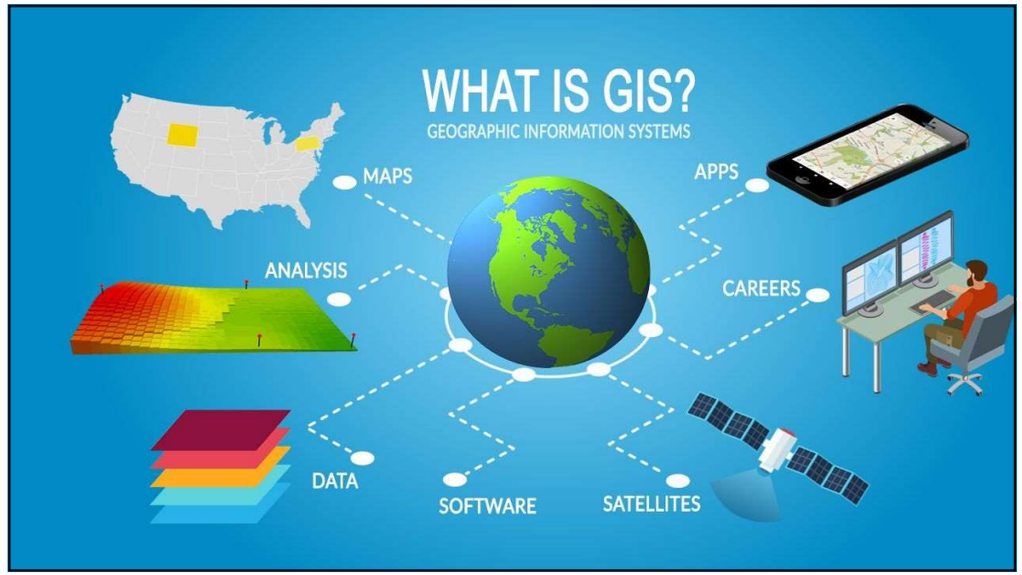
PRESENTS,

PRINCIPLES OF GEOGRAPHIC INFORMATION SYSTEMS PRACTICAL

T.Y.B.Sc.I.T – SEM VI

9029120671 / 7021047199

Mumbai University | Course Code: USIT6P4



B. Sc. (Information Technology)		Semester – VI	
Course Name: Principles of Geographical Information System Practical		Course Code: USIT6P4 (Elective II)	
Periods per week (1 Period is 50 minutes)		3	
Credits		2	
		Hours	Marks
Evaluation System	Practical Examination	2½	50
	Internal	--	-

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https://drive.google.com/drive/folders/18m6o_9tDOOdBHDtfgDxsO3ShY7nQfBPo
https://itvoyagers.in/advance-topics/geographical-information-system-gis/

Practical No	Details
0	Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.
1	Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics
2	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping
3	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files Using Plugins, Searching and Downloading OpenStreetMap Data
4	Working with attributes, terrain Data
5	Working with Projections and WMS Data
6	Georeferencing Topo Sheets and Scanned Maps Georeferencing Aerial Imagery Digitizing Map Data
7	Managing Data Tables and Saptial data Sets: Table joins, spatial joins, points in polygon analysis, performing spatial queries
8	Advanced GIS Operations 1:Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data
9	Advance GIS Operations 2: Batch Processing using Processing Framework Automating Complex Workflows using Processing Modeler Automating Map Creation withPrint Composer Atlas
10	Validating Map data

Practical 0: Familiarizing Quantum GIS: Installation of QGIS, datasets for both Vector and Raster data, Maps.

Aim: Installation of QGIS software

Description: QGIS is the leading Free and Open Source Desktop GIS. It allows you to create, edit, visualise, analyse and publish geospatial information on Windows, Mac OS, Linux, BSD (Berkeley Software Distribution) and Android (via the QField app). We also provide an OGC (Open Geospatial Consortium) Web Server application, a web browser client and developer libraries. The QGIS project is under very active development by an enthusiastic and engaged developer community with good mechanisms for help via stack exchange, mailing lists and (optionally) through a global network of commercial support providers.

What is QGIS

While ArcGIS continues to be the standard, QGIS is a common alternative to commercial GIS software options. QGIS, like the Austrian state of Vorarlberg and the cantons Glarus and Solothurn in Switzerland have taken over many private and public bodies. Whilst the ArcGIS standard remains, QGIS is a common alternative to commercial GIS software. Numerous public and private organizations, including Vorarlberg, Austria, and the Swiss Cantons of Glarus and Solothurn have taken over the QGIS.

What is ArcGIS

ArcGIS is a GIS program that enables geographical information to be managed and analyzed through the visualization of geographical statistics through layer building maps such as climate data or trade flows. It was used to establish and demonstrate groundbreaking research by a number of universities and institutions in both the humanities and the sciences. It is also used by numerous governments and commercial/private organizations around the world.

Like all GIS applications, QGIS provides a graphical user interface allowing display of map layers and manipulation of data for analyses and map-making.
A Geographical Information System (GIS) is a collection of software that allows you to create, visualize, query and analyze geospatial data. Geospatial data refers to information about the geographic location of an entity. This often involves the use of a geographic coordinate, like a latitude or longitude value. Spatial data is another commonly used term, as are: geographic data, GIS data, map data, location data, coordinate data and spatial geometry data. Applications using geospatial data perform a variety of functions. Map production is the most easily understood function of geospatial applications. Mapping programs take geospatial data and render it in a form that is viewable, usually on a computer screen or printed page. Applications can present static maps(a simple image) or dynamic maps that are customized by the person viewing the map through a desktop program or a web page.
Many people mistakenly assume that geospatial applications just produce maps, but geospatial data analysis is another primary function of geospatial applications. Some typical types of analysis include computing:
1. Distances between geographic locations
2. The amount of area (e.g., square meters) within a certain geographic region
3. What geographic features overlap other features?
4. The amount of overlap between features
5. The number of locations within a certain distance of another
6. and so on...

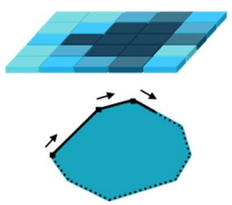
System Requirements
Windows OS:
Minimum: Pentium III / 256 MB RAM.
Recommended: 1 GB of RAM and 1.6 GHz processor.
Operation System: Platforms Windows and Linux (Win XP or newer, Linux Suse 8.2/9.0/9.2, Linux Debian (Lliurex))

MAC OS:
PC/Desktop with at least Pentium IV
Tiger OS, Leopard OS.

Components of Geographic Information Systems

The 3 main components of Geographic Information Systems are:

1. DATA: GIS stores location data as **thematic layers**. Each data set has an attribute table that stores information about the feature. The two main types of GIS data are **raster and vector**:



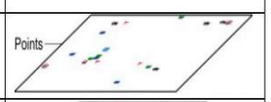
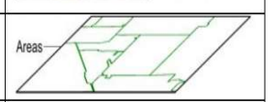
a. **Raster:** Raster look like grids because they store data in rows and columns. They can be discrete or continuous. For example, we often represent land cover, temperature data and imagery as raster data.

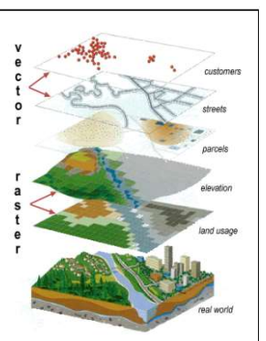
b. **Vector:** Vector data is best described as graphical representations of the real world. There are three main types of vector data: points, lines, and polygons. For example, fire hydrants, contours and administrative boundaries are often vectors.

2. HARDWARE: Hardware runs GIS software. It could be anything from powerful servers, mobile phones or a personal **GIS workstation**. The CPU is your workhorse and data processing is the name of the game. Dual monitors, extra storage, and crisp graphic processing cards are must-haves too in GIS.

3. SOFTWARE: ArcGIS and QGIS are the leaders in **GIS software**. GIS software specialize in spatial analysis by using math in maps. It blends geography with modern technology to measure, quantify and understand our world.

The foundation of GIS is the ability to locate objects and events (Streams, Villages, Disease cases) and link with appropriate information in order to identify patterns and provide a basis for map making and analysis. Key types of geographical data, represented a separate may layers in GIS, are outlined in the table below.

Sr. No	Data Type	Example	Layer on Map
1	POINT	Building, Hospital, City, Well.	
2	LINE	River, Road	
3	POLYGON	Administrative Boundaries, Census tacts.	
4	RASTER	Pixel or grid data	



Vector data: A representation of the world using points, lines, and polygons. Vector models are useful for storing data that has discrete boundaries, such as country borders, land parcels, and streets.

Point features: A map feature that has neither length nor area at a given scale, such as a city on a world map or a building on a city map.

***Line features*:** A map feature that has length but not area at a given scale, such as a river on a world map or a street on a city map.

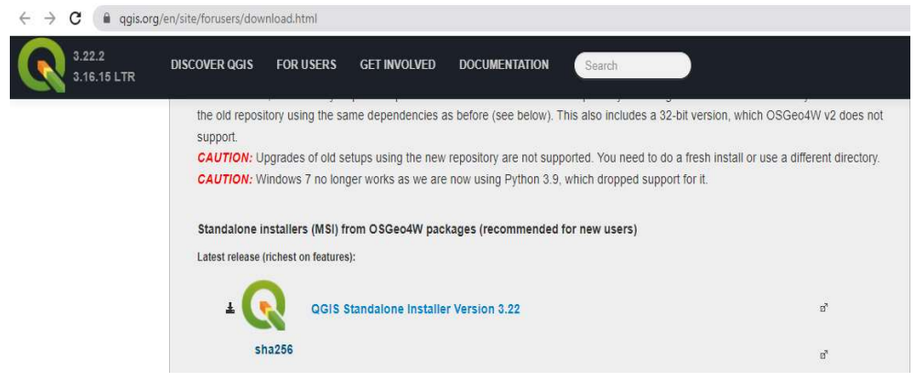
***Polygon features*:** A map feature that bounds an area at a given scale, such as a country on a world map or a district on a city map.

Raster data. A representation of the world as a surface divided into a regular grid of cells. Raster models are useful for storing data that varies continuously, as in an aerial photograph, a satellite image, a surface of chemical concentrations, or an elevation surface.

With a GIS application you can open digital maps on your computer, create new spatial information to add to a map, create printed maps customised to your needs and perform spatial analysis.

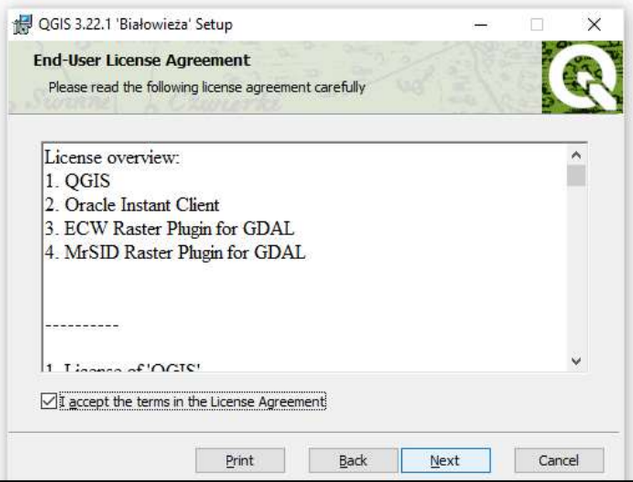
Step 1: Create a folder in C:\Program Files\Prof Gufran\QGIS 3.22.1\

Step 2: Download the latest 64 it version of QGIS for windows which is QGIS 3.22.1 'Bialowieza'.

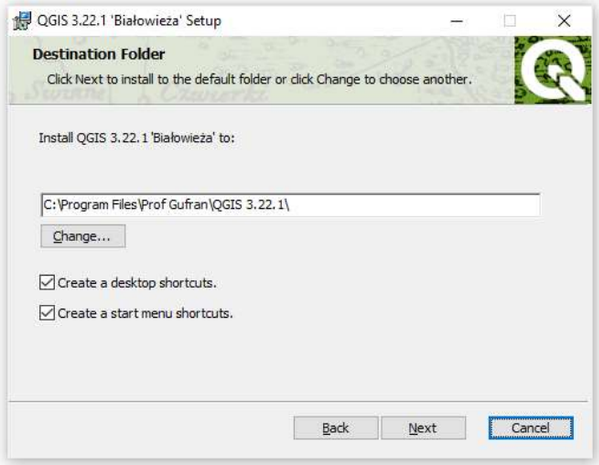


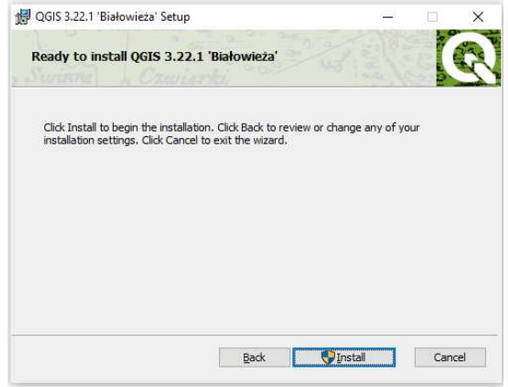
Step 3: Now install the software.

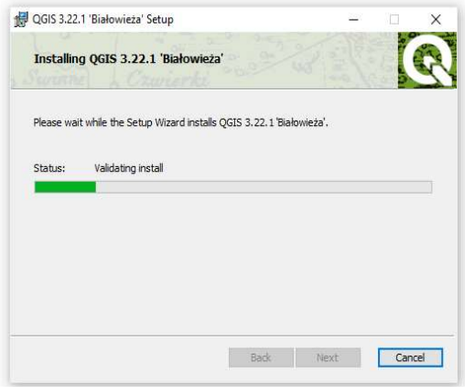
Step 4: Accept the License Agreement and click Next.



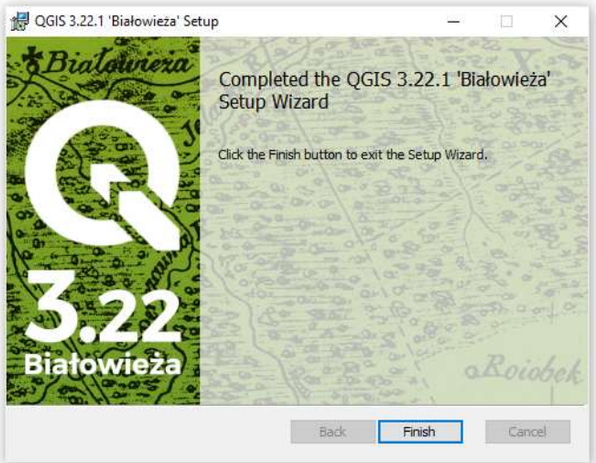
Step 5: Now browse your created folder location and click Next, then Install & Finish.



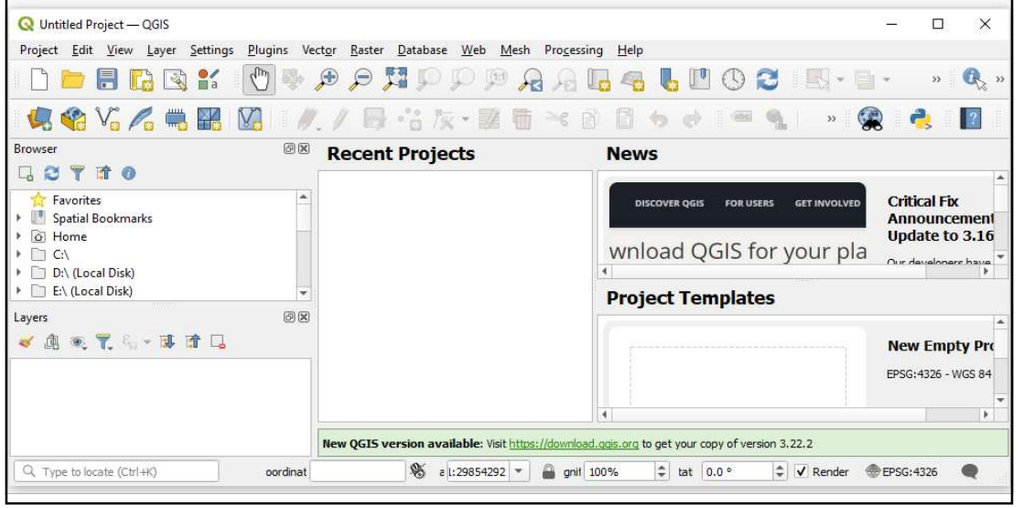




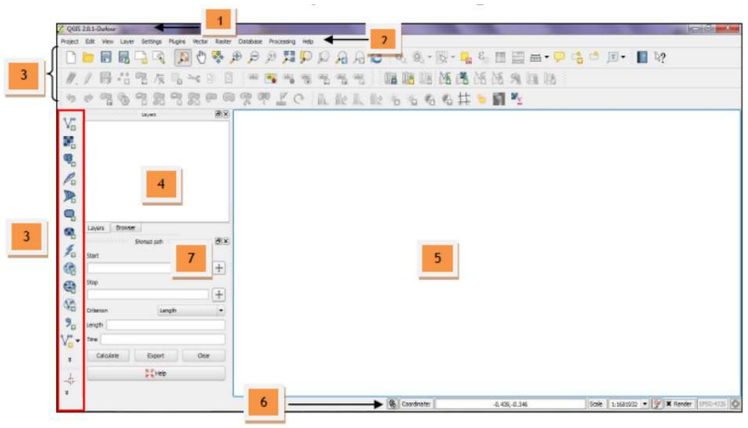
Step 7: Click Finish to complete the installation. Reboot your machine once the installation is complete.



Step 8: Now open the software.



Understanding QGIS Desktop Environment



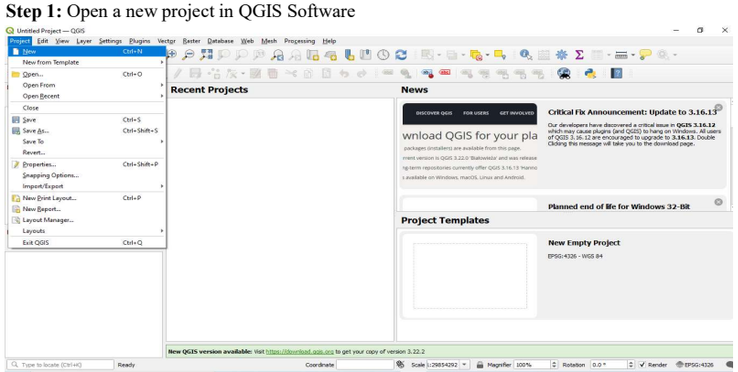
Quantum GIS interfaces change from one project to another depending on the required interface of the project. Below are the basic menus that you will encounter in Quantum GIS during the practicals.

1. Title of the Project - Shows the title of project that you are going to view.
2. Menu Bar – This provides access to various Quantum GIS features using a standard hierarchical menu.
3. Toolbars – These provide access to most of the same functions as the menus, plus additional tools for interacting with the map. It shows the command for zoom in, zoom out, pan, back to original view, go back to previous extent, go to next extent, object-information, coordinate read-out, measure, print and help.
4. Table of Contents/Map Legend (TOC) - Shows the layers that can be turned on or off and the legend, attributes symbols and query symbols available for the corresponding project.
5. Display Window - Shows the feature/s that you have turn on from the TOC.
6. Status Bar - Shows you your current position in map coordinates (e.g. metres or decimal degrees) as the mouse pointer is moved across the map view. To the left of the coordinate display in the status bar is a small button that will toggle between showing coordinate position or the view extents of the map view as you pan and zoom in and out.
7. Data sources browser – In previous versions, QGIS browser was only provided as an external application which enables us to explore our spatial data sets. In QGIS 2.0.1-Dufour this application is also integrated in the QGIS framework as an additional panel just below the Table of Contents.

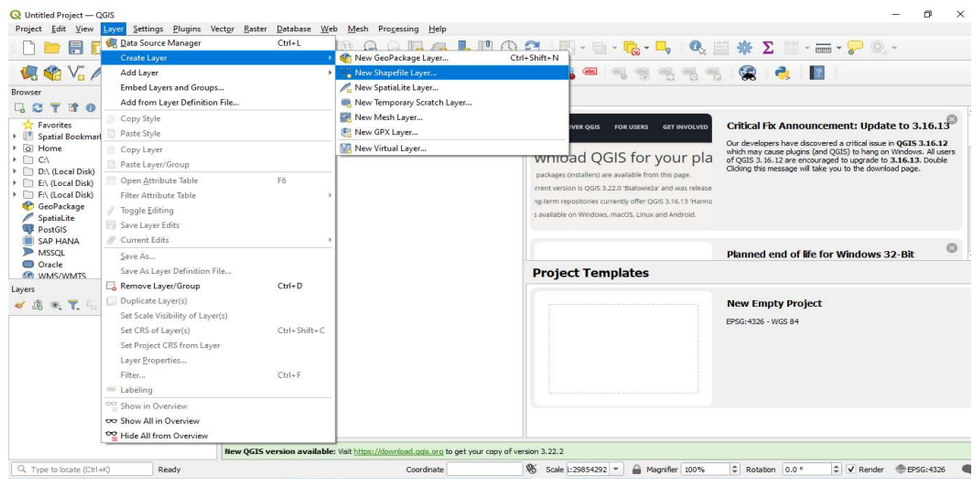
Practical 1: Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics.

Aim: The aim of this practical is to create a map step-by-step using various vector layers (polygon layer, line layers and point layers)

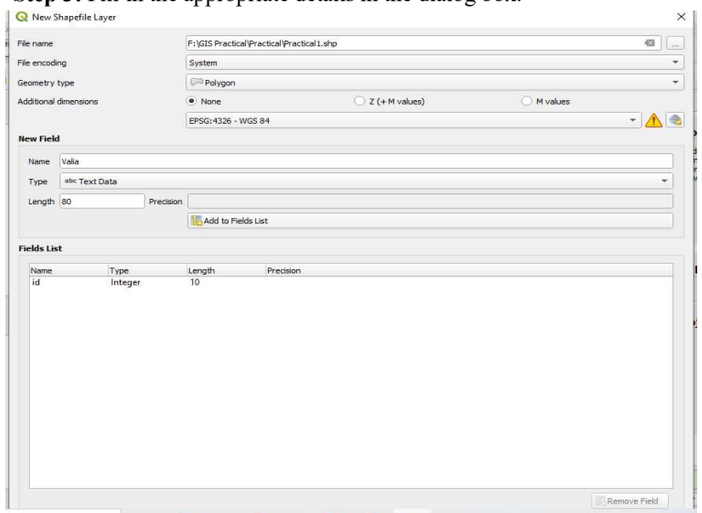
Step 1: Open a new project in QGIS Software



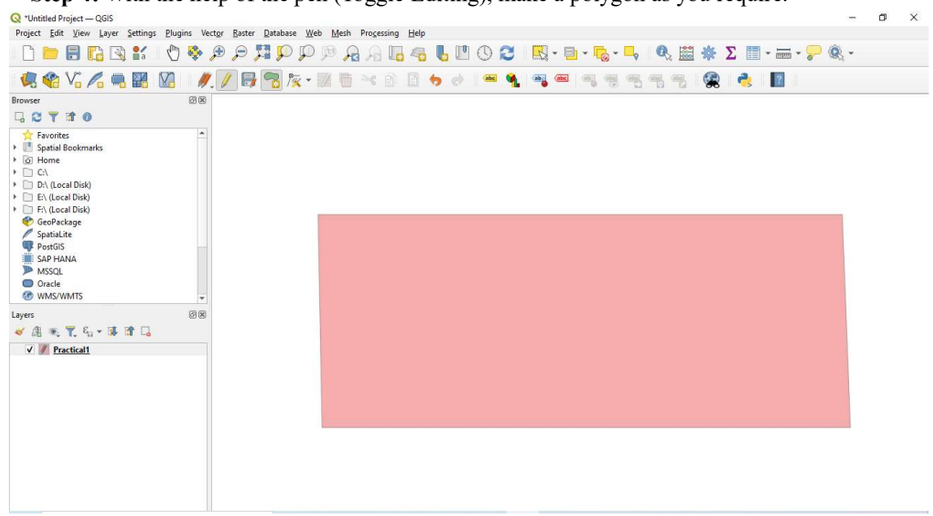
Step 2: Create a Shape File Layer



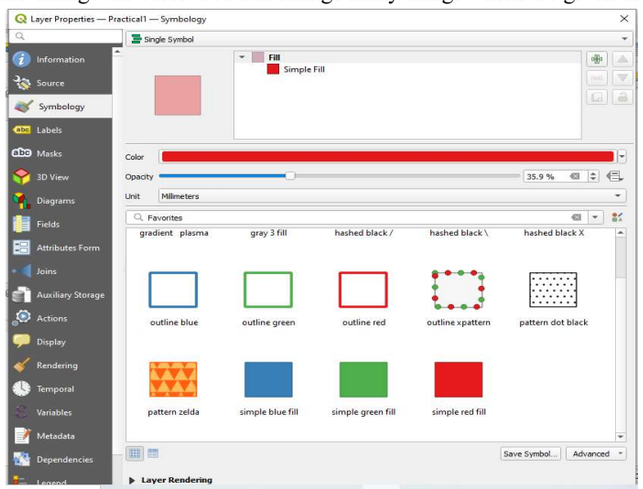
Step 3: Fill in the appropriate details in the dialog box.



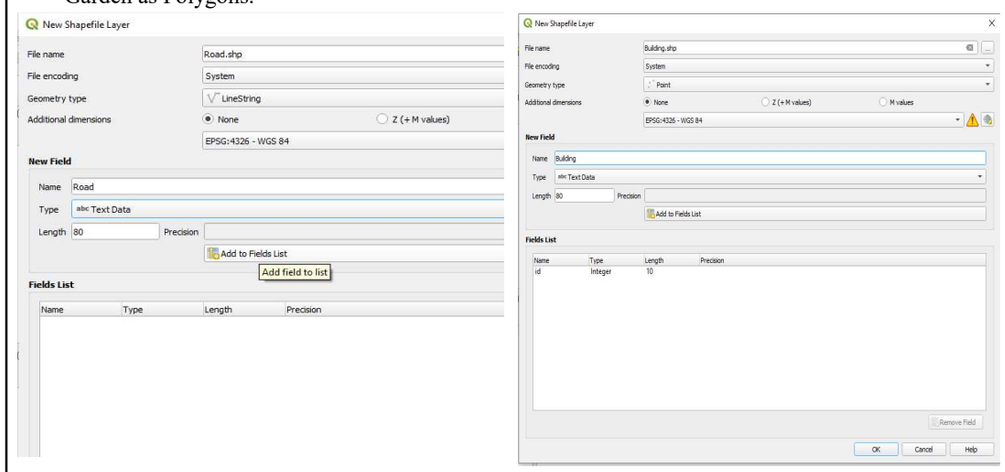
Step 4: With the help of the pen (Toggle Editing), make a polygon as you require.



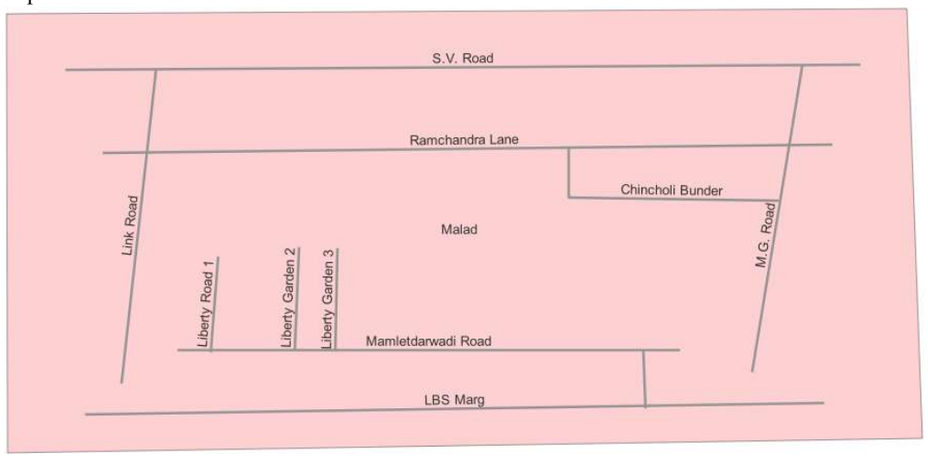
Step 5: You can change the color of the area. Right click on the layer (Practical1), goto Properties and change the color. You can change many things which are given in the Properties.



Step 6: Create a new Shape File Layer for Roads as Line, Bank, School, Buildings as Points and Garden as Polygons.



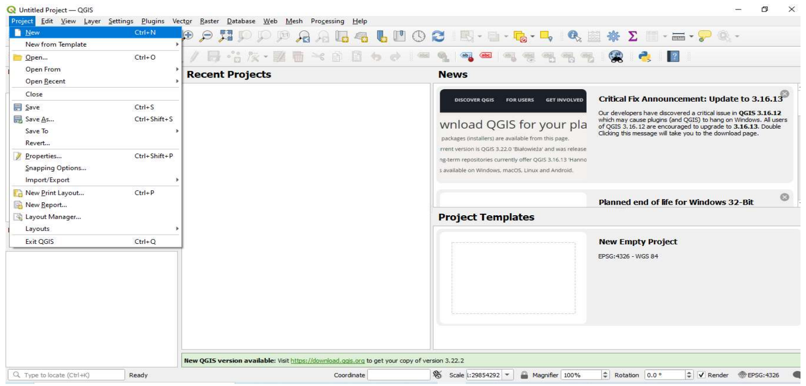
Step 7: After creating Shape Files for each one them as in Step 6, make the components wherever required.



Practical 2: Exploring and Managing Raster Data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping

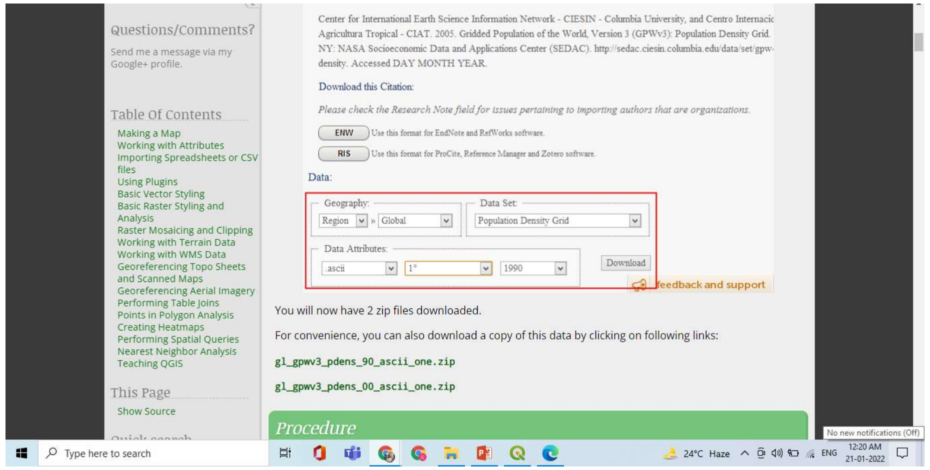
Aim: The aim of this practical is to create a map step-by-step using various raster layers.

Step 1: Open a new project in QGIS Software



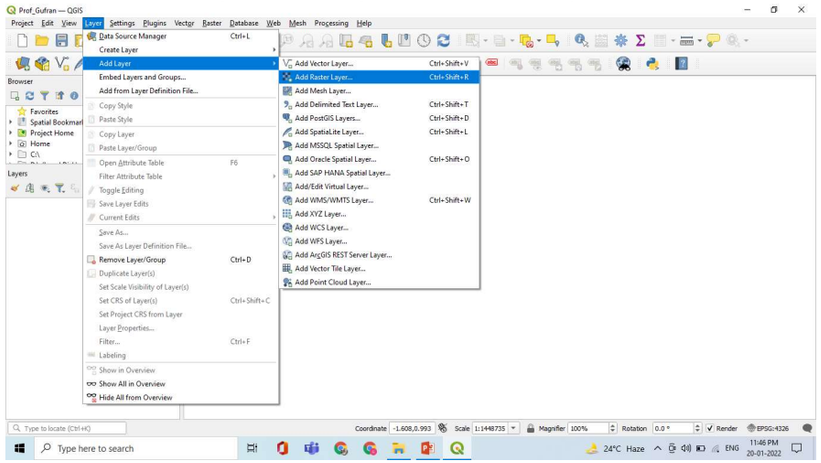
Step 1: Download the data(http://gis.humangeo.su.se/qgistutor/www.qgistutorials_qgis2.com/en/docs/raster_styling_and_analysis.html)

Gridded Population of the World (GPW) v3.



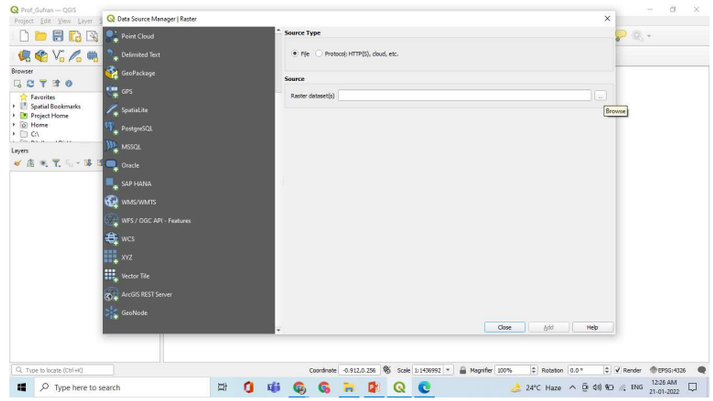
Step 2: Adding raster layers

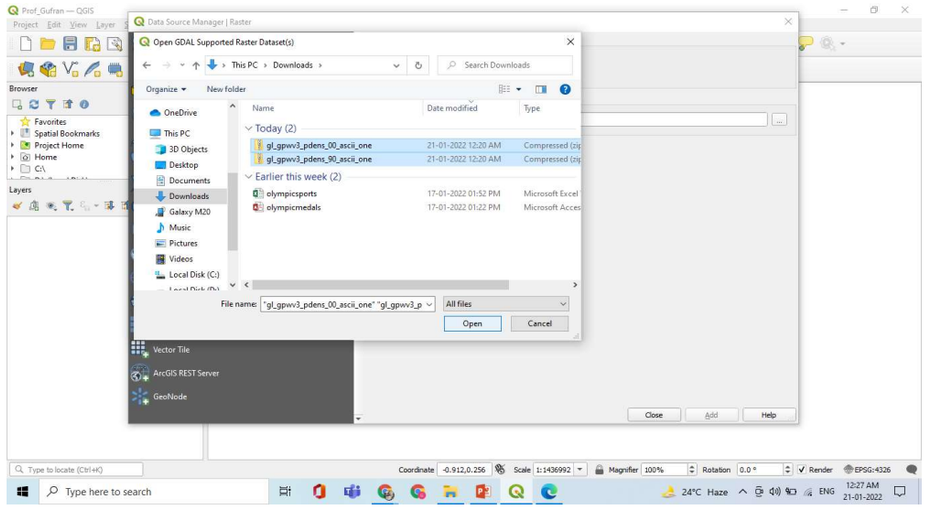
From menu bar select Layer → Add Layer → Add Raster Layer



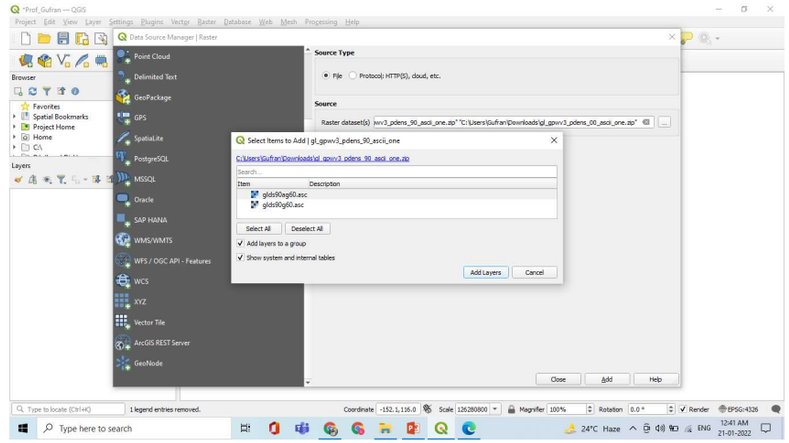
Step 3: Raster Styling and Analysis (https://www.qgistutorials.com/en/docs/raster_styling_and_analysis.html)

1. **Locate the downloaded zip files. Hold down the Ctrl key and click on both the zip files to select them. This way you are able to load both the files in a single step.**

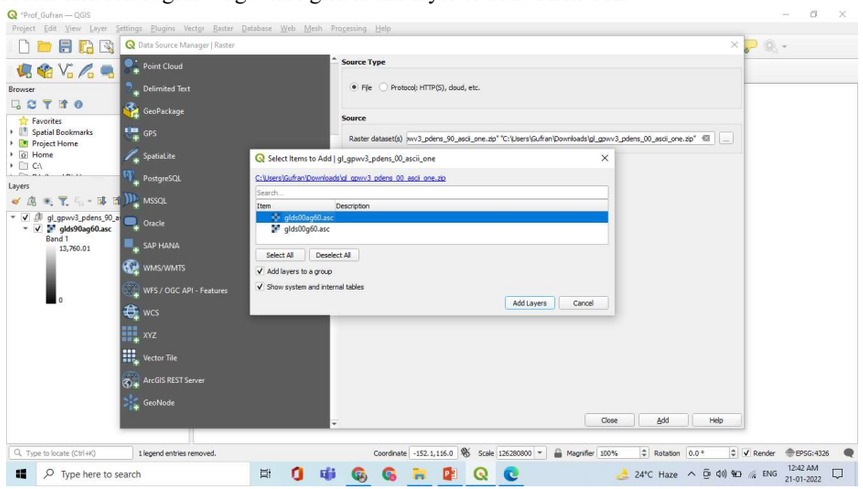




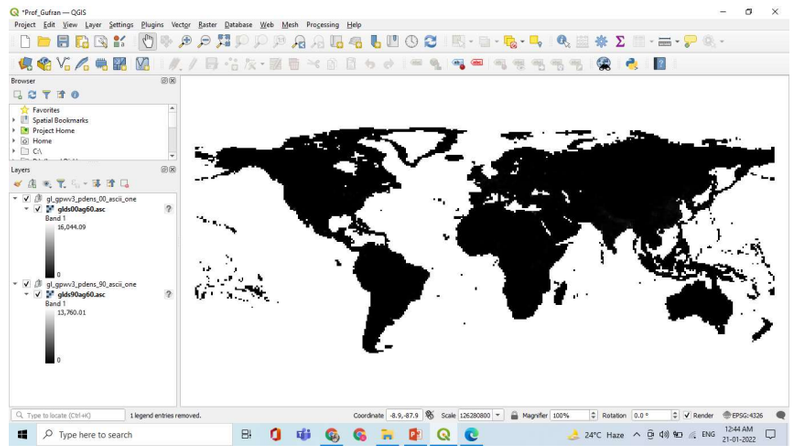
Step 4: Each zip file contain 2 grid files. The a in the filename suggests that the population counts were adjusted to match the UN totals. We will use the adjusted grids for this tutorial. Select glds90ag60.asc as the layer to add. Click OK.



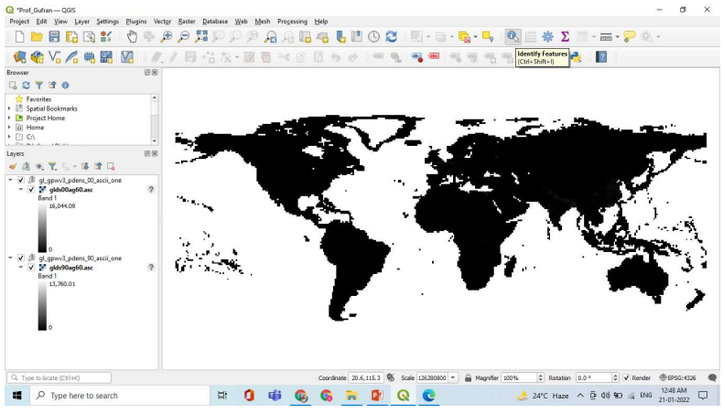
Step 5: Since we selected both the zip files, you will see similar dialogs once again. Repeat the process and select glds00ag60.asc grid as the layer to add. Click OK.

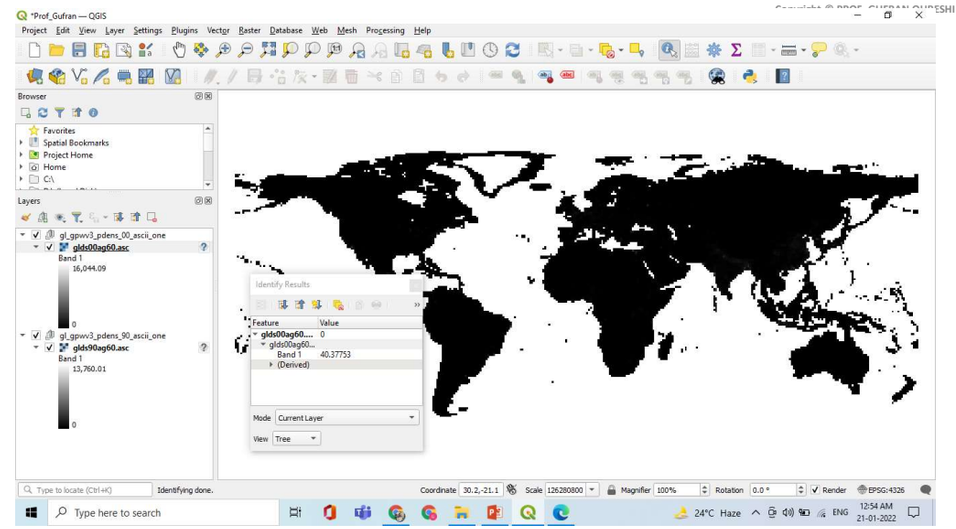


Step 6: Now you will see both the rasters loaded in QGIS. The raster is rendered as in grayscale, where darker pixels indicate lower values and lighter pixels indicate higher values.

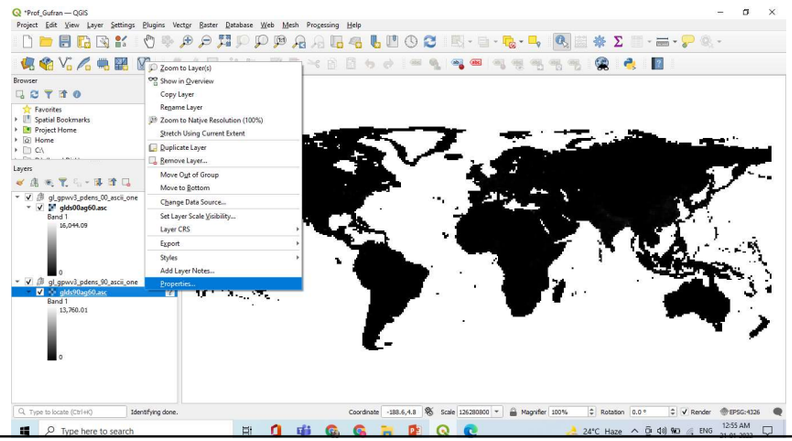


Step 7: Each pixel in the raster has a value assigned. This value is the population density for that grid. Click on Identify Features button to select the tool and click anywhere on the raster to see the value of that pixel.

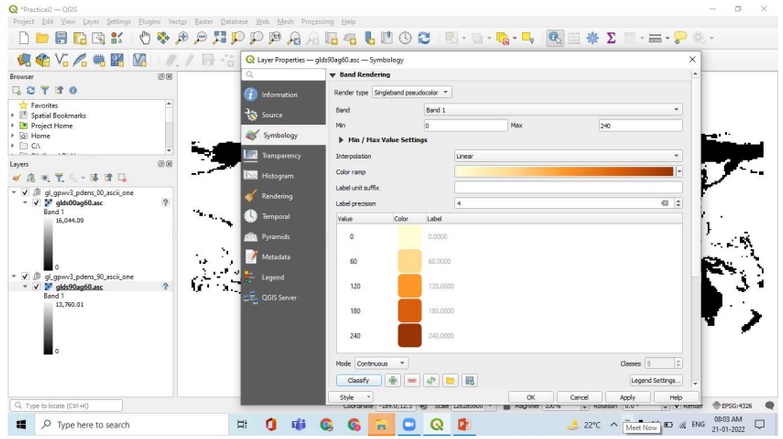


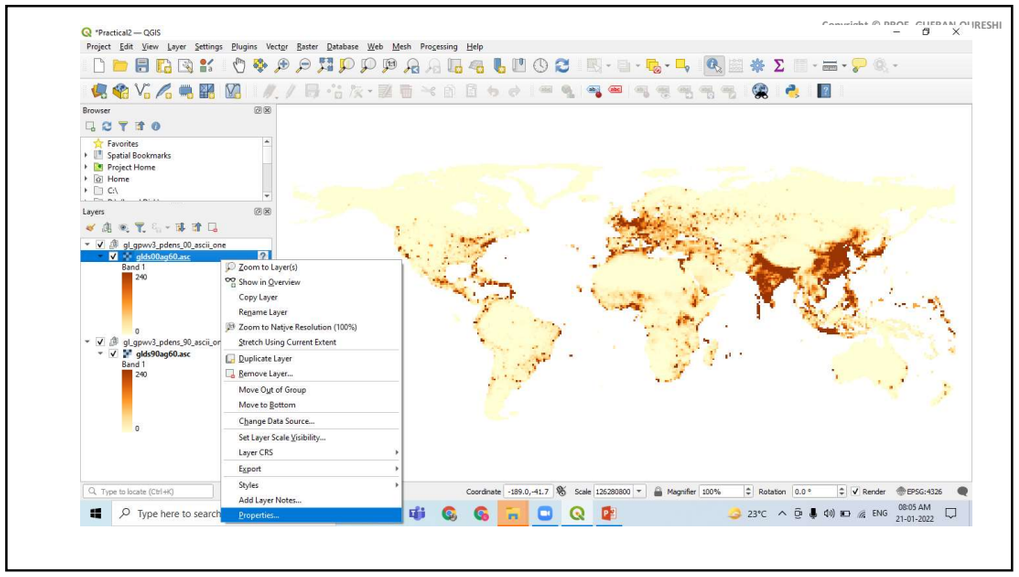


Step 8: To better visualize the pattern of population density, we would need to style it. Right-click on the layer name and select Properties. You can also double-click on the layer name in the TOC to bring up the Layer Properties dialog.



Step 9: Under the Symbology tab, change the Render type to Singleband pseudocolor. Next, click Classify under Generate a new color map. You will see 5 new color values created. Click OK.




*Practical2 — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Browser
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glds90ag60.asc
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Zoom to Layer(s)
Show in Overview
Copy Layer
Rename Layer
Zoom to Native Resolution (100%)
Stretch Using Current Extent
Duplicate Layer
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Set Layer Scale Visibility...
Layer CRS
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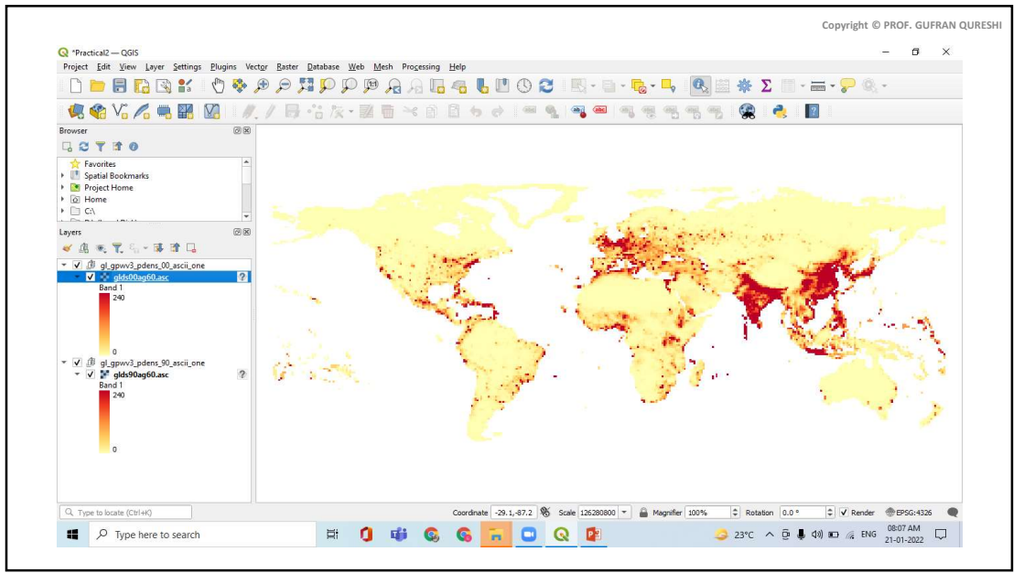
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*Practical2 — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
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Layers
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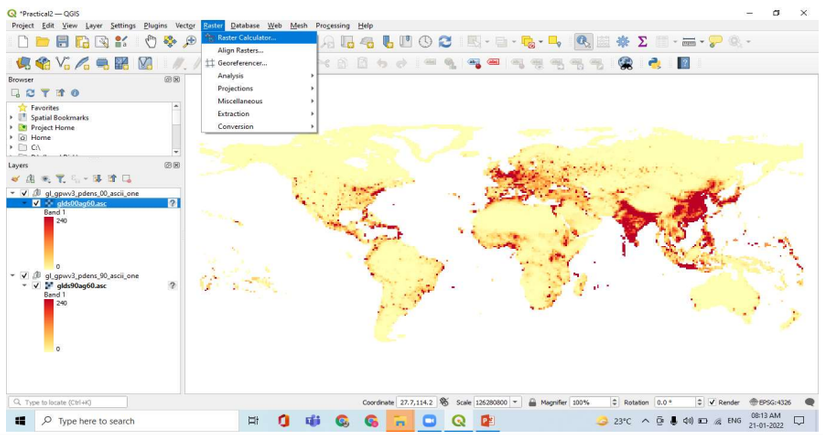
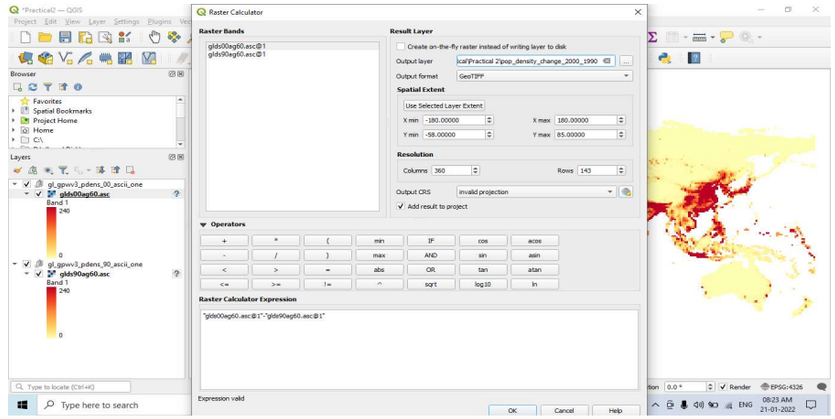
08:07 AM
21-01-2022

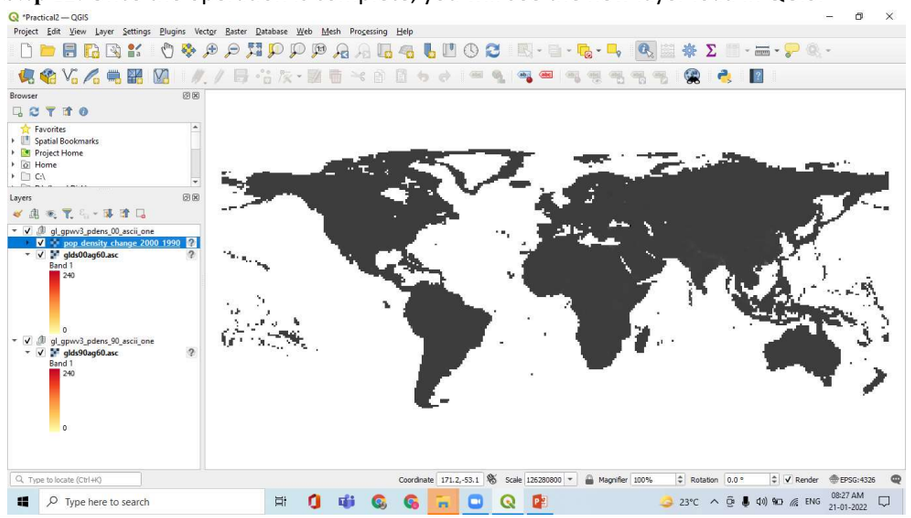
Step 10: For our analysis, we would like to find areas with largest population change between 1990 and 2000. The way to accomplish this is by finding the difference between each grid's pixel value in both the layer. Select Raster → Raster Calculator.



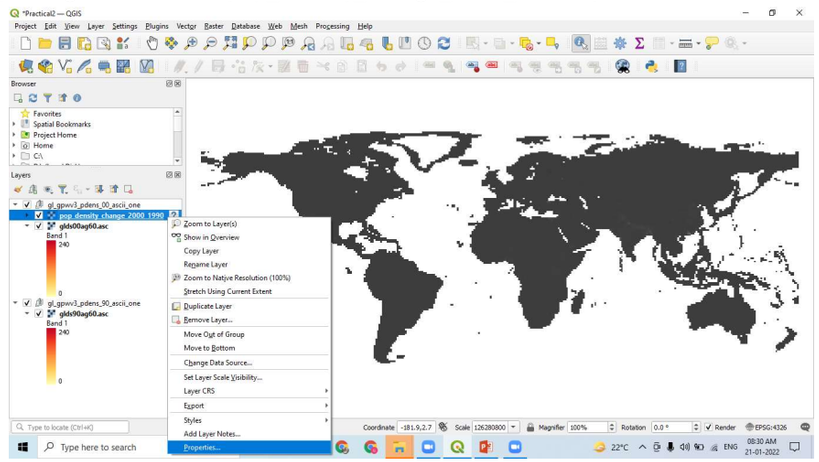
Step 11: In the Raster bands section, you can select the layer by double-clicking on them. The bands are named after the raster name followed by @ and band number. Since each of our rasters have only 1 band, you will see only 1 entry per raster. The raster calculator can apply mathematical operations on the raster pixels. In this case we want to enter a simple formula to subtract the 1990 population density from 2000. Enter "glds00ag60@1" – "glds90ag60@1" as the formula. Name your output layer as pop_density_change_2000_1990.tif and check the box next to Add result to project. Click OK.



Step 12: Once the operation is complete, you will see the new layer load in QGIS.

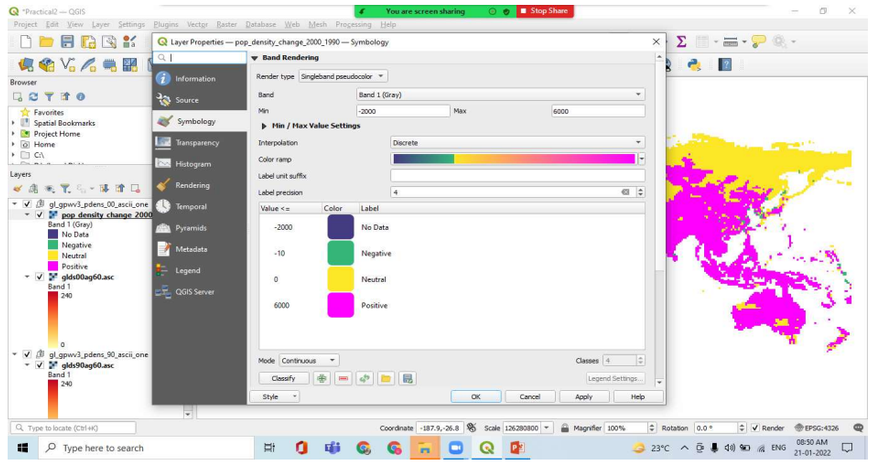


Step 13: This grayscale visualization is useful, but we can create a much more informative output. Right-click on the pop_density_change_2000_1990 layer and select Properties.

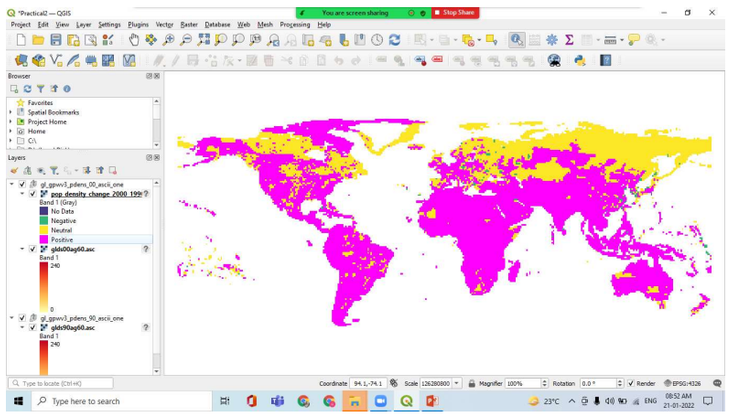


Step 14: We want to style the layer so pixel values in certain ranges get the same color. Before we dive in to that, go to the Metadata tab and look at the properties of the raster. Note the minimum and maximum values of this layer.

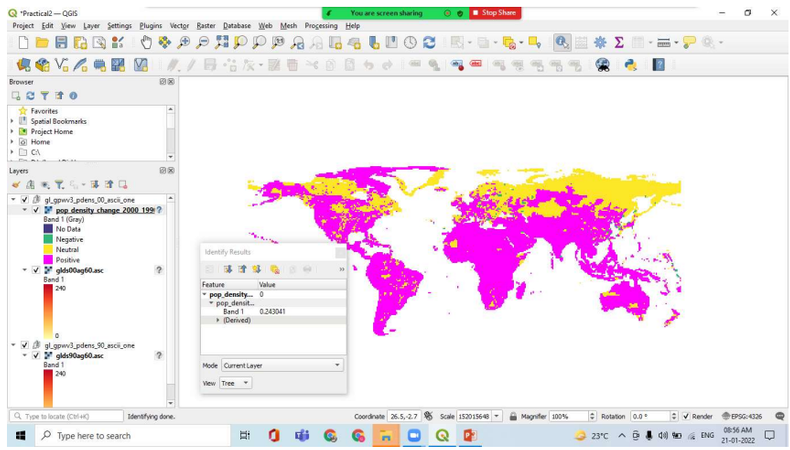
Step 14: Now go to the Symbology tab. Select Singleband pseudocolor as the Render type under Band Rendering. Set the Color interpolation to Discrete. Click the Add entry button 4 times to create 4 unique classes. Click on an entry to change the values. The way color map works is that all values lower than the value entered will be given the color of that entry. Since the minmum value in our raster is just above -2000, we choose -2000 as the first entry. This will be for the No Data values. Enter the values and Labels for other entries as below and click OK.



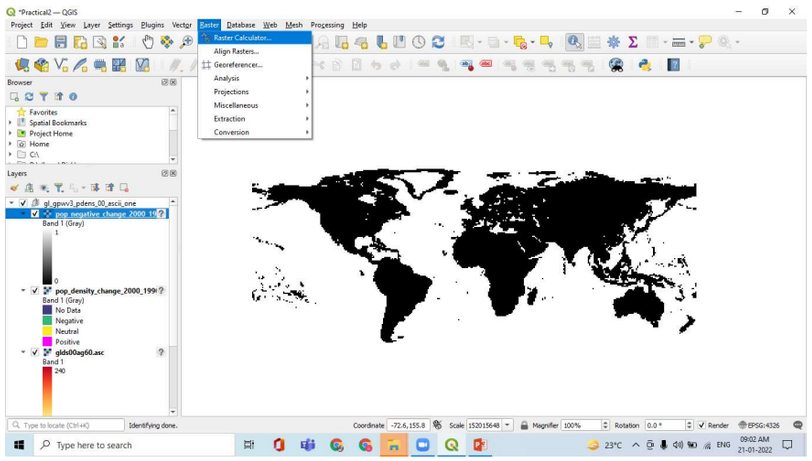
Step 15: Now you will see a much more powerful visualization where you can see areas which has seen positive and negative population density changes. Click on Zoom In button and draw a rectangle around Europe to explore the region in more detail.



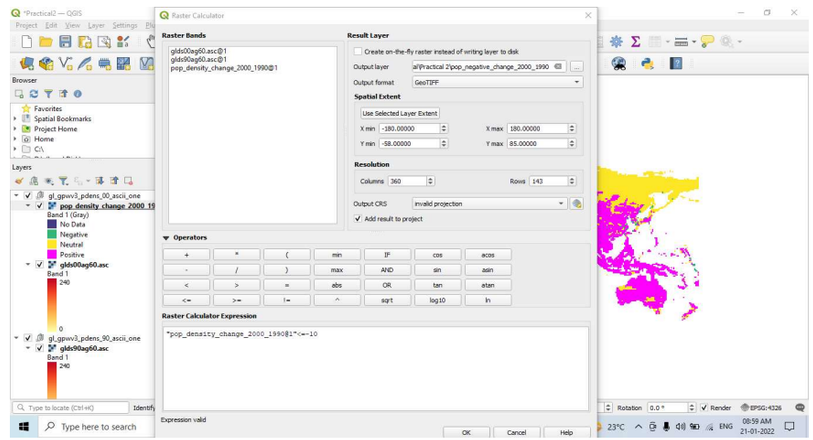
Step 16: Select the Identify tool and click on the Purple and Yellow regions to verify that your styling rules worked as intended.



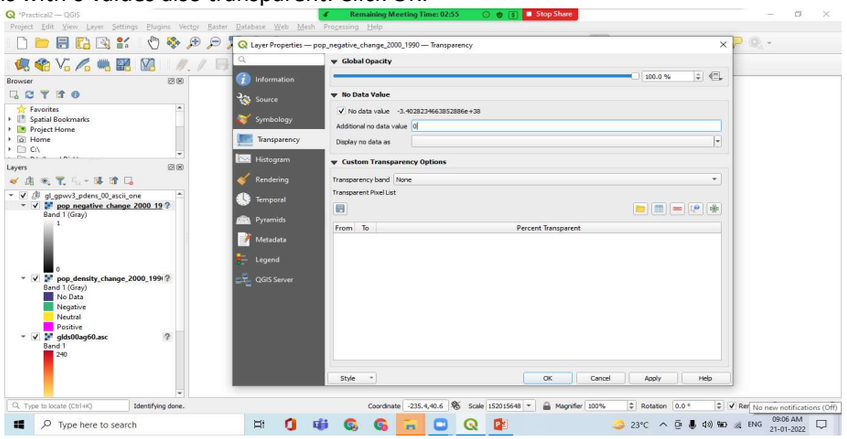
Step 17: Now let's take this analysis one-step further and find areas with only *negative* population density change. Open Raster ▸ Raster calculator.



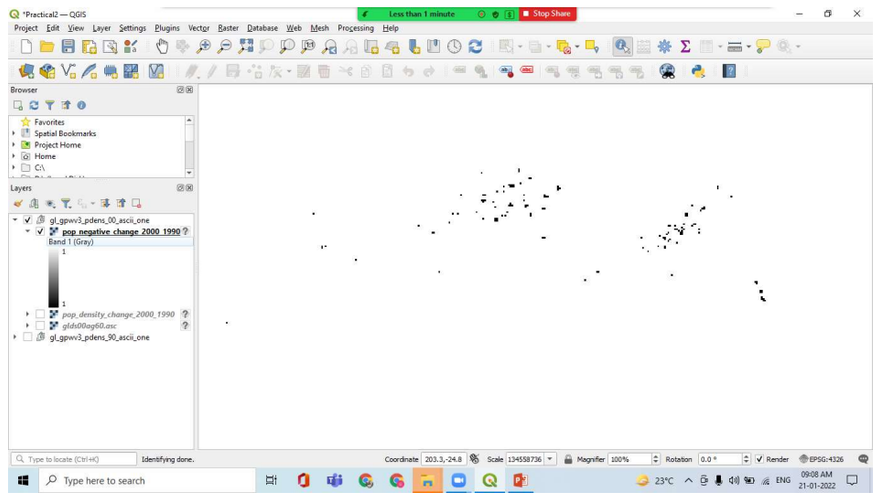
Step 18: Enter the expression as shown below What this expression will do is set the value of the pixel to 1 is if matches the expression and 0 if it doesn't. So we will get a raster with pixel value of 1 where there was negative change and 0 where there wasn't. Name the output layer as pop_negative_change_2000_1990 and check the box next to Add result to project. Click OK.



Step 19: Once the new layer is loaded, right-click on it and select Properties. In the Transparency tab, add 0 as the Additional no data value. This setting will make the pixels with 0 values also transparent. Click OK.



Step 20: Now you will see the areas of negative population density change as gray pixels.

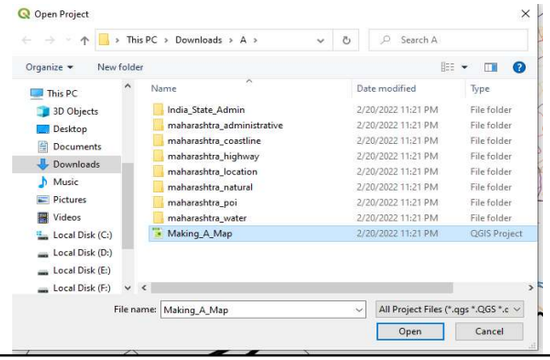


Practical 3: Making a Map, Working with Attributes, Importing Spreadsheets or CSV files Using Plugins, Searching and Downloading OpenStreetMap Data.

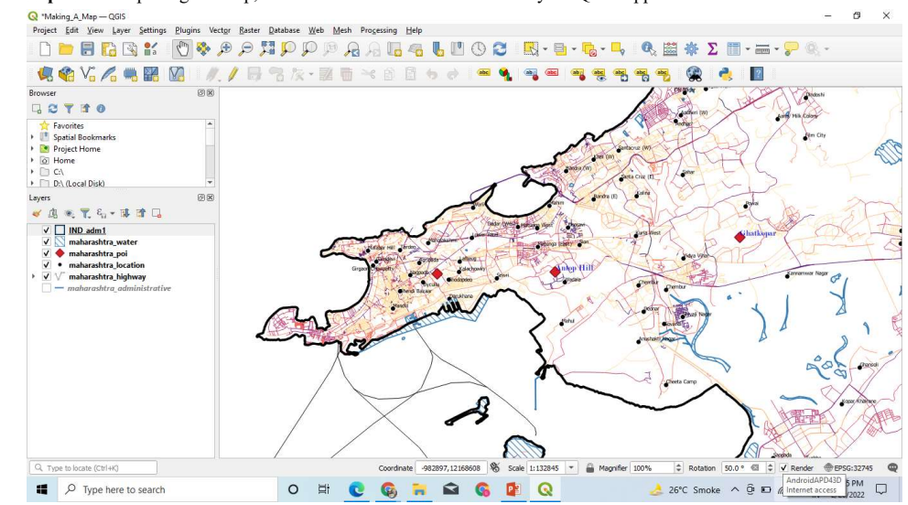
Aim: The aim of this practical is to create a map step-by-step using OpenStreetMap Data.

a) Making a Map

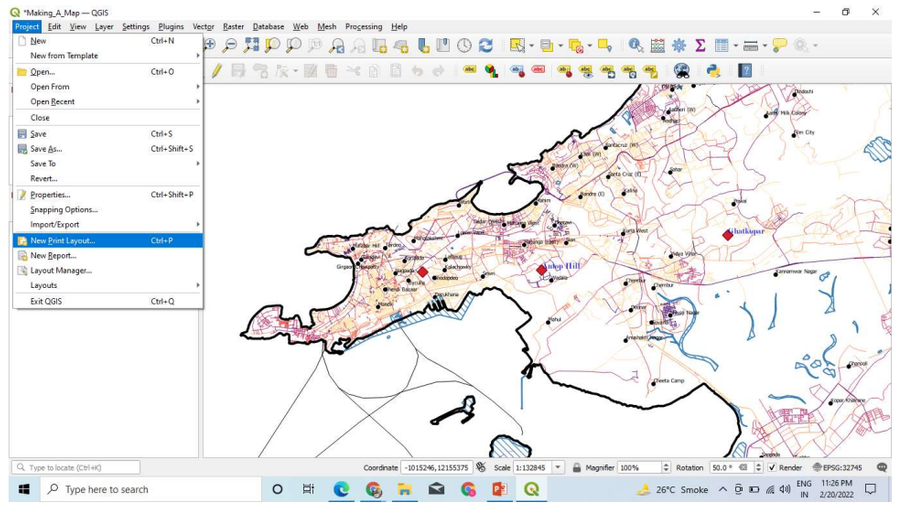
Step 1: Create a new Thematic Map or open an existing one by clicking on Project → Open



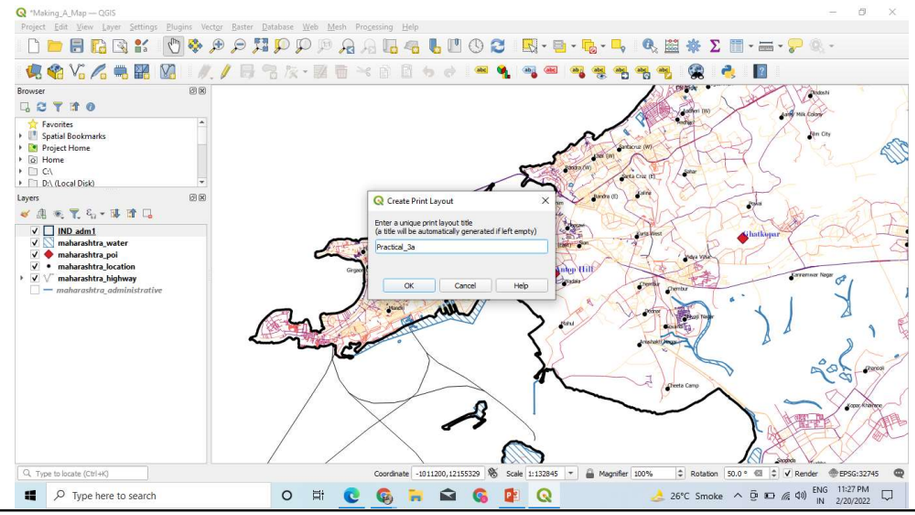
Step 2: After opening the map, it should look somewhat like this in your QGIS application



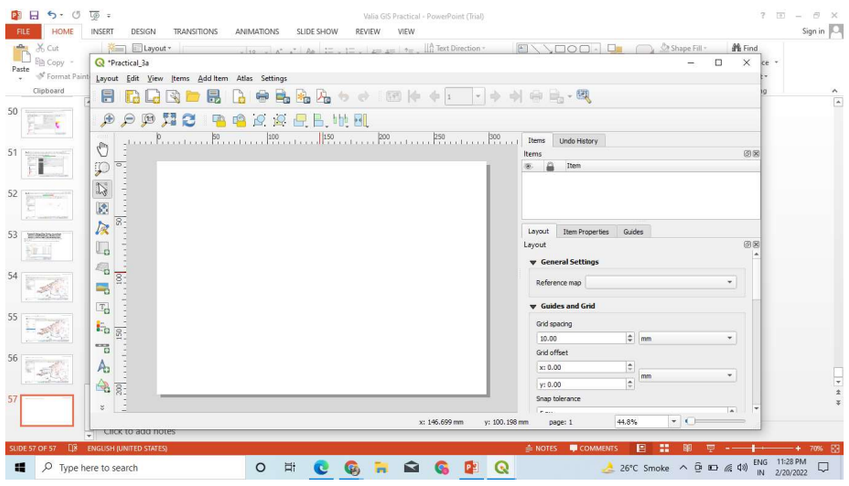
Step 3: Next, Click on Project → New Print Layout



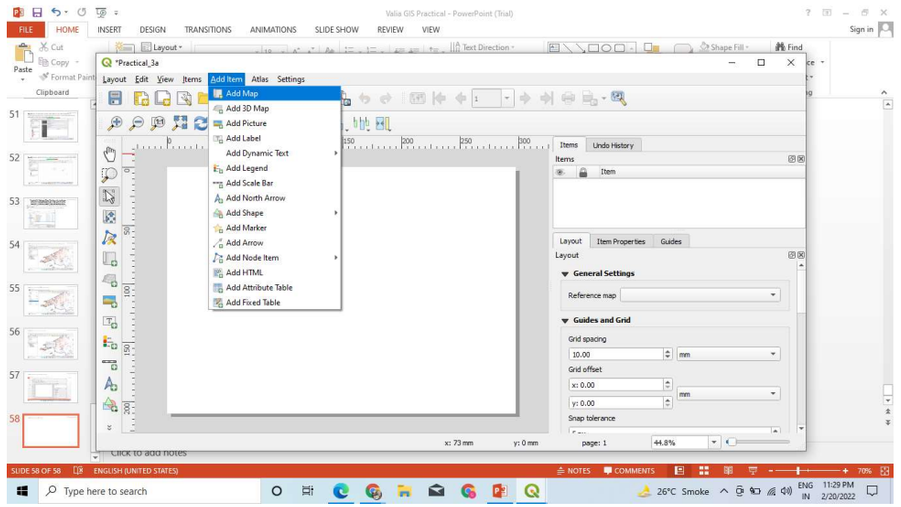
Step 4: Insert a suitable title and press "OK"



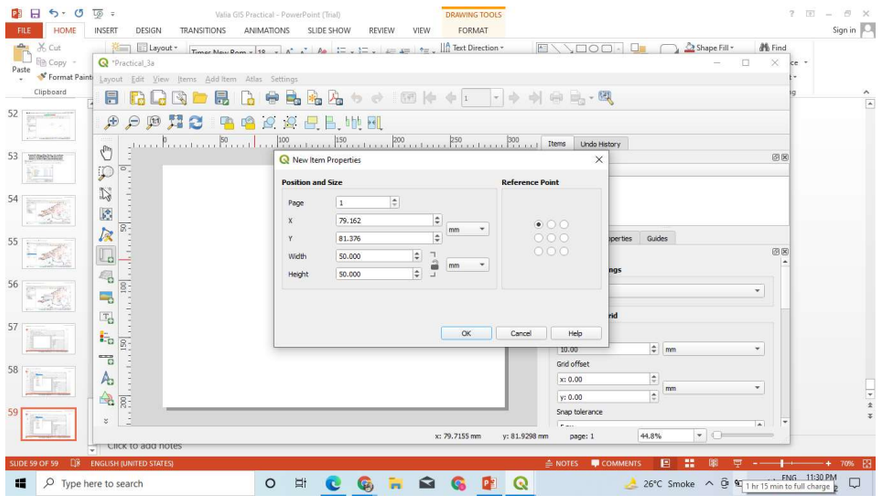
Step 5: A new Print Layout Window will Open



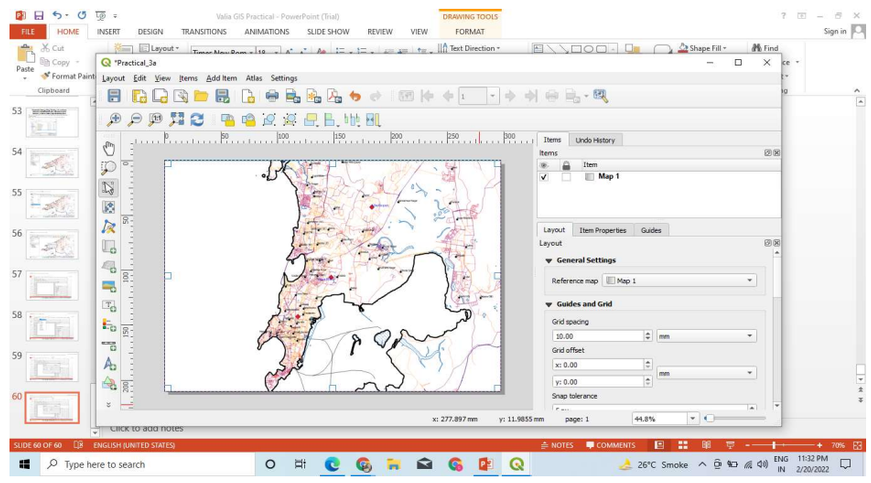
Step 6: Select Add Item → Add Map



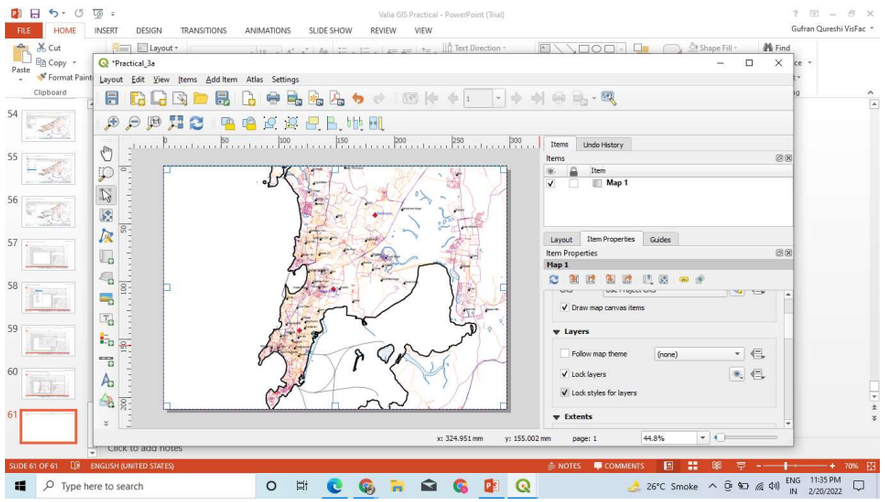
Step 7: Left click on the canvas and you should be presented with the following dialog box.



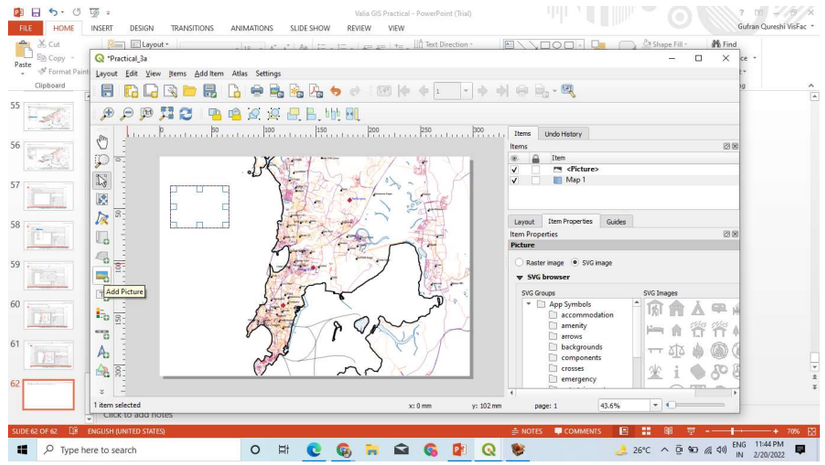
Step 8: Click "OK" to keep and select the default values and your map should now be created. Resize it so that it takes up the entire space of the canvas and should look like below:



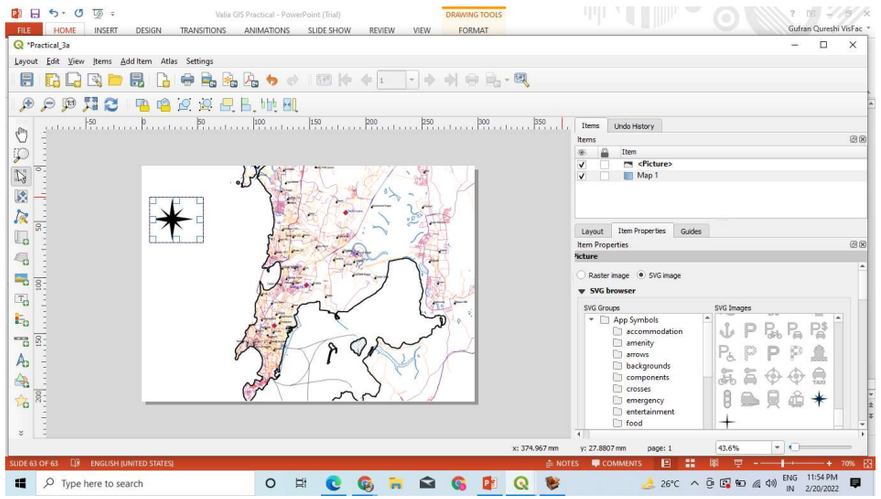
Step 9: After adding the map, go to Item Properties → Map1 → Layers and Check on Lock Layers and Lock Styles for layers.



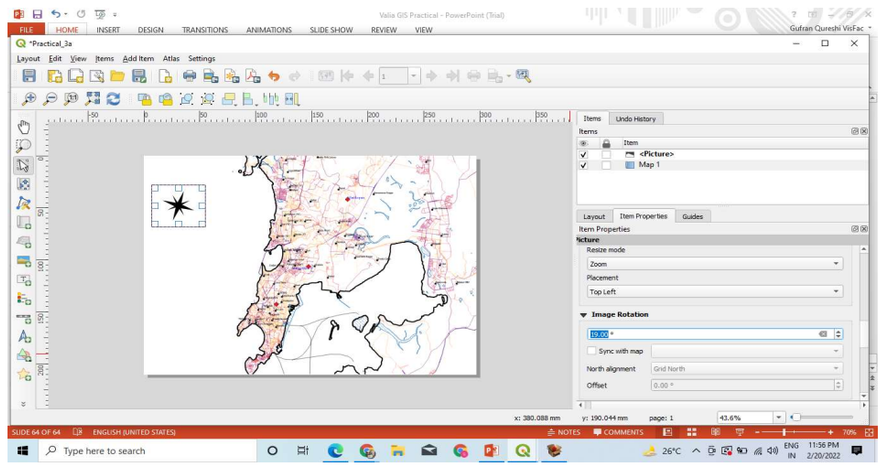
Step 10: This will ensure that if any change in layers or change their styles, the Print Layout view will not change. Go to Add Item → Add Picture → Place a picture box at appropriate location.



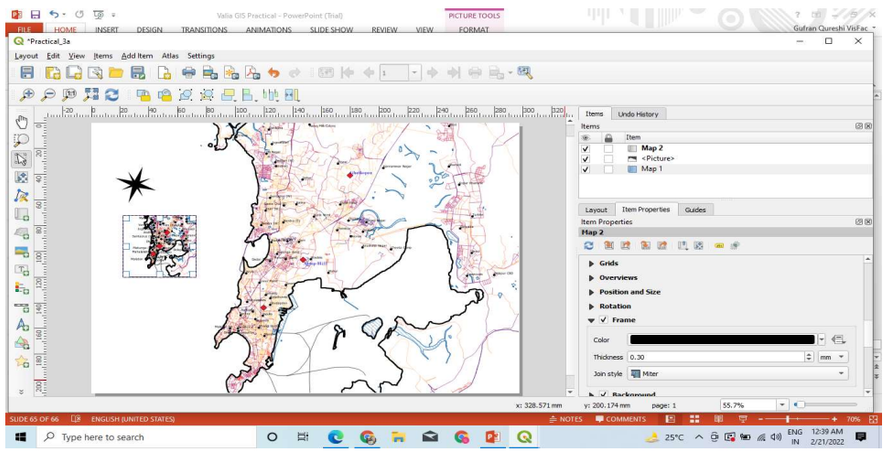
Step 11: Next, select “SVG browser” and select any symbol from “SVG images” you like as seen below:



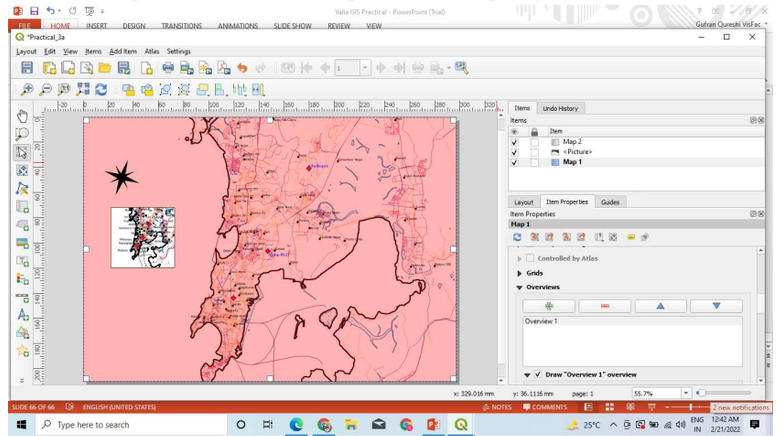
Step 12: Also adjust Image Rotation to its appropriate value by navigating to Item Properties → Image Rotation. I’ve rotated it at an angle of 19 degree as shown below:



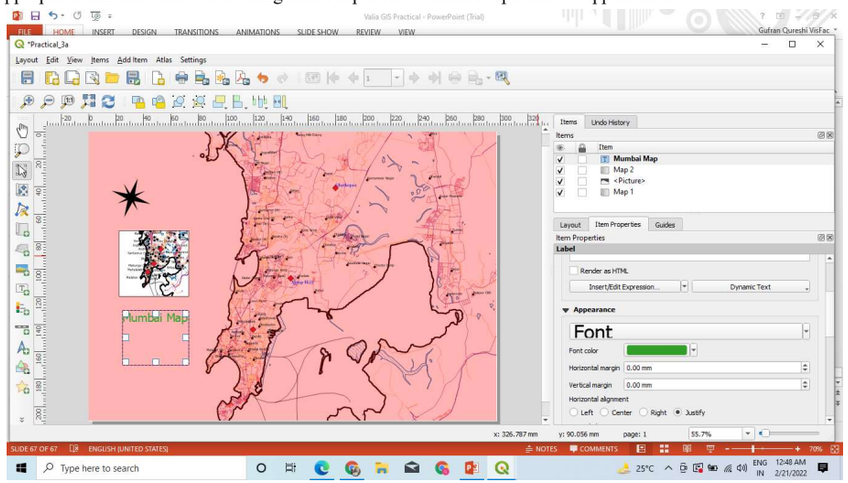
Step 13: Add an inset Using Add Item → Add Map → Select an area to be highlighted on main Map. Set a frame for Inset by enabling the check box for Frame.



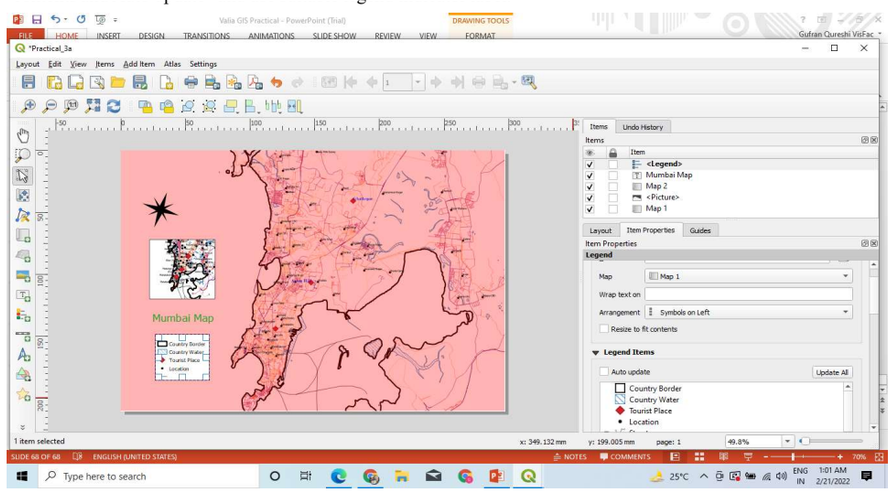
Step 14: To highlight the are shown in Inset, select the Picture representing main Map from Items pane.
In Item Properties → Overviews → using icon add an overview. Select the checkbox. Draw Overview and name the Picture object representing inset (Map1 in our case → What this is telling the Print Composer is that it must highlight our current object Map 1 with the extent of the map shown in the Map 2 object).



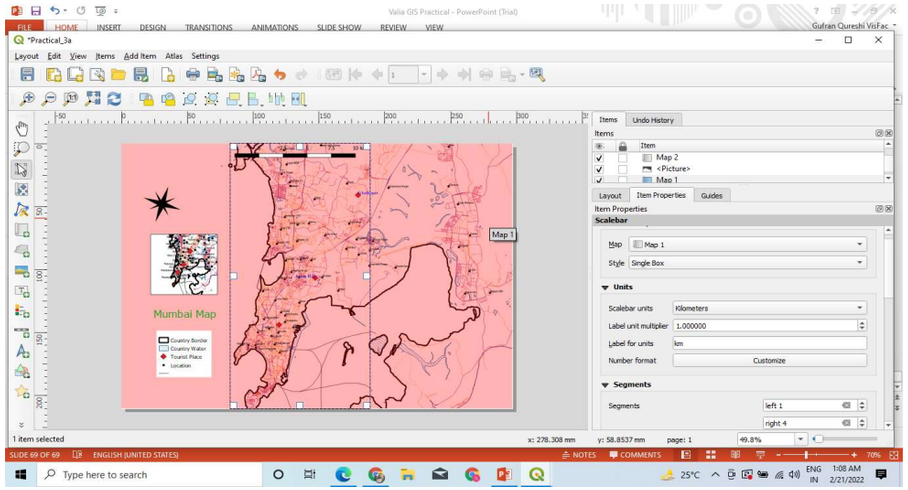
Step 15: Next, add a label by navigating to Add Item → Add Label. Change the Label text To "Mumbai Map", Set appropriate font size and colour using Item Properties → Main Properties → Appearance.



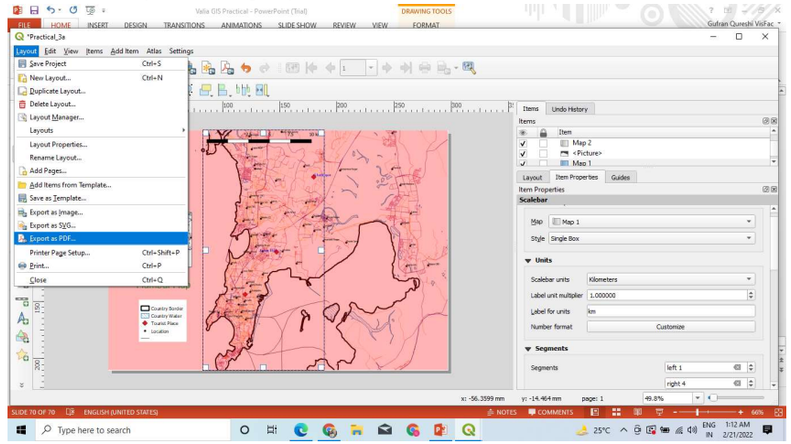
Step 16: Next go to Add Item → Add Legend → Place the legend indicator at appropriate location. Uncheck "Resize to fit contents and Auto update" and use suitable legend indicator label.



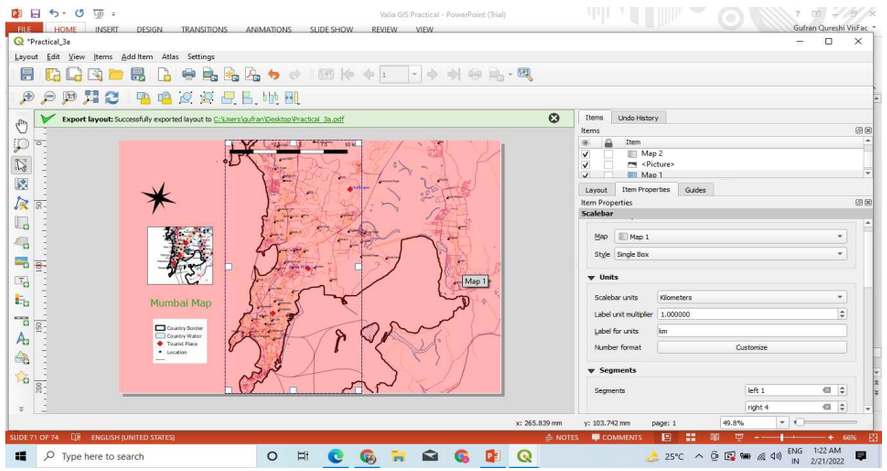
Step 17: Next, add a Scale bar by navigating to Add Item → Add Scale Bar and add left 1 and right 4 respectively in the segments section:



Step 18: Your image is now ready and can be exported. To do so, click on the "Layout" tab and select "Export as PDF". Save it wherever you like and specify a name to it.

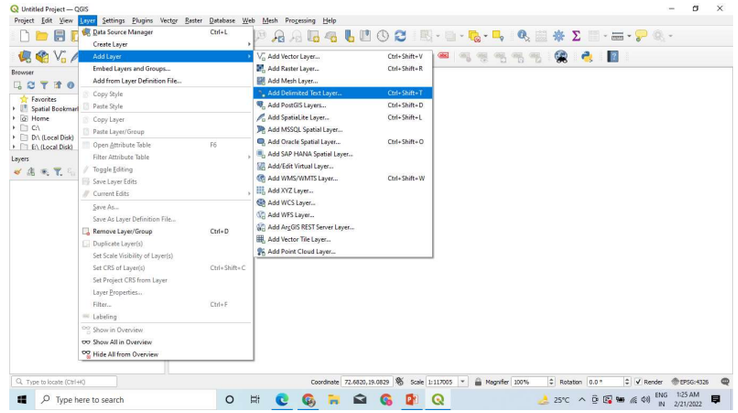


Step 19: At the end, a green dialog box stating "Export Layout: Successfully exported" with a green tick to the left will be displayed as shown below:

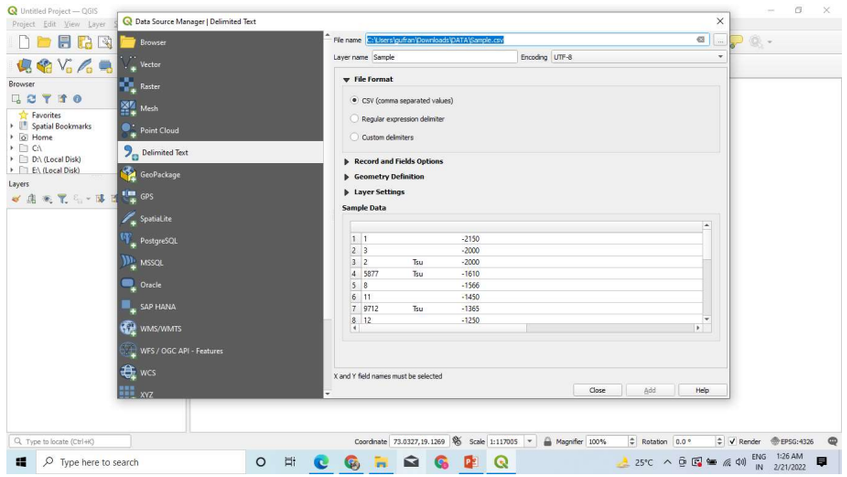


b. Importing Spreadsheets or CSV files.

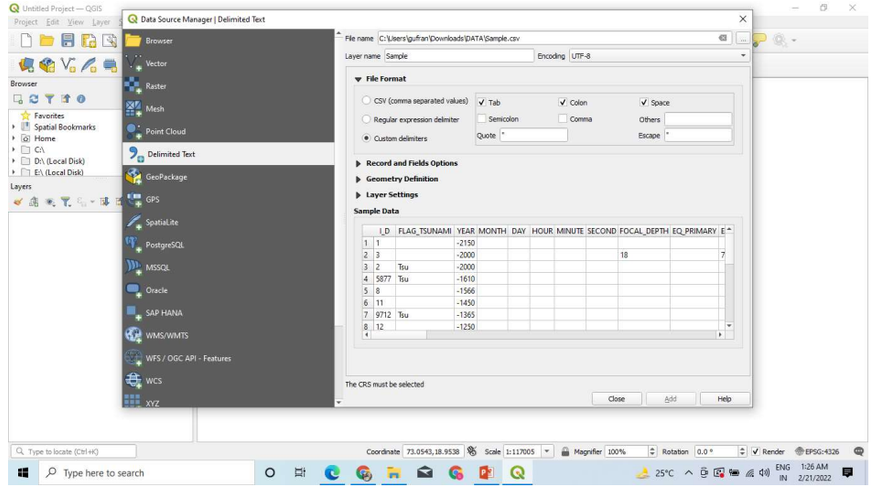
Step 1: Many times the GIS data comes in a table or an Excel spreadsheet or a list lat/long coordinates, therefore it has to be imported in a GIS project. Sample file for Earthquake data will be used in this practical. Go to Layer → Add Layer → Add Delimited text Layer



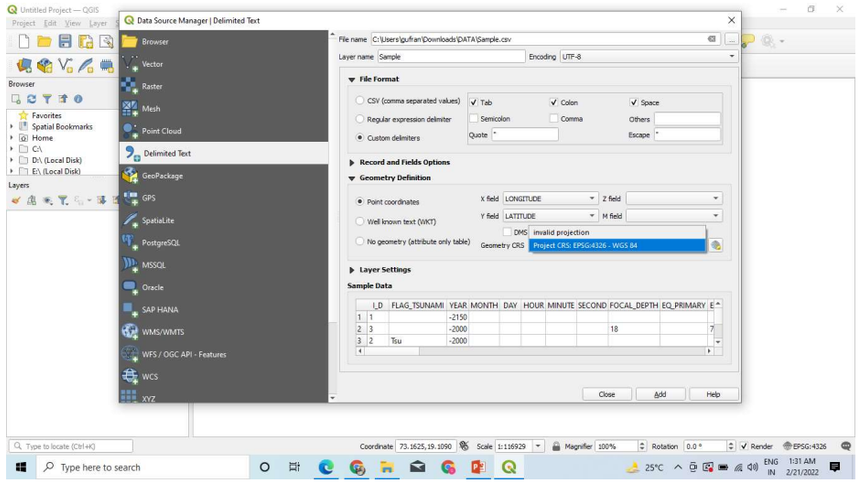
Step 2: Data Source Manager | Delimited Text window will appear. Select the \GIS_Workshop\Practicals\Practical_03\C\Sample.csv file from data folder.



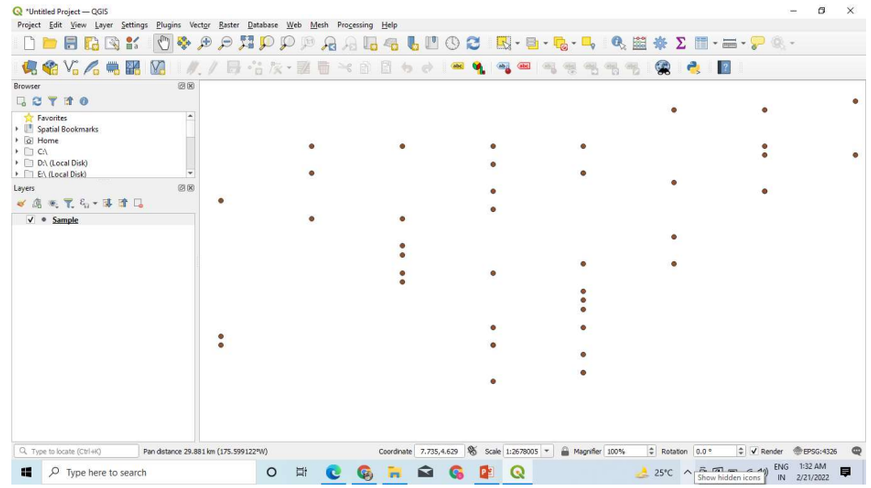
Step 3: Select the "Custom Delimiters" radio buttons and check the "Tab", "Colon" and "Space" checkboxes.



Step 4: Change the "Geometry CRS: Project CRS" value from the "Geometry Definition" tab in the same window. Select "Longitude" in the X Field and "Latitude" in the Y Field and click on the "Add" button.



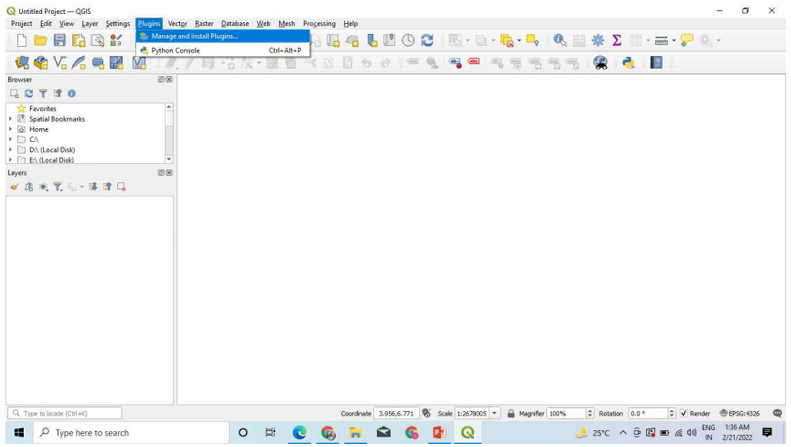
Step 5: These coordinates should then be displayed.



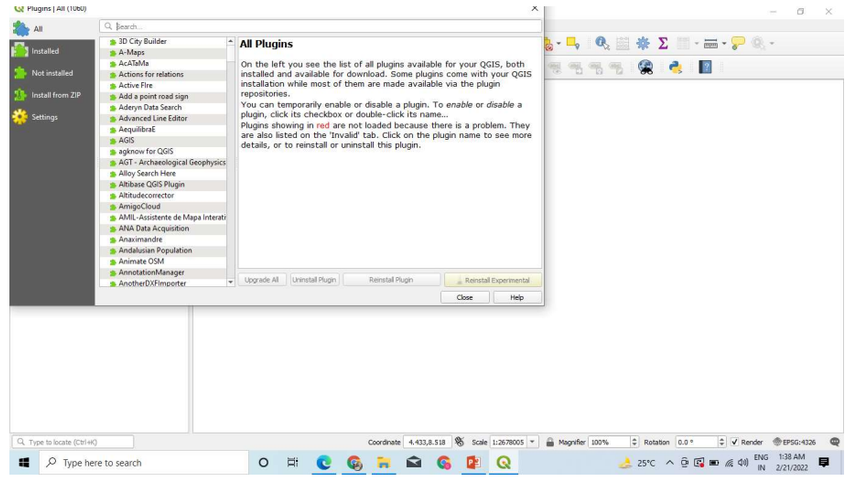
c. Using Plugins

Step 1: Core plugins are already part of the standard QGIS installation. To use these, just enable them.

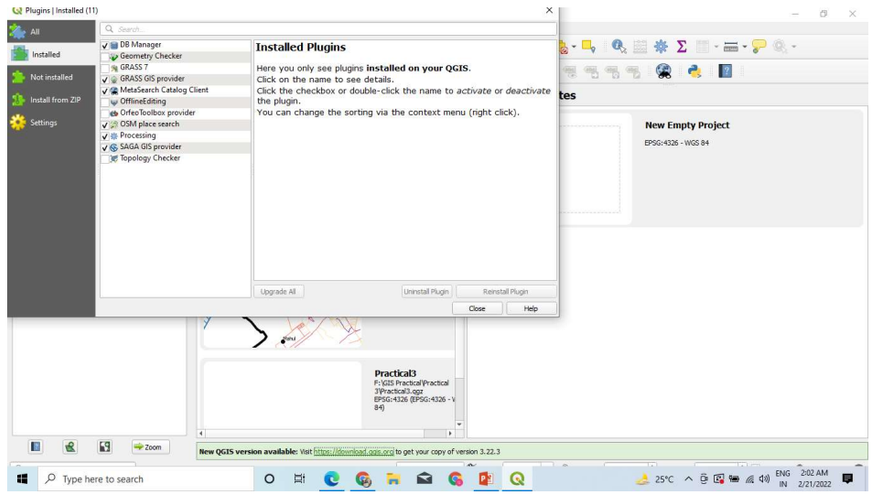
Step 2: Open QGIS. Click on Plugins → Manage and Install Plugins



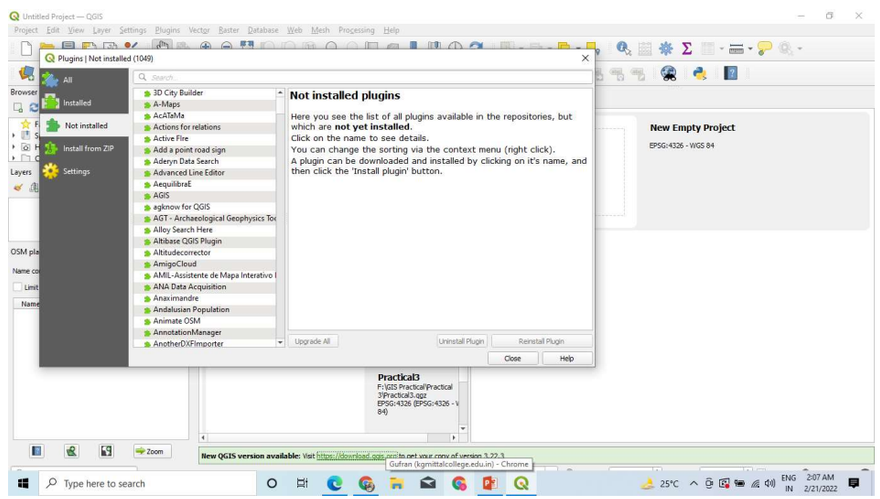
Step 3: After clicking on it, the following window will show up.



Step 4: To enable a plugin, check the checkbox next to the plugin and then you can use it.



Step 5: External plugins are available in the QGIS Plugins repository and need to be installed by you before using them.

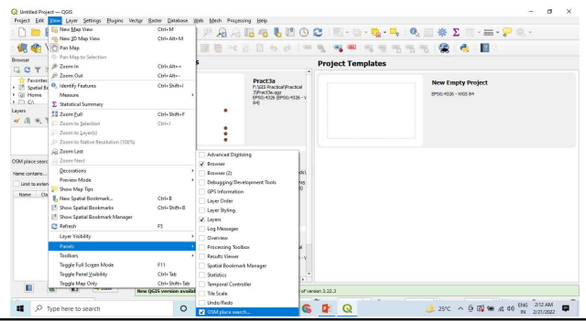


d. Searching and Downloading OpenStreetMap Data

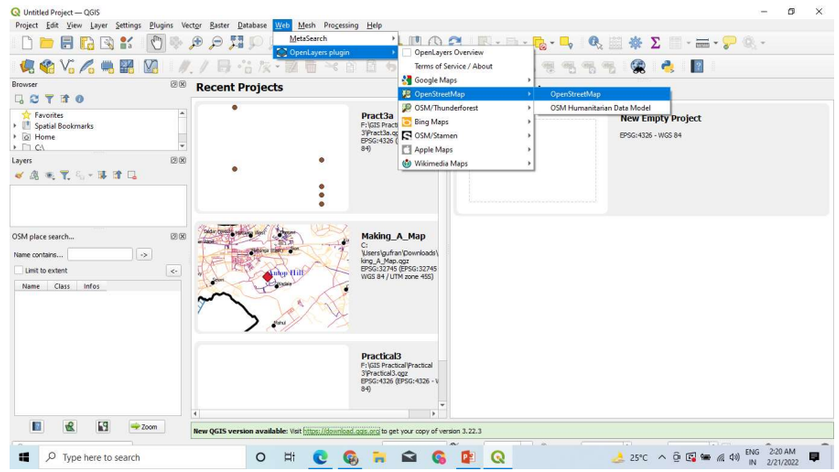
OpenStreetMap (OSM) created by Steve Coast in the UK in 2004 is a collaborative project to create a free editable map of the world. Rather than the map itself, the data generated by the project is considered its primary output. The creation and growth of OSM has been motivated by restrictions on use or availability of map information across much of the world, and the advent of inexpensive portable satellite navigation devices.

Step 1: Add "Open Layer (https://plugins.qgis.org/plugins/openlayers_plugin/)" and "OSM place Search" Plugin from Not Installed option from Plugin Manager Dialog Box.

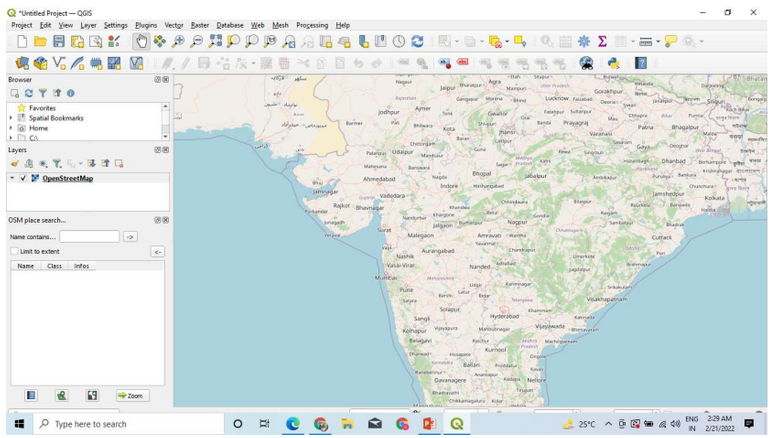
Step 2: The OSM Place Search plugin will install itself as a Panel in QGIS, if not go to View → Panels → select OSM place Search.



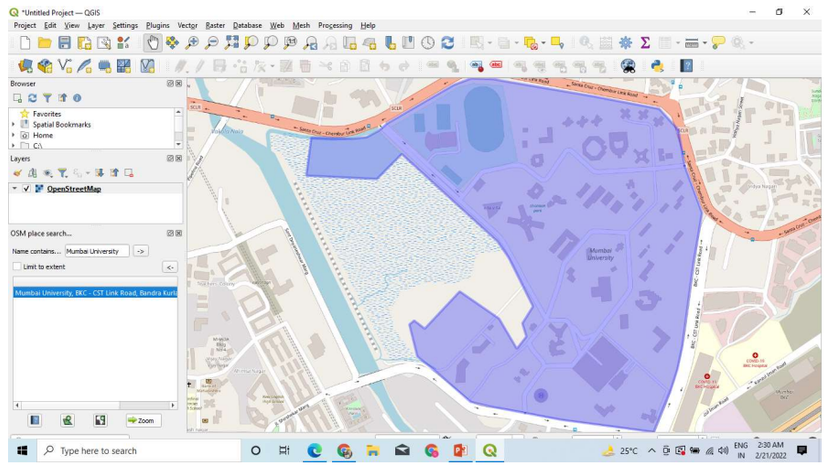
Step 3: Go to Web → OpenLayer Plugin and select Open Street Map



Step 4: A World map will appear on screen.
If an error occurs in loading maps, go to project properties → CRS → Check "No CRS (or unknown/non-Earth projection)"



Step 5: In OSM Place search Pane → Enter Mumbai University or any place name to search.
Double click on the desired place in OSM Place search Panel or Click and press on the "Zoom" button.

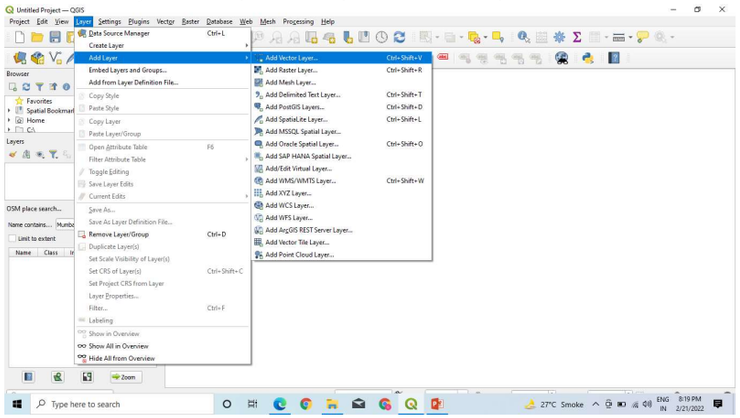


Practical 4: Working with attributes, terrain data.

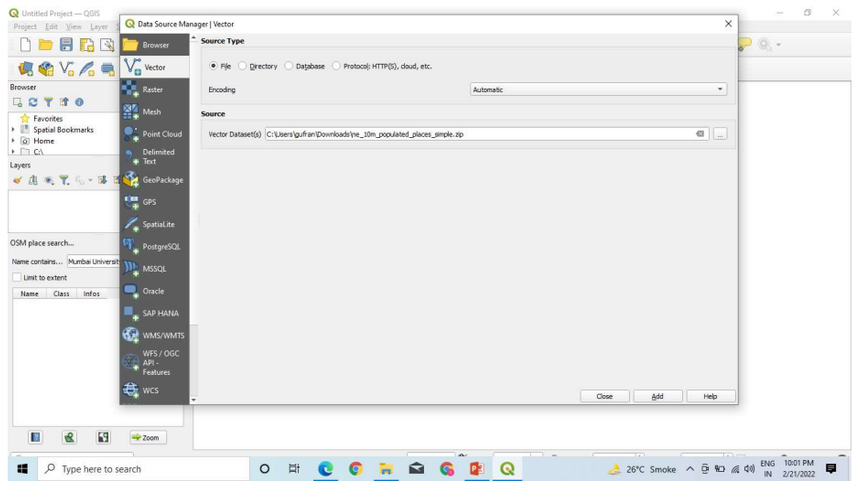
Aim: The aim of this practical is to understand attributes & terrain data.

a) Working with attributes

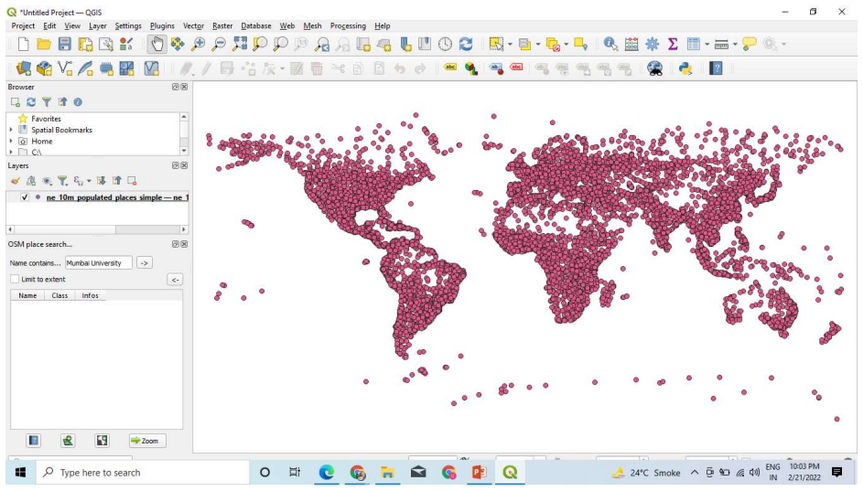
Step 1: Create a new Project. Go to Layer → Add Layer → Add Vector Layer



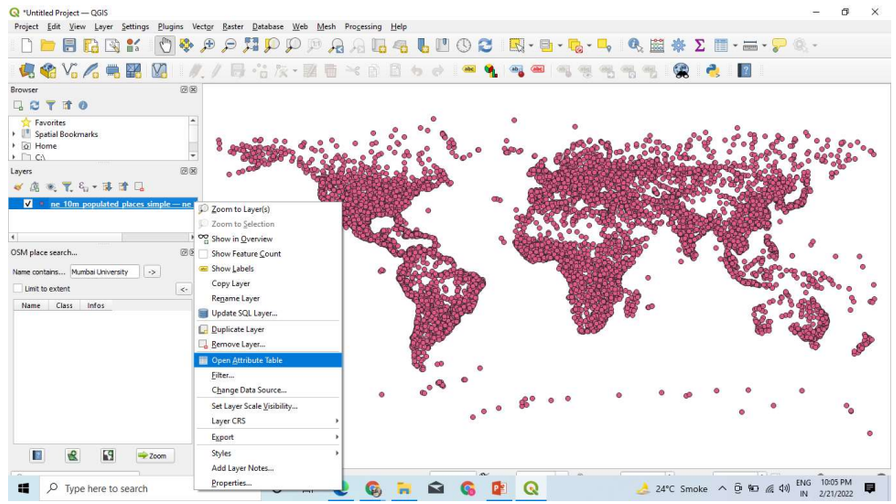
Step 2: Select "\GIS_Workshop\Practicals\Practical_04\A\Data\ne_10m_populated_places_simple.zip"



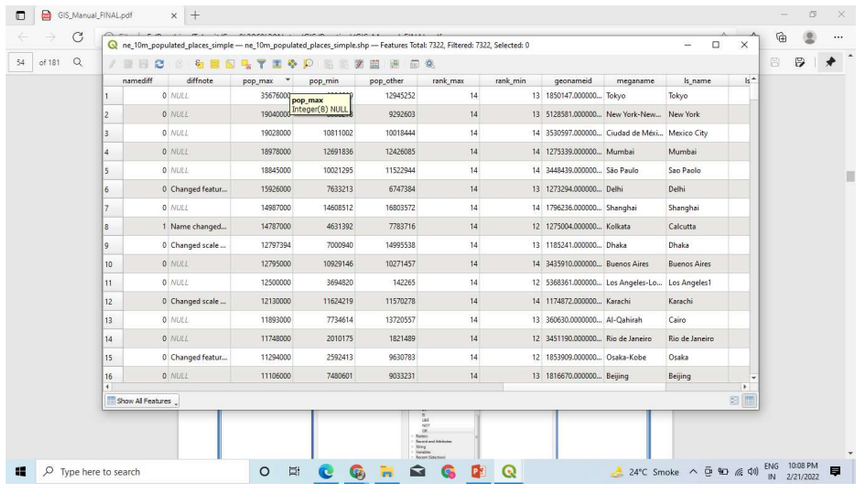
Step 3: After clicking on Add, the following window will show up.



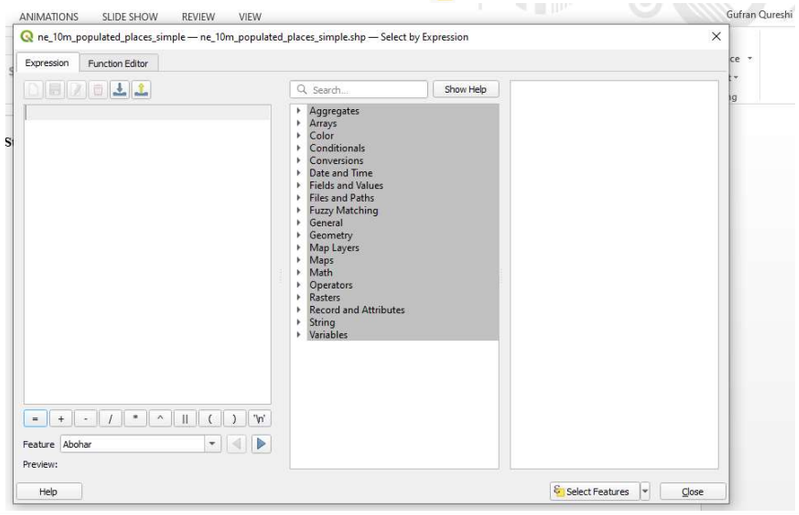
Step 4: Right click on Layer in Layer Panel → Open Attribute Table.



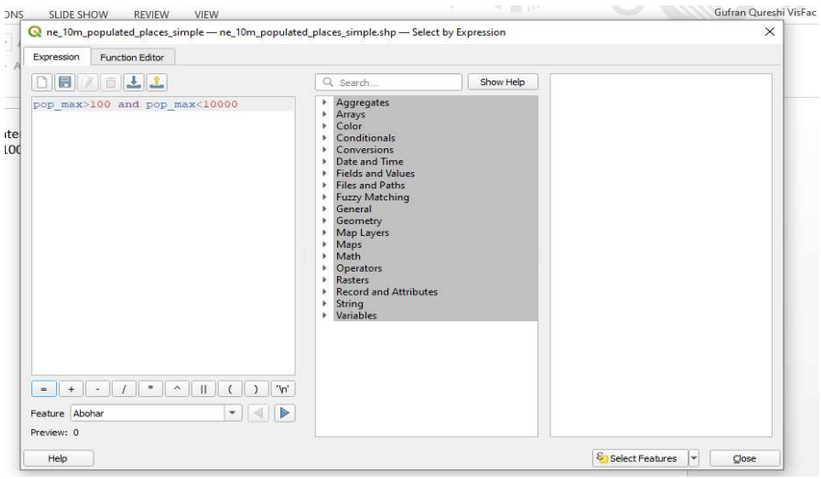
Step 5: Explore various attributes and their values in the Attribute table. To find the Place with maximum population click on “pop_max” file.



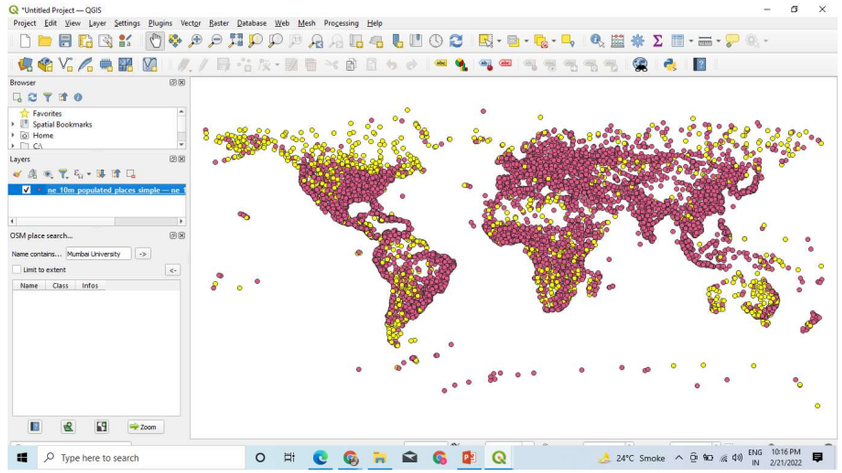
Step 6: On clicking the Select feature using expression button the following window will appear.



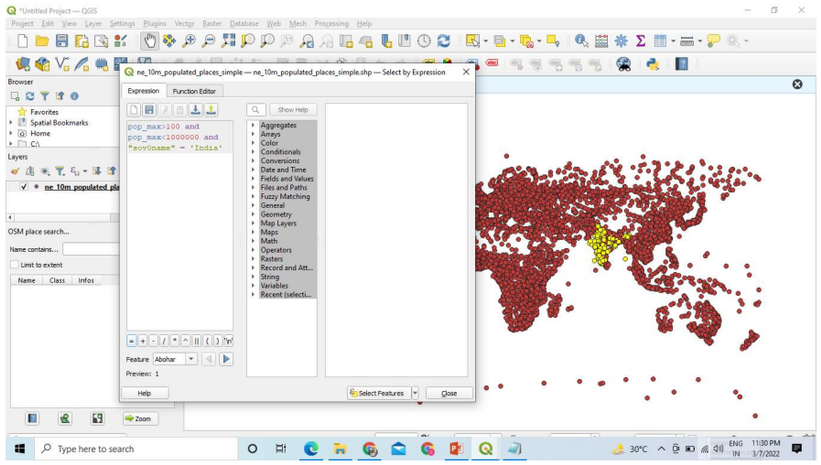
Step 7: Enter pop_max>100 and pop_max<10000 and click “select features” button to get all the places with population between 100 and 10000.



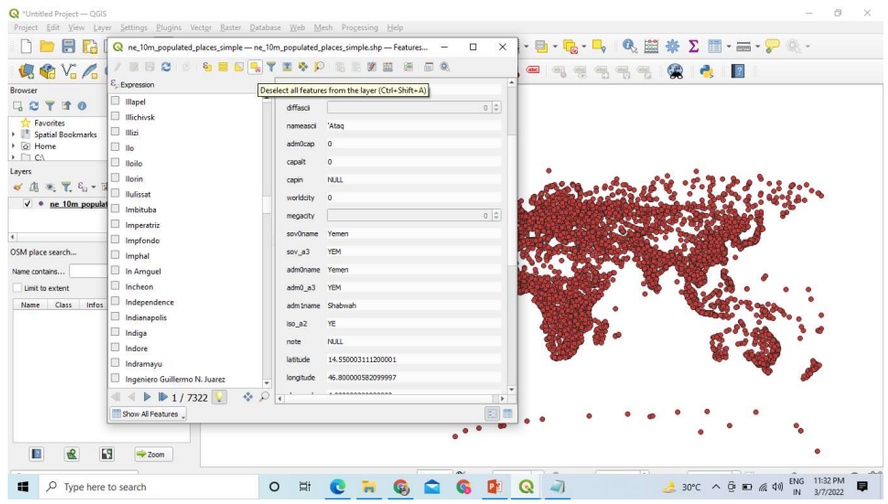
Step 8: Enter pop_max>100 and pop_max<10000 and click “select features” button to get all the places with population between 100 and 10000 and click close. The places matching the criteria will appear in different color.



Step 9: Different queries can be performed using the dataset. Enter pop_max>100 and pop_max<1000000 and "sov0name" = 'India' and click "select features" button to get all the places with population between 100 and 1000000 and click close. The places matching the criteria will appear in different color.



Step 10: Use the deselect button to deselect the feature to be rendered in original color.

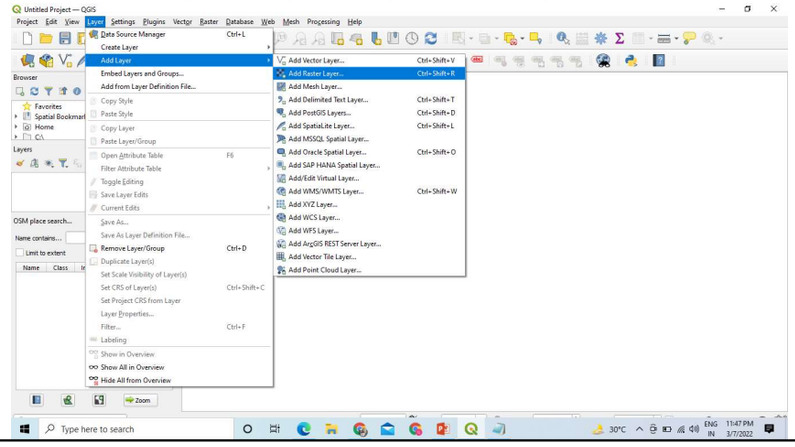


Practical 4: Working with attributes, terrain data.

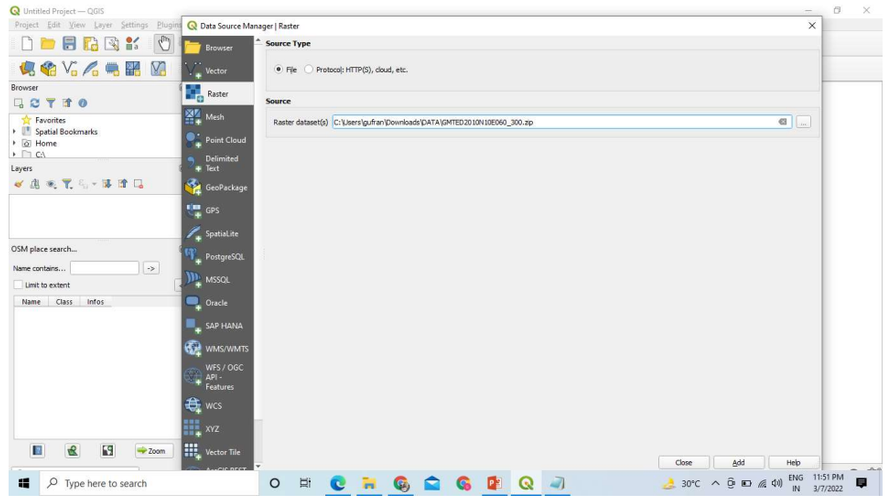
Aim: The aim of this practical is to understand attributes & terrain data.

b) Terrain Data and Hill shade analysis

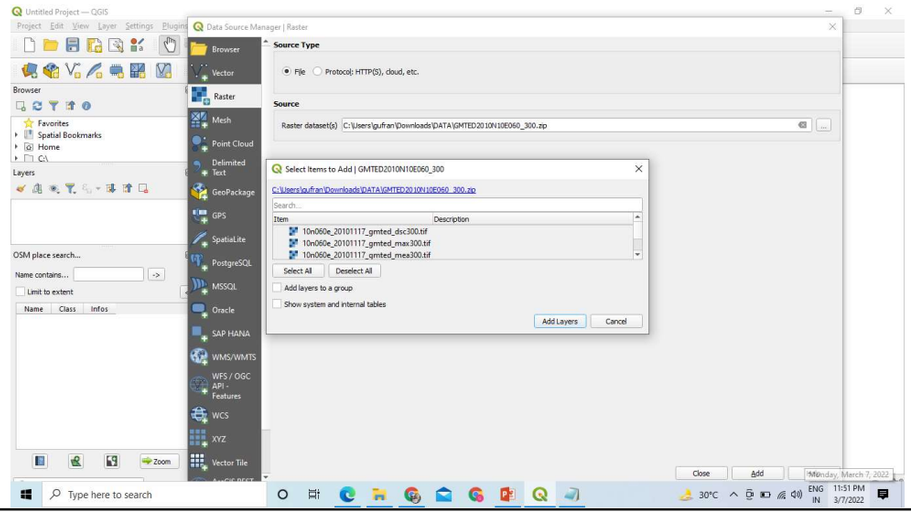
Step 1: Create a new Project. Go to Layer → Add Layer → Add Raster Layer



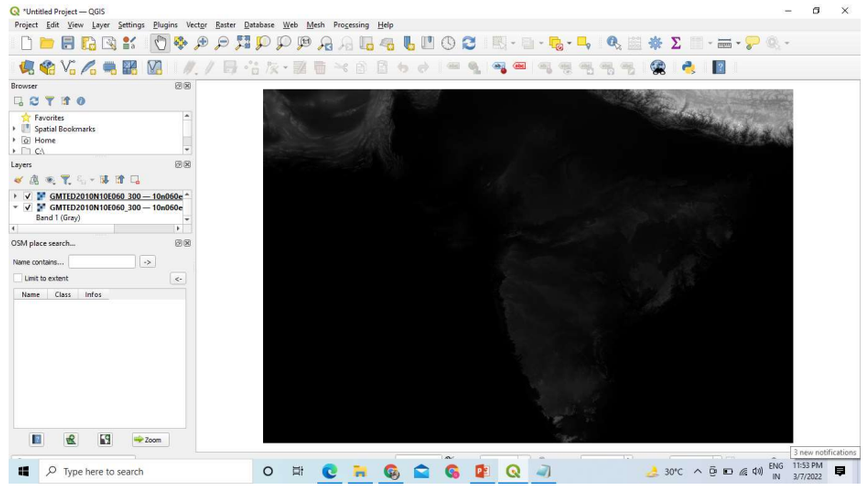
Step 2: Select "\GIS_Workshop\Practicals\Practical_04\A\Data\GMTED2010N10E060_300.zip"



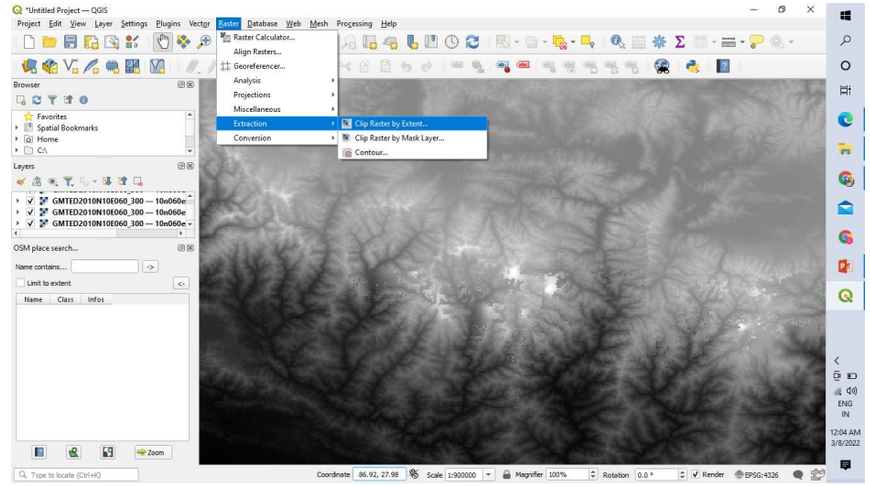
Step 3: After clicking on Add, the following window will show up.



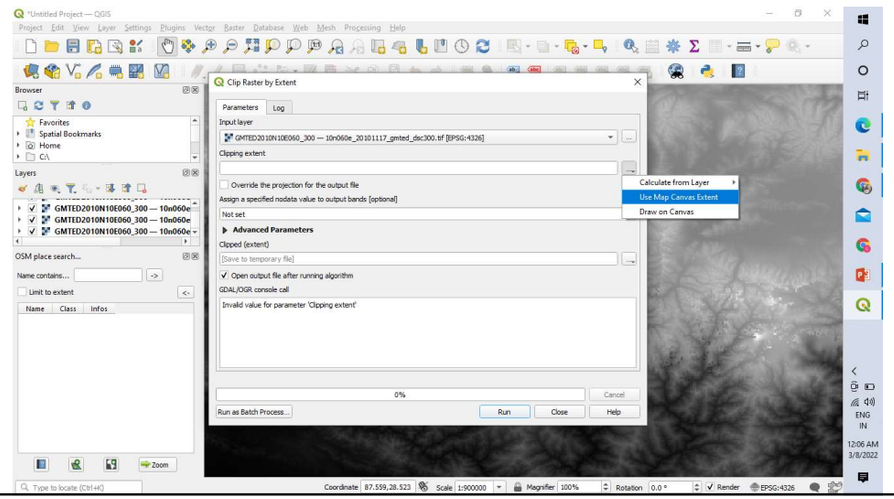
Step 4: Click Add Layers and close the Data Source Manager. Your terrain data is loaded.



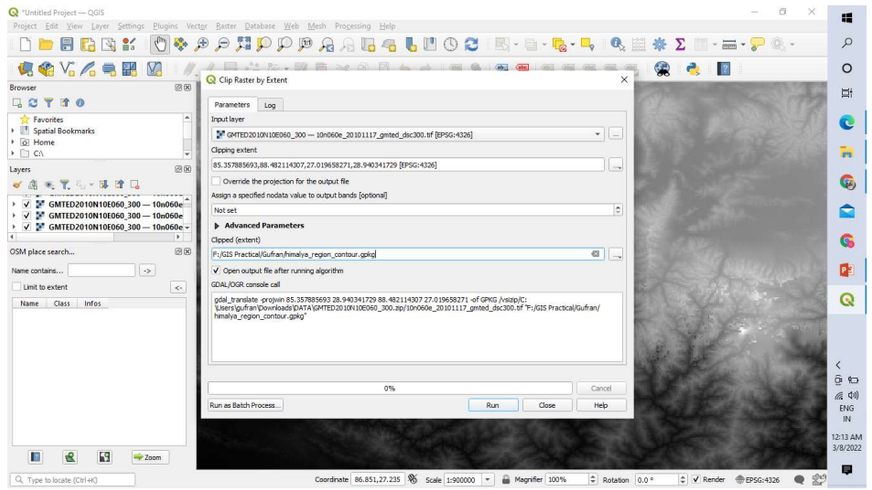
Step 5: Enter 86.92, 27.98 in the coordinate field, Scale 900000 and Magnifier 100% at the bottom of QGIS. Select Raster → Extraction → Clip raster by extent.



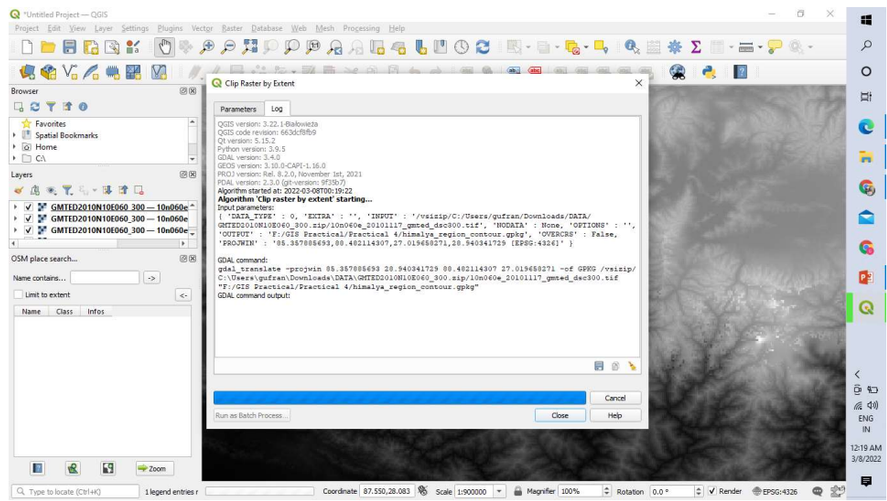
Step 6: Select the clipping area by selecting the option **Use Map Canvas** Extent if the visible part of map is to be selected or manually select an area on canvas by using **Select Extent on Canvas**.



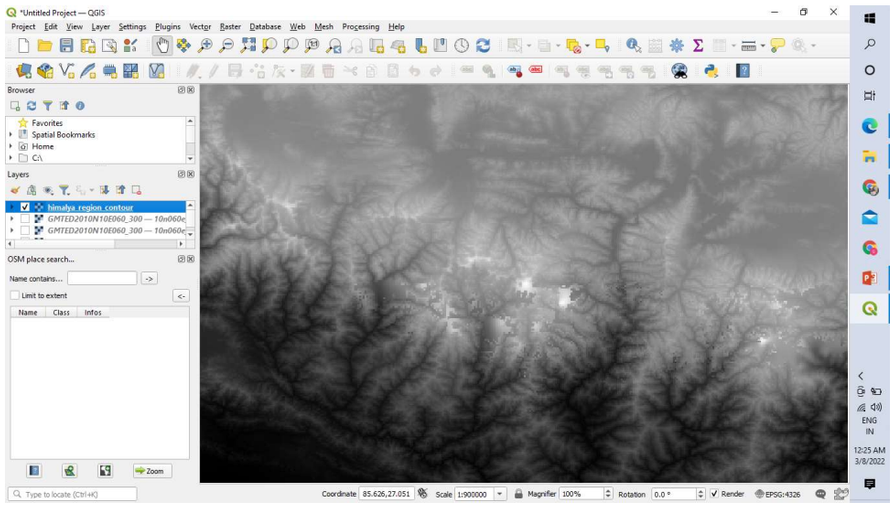
Step 7: Select the location and file name for storing clipped raster layer. Press RUN.



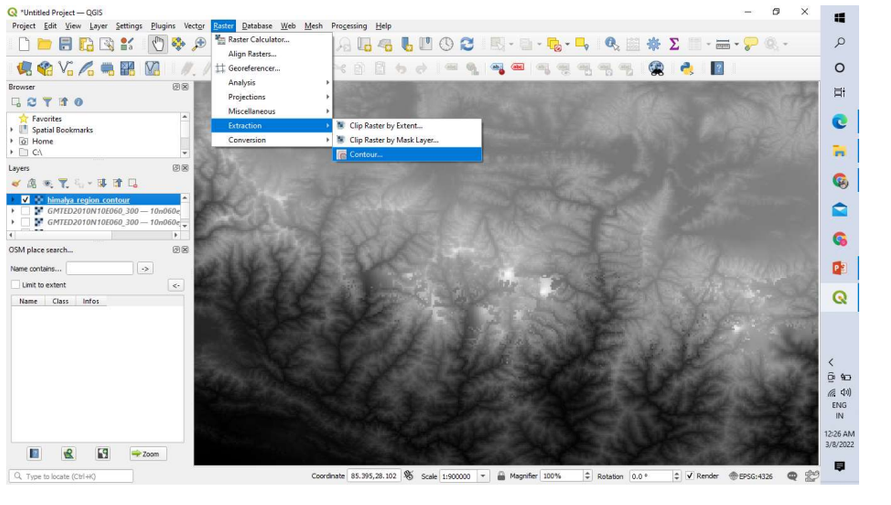
Step 8: After pressing the RUN the following window will appear and layer will be created for the given file name.



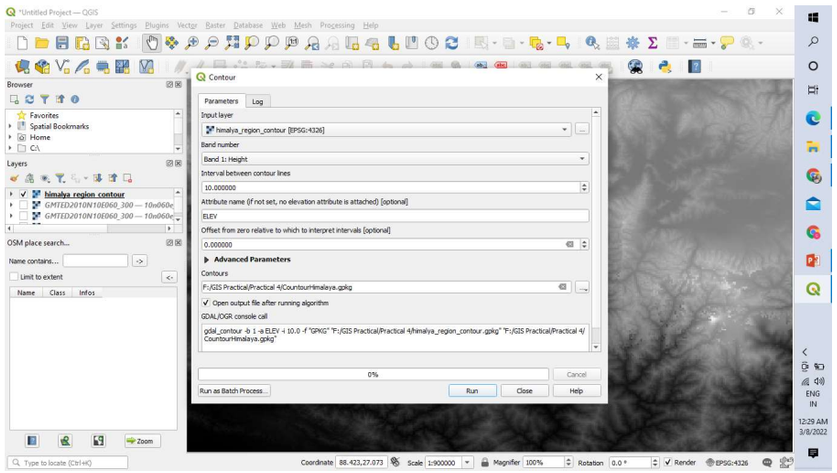
Step 9: Deselect the original layer and keep the clipped one under layer tab.



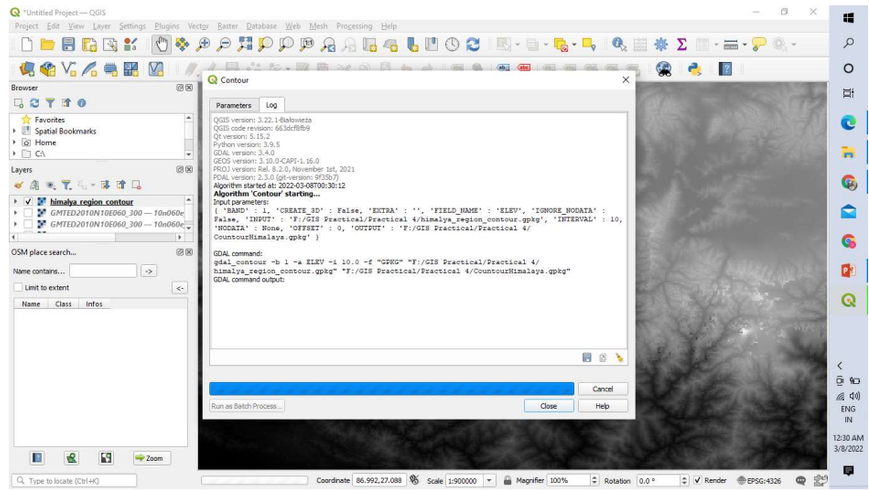
Step 10: Go to Raster → Extraction → Contour.



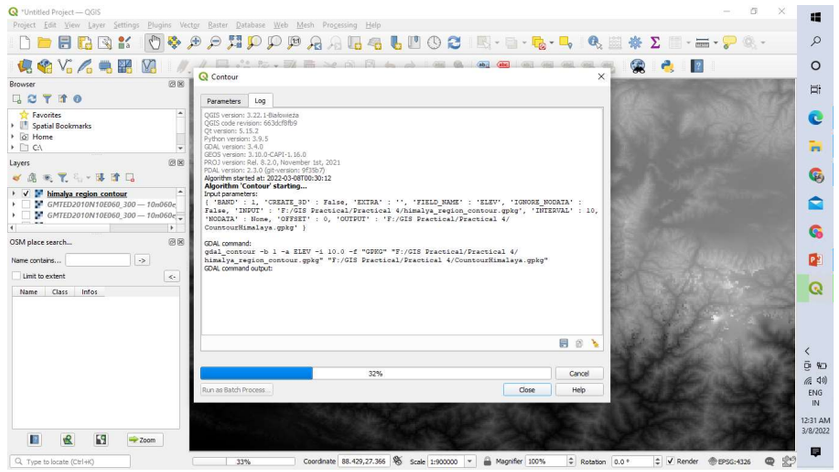
Step 11: Select output file and location and Press RUN.



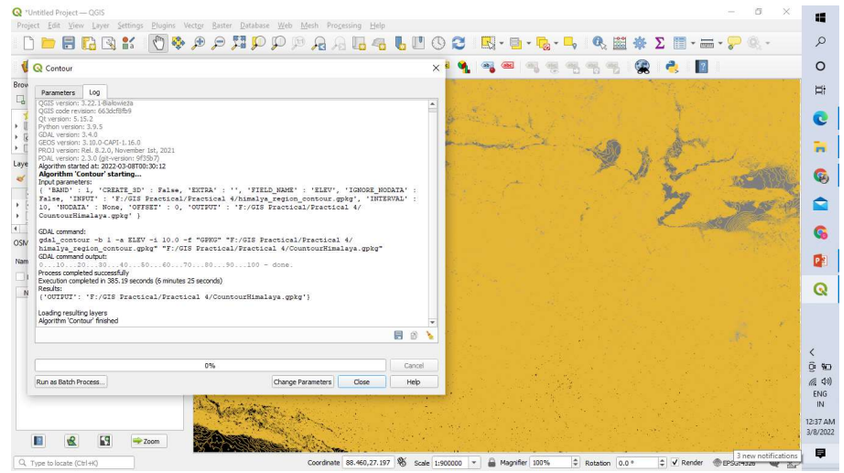
Step 12: Select output file and location and Press RUN.



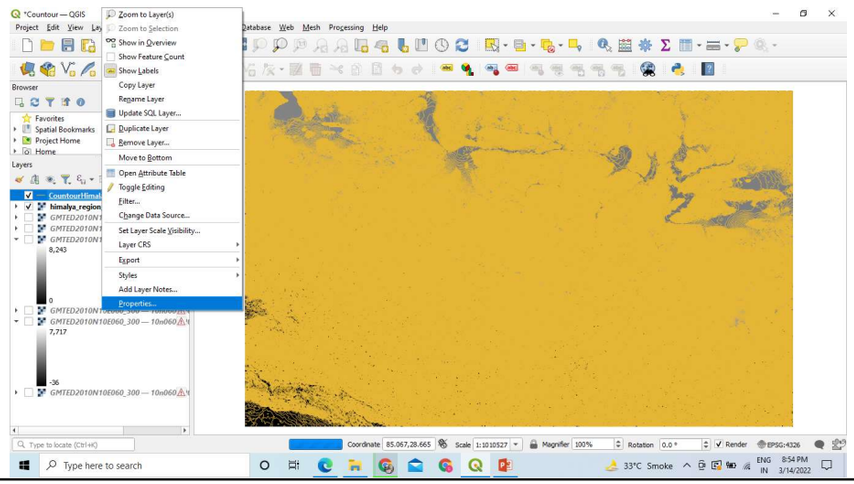
Step 13: Select output file and location and Press RUN.



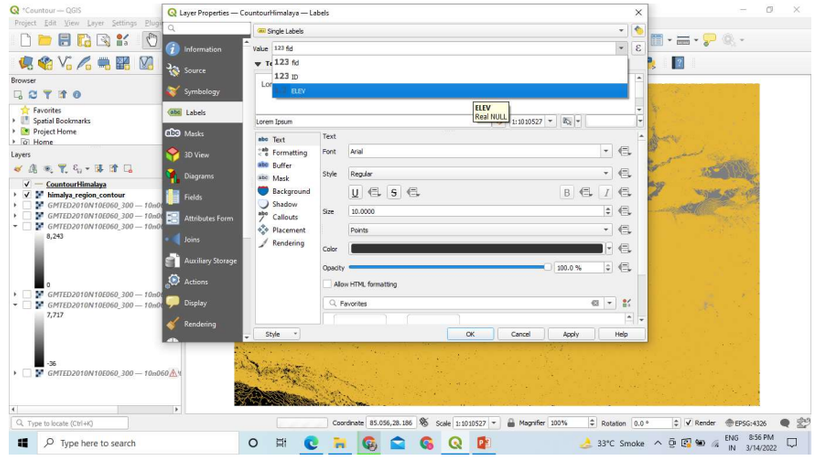
Step 14: Select output file and location and Press RUN.



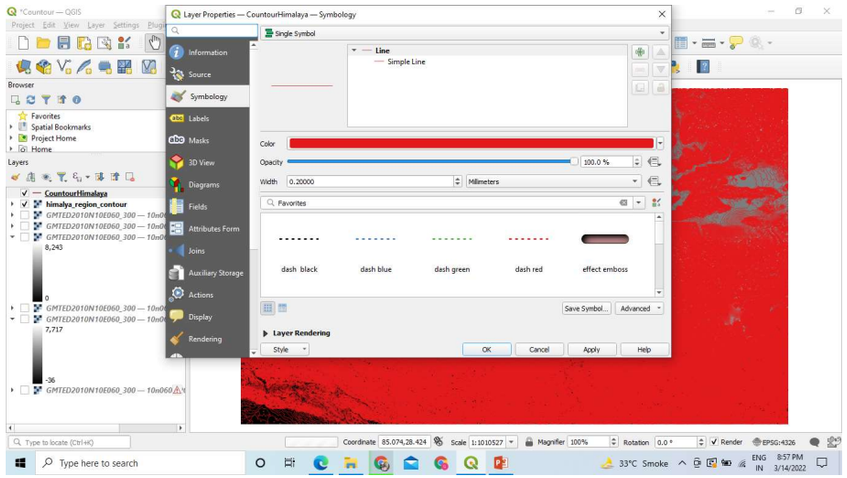
Step 15: Label the layer using “ELEV” field and set appropriate symbols for line. In the Layer panel right click on Contour Raster Layer and select “Open Attribute table”. Arrange the table in descending order based on the value of “ELEV” column.



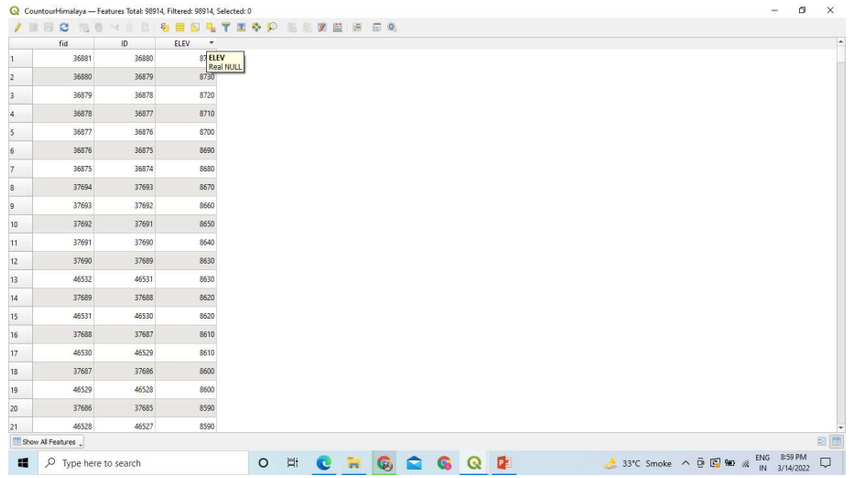
Step 16: Label the layer using “ELEV” field and set appropriate symbols for line. In the Layer panel right click on Contour Raster Layer and select “Open Attribute table”. Arrange the table in descending order based on the value of “ELEV” column.



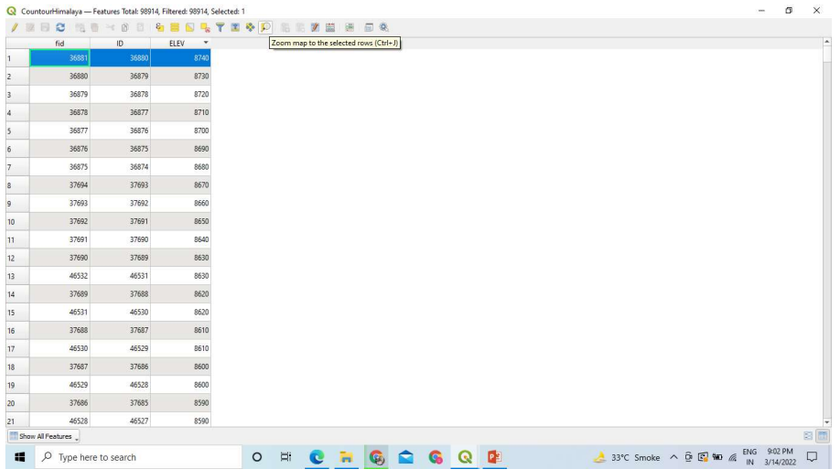
Step 17: Label the layer using “ELEV” field and set appropriate symbols for line. In the Layer panel right click on Contour Raster Layer and select “Open Attribute table”. Arrange the table in descending order based on the value of “ELEV” column.



Step 18: Label the layer using “ELEV” field and set appropriate symbols for line. In the Layer panel right click on Contour Raster Layer and select “Open Attribute table”. Arrange the table in descending order based on the value of “ELEV” column.

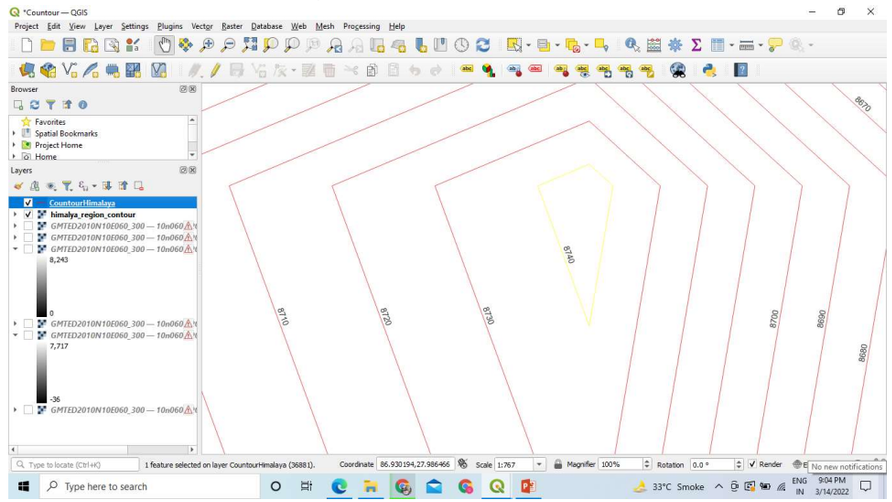


Step 19: Select first row & click on “Zoom map to the selected rows”.



	fid	ID	ELEV
1	36881	36880	8740
2	36880	36879	8730
3	36879	36878	8720
4	36878	36877	8710
5	36877	36876	8700
6	36876	36875	8690
7	36875	36874	8680
8	37694	37693	8670
9	37693	37692	8660
10	37692	37691	8650
11	37691	37690	8640
12	37690	37689	8630
13	46532	46531	8630
14	37689	37688	8620
15	46531	46530	8620
16	37688	37687	8610
17	46530	46529	8610
18	37687	37686	8600
19	46529	46528	8600
20	37686	37685	8590
21	46528	46527	8590

Step 20: Select first row & click on “Zoom map to the selected rows”.



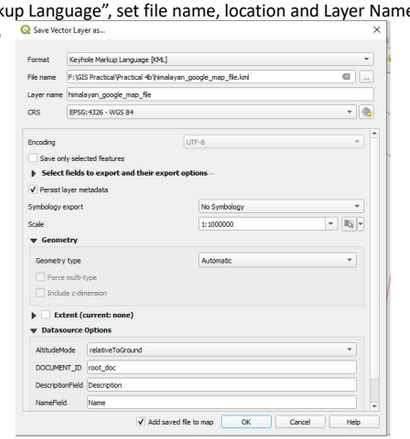
Step 21: Compare the above counter line raster layer with the previous Google map image or visit https://www.google.com/maps/@27.9857765,86.9285378,14.75z/data=!5m1!1e4?hl=en-US

➢ To verify the above contour files using Google Map

➢ Make a copy of Contour Layer, Go to Layer →Save As

➢ Select file format as "Keyhole Markup Language", set file name, location and Layer Name.

➢ Also set CRS to WGS 84 EPSG:4326

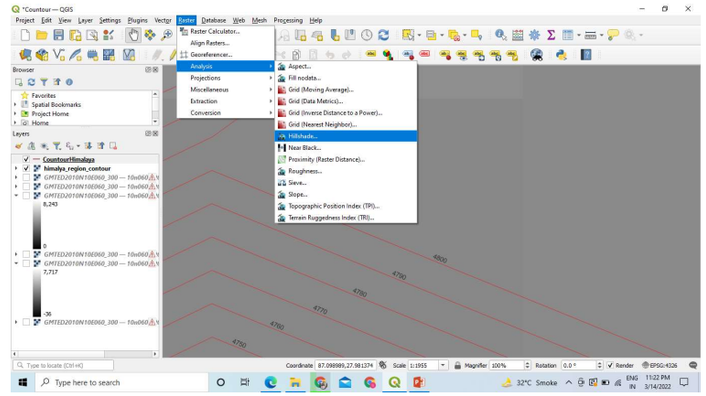


Step 22: Go to the stored location on Hard Disk and open the "Himalayan_Google_Map_File.kml" with Google Map.\
A **Hillshade** is a grayscale 3D representation of the surface, showing the topographical shape of hills and mountains using shading (levels of gray) on a map, just to indicate relative slopes, mountain ridges, not absolute height.

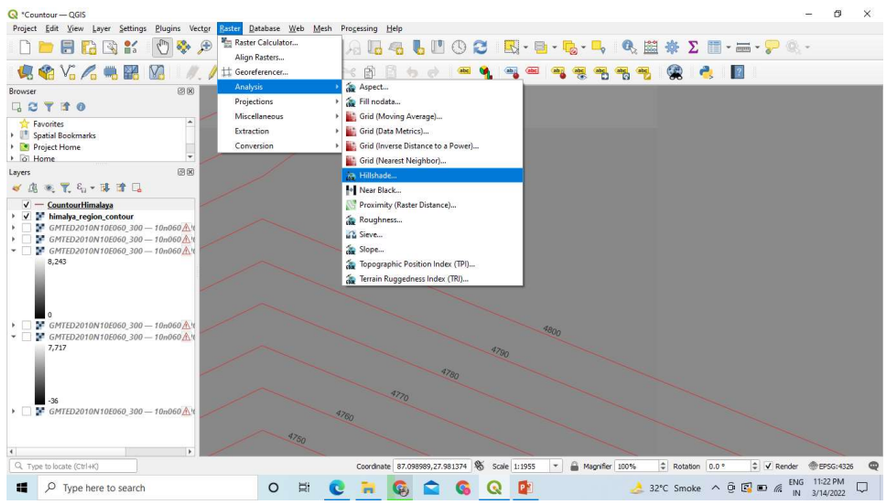
➢ For Hill Shade surface analysis

➢ Go to Plugin → Install Georeferencer GADL.

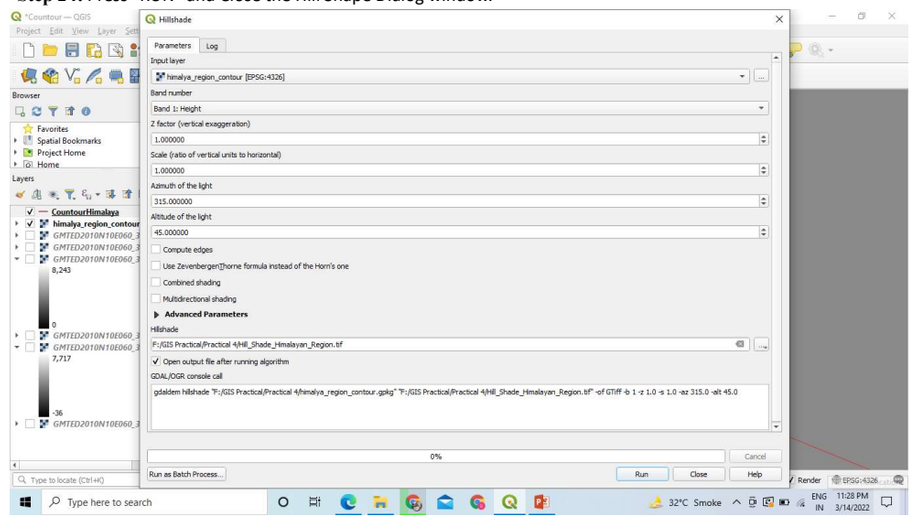
➢ After successful installation of plugin Go to Raster → Analysis → Hill Shade



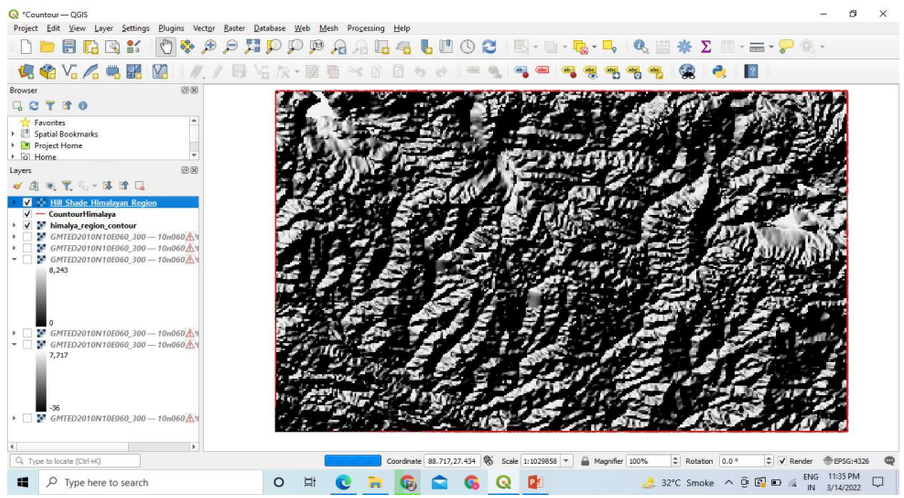
Step 23: Select the input raster layer, select file name and location for storing Hill Shade output file.



Step 24: Press "RUN" and Close the Hill Shape Dialog window.



Step 25: After Raster styling the Output will appear like this.



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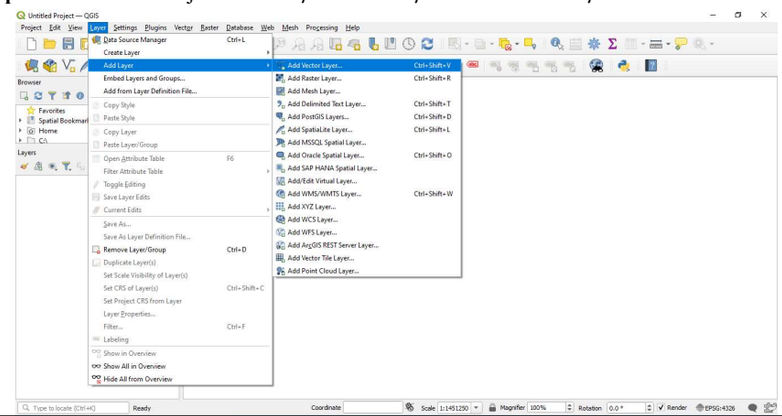
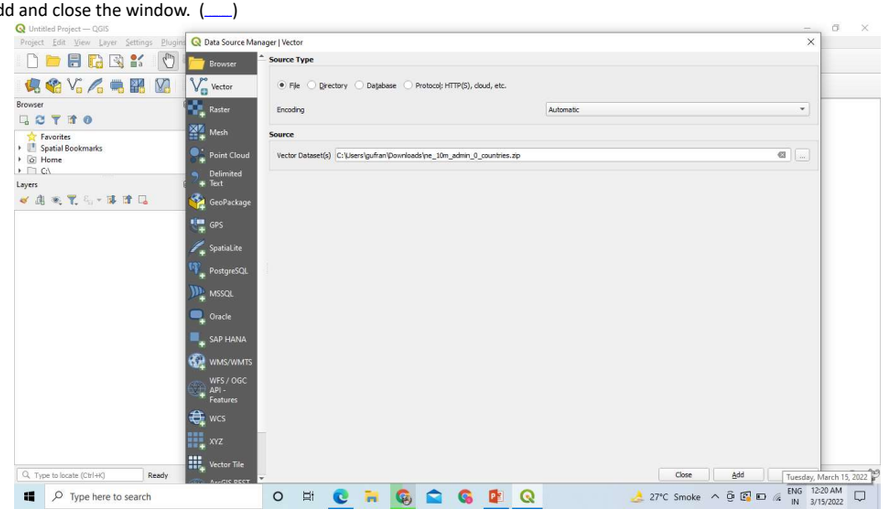
Practical 5: Working with Projections and WMS Data

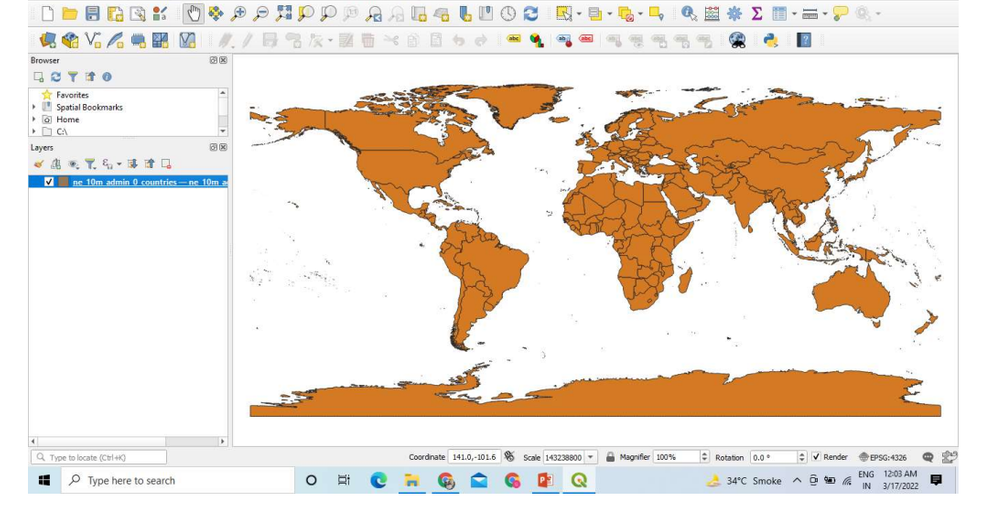
A Web Map Service (WMS) is a standard protocol developed by the Open Geospatial Consortium in 1999 for serving georeferenced map images over the Internet. These images are typically produced by a map server from data provided by a GIS database

Step 1: Create a new Project. Go to Layer → Add Layer → Add Vector Layer



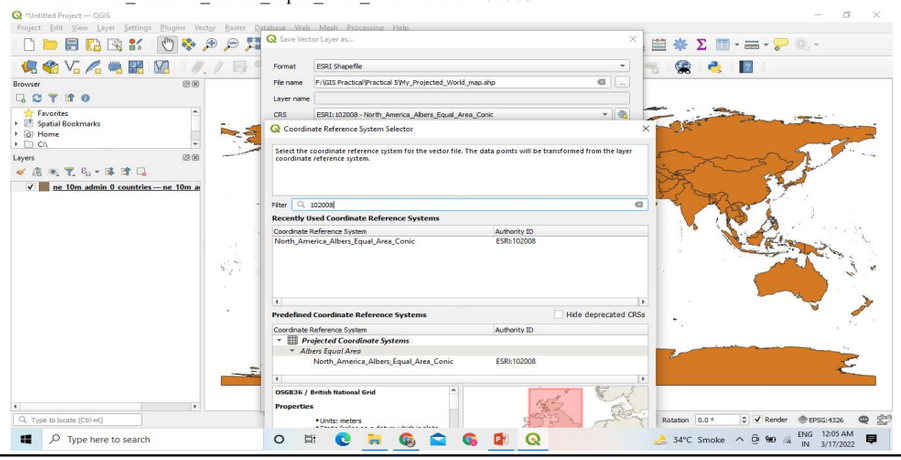
Step 2: Select "\GIS_Workshop\Practicals\Practical_05\Data\ne_10m_admin_0_countries.zip" Layer from data folder." Click Add and close the window. (___)



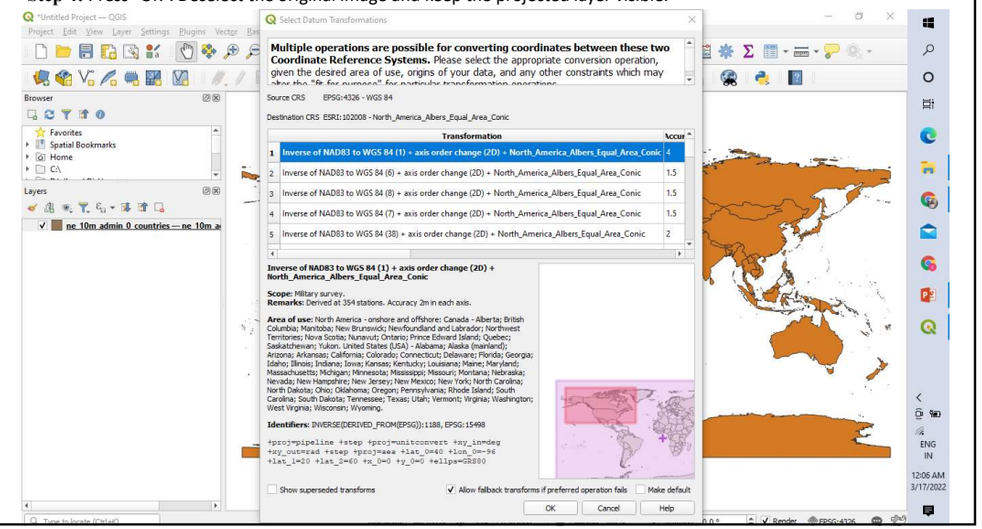


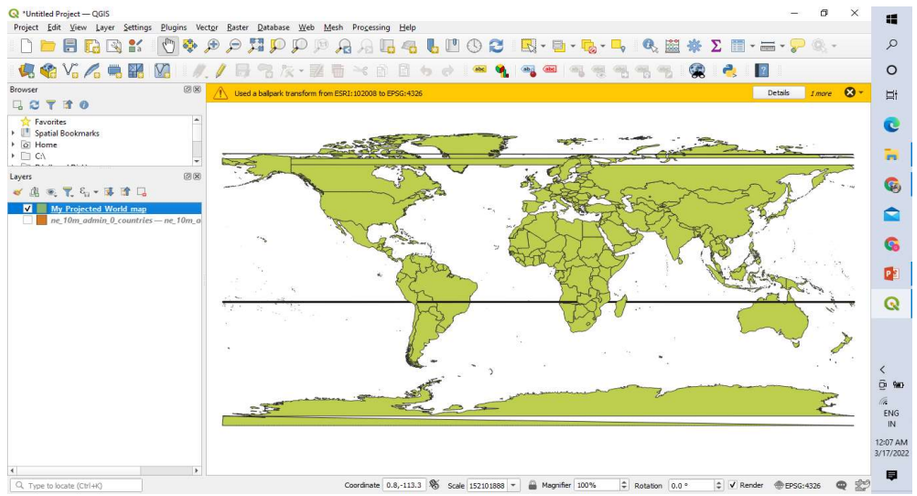
Step 3: Go to Layer → Save As

- Select format as ESRI Shape File
- Select folder location and file name
- Set CRS North_America_Albers_Equal_Area_Conic EPSG: 102008

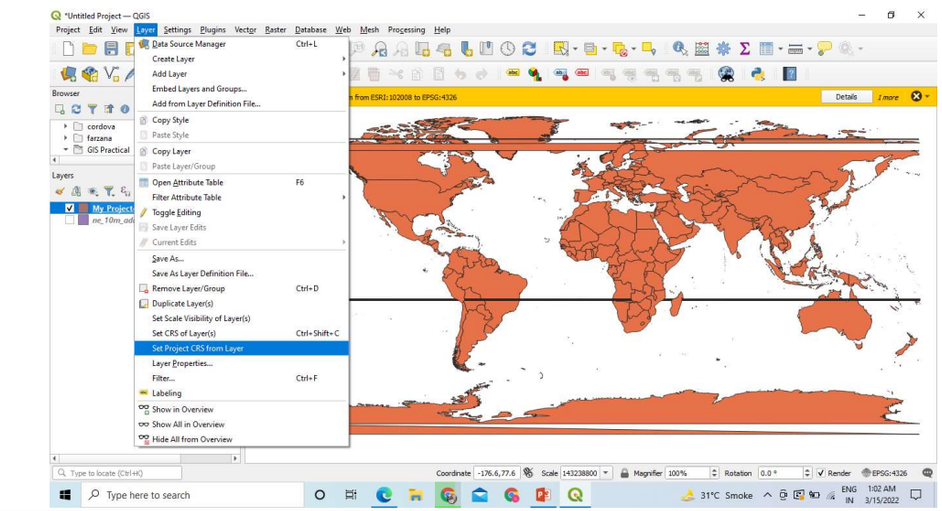


Step 4: Press "OK". Deselect the original Image and keep the projected layer visible.

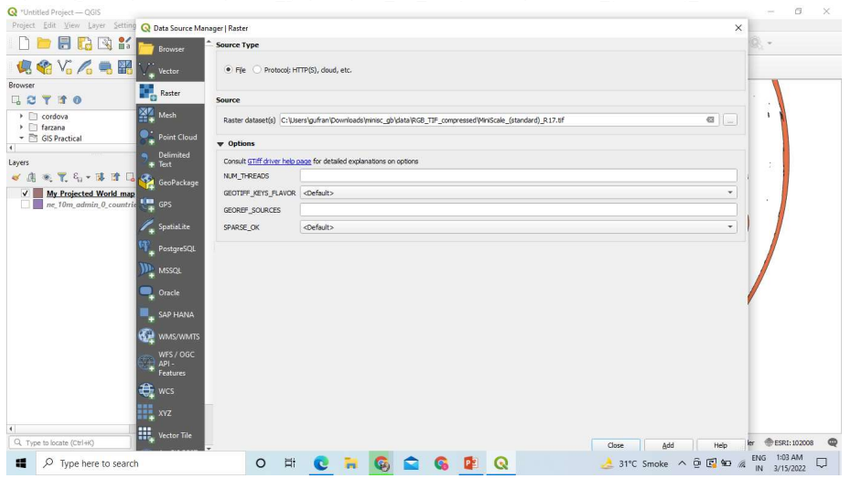




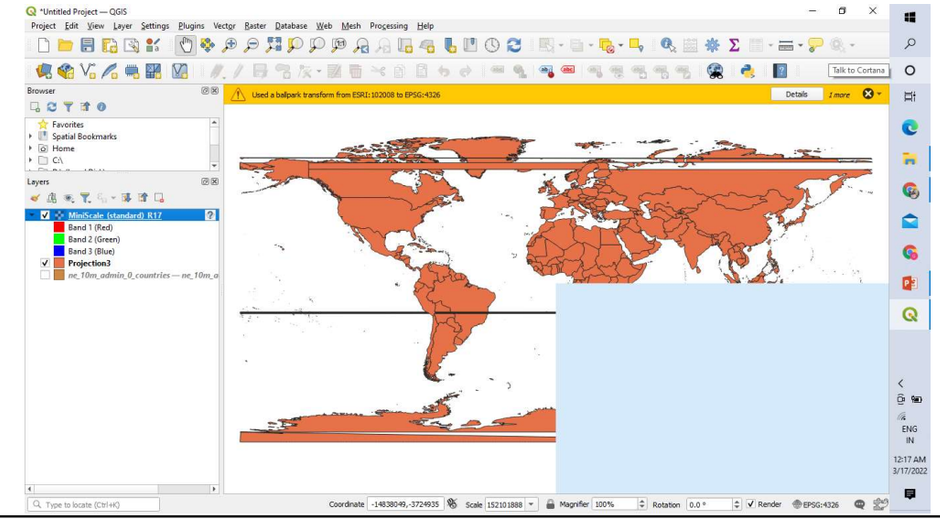
Step 5: Select Layer → Set Project CRS from Layer



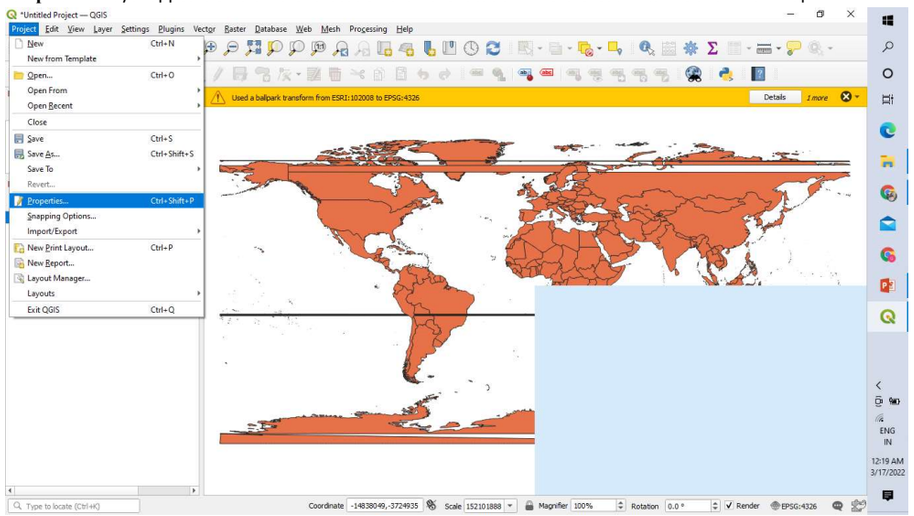
Step 6: Select Layer → Add Layer → Add Raster Layer → Select C:\Users\gufran\Downloads\minisc_gb\data\RGB_TIF_compressed\MiniScale_(standard)_R17.tif from Location.



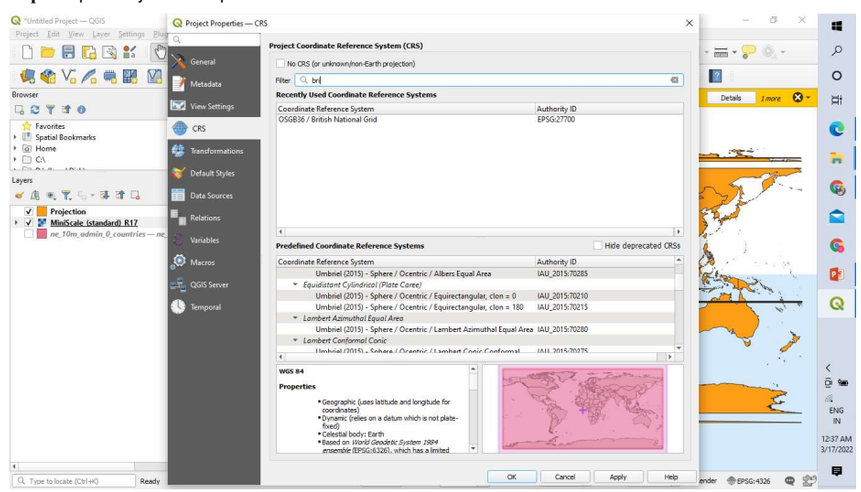
Step 7: The Layer appears on a different location than the location where Great Britain is shown on Map.

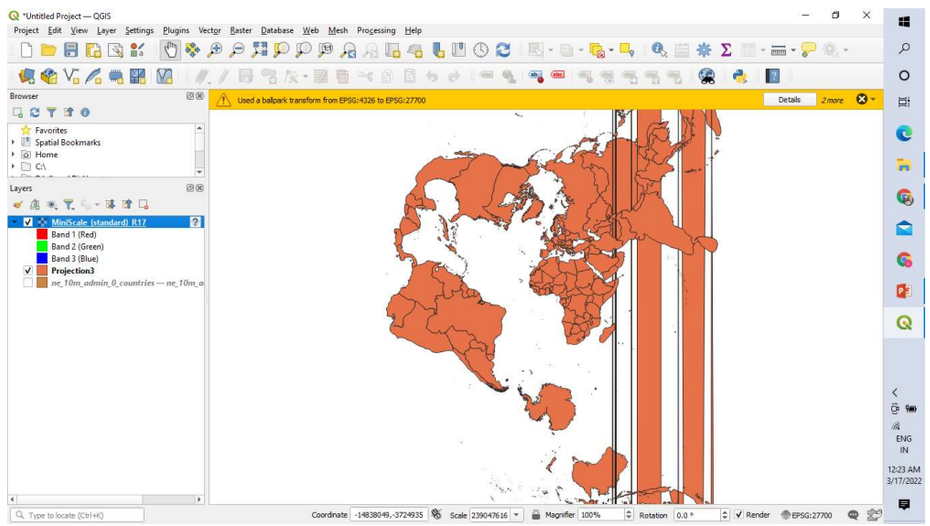


Step 7: The Layer appears on a different location than the location where Great Britain is shown on Map.



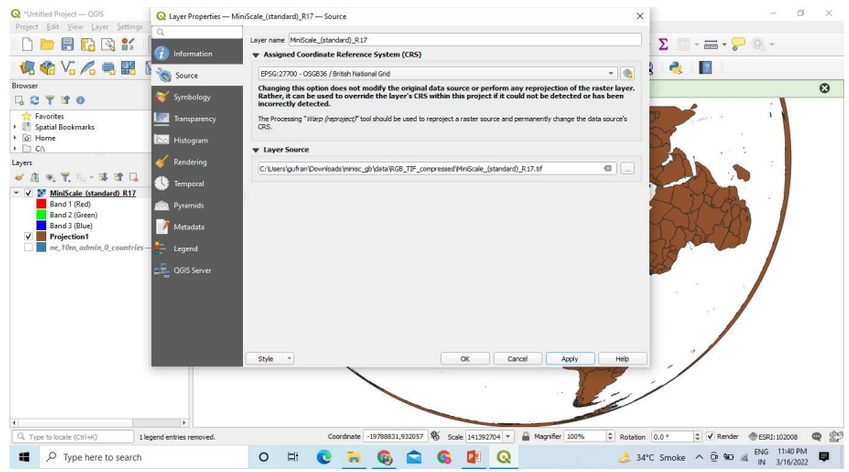
Step 8: Open Project → Properties → CRS → Search bri → select British National Grid EPSG 27700.





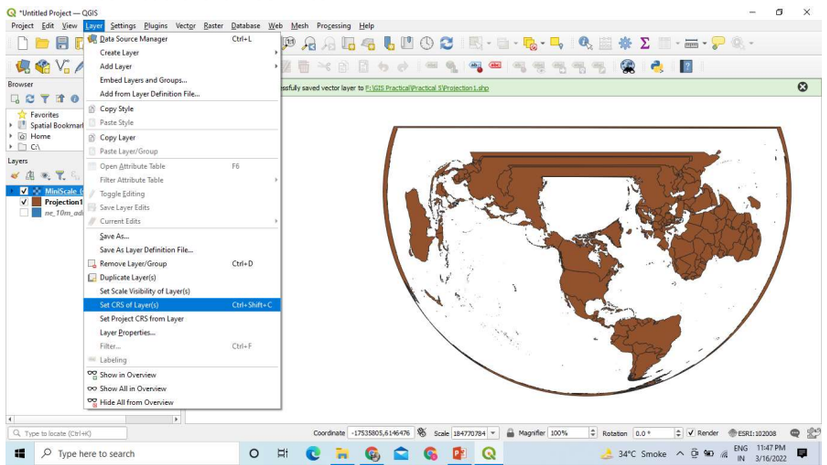
Step 9: Open Layer Properties→CRS → Search bri → select British National Grid EPSG 27700.

- Select format as ESRI Shape File
- Set CRS British National Grid EPSG 27700



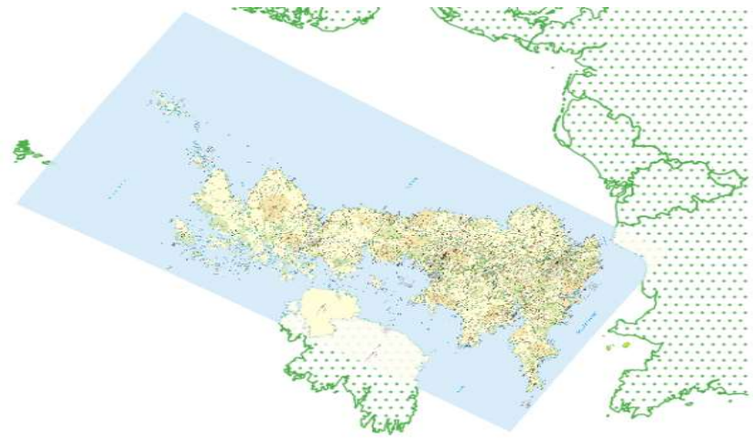
Step 10: Open Layer Properties→CRS → Search bri → select British National Grid EPSG 27700.

- Select format as ESRI Shape File
- Set CRS British National Grid EPSG 27700



Step 11: Processing may take some time.

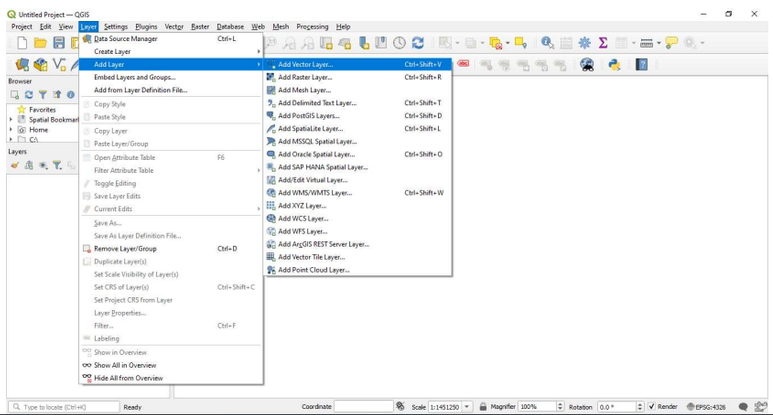
➢ Locate United Kingdom on Layer; the vector layer exactly coincides by the raster layer covering United Kingdom.



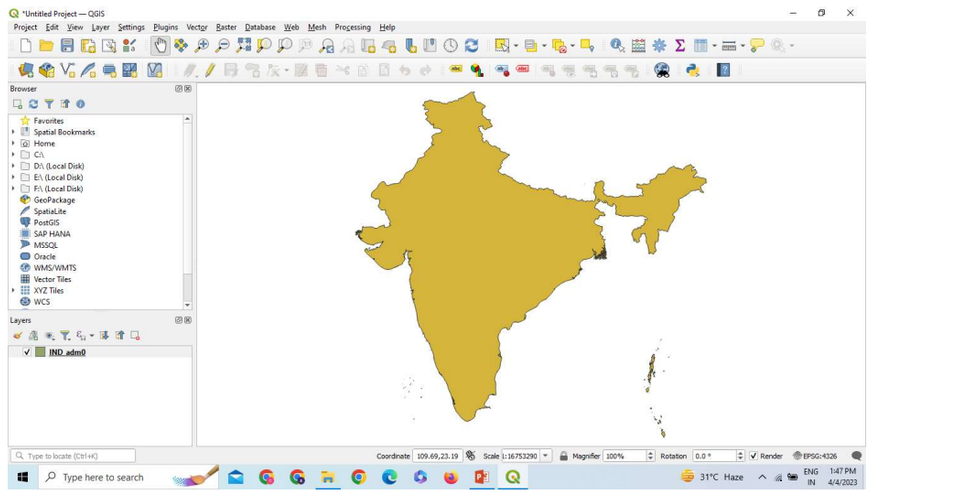
Practical 6: Georeferencing

A. Georeferencing Topo Sheets and Scanned Maps

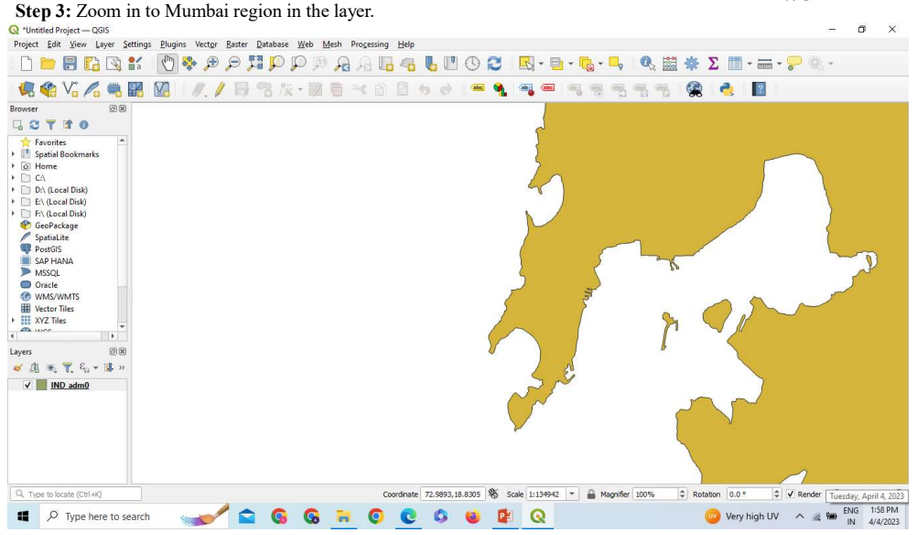
Step 1: Create a new Project. Go to Layer → Add Layer → Add Vector Layer



Step 2: Select GIS_Workshop\Prac06\A\IND_adm0.shp



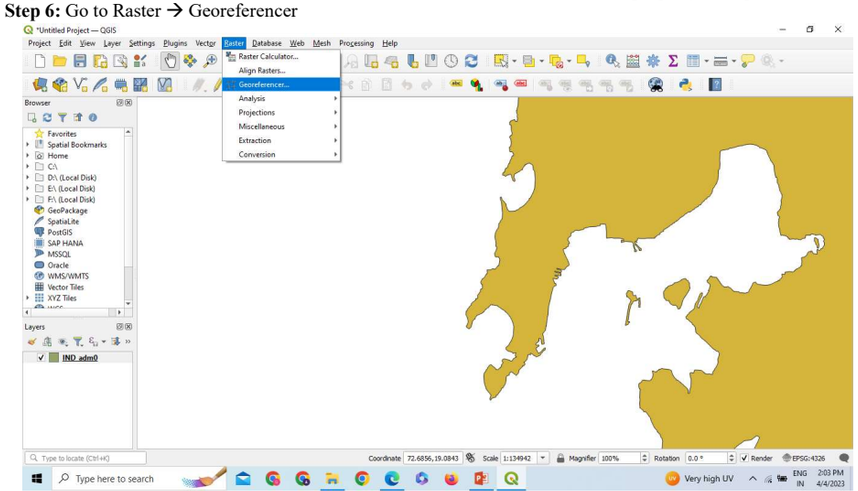
Step 3: Zoom in to Mumbai region in the layer.



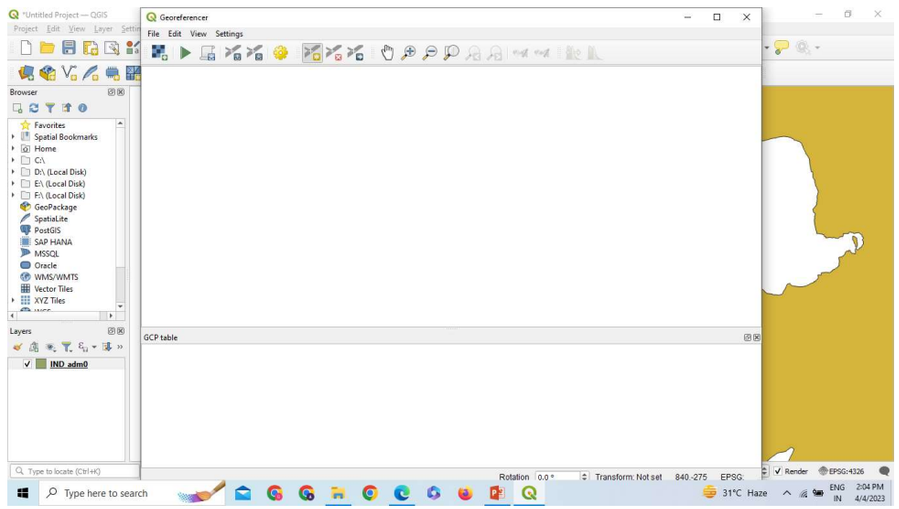
Step 4: Go to Plugins → Manage and Install Plugins

Step 5: Ensure that Georeferencer GDAL is checked, if not install Georeferencer GDAL plugin (Not required in latest version).

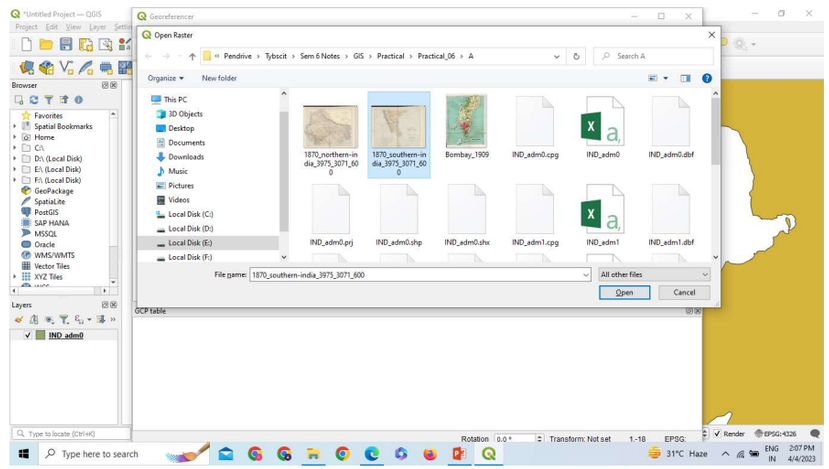
Step 6: Go to Raster → Georeferencer



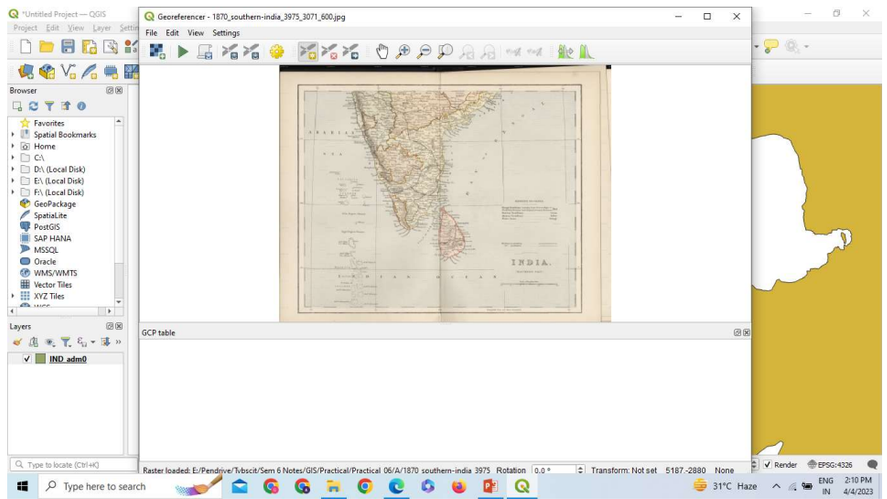
Step 7: A new Georeferencer window will appear.



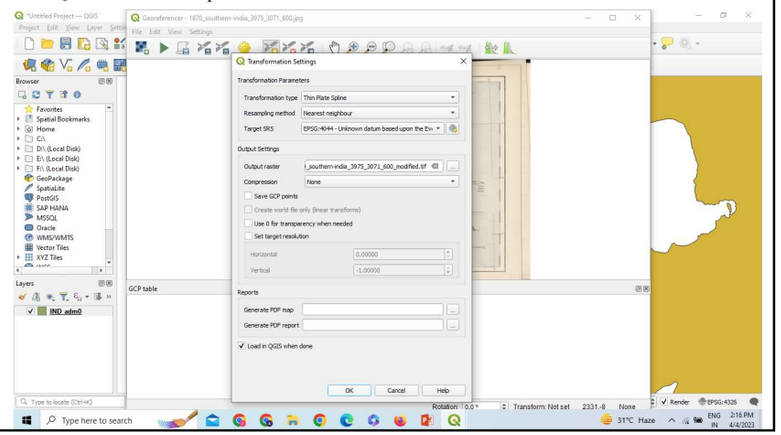
Step 8: File → Open Raster → Select file "1870_southern-india_3975_3071_600.jpg" from project data folder.



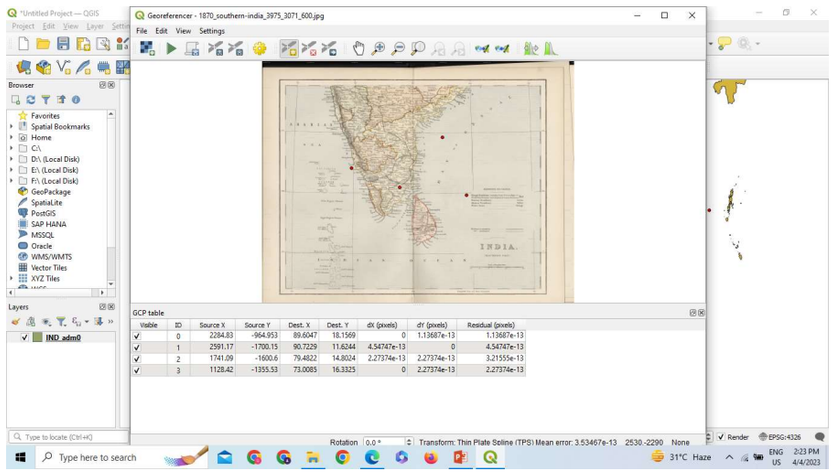
Step 9: The following screen will appear



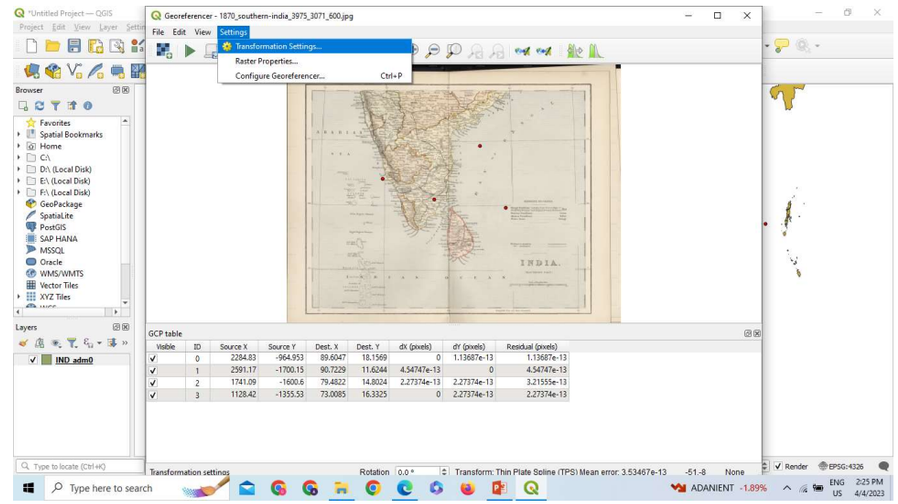
Step 10: Go to Settings → Transformation Settings → Select Transformation type → Thin Plate Spline
Re-sampling Method → Nearest Neighbour
Target SRS → Everest 1830 datum: EPSG 4044
Select Output Raster Name and Location
Check the "Load in QGIS when done" option
Press "OK"



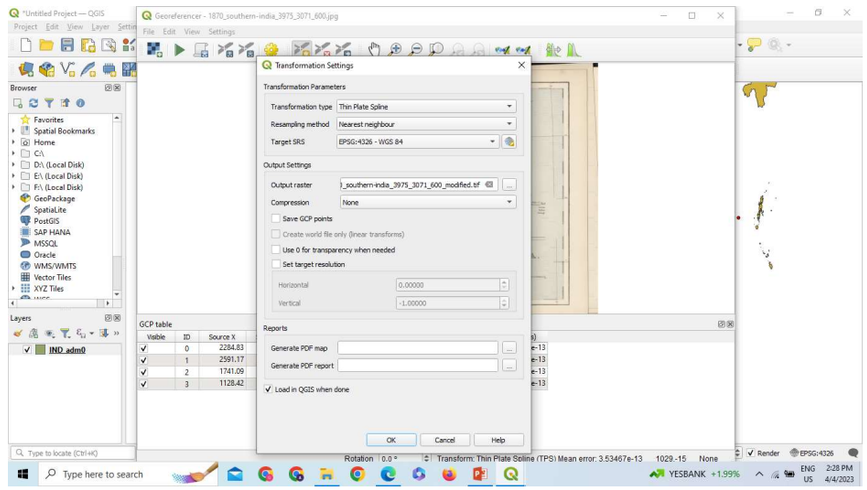
Step 11: In Georeferencer window Go to Edit → Add Points → Select the set of control points → From map canvas.



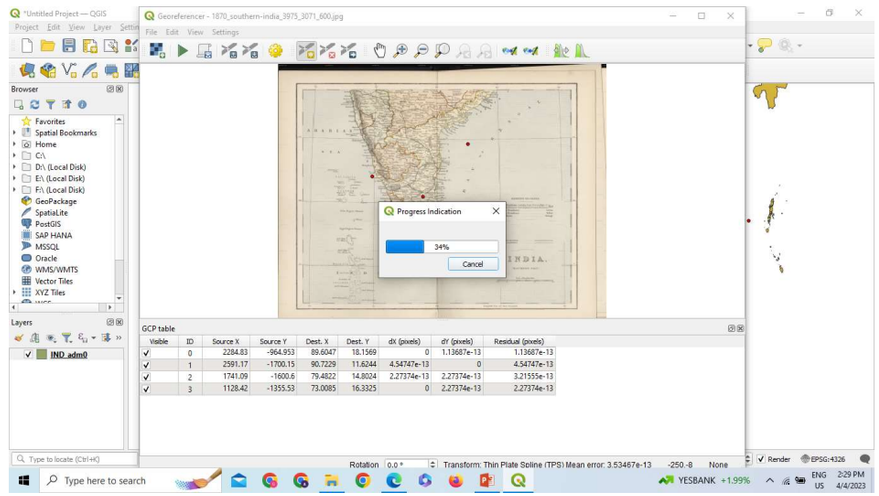
Step 12: Go to, Setting → Transformation Settings.

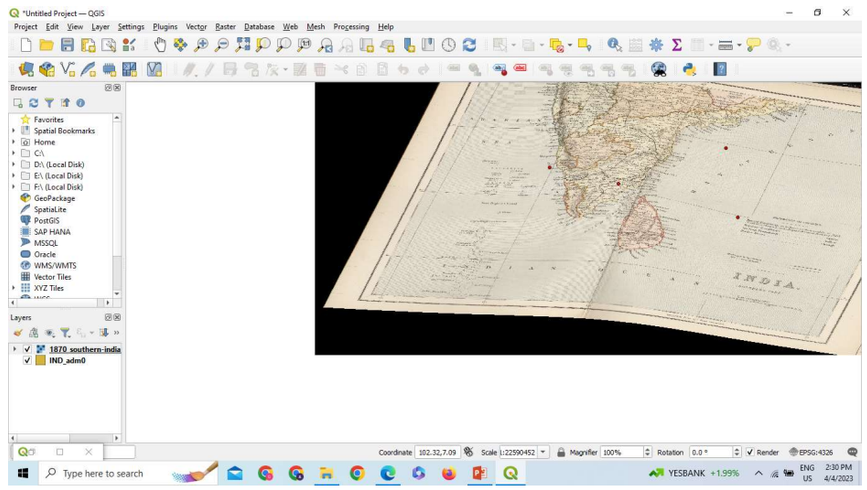


Step 13: Go to, Setting → Transformation Settings → Set Target SRS → EPSG: 4326 – WGS 84.

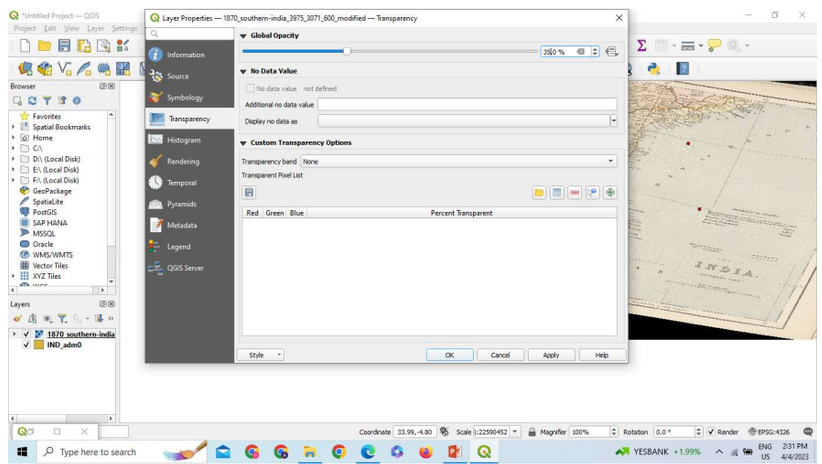


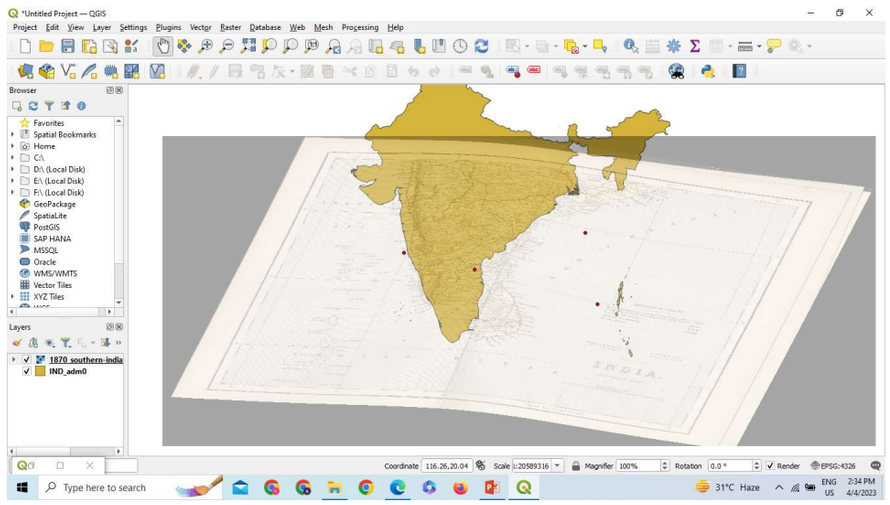
Step 14: Press Run





Step 15: Set Transparency level of raster layer to appropriate level.
Right Click 1870_southern-india → Properties → Transparency → Global Opacity → 35%



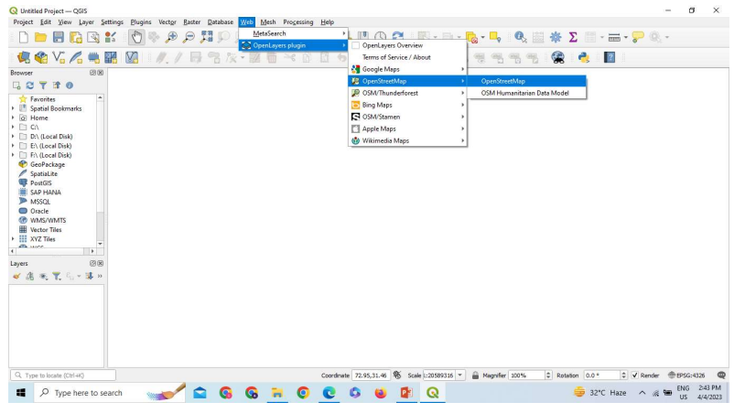


Practical 6: Georeferencing

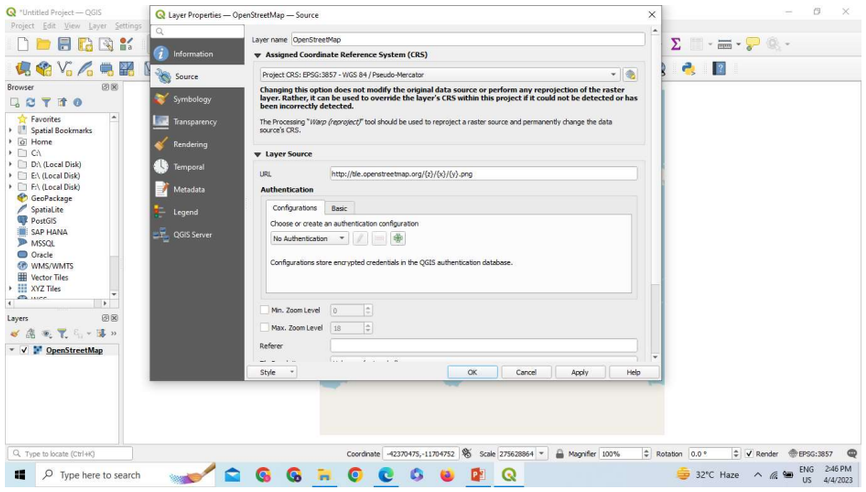
B. Georeferencing Aerial Imagery

Step 1: Install plugin OpenStreetMap

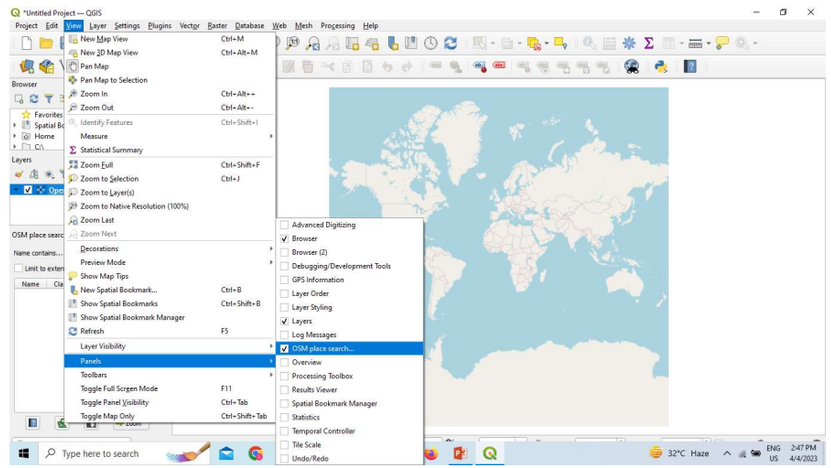
Go to Web Menu → OpenLayerPlugin → OpenStreetMap → OpenStreetMap



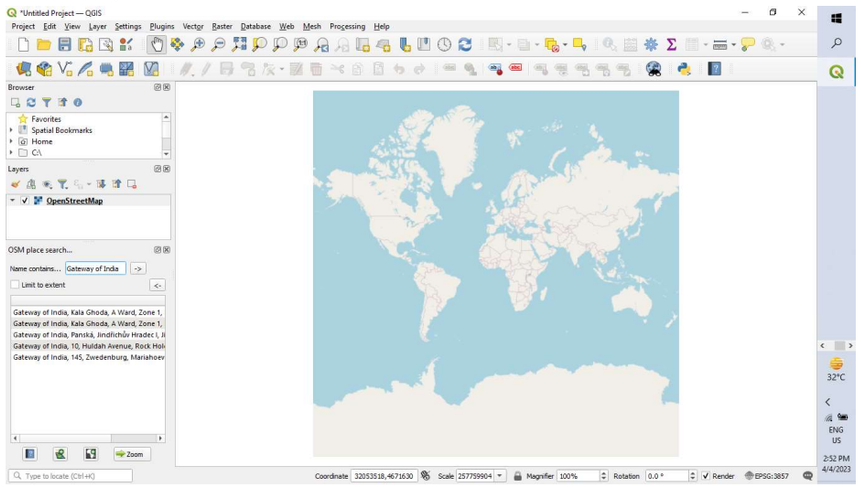
Step 2: Go to Project → Properties → Set CRS to EPSG 3857



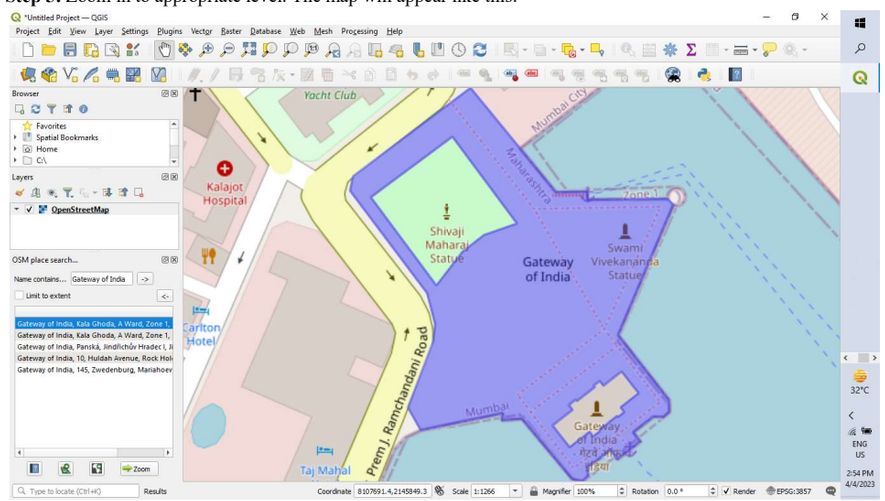
Step 3: Go to View → Panels → select OSM Place search



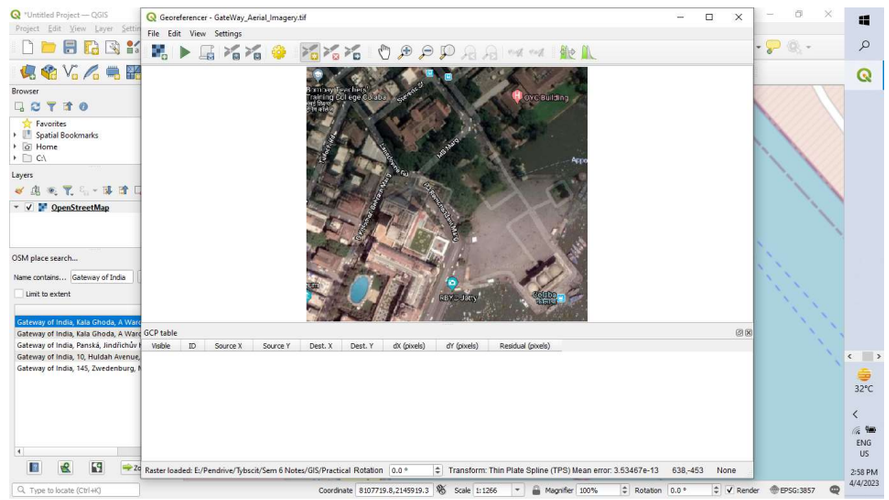
Step 4: The Gateway of India, Mumbai is located at 18.92°N 72.83°E
Search Gateway of India in OSM Search Panel



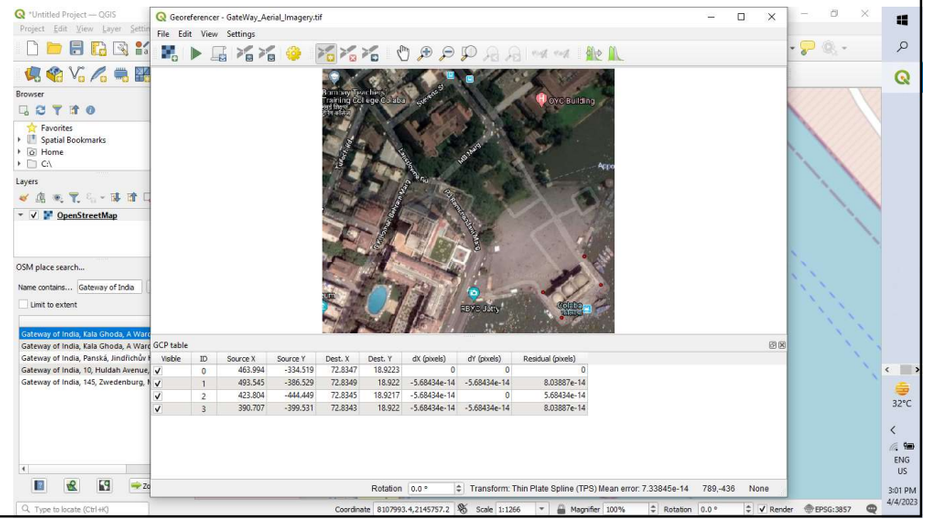
Step 5: Zoom in to appropriate level. The map will appear like this.



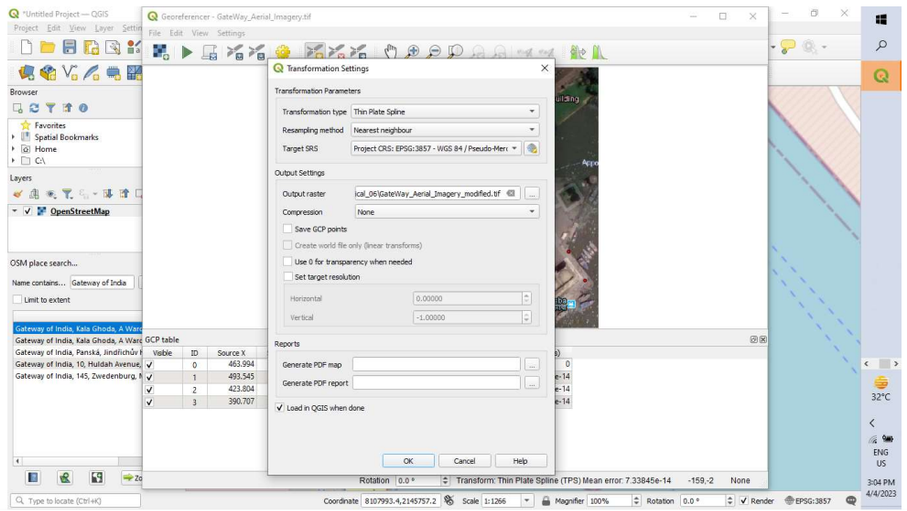
Step 6: File → Open Raster. Select file "Gateway_Aerial_Imagery.tif" from project data folder



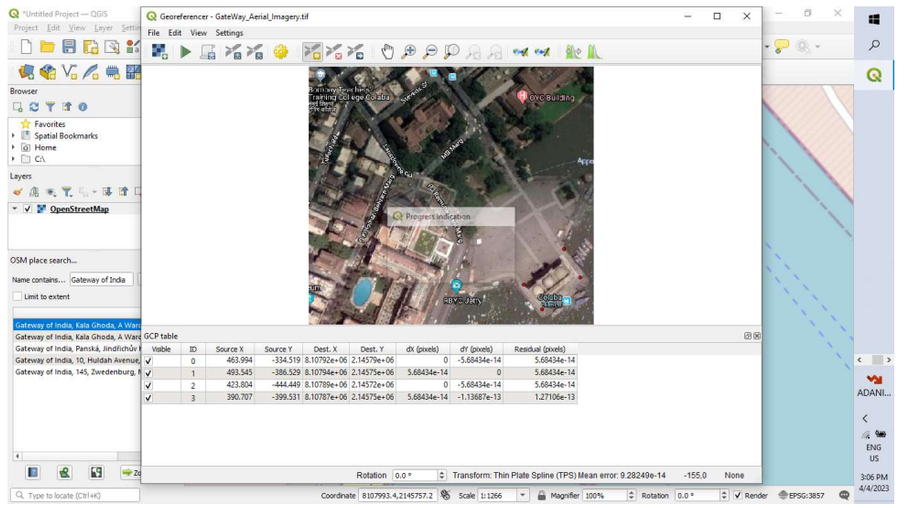
Step 7: Go to Edit → Add Point. Select control points from map (Indicated in red color) → From Map Canvas.



Step 8: Go to Setting → Transformation Setting → Set Target SRS → EPSG:3857 – WGS 84 and Output raster path.



Step 9: Press Run

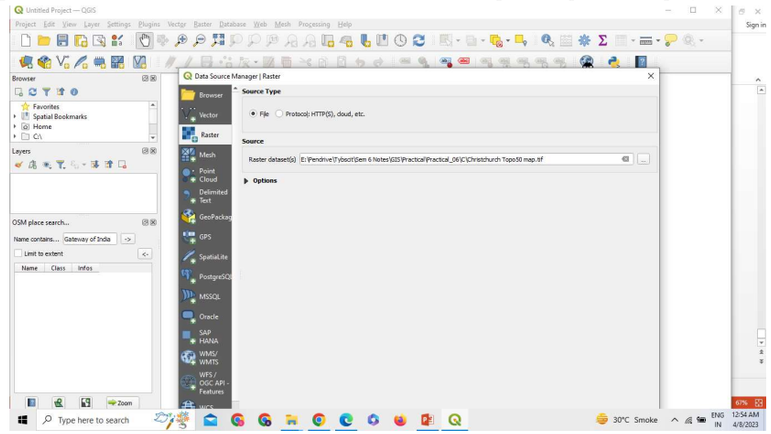


Step 10: Observe that the aerial image of the Gateway of India is georeferenced on OSM in the map canvas.

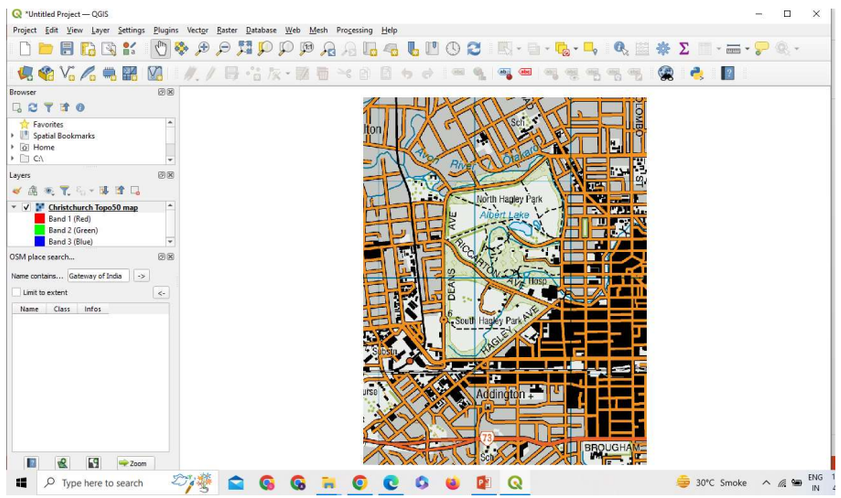
Practical 6: Georeferencing

C. Digitizing Map Data

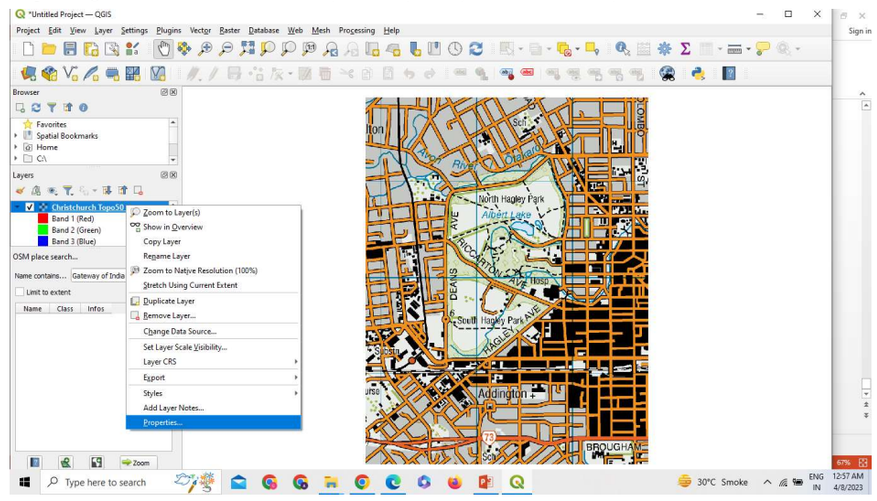
Step 1: Go to Layer → Add Raster → Select "Christchurch Topo50 map.tif" from project Folder



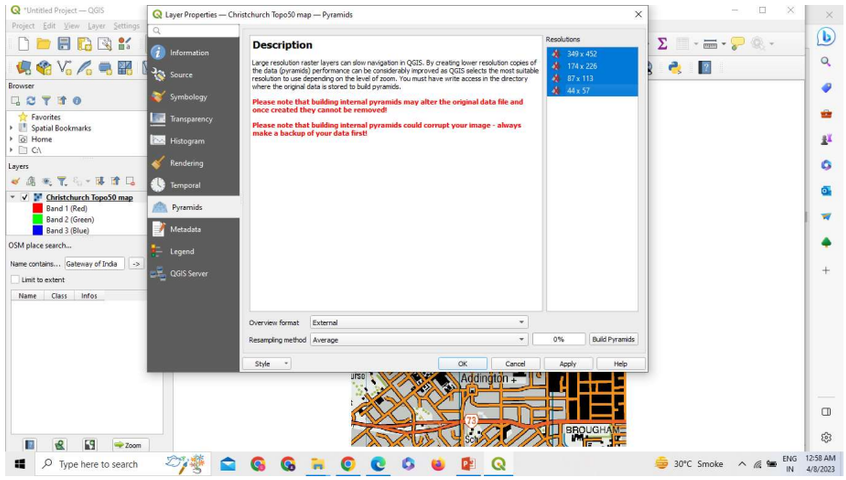
Step 2: QGIS offers a simple solution to make raster load much faster by using Image Pyramids



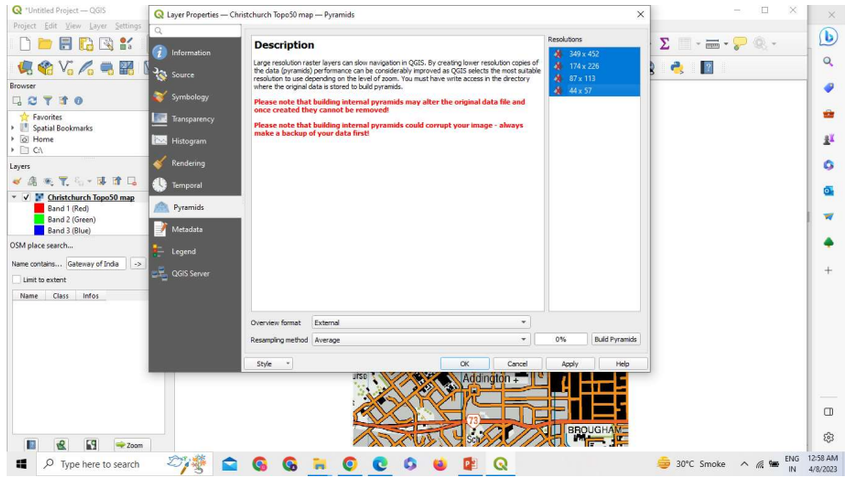
Step 3: Right-click the Christchurch Topo50 map.tif layer and select Properties.



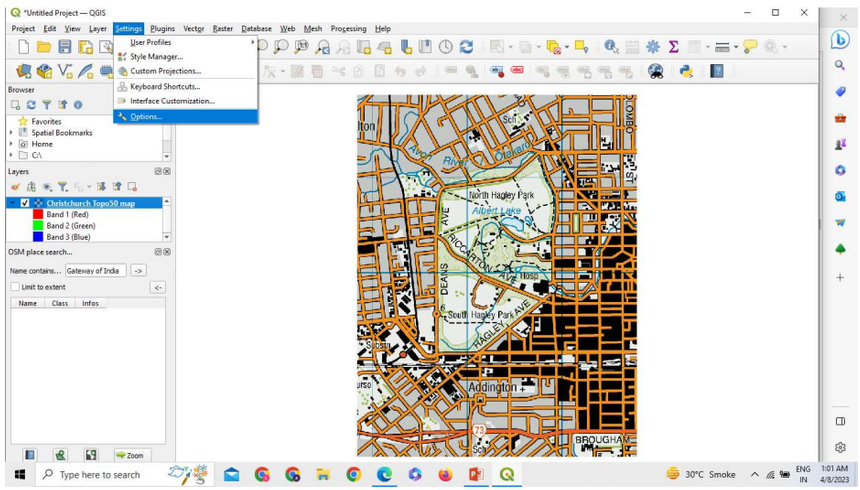
Step 4: Choose the Pyramids tab. Hold the Ctrl key and select all the resolutions offered in the Resolutions panel.



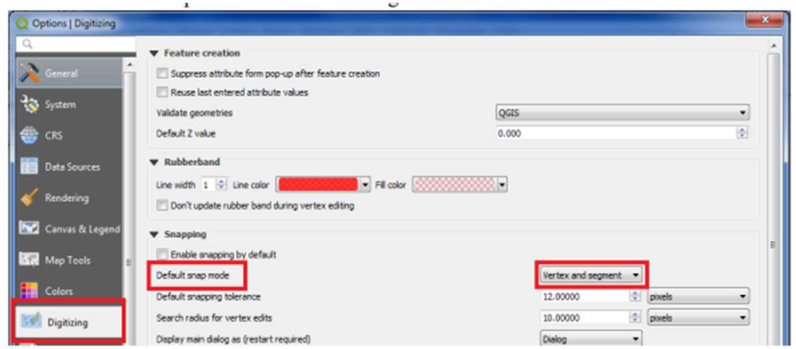
Step 5: Click Build pyramids. Then click OK.



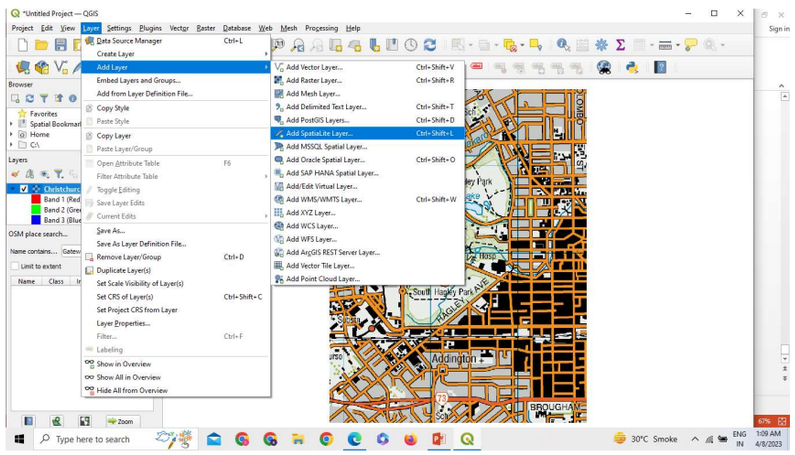
Step 6: Go to Settings → Options



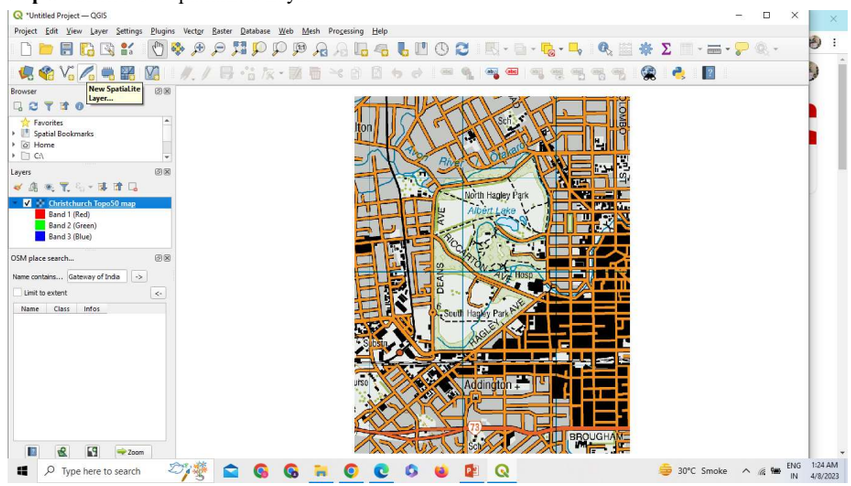
Step 7: Select the Digitizing tab in the Options dialog. Set the Default snap mode to vertex and segment. Press OK.



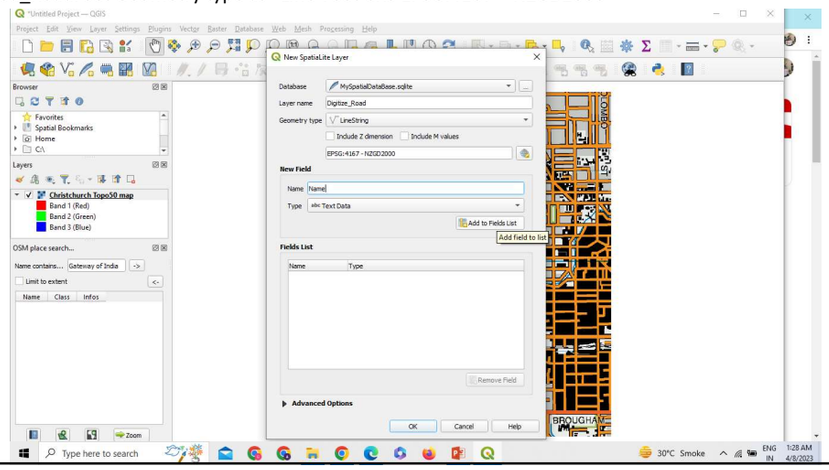
Step 8: Go to Layer → Add Layer → Add Spatialite Layer.



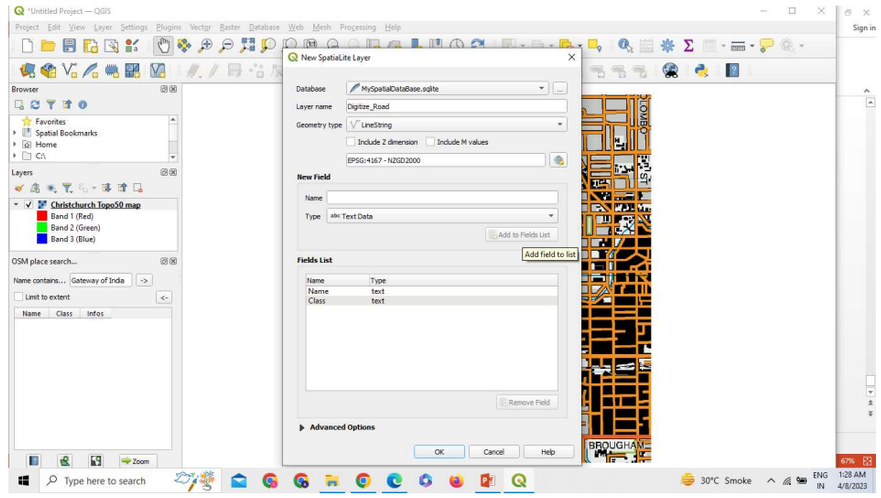
Step 9: Click New SpatialLite Layer



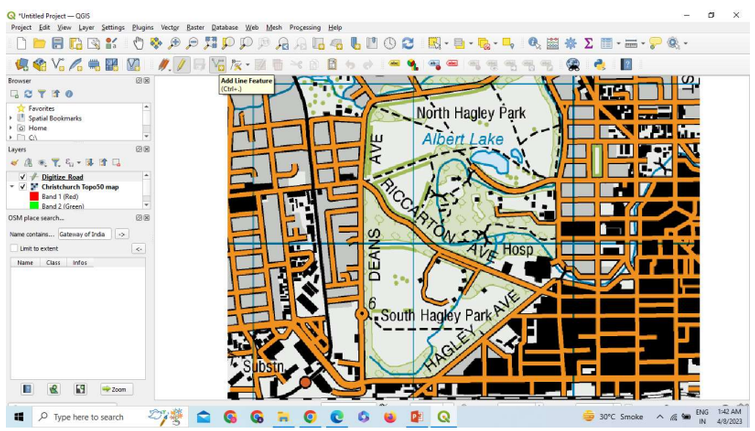
Step 10: Select the name and location for Spatial database eg: "GIS_Workshop\Practicals\Practical_06\C\MySpatialDataBase.sqlite". Name the Layer as "Digitized_Road. Set Geometry type as "Line". Set CRS EPSG:4167 – NZGD2000



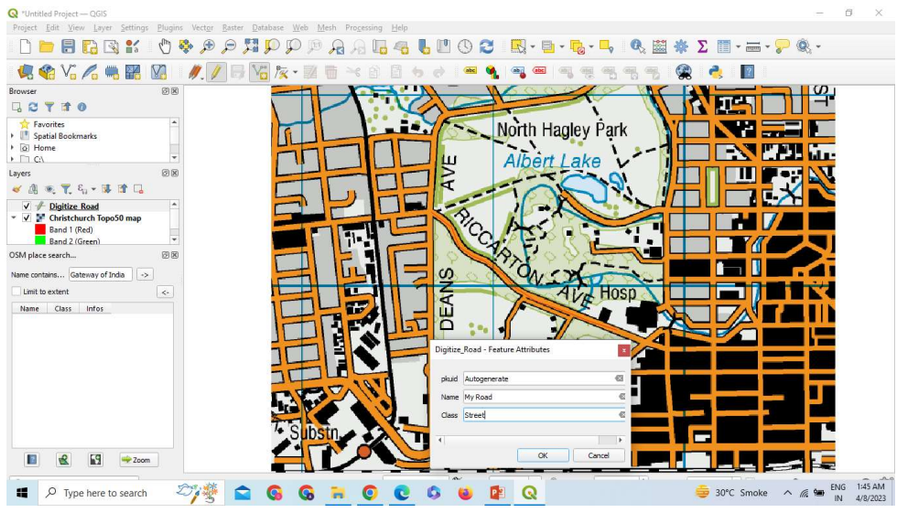
Step 11: Add "Name" and "Class" fields using "Add to Fields List".



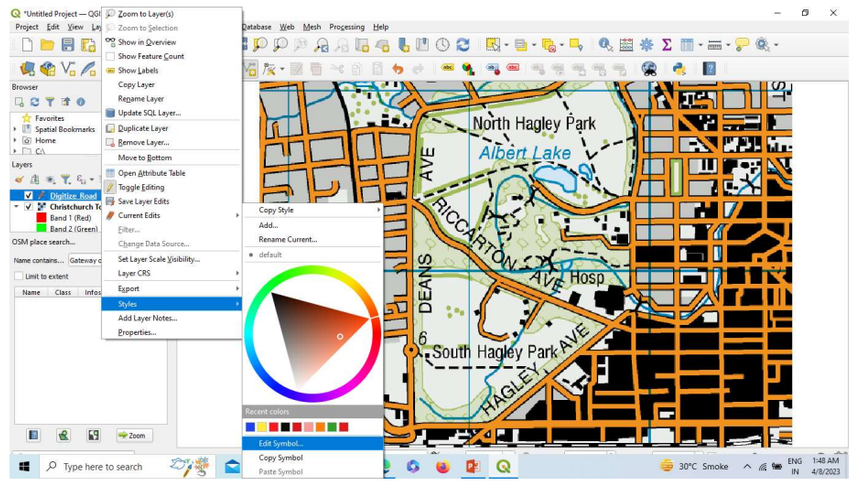
Step 12: Once the layer is loaded, click the Toggle Editing button to put the layer in editing mode. Click the Add feature button.



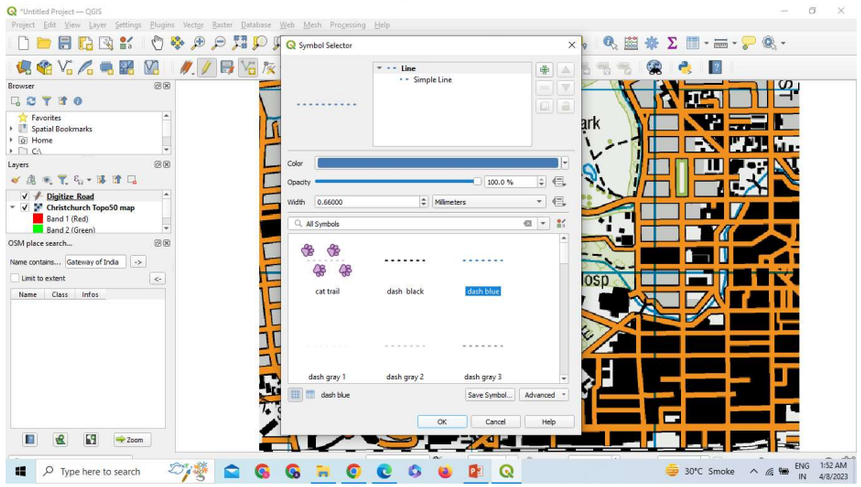
Step 12: Click on the map canvas to add a new vertex. Add new vertices (red line) along the road feature. Once you have digitized a road segment, right-click to end the feature.



Step 13: On Layer Panel Right Click on Digitize_Road, Select the Style tab in the Layer Properties dialog.



Step 14: Click on the “OK” button after choosing your appropriate style.



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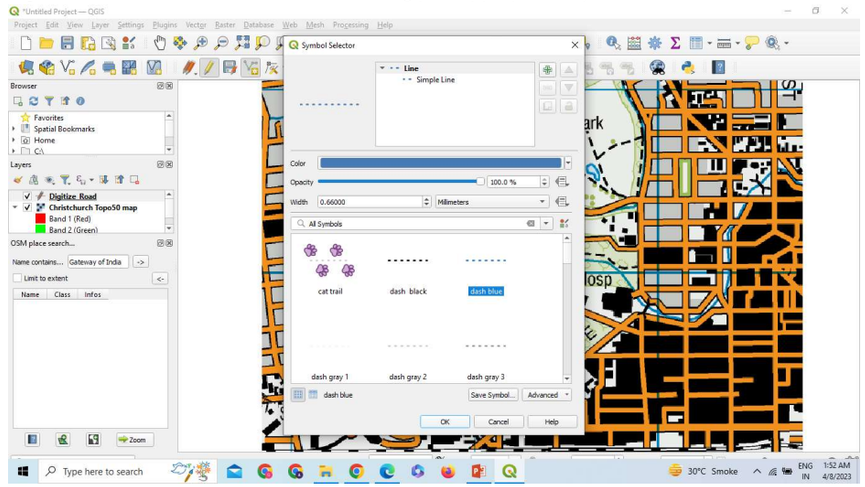
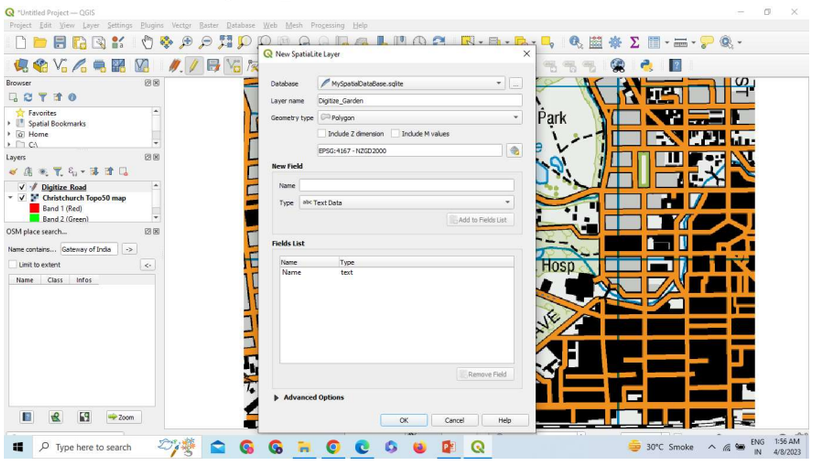
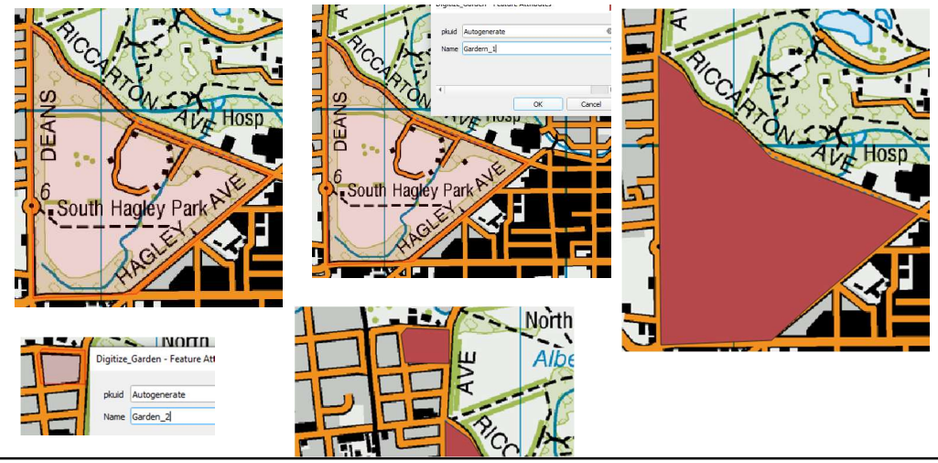
Step 14: Click on the “OK” button after choosing your appropriate style.



Step 15: Create a new spatial layer once again, but this time it should be a polygon based layer. Set the CRS to 4167 and name as Digitized_Garden. Add new Field “Name”.



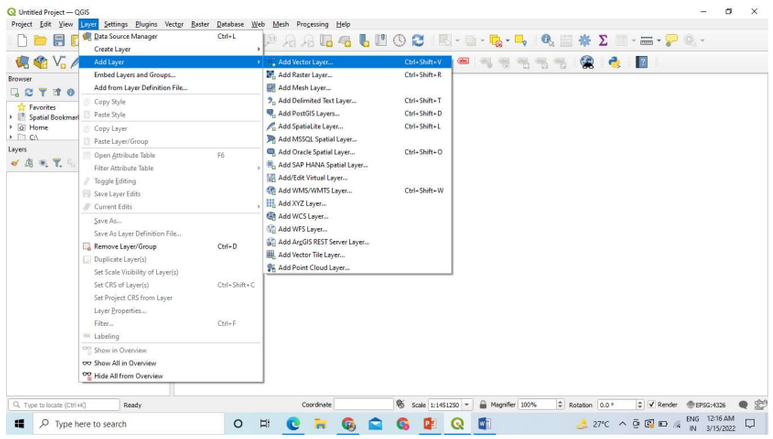
Step 16: Select Digitized_Garden layer in Layer Panel and click on Toggle Editing button and then Add Polygon Feature button on the tool bar. Add two gardens to the region by adding polygon.
The layer will appear on map canvas.



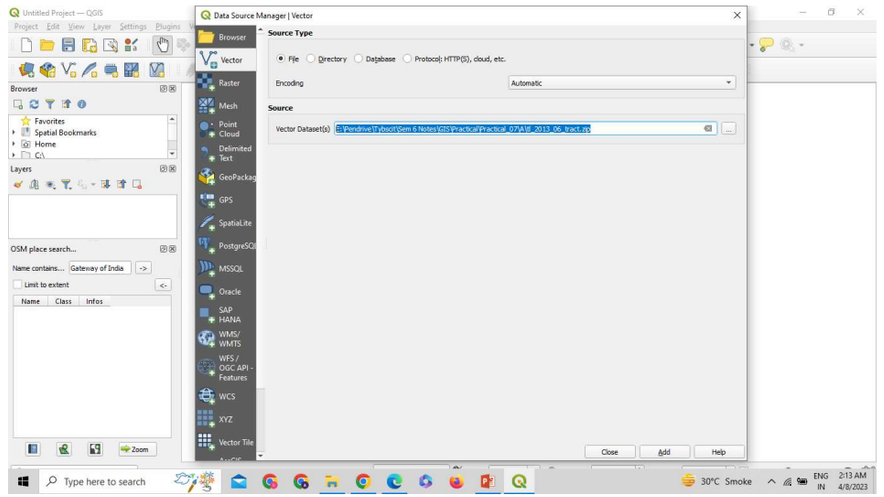
Practical 7: Managing Data Tables and Saptial data Sets

Step 1: Start a new Project.

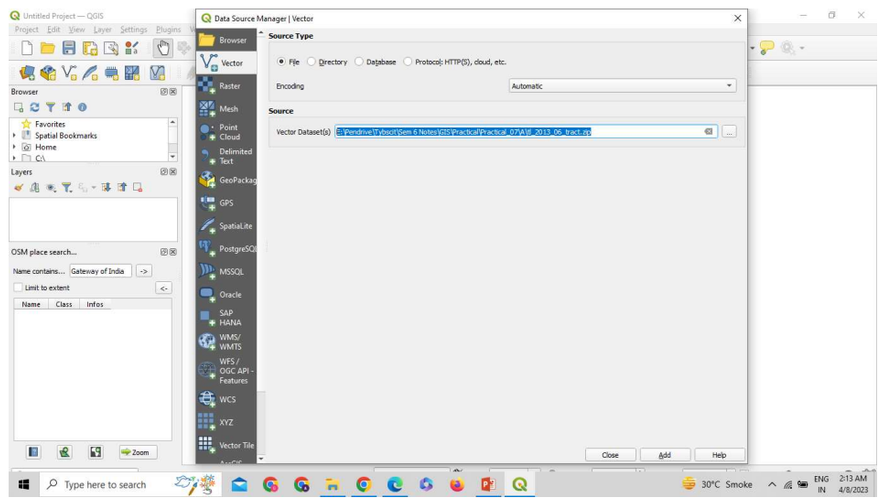
Step 2: Go to Layers → Add Layer → Add Vector Layer

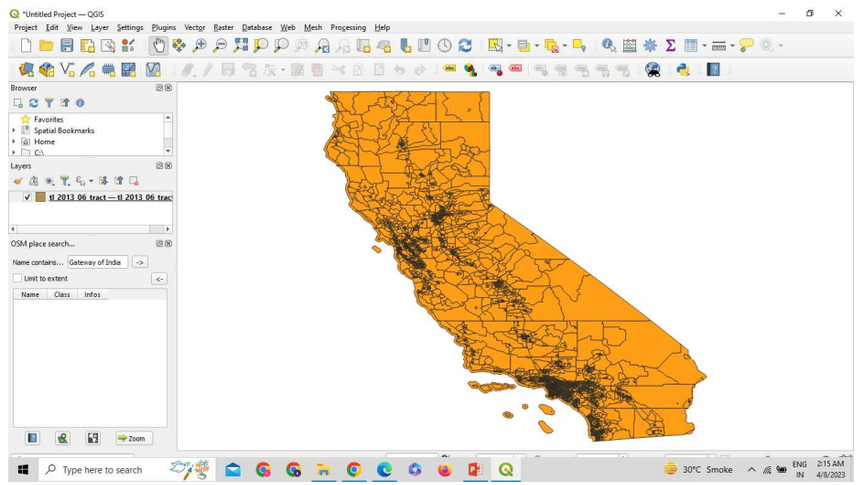


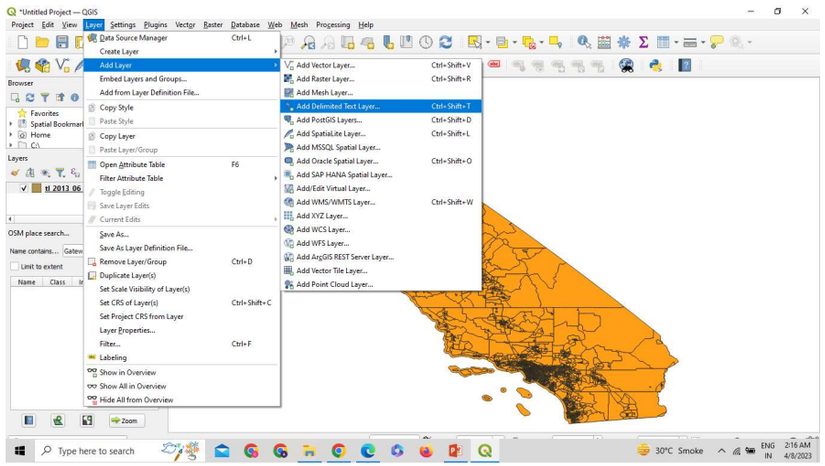
Step 2: Select E:\Pendrive\Tybscit\Sem 6 Notes\GIS\Practical\Practical_07\A\tl_2013_06_tract.zip

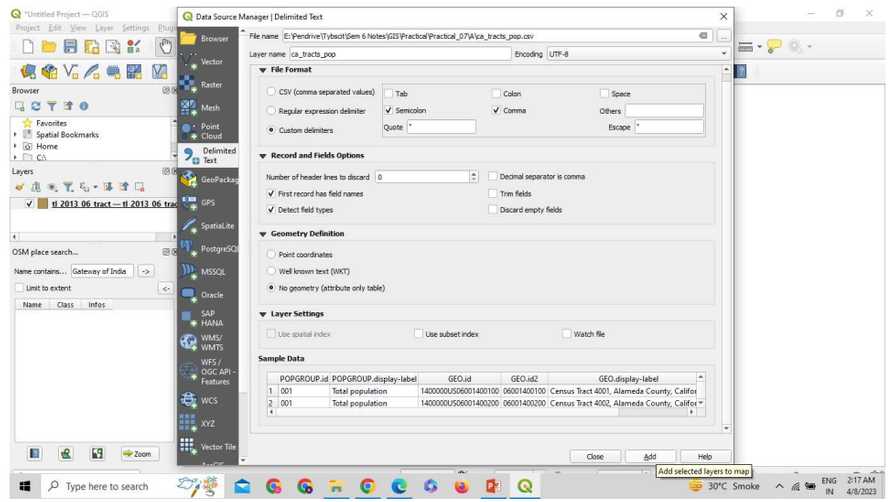


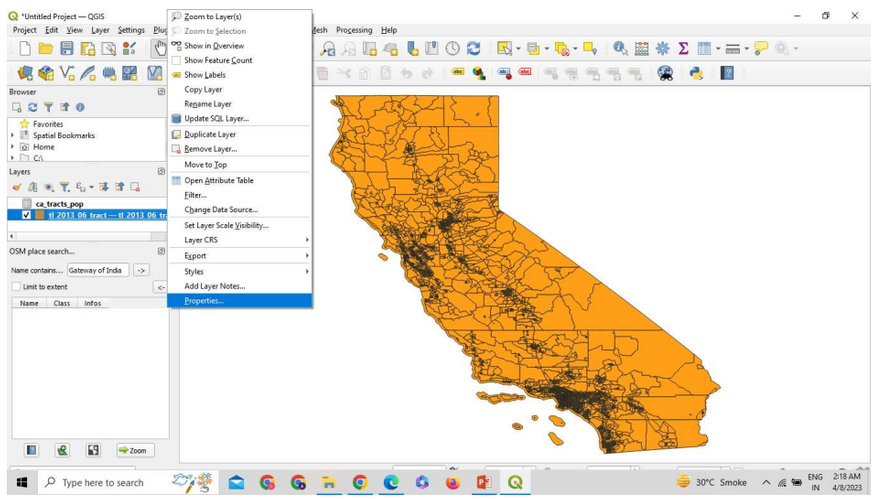
Step 2: Select E:\Pendrive\Tybscit\Sem 6 Notes\GIS\Practical\Practical_07\A\tl_2013_06_tract.zip

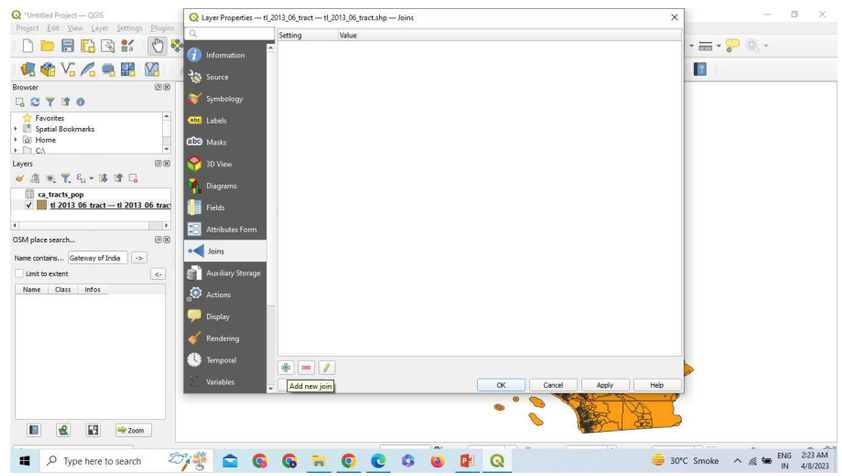


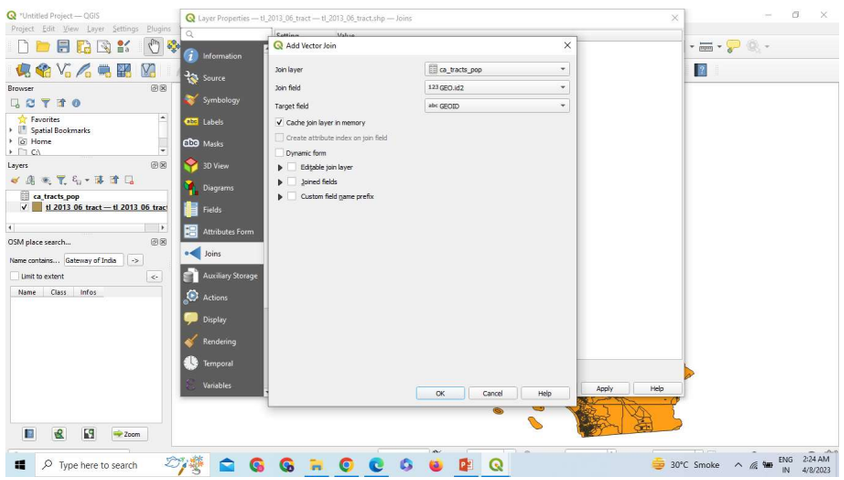


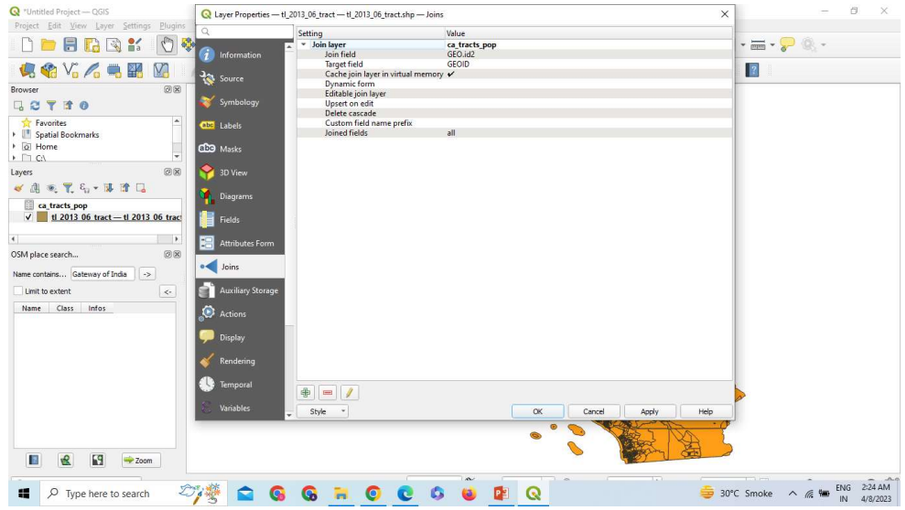


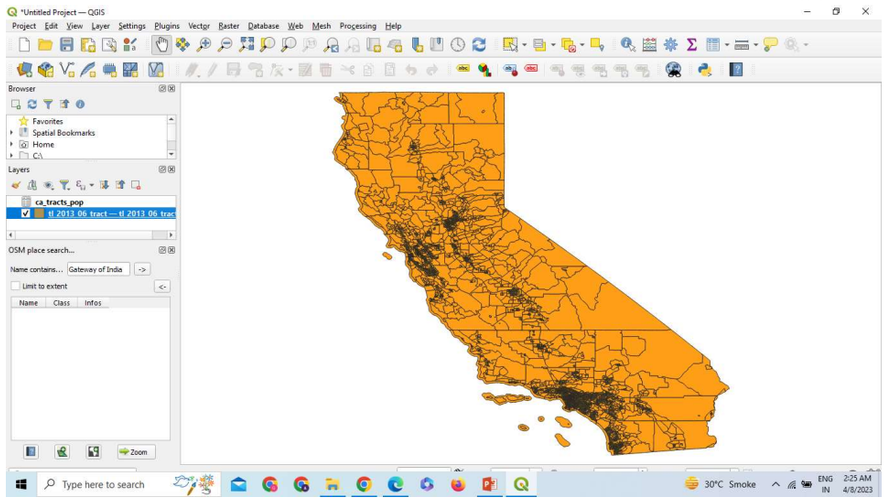


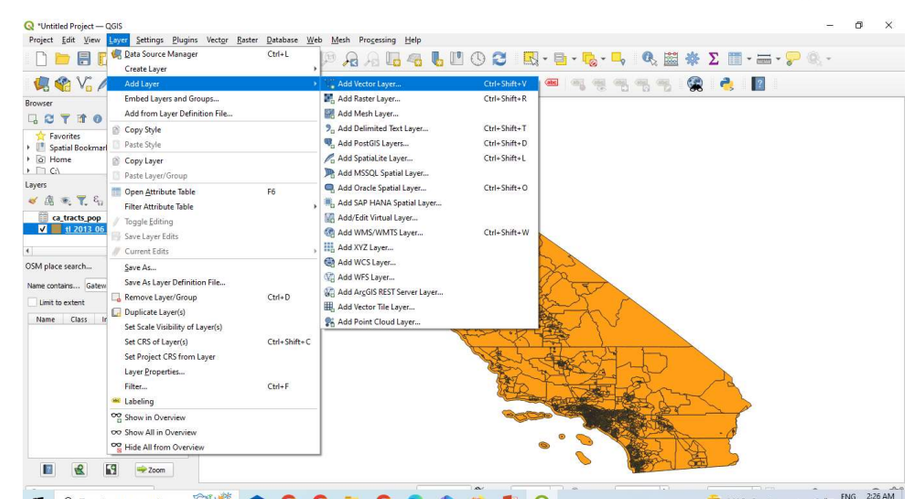


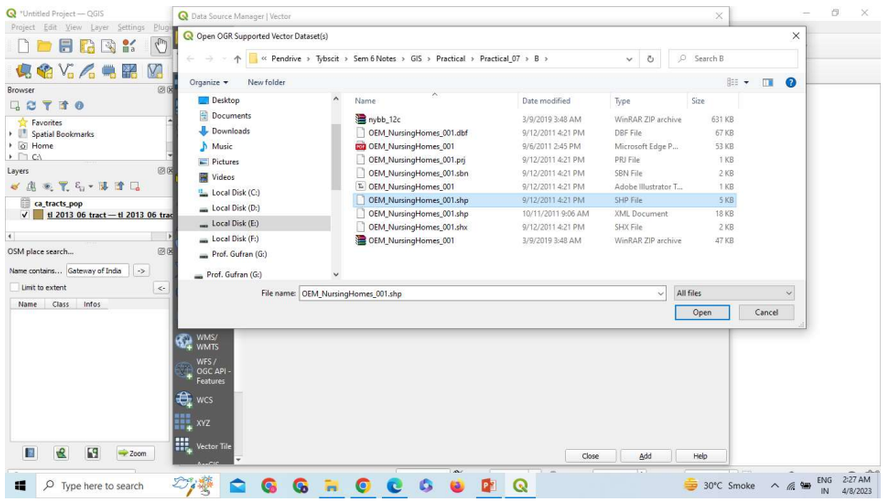


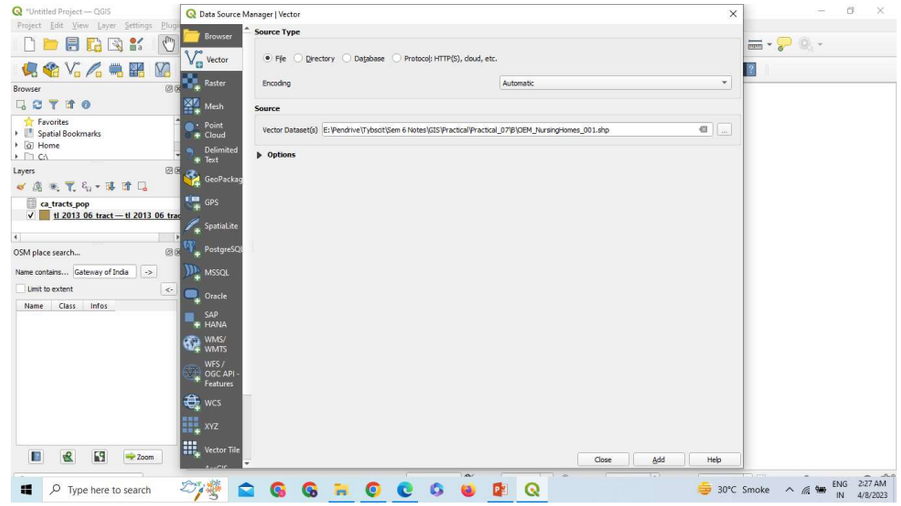


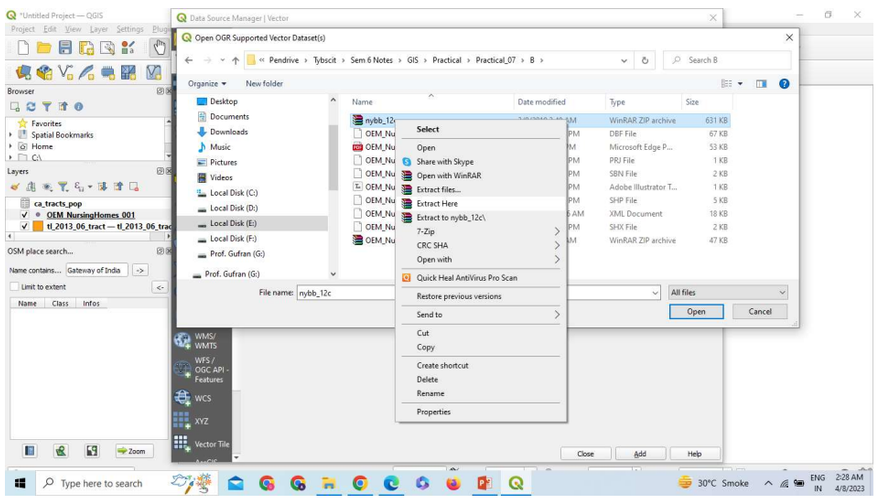


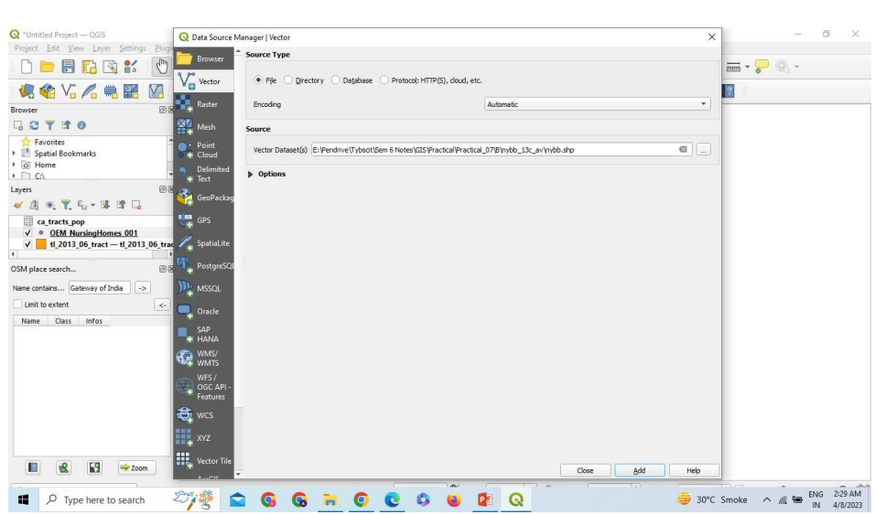


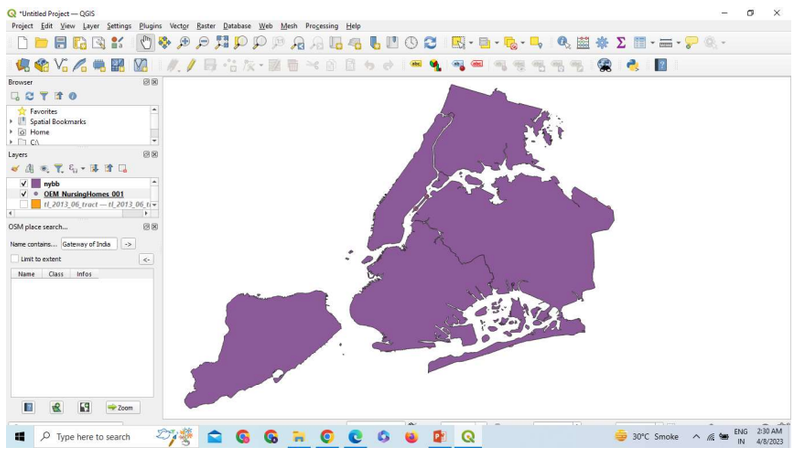


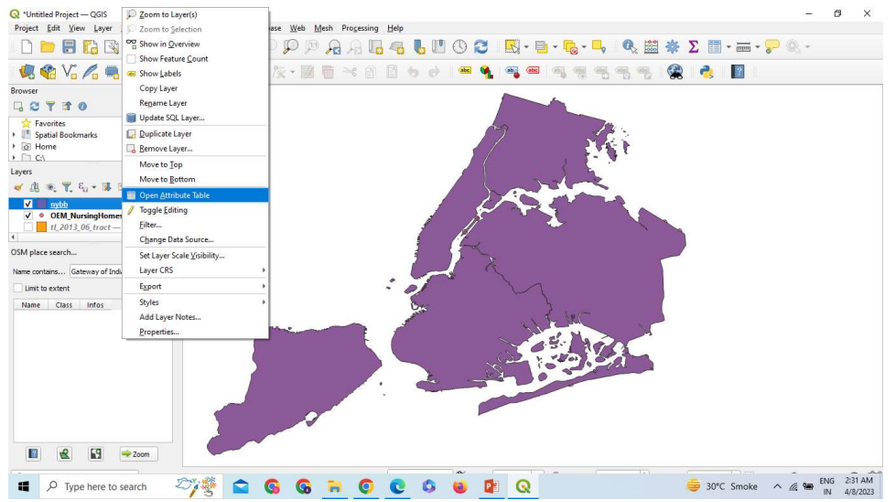


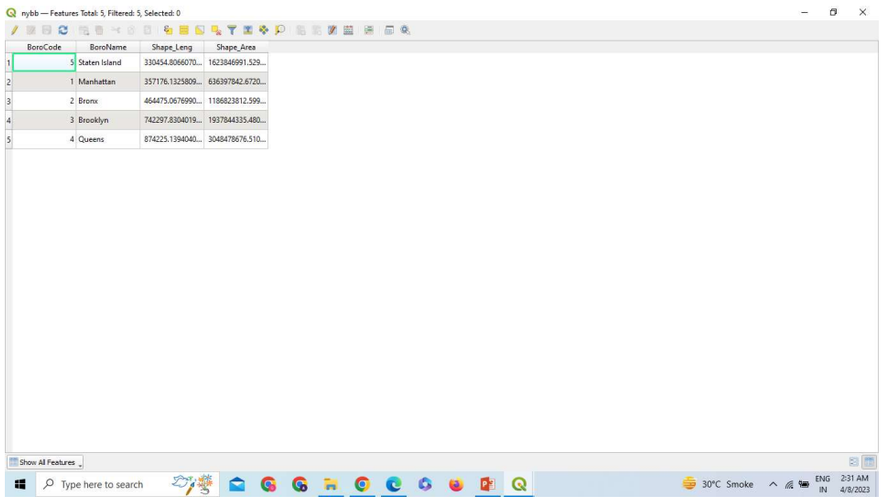


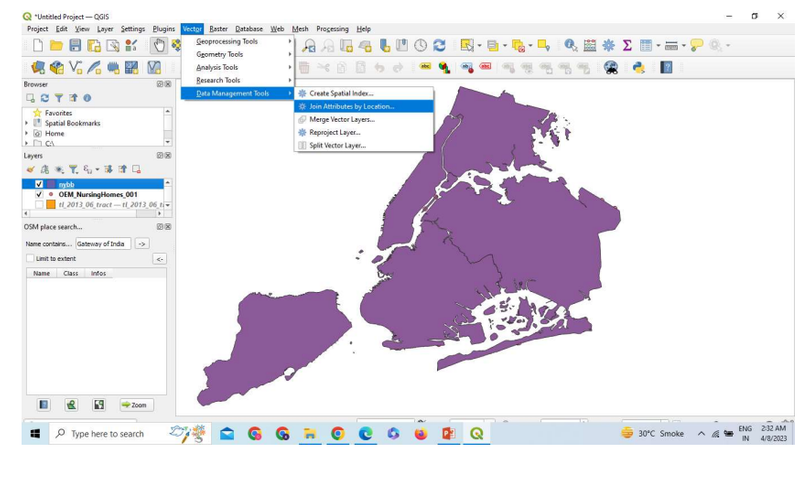


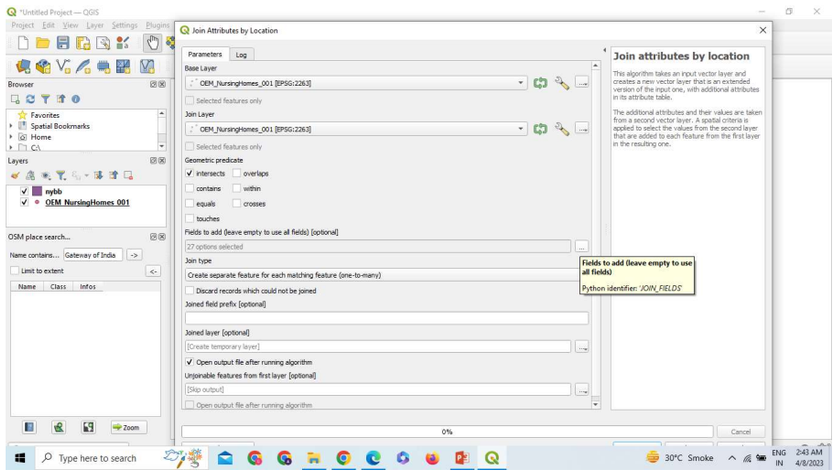


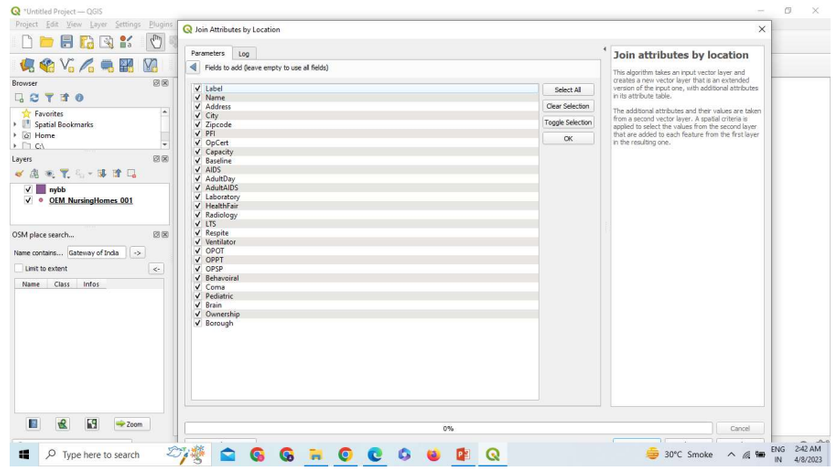


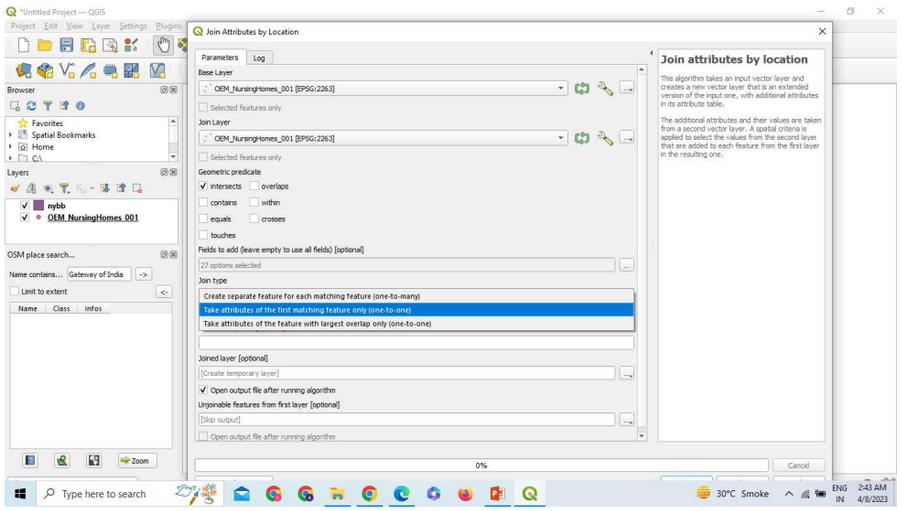


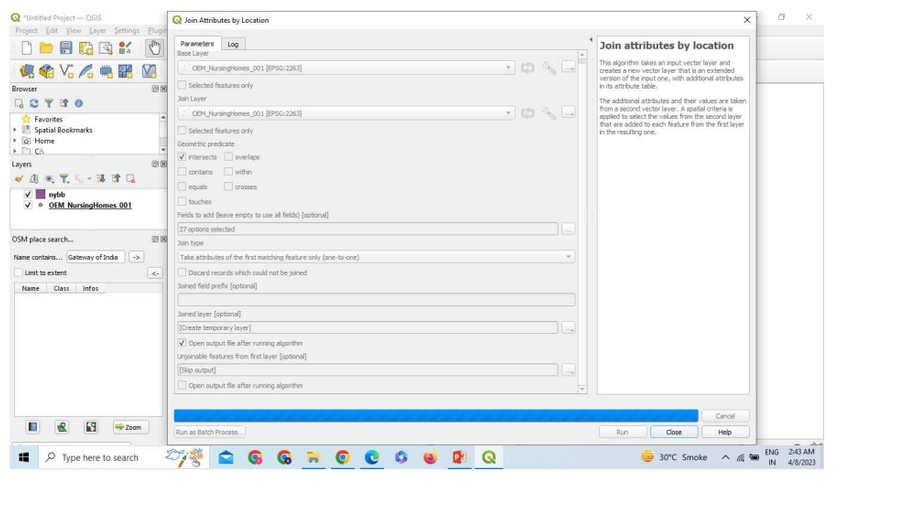


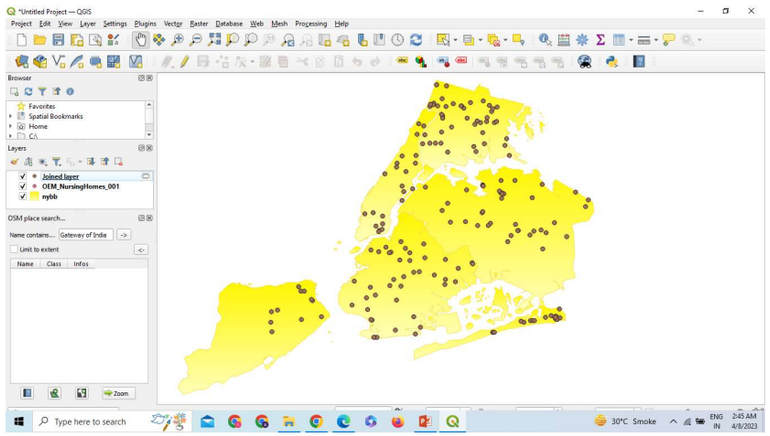


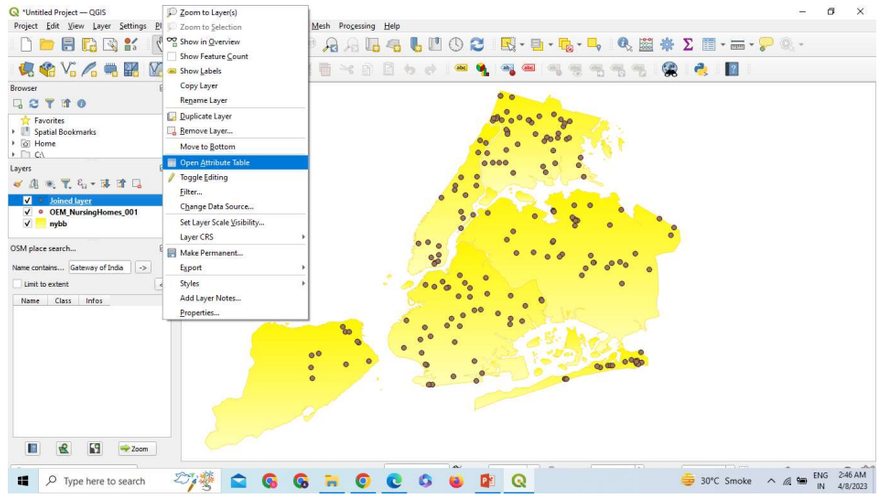


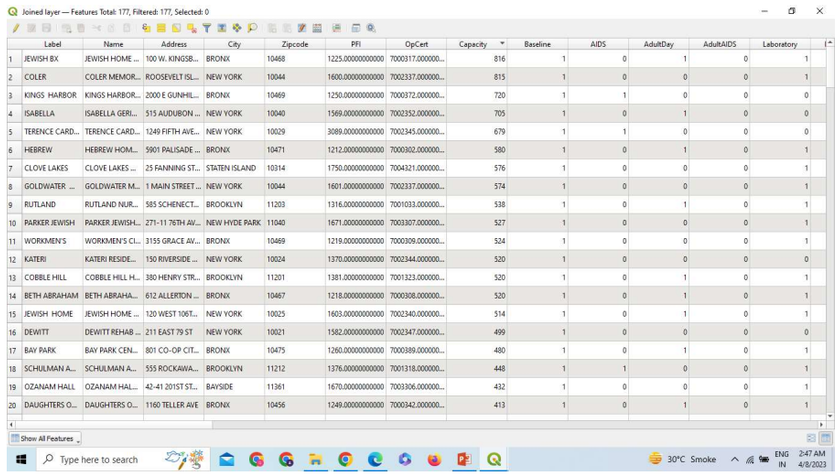


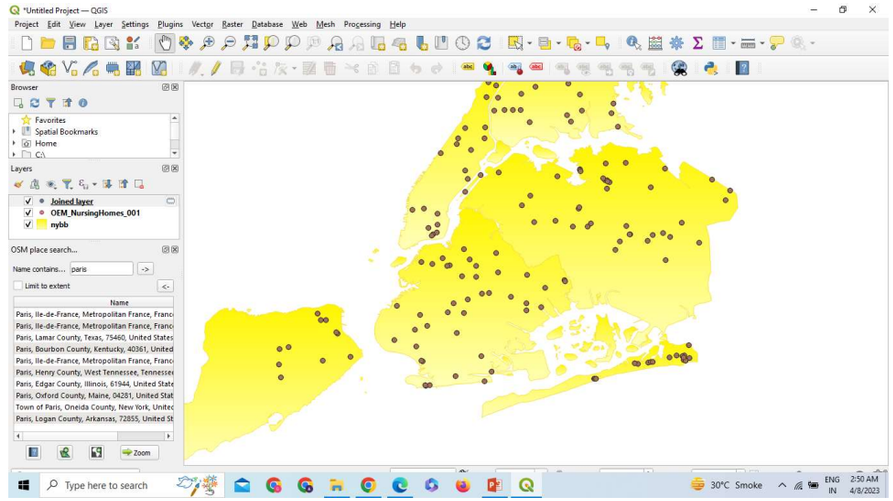


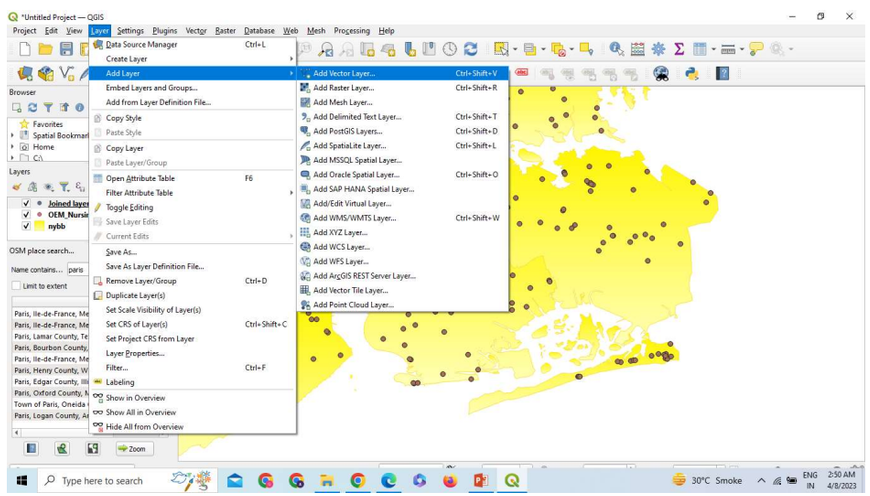


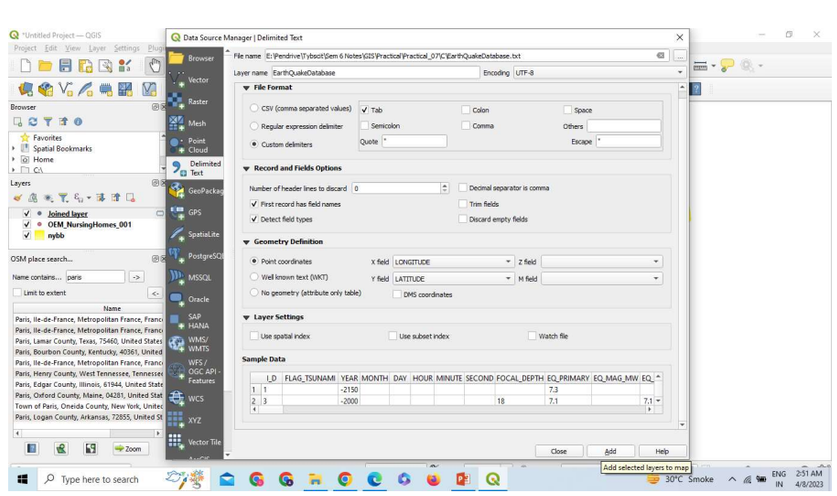


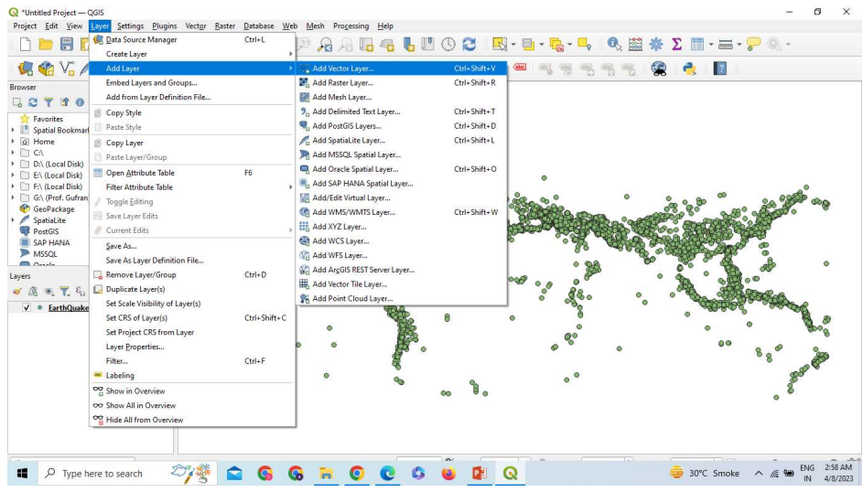


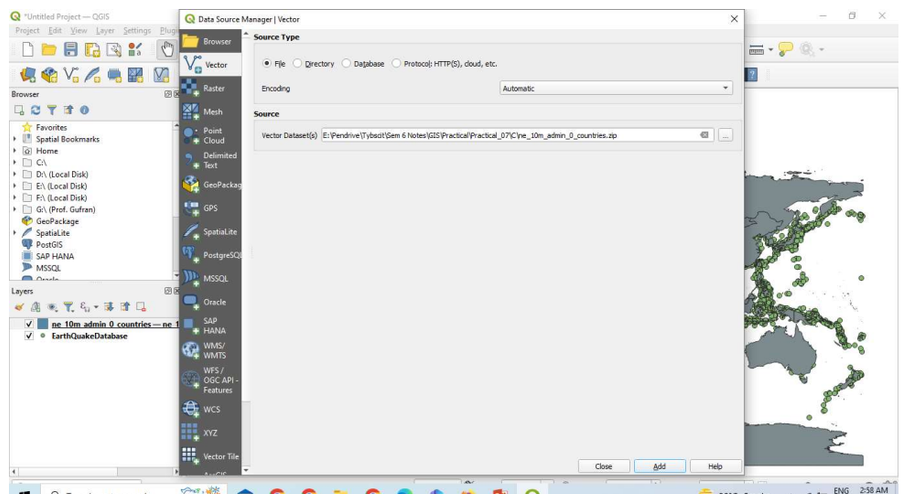


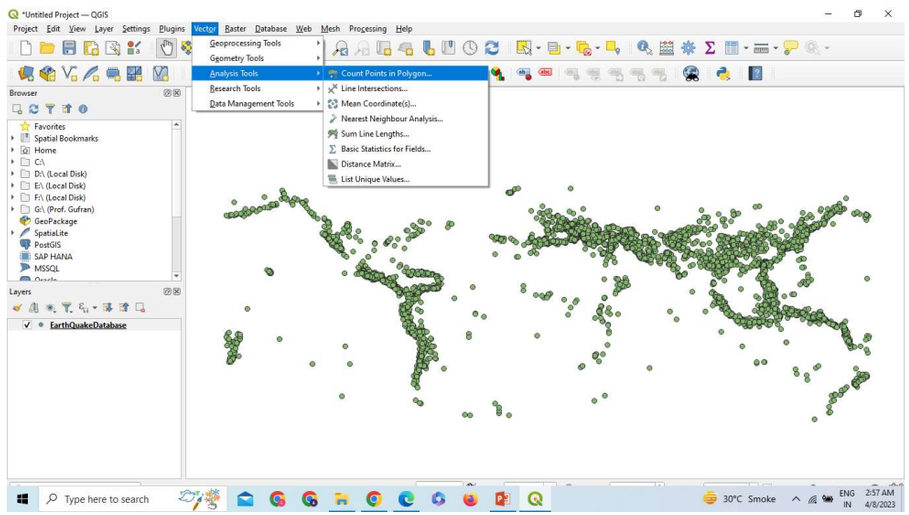


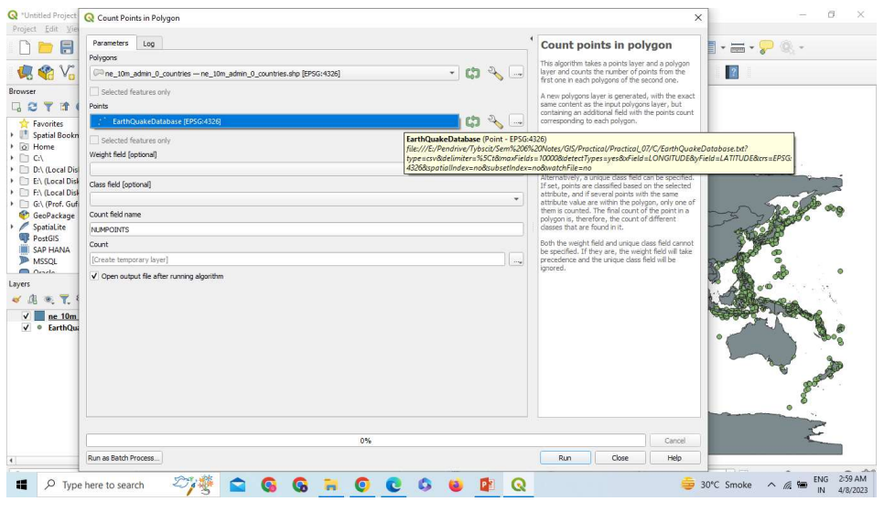


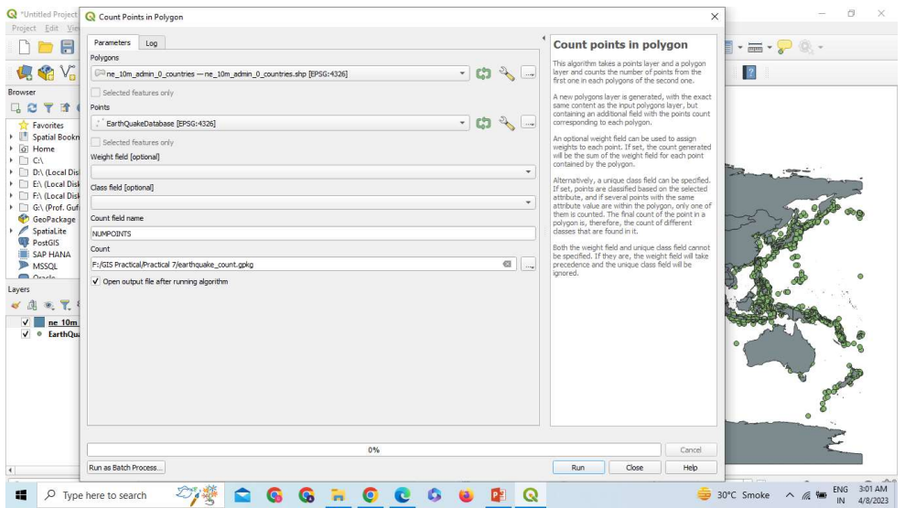


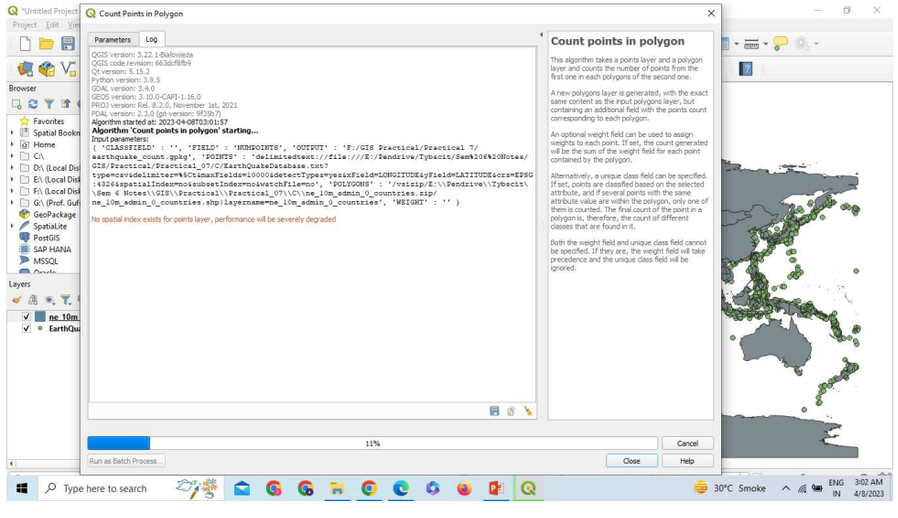


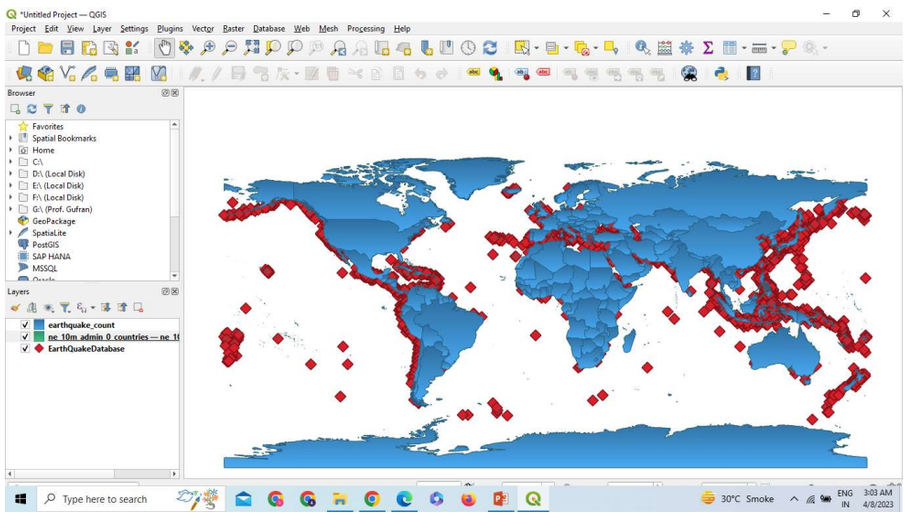


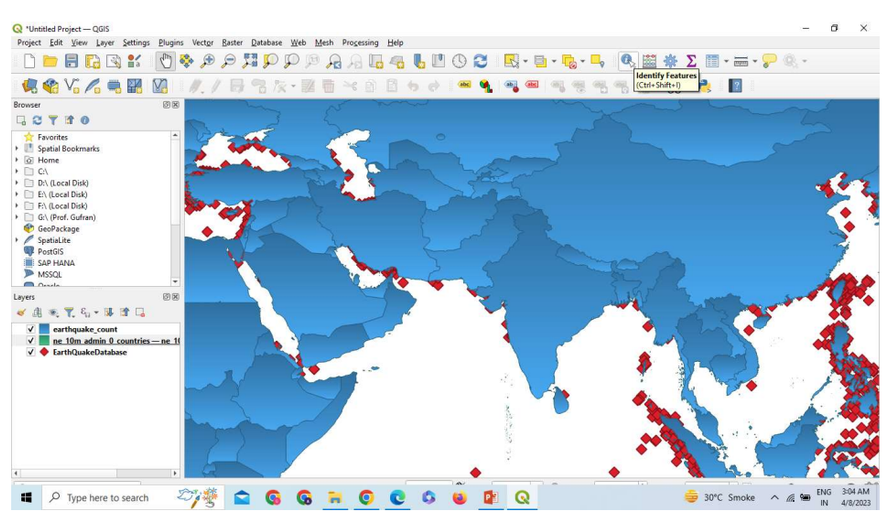


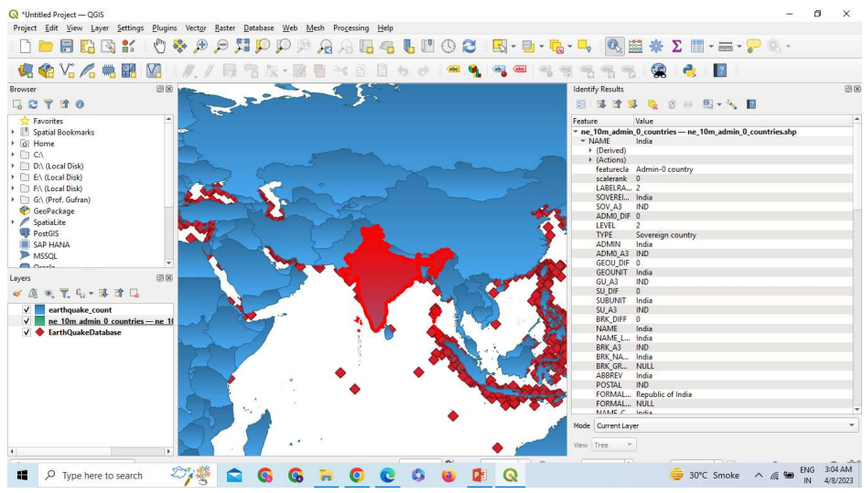


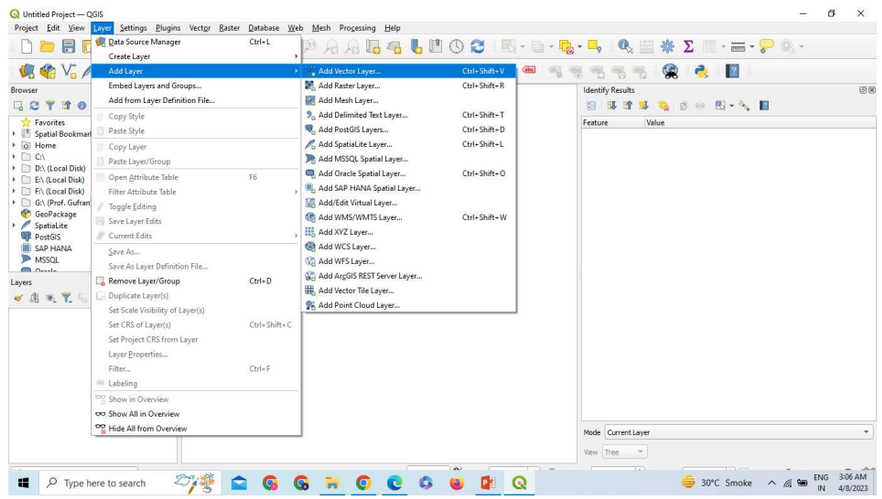


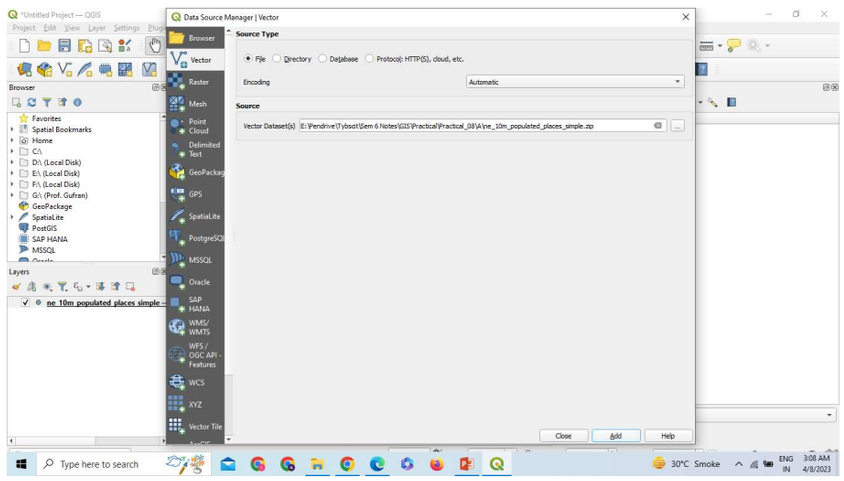


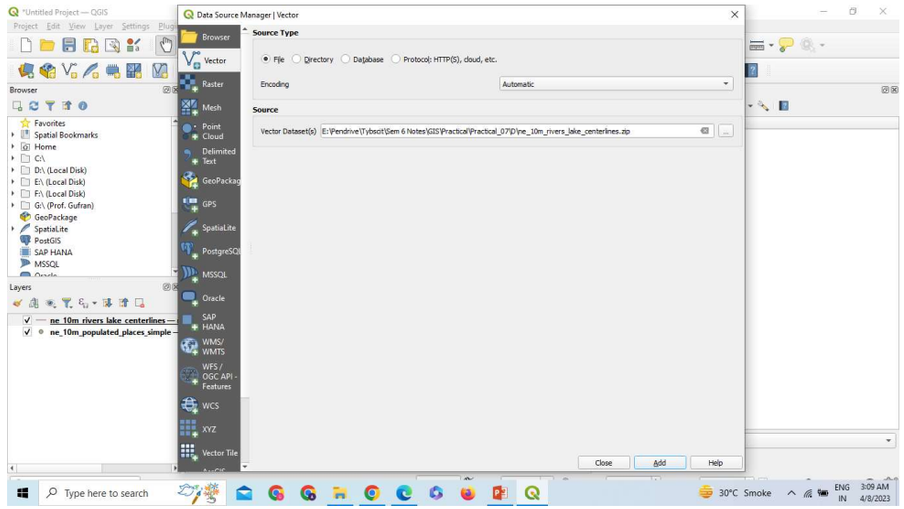


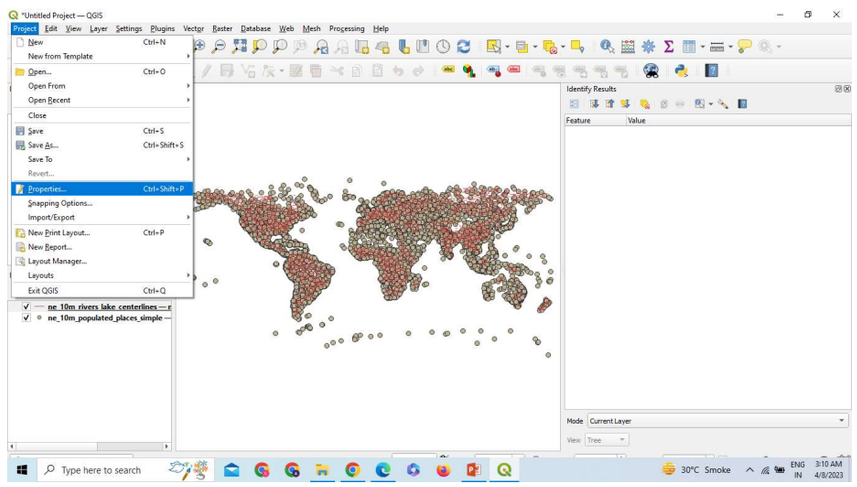


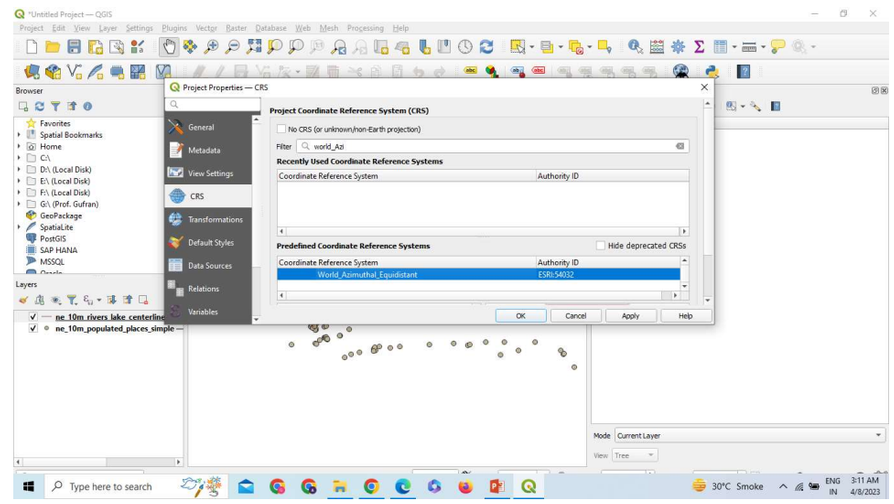


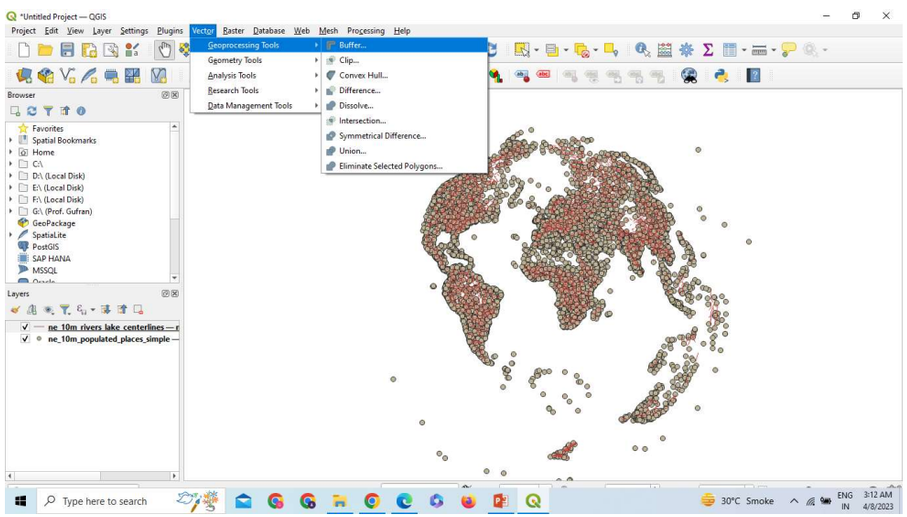


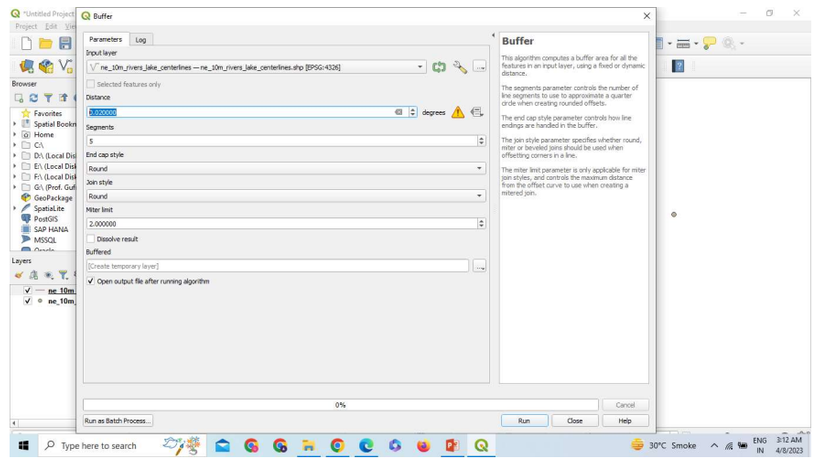


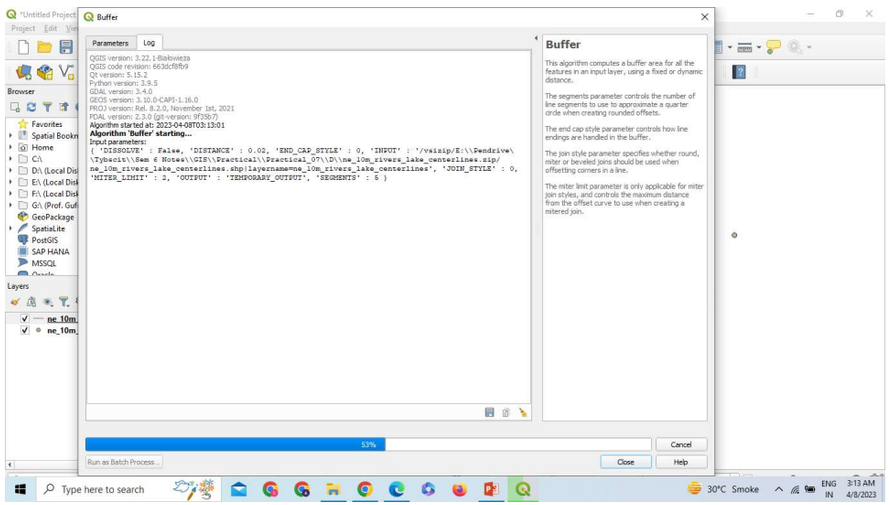


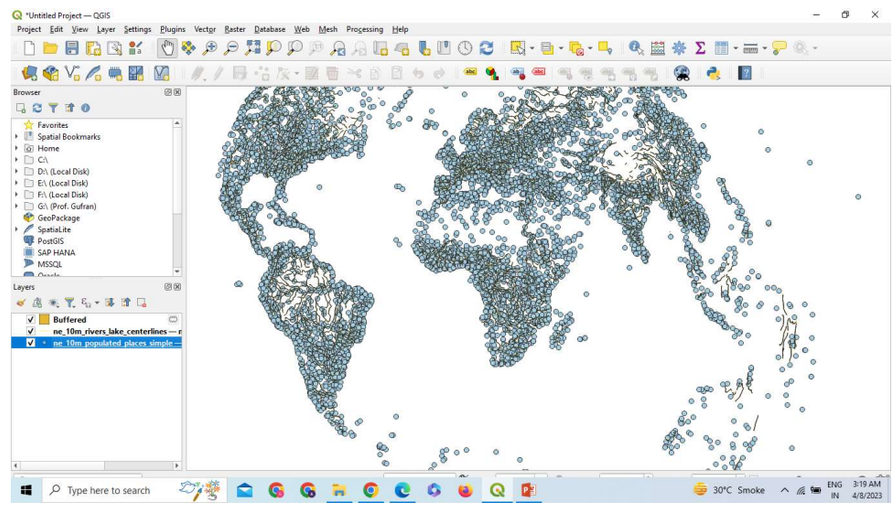


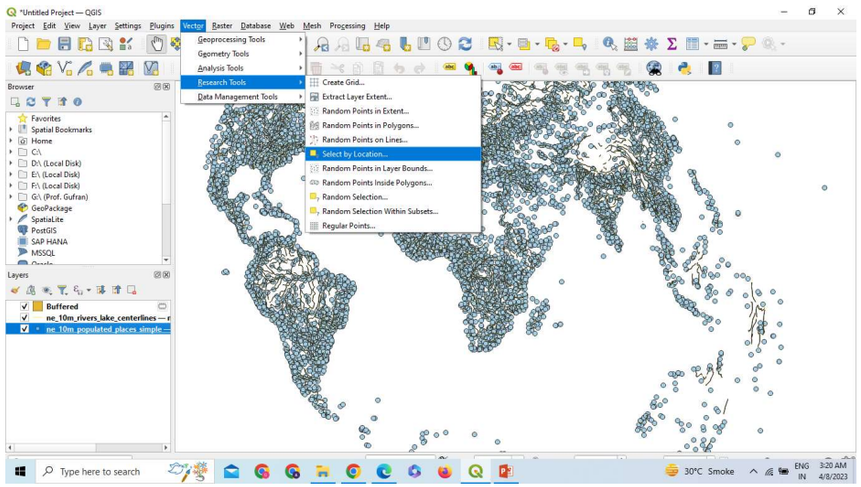


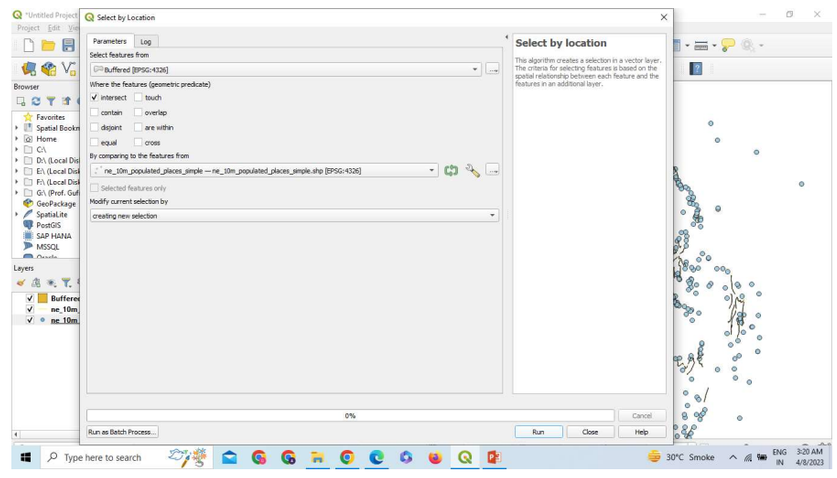


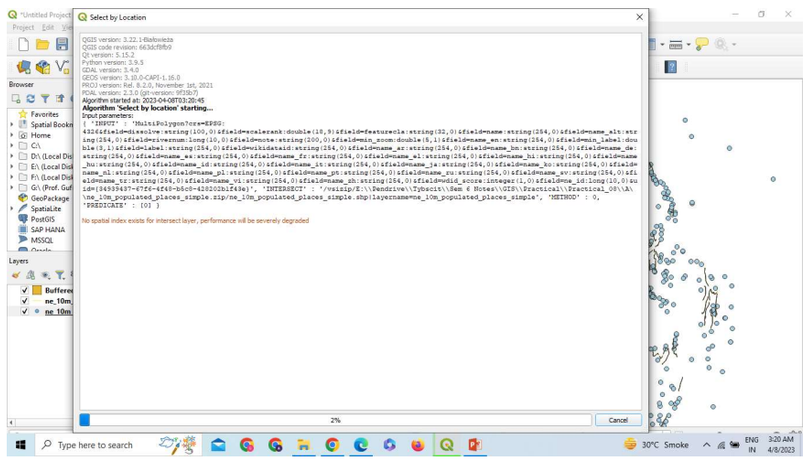












This will highlight only those rivers containing a populated place within 2 KM