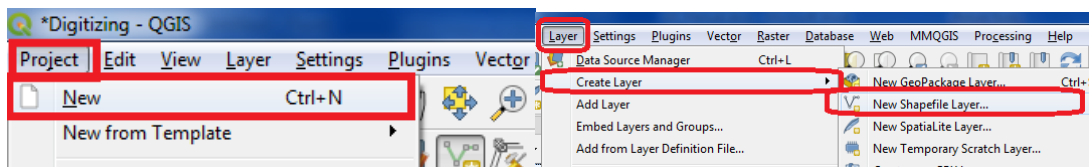


PRACTICAL – 1 : Creating and Managing Vector Data:

- Adding vector layer
- Setting properties
- Vector Layer Formatting



Fill the appropriate information in each text box.

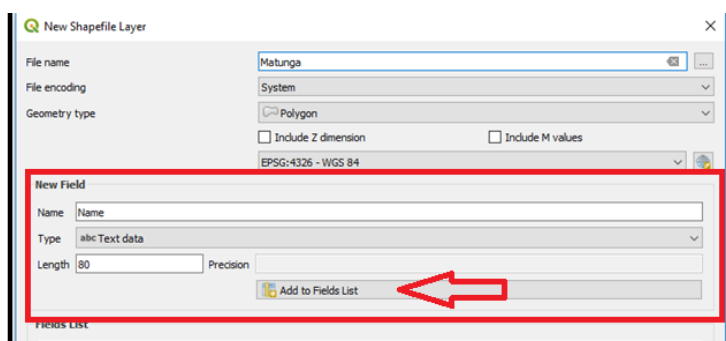
- File name :
- By default the file will be saved in bin folder.
- To avoid it click on following button to change the location of file

Field Panel

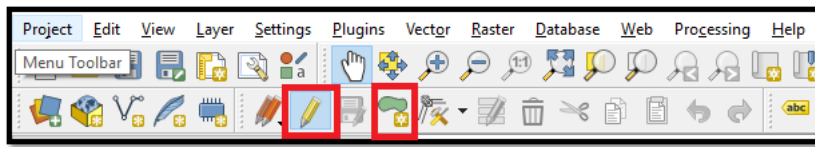
- Add the Attribute you want to show. (Column Name for Table)
- Specify Type (DataType:Text Data/Decimal Data/Whole Number/Date) of Attribute
- Specify the Length of the Attribute. Specify Precision (If Data Type is Decimal)

Click on Add to Field List Button.

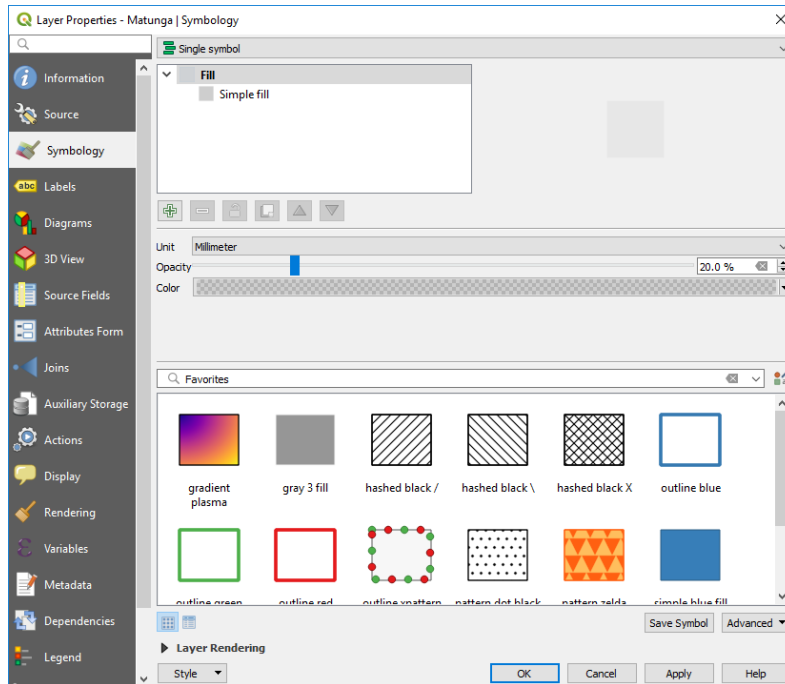
- You can add as many fields (Column Name) as you want for the layer.



Follow the steps to plot Polygon :

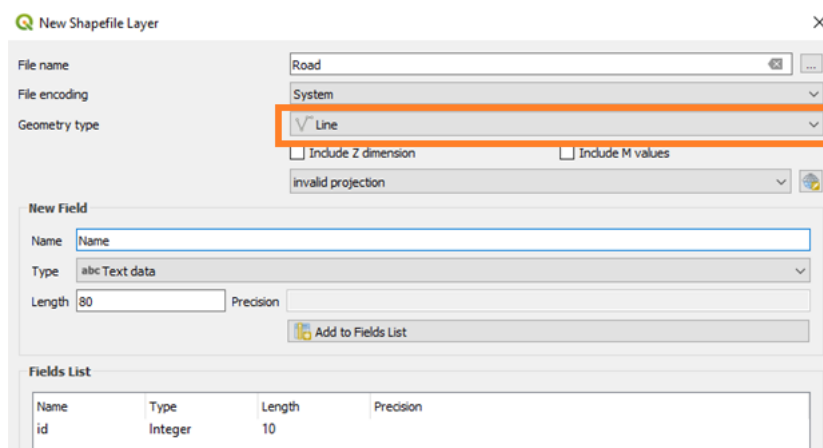


We can set properties by right clicking on the created field name and going inside the properties option:



b) Creating Line vector layer

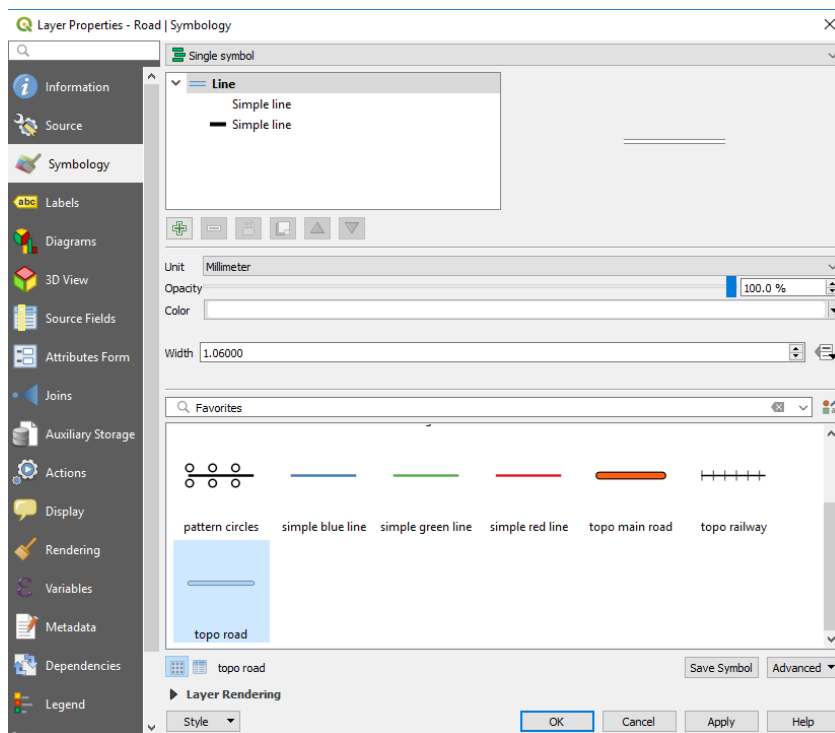
- Repeat the same steps as we have done for polygon layer.
- Select geometry type Line.



To plot road click on Add Line Feature

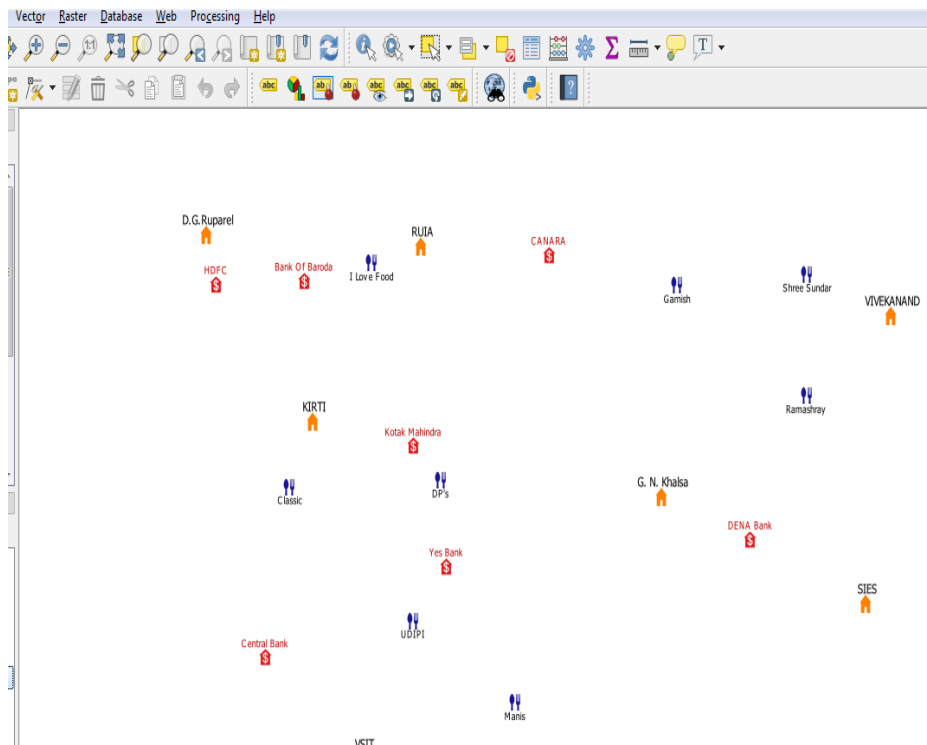


Properties window:



C. Create Point vector layer

➤ Repeat same steps to add point layers as we have done in previous layers.(For ATM, Restaurants, Banks, Bus Stops etc)



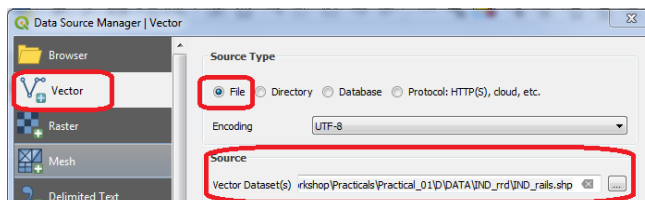
Final Output:



d) Calculating line lengths and statistics

Go to Layer -> Add Layer -> Add Vector Layer

- Add the following file to project



"GIS_Workshop\Practicals\Practical_01\DATA\IND_rrd\IND_rails.shp"
"ADD"

Press

- Also add India Administrative Map

"GIS_Workshop\Practicals\Practical_01\DATA\IND_adm\IND_adm0.shp"

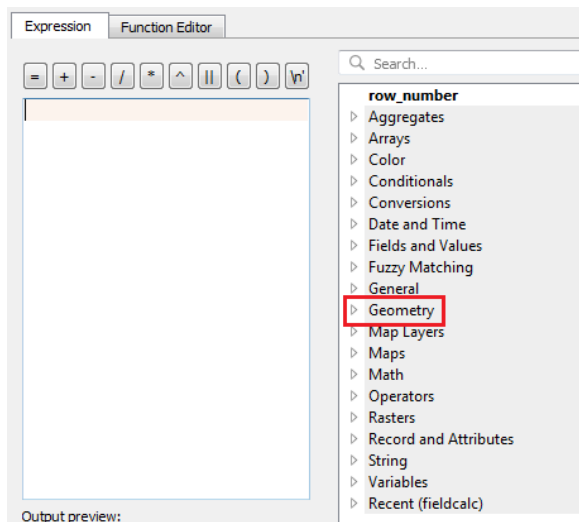
- Double Click on IND_adm0



In layer Pane, Right click on IND_rails -> Open attribute table -> Press Open Field Calculator using button.

- Set the output field as "Track_Len", field type to "Decimal Number".

From Function List search \$length or go to Geometry -> Select \$length



Set expression as:

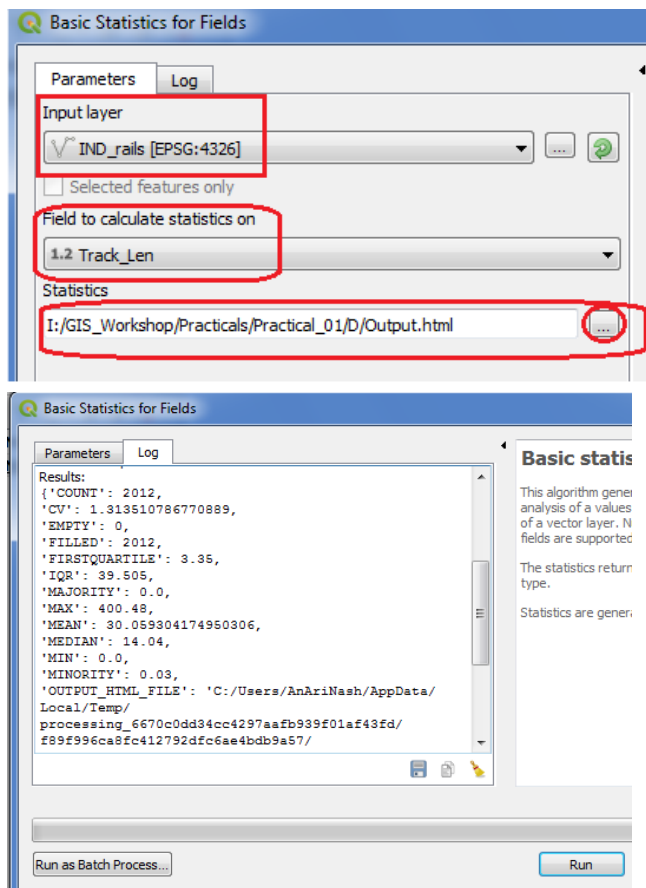


A new column is added to the attribute table with value representing the length of track in KM. Press CTRL+S or click on Save Edits option on tool bar

- Close the attribute table window.
- For calculating the total length of Railway tracks in India.
- Select Vector ->Analysis Tools ->Basic Statics for Fields

Select IND_rails layer from input layer. And select Track_Len in “Field to Calculate statistics on”

Press Run -> The Result is



Open the "output.html" file to get the field statistics.

Analyzed field: Track_Len

Count: 2012

Unique values: 1608

NULL (missing) values: 0

Minimum value: 0.0

Maximum value: 400.48

Range: 400.48

Sum: 60479.3200000000014

Mean value: 30.059304174950306

Median value: 14.04

Standard deviation: 39.483220276624444

Coefficient of Variation: 1.313510786770889

Minority (rarest occurring value): 0.03

Majority (most frequently occurring value): 0.0

First quartile: 3.35

Third quartile: 42.855000000000004

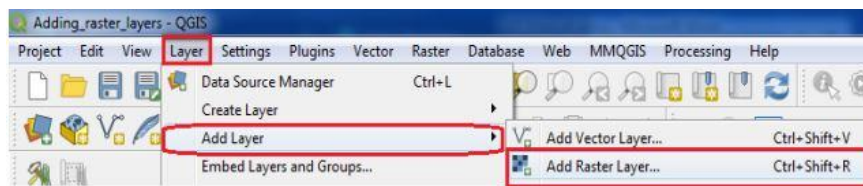
Interquartile Range (IQR): 39.505

- The above statistics show that the total length of Railway track in India is 60,479.32 KM.

Practical 2

a) Adding raster layers

- From menu bar select layer → add layer → add raster layer

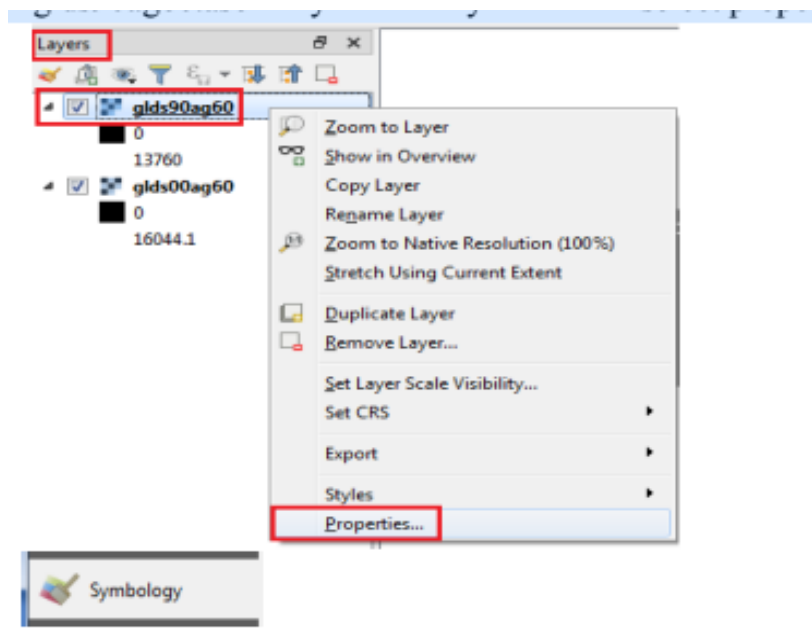


- Go to Project → Properties OR Press the Set CRS option on bottom right corner.

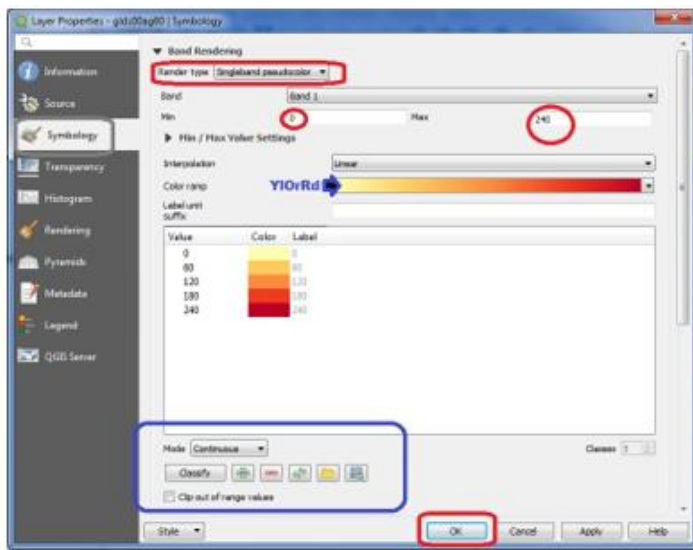


b) Raster Styling and Analysis

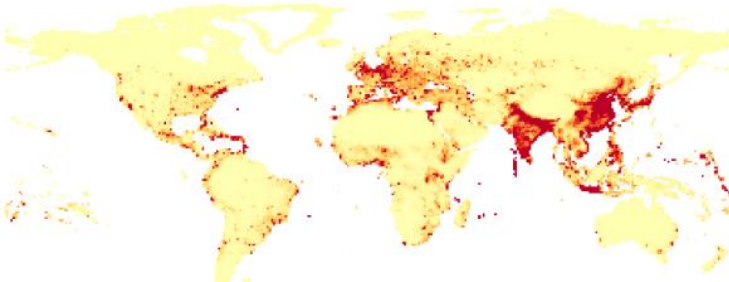
- To start with analysis of population data, convert the pixel from grayscale to Color.
- Select "glds90ag60.asc" Layer from layer Pane → select property OR double click on it.



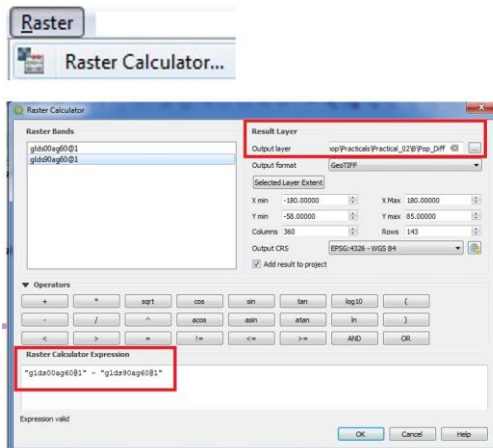
- Select symbology



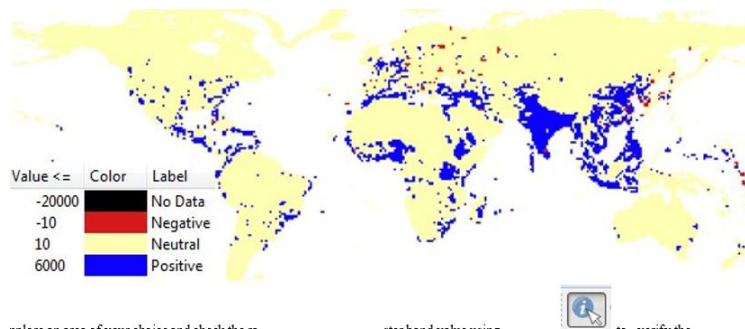
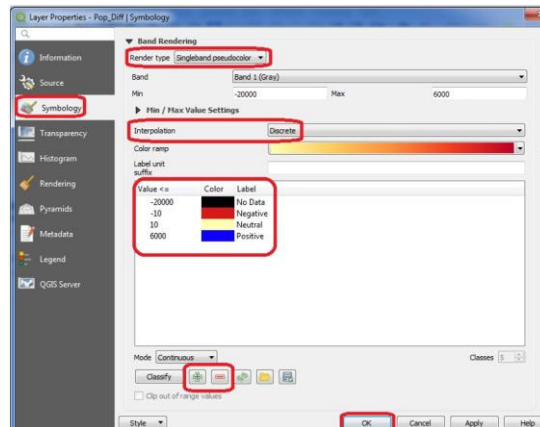
- Press "APPLY"
- Repeat the same for "glds00ag60.asc" Layer



- Go to Raster → Raster Calculator

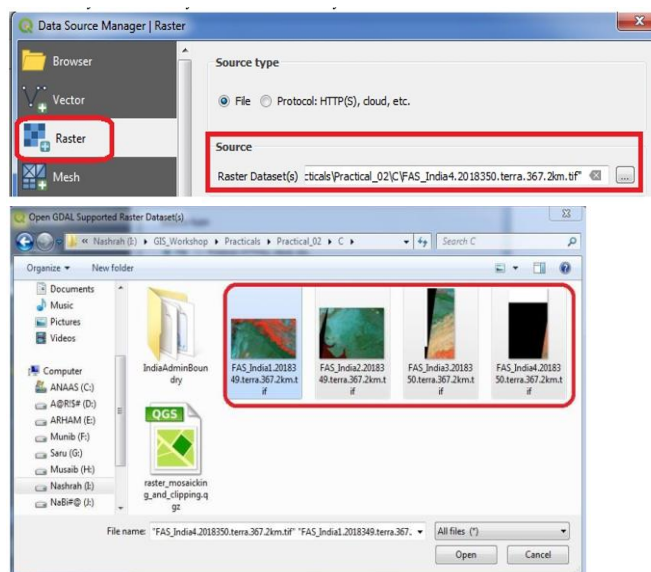


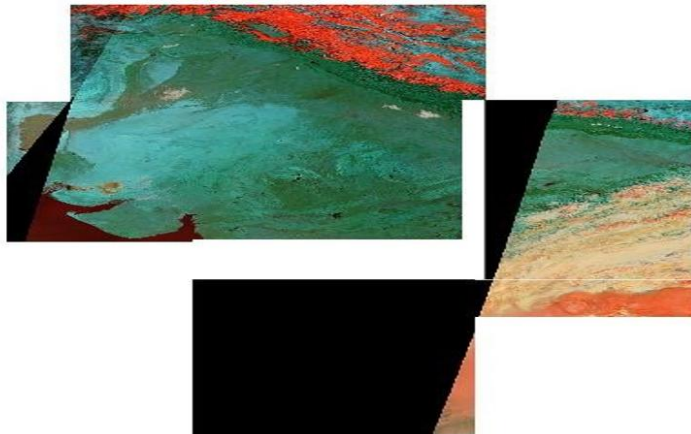
- Put the expression ""glds00ag60@1" - "glds90ag60@1""
- Select the output file location & name and Press OK.
- Remove the other two layers i.e. glds00ag60.asc and glds90ag60.asc
- Double click on pop_diff layer
- Select symbology



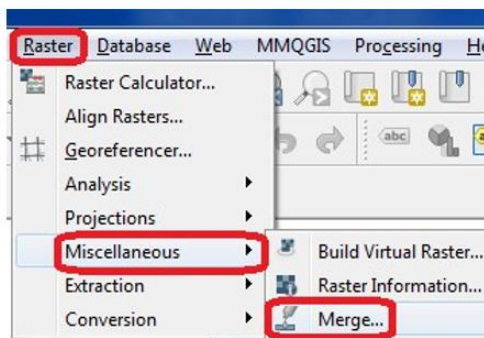
C) Raster Mosaicking and Clipping

Go to Layer → Add Layer → Add Raster Layer

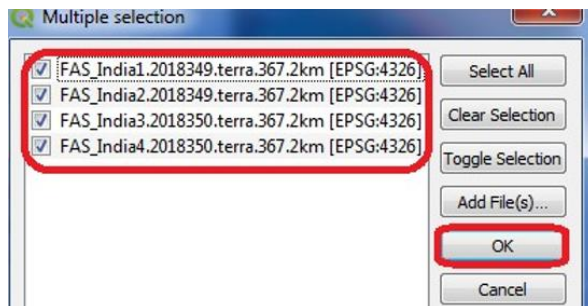




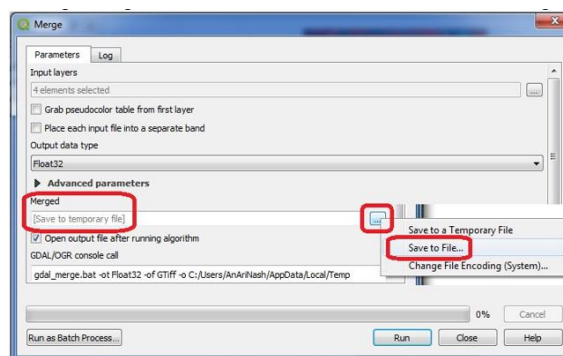
➤ Go to Raster → Miscellaneous → Merge



In the Merge dialog window Select all layers and Press OK.

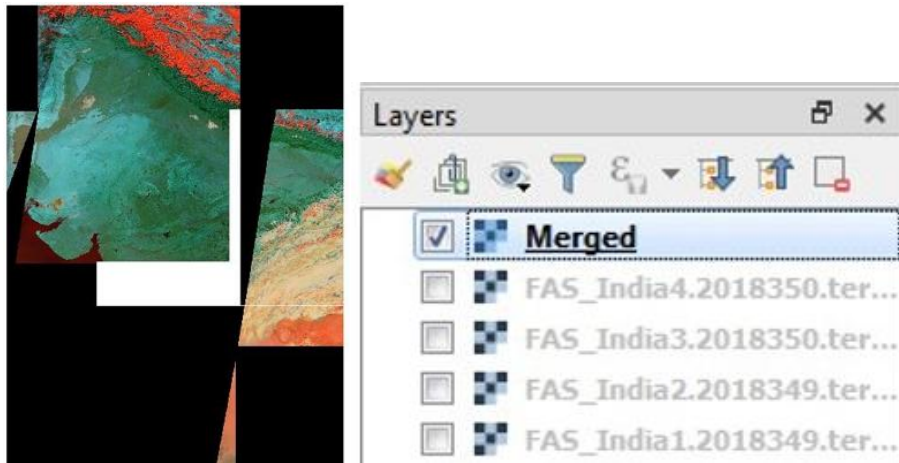


In Merge dialog window select a file name and location to save merged images.



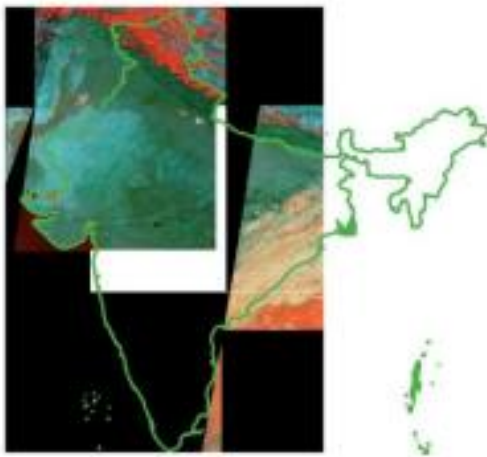
➤ Save the file to “GIS_Workshop/Practicals/Practical_02/C/” location with the name as Merge_Files.tif

➤ Press Run and after completion of operation close the Merge window dialog box.

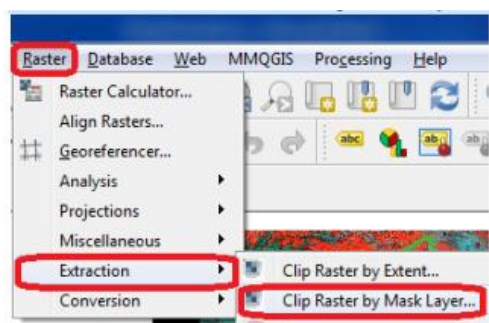


Go to Layer → Add Vector Layer → Select

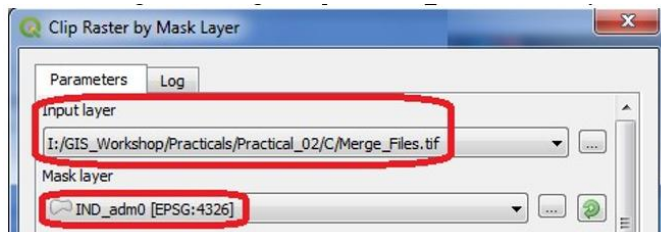
\\GIS_Workshop\\Practicals\\Practical_02\\C\\IndiaAdminBoundry\\IND_adm0.shp
file.



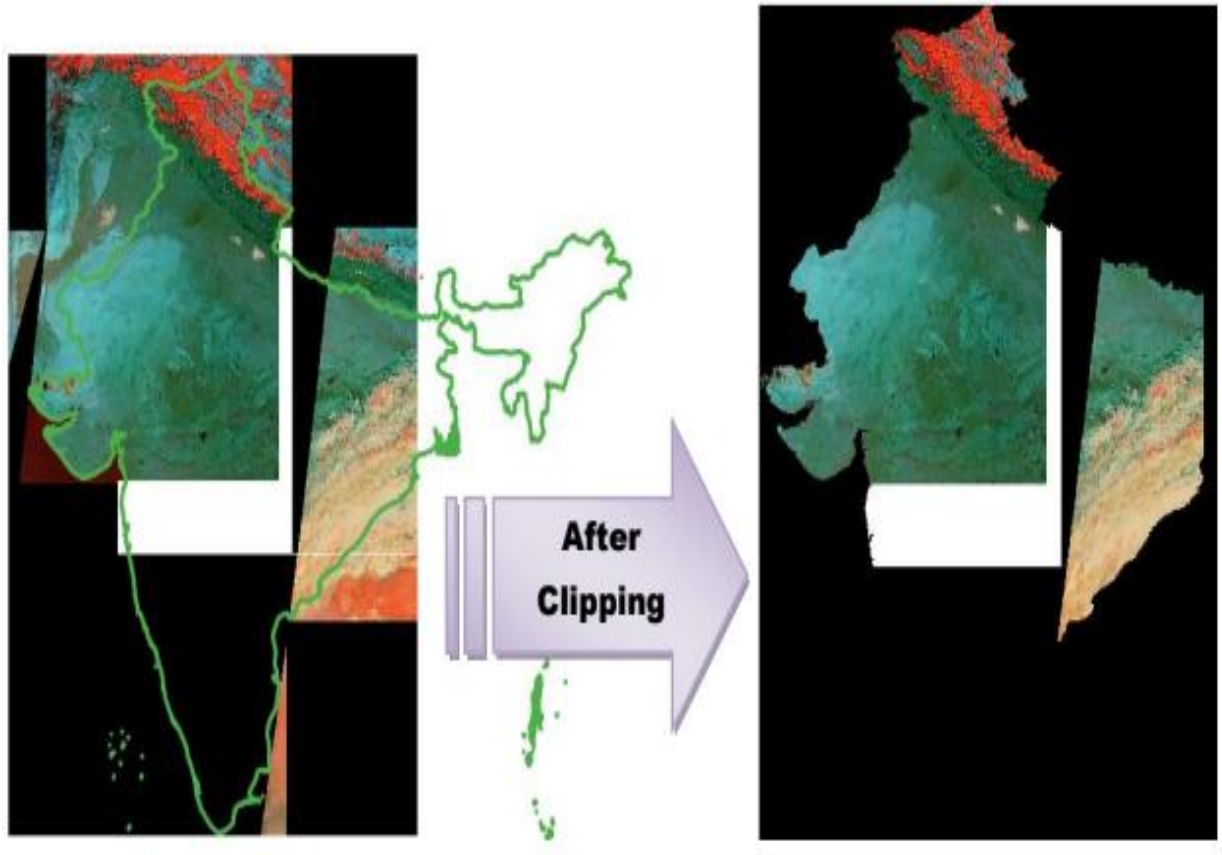
Go to Raster → Extraction → Clip Raster by Mask Layer

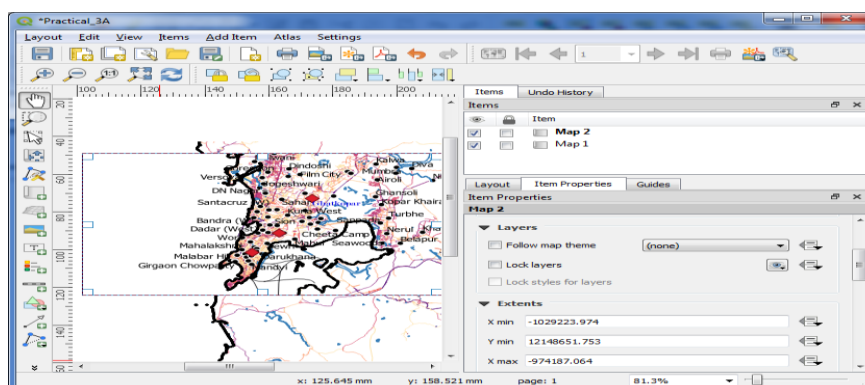


Select the merge raster image as input and Ind_adm0 as mask layer.

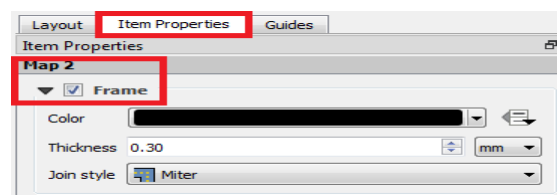
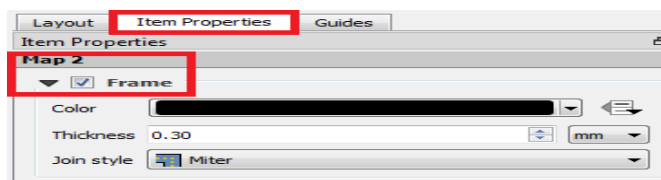
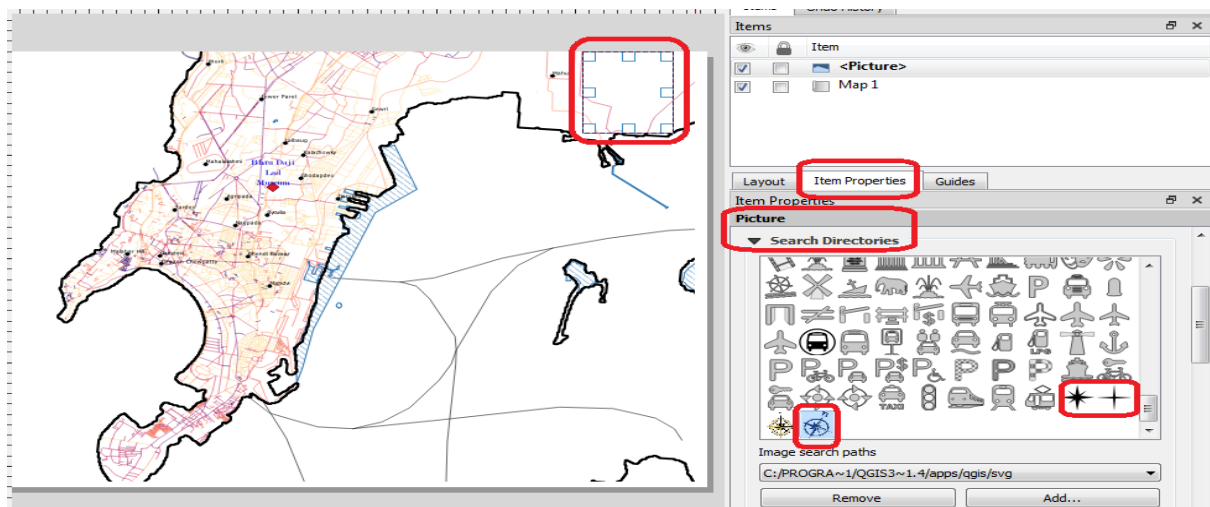


Press Run

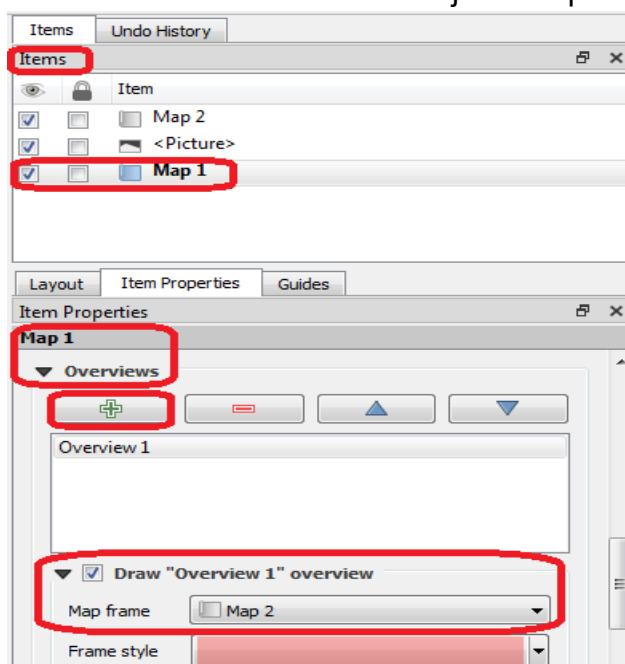




- Go to Add Item → Add Picture → Place a picture box at appropriate location.

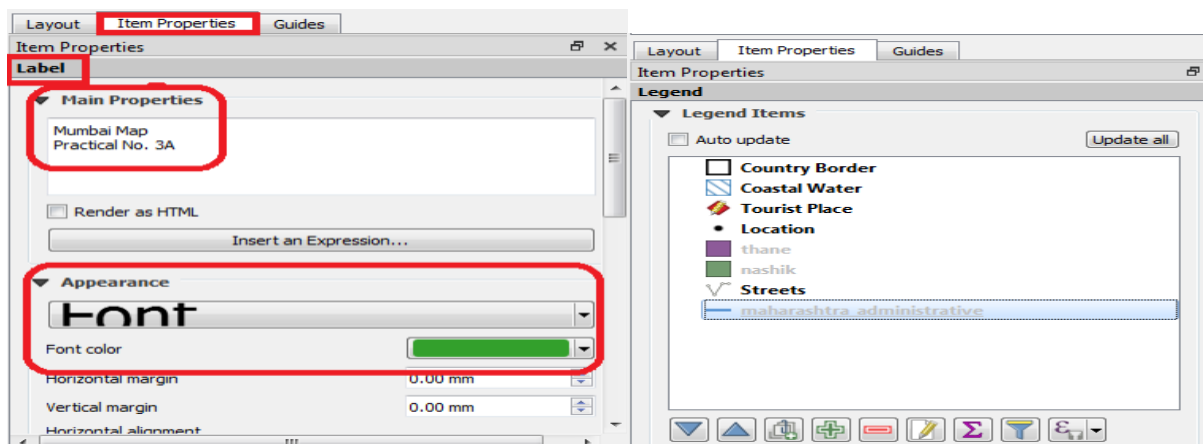


- To highlight the area shown in Inset
- Select the Picture representing main Map from Items pane.
- In Item Properties → Overviews → using icon add an overview.
- Select the checkbox Draw Overview
- Name the Picture object representing inset (Map1 in our case)

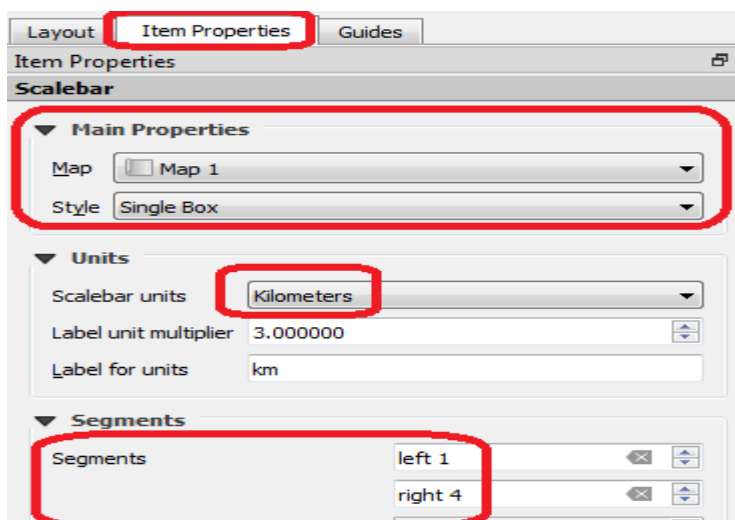
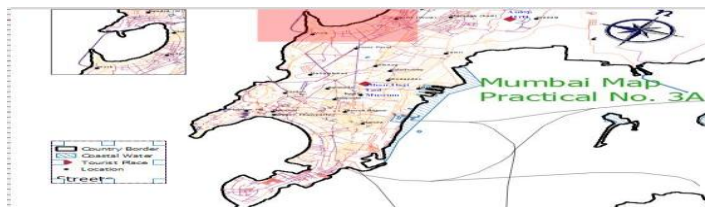


- Change the Label text To “Mumbai Map”, Set appropriate font size and colour using Item

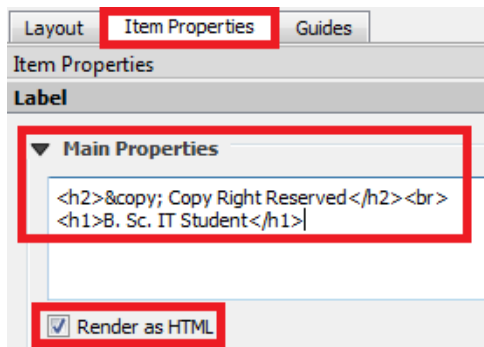
Properties→ Main Properties.



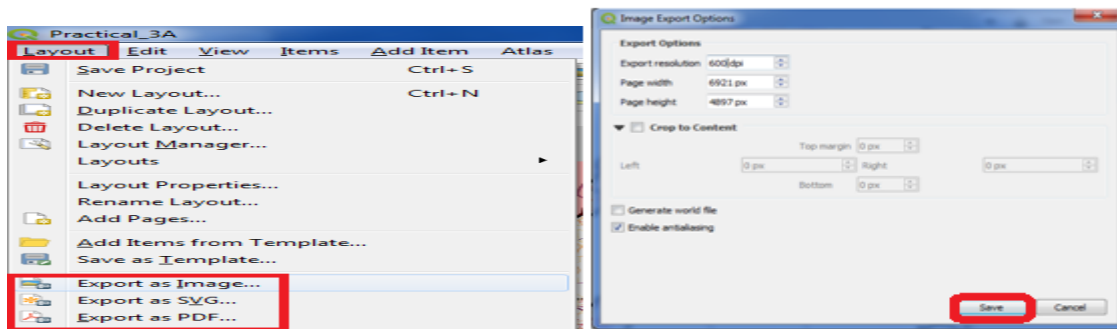
- The Print Layout will appear



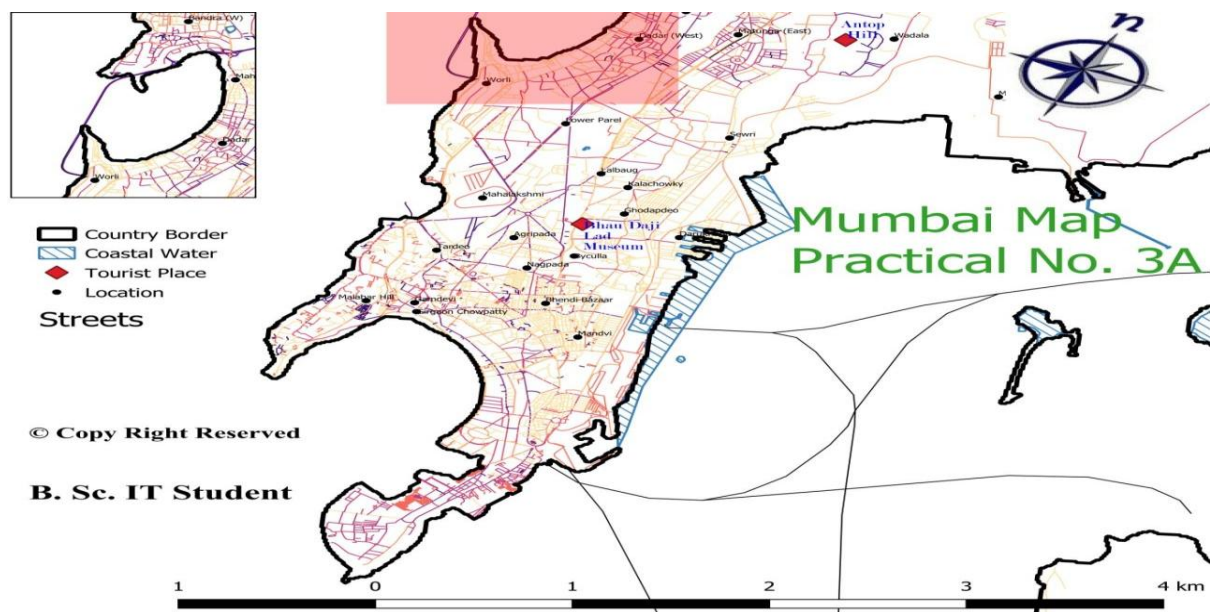
- Add Item → Add Label→Add a Label using HTML rendering



➤ A Map can be saved in Image or PDF using Layout → Export as Image



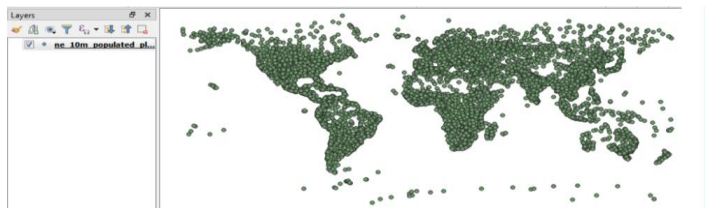
➤ Open the PDF or Image from location.



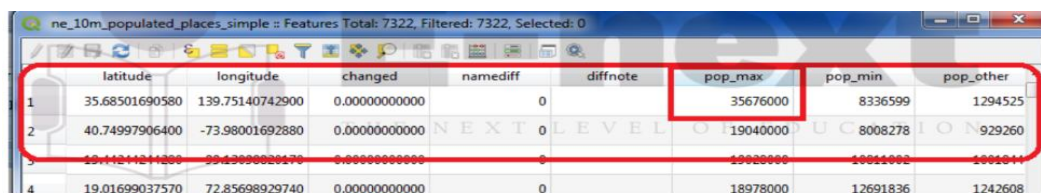
PRACTICAL – 4

A. Working with attributes

- Start a new project.
- Go to Layer → Add Layer → Add Vector Layer
- Select
“\GIS_Workshop\Practicals\Practical_04\A\Data\ne_10m_populated_places_simple.zip”



- Right click on Layer in Layer Panel → Open Attribute Table.
- Explore various attributes and their values in the Attribute table.
- To find the Place with maximum population click on “pop_max” file



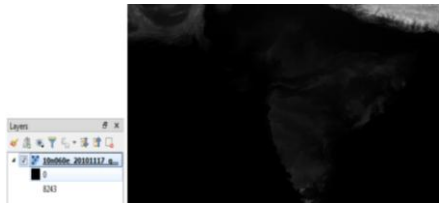
	latitude	longitude	changed	namediff	diffnote	pop_max	pop_min	pop_other
1	35.68501690580	139.75140742900	0.00000000000	0		35676000	8336599	1294525
2	40.74997906400	-73.98001692880	0.00000000000	0		19040000	8008278	929260
3	19.14241244280	99.13000000000	0.00000000000	0		13000000	10000000	1000000
4	19.01699037570	72.85698929740	0.00000000000	0		18978000	12691836	1242608

- Enter pop_max>100 and pop_max<10000 and click button to get all the places with population between 100 and 10000.
- The places matching the criteria will appear in different color.

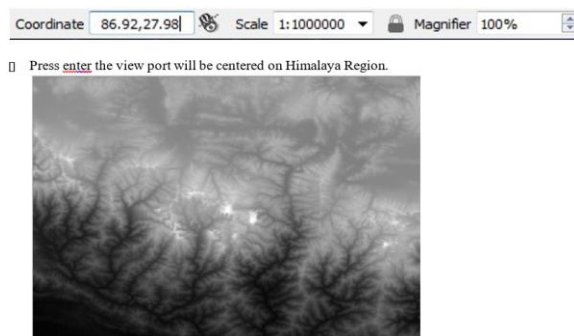


B. Terrain Data and Hill shade analysis

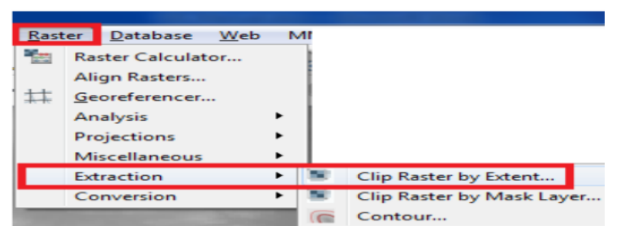
- Go to Layer → Add Raster Layer → select “10n060e_20101117_gmted_mea300.tif”, from Data folder.



- The Lower altitude regions are shown using dark color and higher using light shade as seen on top region containing Himalaya and Mt Everest.
- Mt. Everest - is located at the coordinates 27.9881° N, 86.9253° E.
- Enter 86.92, 27.98 in the coordinate field, Scale 900000 and Magnifier 100% at the bottom of QGIS.

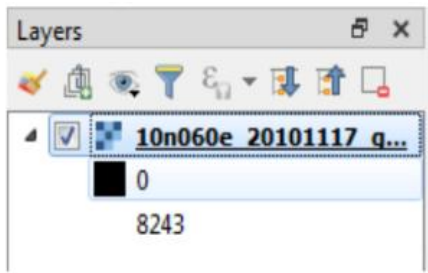


- Crop the raster layer only for the region under study.
- Go to Raster → Extraction → Clip Raster by Extent.

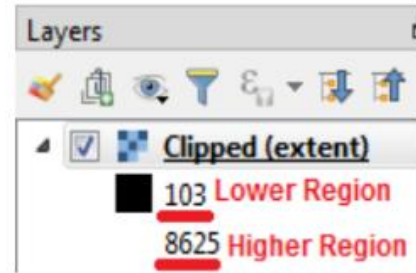


- Select the raster layer (if project contains multiple layers).
- Select the clipping area by selecting the option Use Canvas Extends if the visible part of map is to be selected or manually select an area on canvas by using Select Extent on Canvas.
- Select the location and file name for storing clipped raster layer.
- Press RUN.

- Deselect the original layer and keep the clipped one.
- The Clipped raster layer is representing altitude are from 103 Meters.



Original Raster



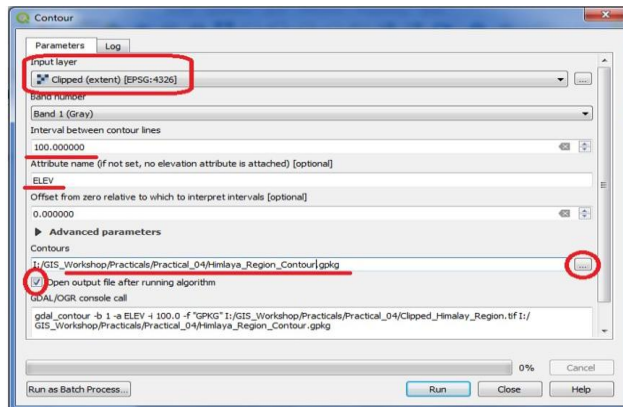
Clipped Raste

- Counter lines are the lines on a map joining points of equal height above or below sea level. A

contour interval in surveying is the vertical distance or the difference in the elevation between

the two contour lines in a topographical map.

- To derive counter lines from given raster.
- Go to Raster → Extraction→ Contour
- The Contour configuration window will appear

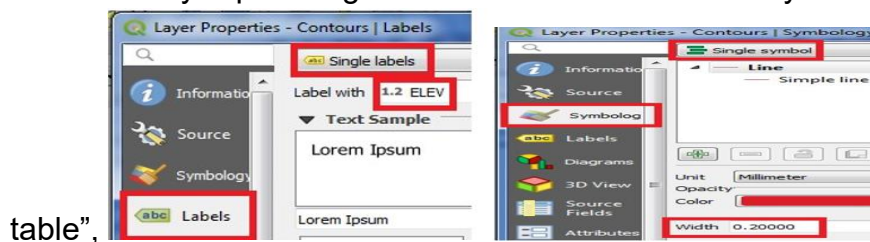


- Select the input raster layer name. Set contour interval 100.00 meters, select the output file name & location and check the option to add output file to project after processing.

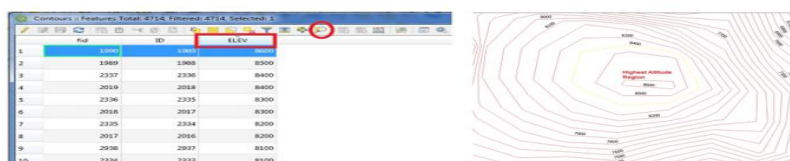
- The contour layer will appear like this



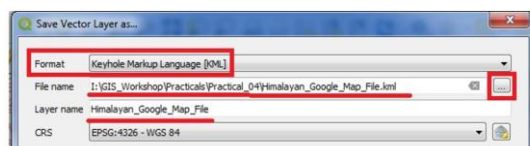
- Label the layer using “ELEV” field and set appropriate symbols for line.
- In the Layer panel right click on Contour Raster Layer and select “Open Attribute



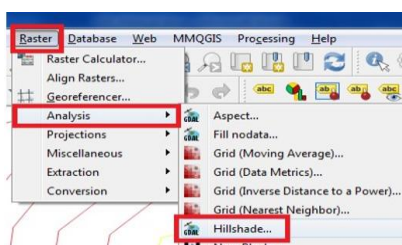
- Arrange the table in descending order based on the value of “ELEV” column.



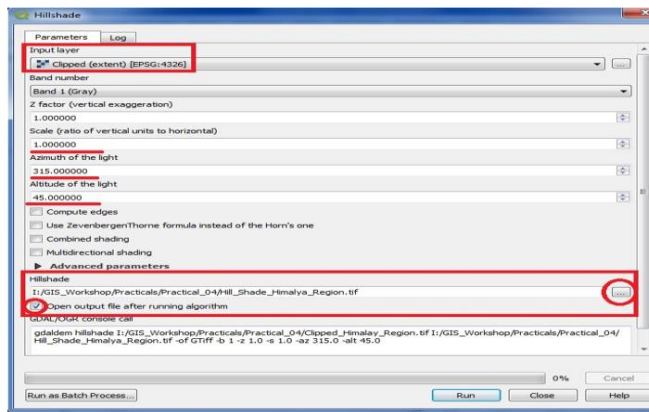
- To verify the above contour files using Google Map
- Make a copy of Contour Layer, Go to Layer → Save As
- Select file format as “Keyhole Markup Language”, set file name, location and Layer Name.
- Also set CRS to WGS 84 EPSG:4326



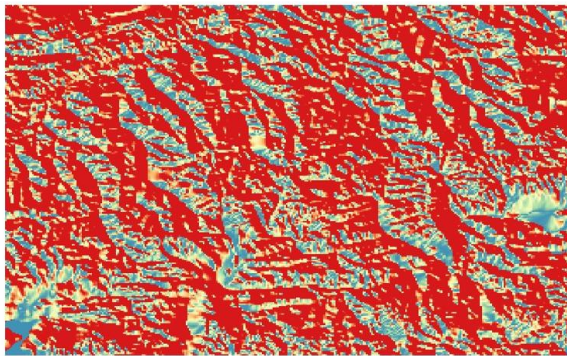
- For Hill Shade surface analysis
- Go to Plugin → Install Georeferencer GADL.
- After successful installation of plugin Go to Raster → Analysis → Hill Shade



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



- press 'RUN' and close the Hill shape Dialouge Window.
- After Raster styling the output will appear like this.



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

- Start a new Project.
- Layer → Add Layer → Vector Layer
- Select “ne_10m_admin_0_countries.zip” Layer from data folder.
- Go to Layer → Save As

Select format as ESRI Shape File

Select folder location and file name

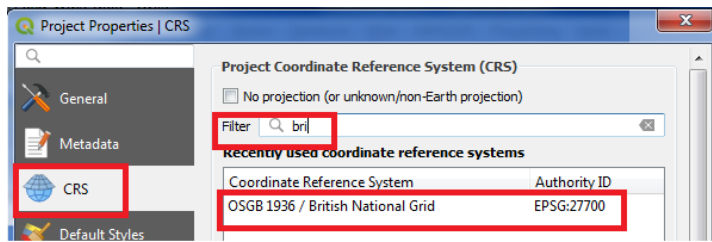
Set CRS North_America_Albers_Equal_Area_Conic EPSG: 102008



- Select Layer → Add Layer → Add Raster Layer → Select MiniScale_(standard)_R17.tif from Location.

“GIS_Workshop\Practicals\Practical_05\DATA\minisc_gb\minisc_gb\data\RGB_TIF_compressed\MiniScale_(standard)_R17.tif”

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

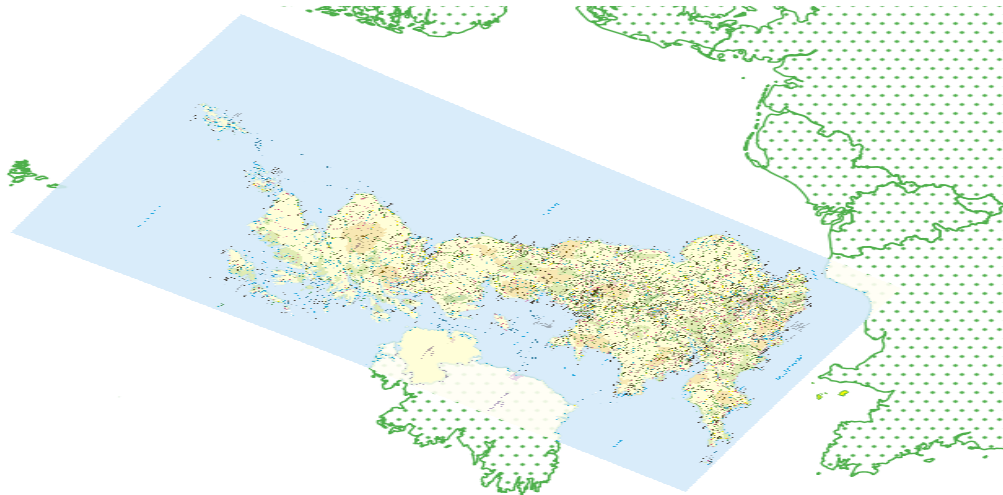


➤ Open Layer Properties→CRS → Search bri → select British National Grid EPSG 27700.

➤ Processing may take some time.

➤ Locate United Kingdom on Layer; the vector layer exactly coincides by the raster layer

covering United Kingdom.



PRACTICAL – 6

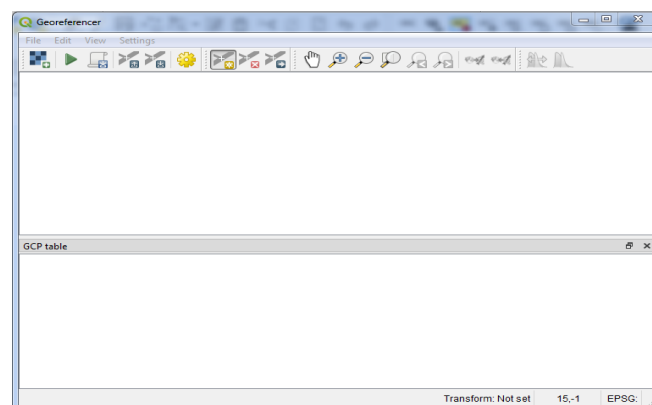
➤ Georeferencing

A. Georeferencing Topo Sheets and Scanned Maps

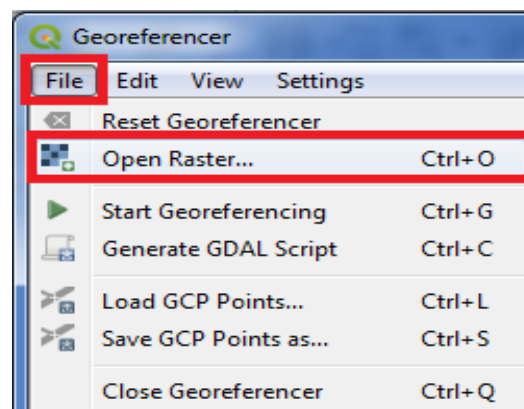
- Start a new project
- Go to Layers → Add Layer → Add vector Layer
- Select GIS_Workshop\Manual\Prac06\IND_adm0.shp
- Zoom in to Mumbai region in the layer.



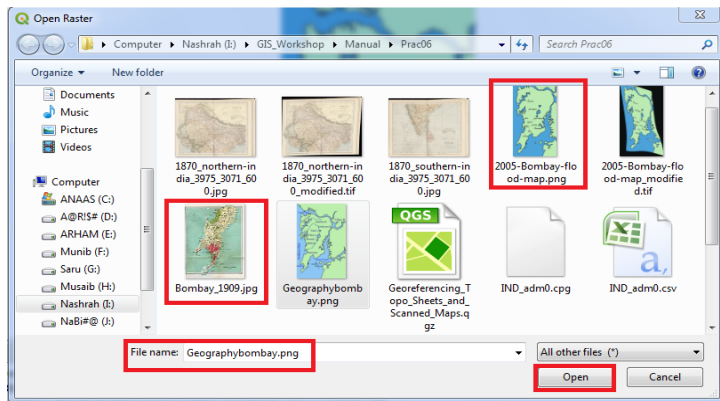
- A new Georeferencer window will open



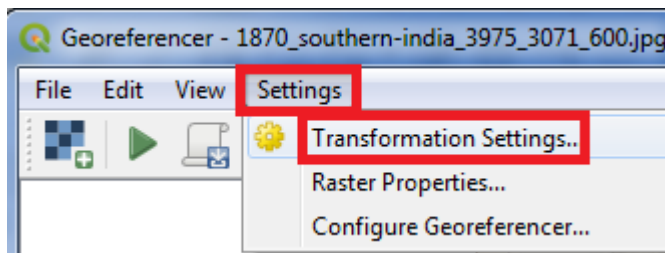
- File → Open Raster



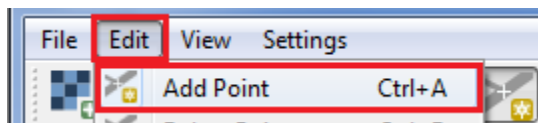
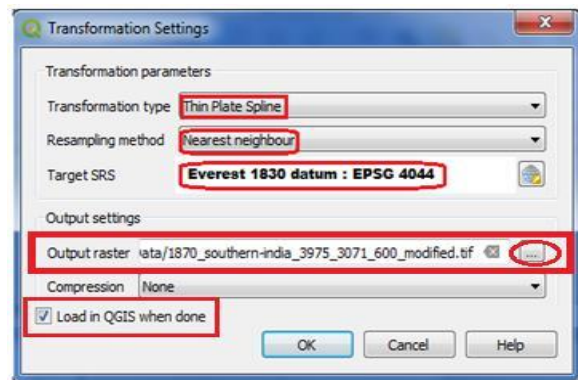
- Select file "1870_southern-india_3975_3071_600.jpg" from project data folder



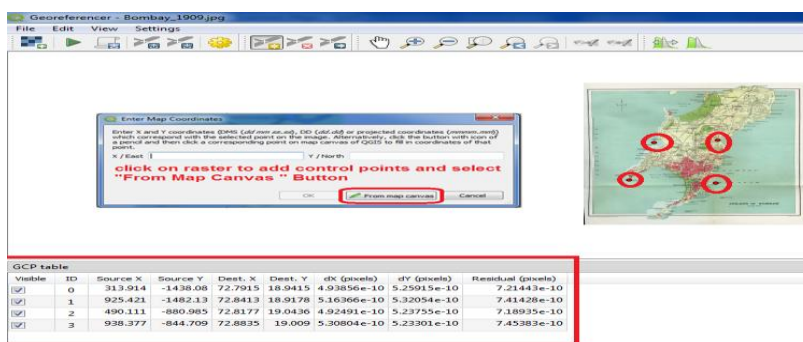
➤ Go to Settings → Transformation Settings



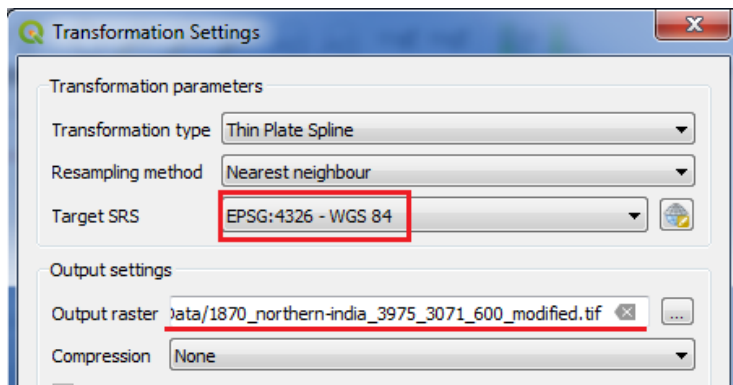
➤ In the Transformation Settings window



➤ In Georeferencer window Go to Edit → Add Points



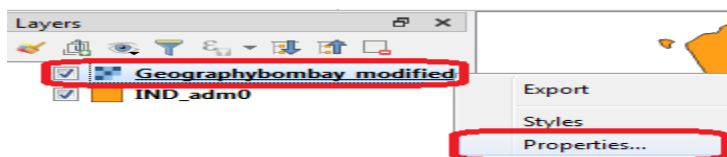
- Select the set of control points.
- Go to, Setting → transformation settings.



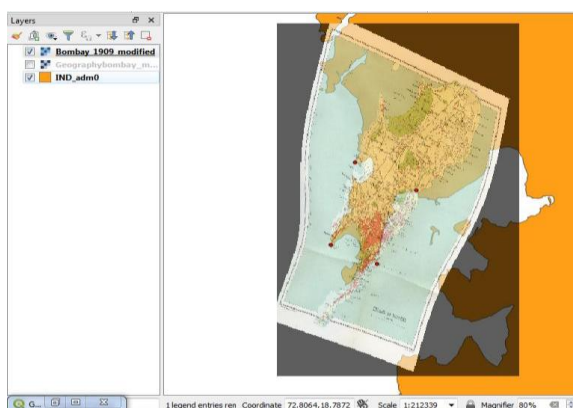
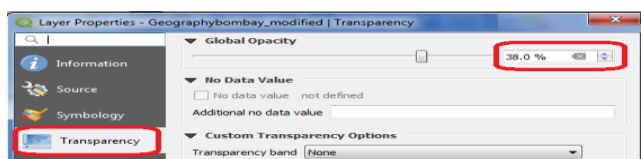
- Press “RUN”
- In Georeferencing window go to → File → Start Georeferencing



- The canvas area will now have the scanned map of Mumbai referenced with control points.



- Select the newly added layer in Layer Panel Right click and go to property
- Set Transparency level of raster layer to appropriate level.

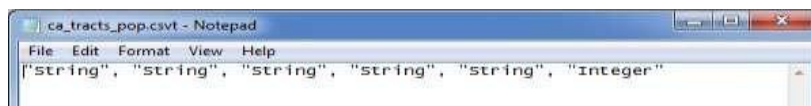


Practical 7:

Managing Data Tables and Spatial data Sets:

a) Table joins

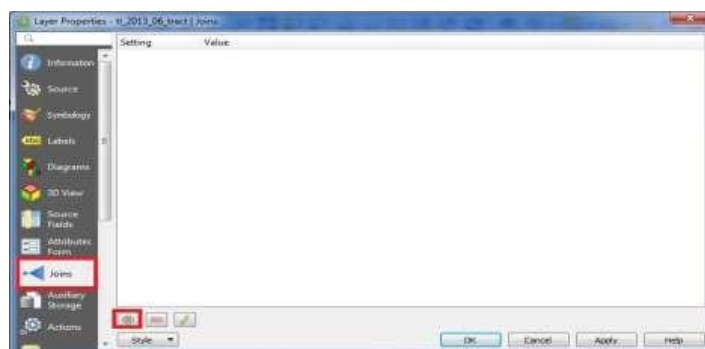
- Start a new project
- Go to Layer -> Add Layer -> Add new Vector Layer
"I:\GIS_Workshop\Practicals\Practical_07\A\Data\tl_2013_06_tract.zip"
- We could import this csv file without any further action and it would be imported. But, the default type of each column would be a *String* (text). That is ok except for the *D001* field which contains numbers for the population. Having those imported as text would not allow us to run any mathematical operations on this column. To tell QGIS to import the field as a number, we need to create a *sidecarfile* with a *.csvt* extension.



- This file will have only 1 row specifying data types for each column. Save this file as *ca_tracts_pop.csvt* in the same directory as the original *.csv* file.

->Go to Layer -> Add Layer -> Add Delimited Text Layer And add I:\GIS_Workshop\Practicals\Practical_07\A\Data\ca_tacts_pop.csv"

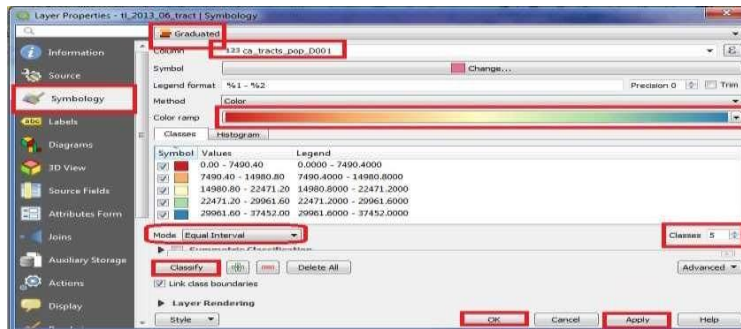
->In the layer panel, Right click on "tl_2013_06_tract", layer and select Properties



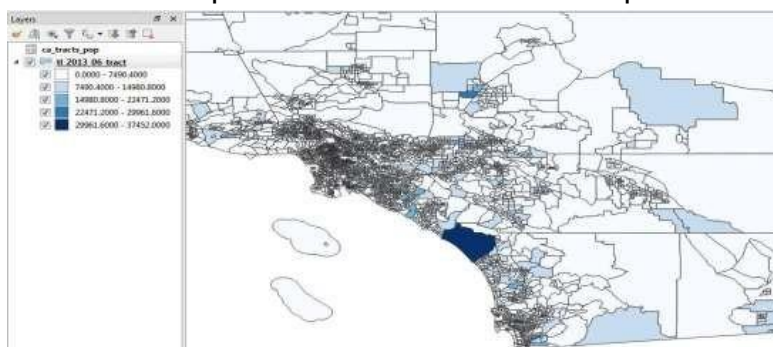
- Select the option in Properties, and click on button to add new table join.
- In the Add Vector Join window set the following properties and click OK.
- ➔ After performing join



For more clear output, select “tl_2013_06_tact” from Layer Panel, right click and select properties. Go to Symbology and set the following properties

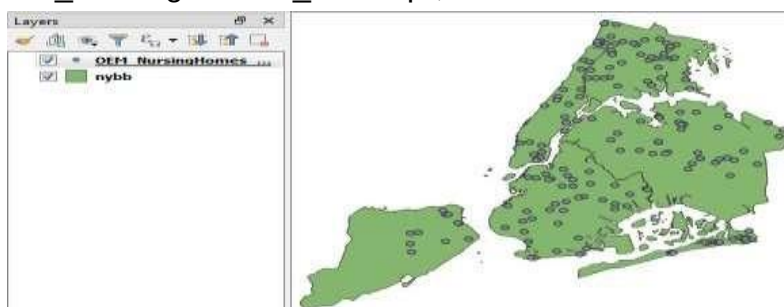


A detailed and accurate population map of California can be seen as the result. Same technique can be used to create maps based on variety of census data.



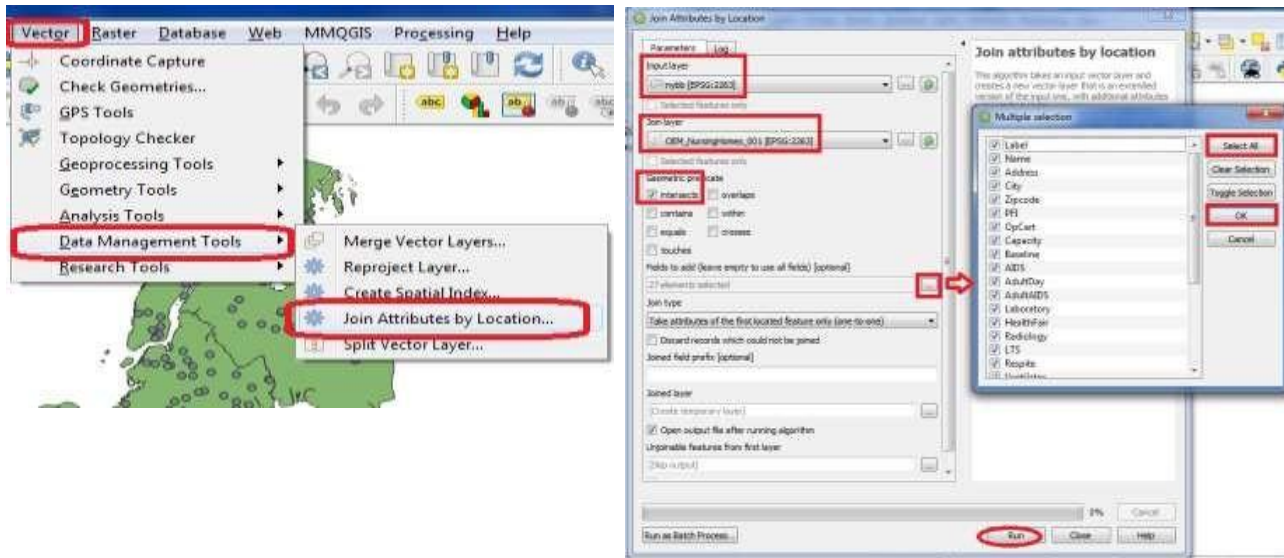
B) spatial joins

- Go to Layer -> Add Layer -> Add Vector Layer -> Select “I:\GIS_Workshop\Practicals\Practical_07\B\Data\nybb_12c\nybb_13c_av\ny bb.shp” and “I:\GIS_Workshop\Practicals\Practical_07\B\Data\OEM_NursingHomes_001\OEM_NursingHomes_001.shp”, from data folder.



-> Go to attribute table and observe the data.
Table before performing Join

➔ Go to Vector ->Data Management Tools ->Join Attributes by Locatio

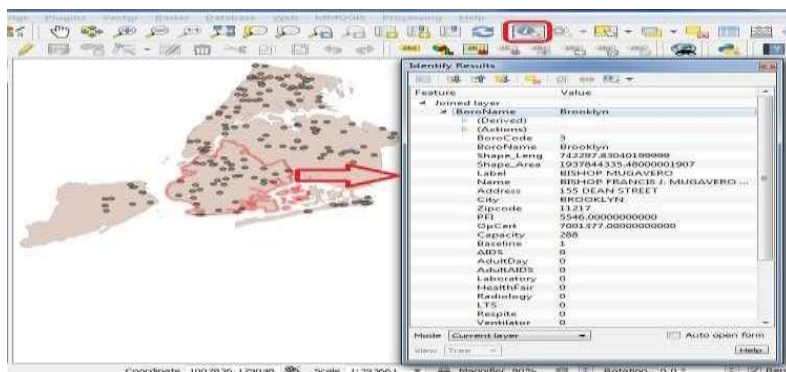


Attribute table after join

City	Zipcode	PFI	OpCert	Capacity
ASTORIA	11102	6384.000000000000	7003405.000000...	280
BROOKLYN	11217	5546.000000000000	7001377.000000...	288
BRONX	10472	1251.000000000000	7000381.000000...	200
STATEN ISLAND	10304	1755.000000000000	7004310.000000...	300
NEW YORK	10003	4807.000000000000	7002351.000000...	28

Use the Identify Feature Button to select a region to view join data on map Layer.

Output

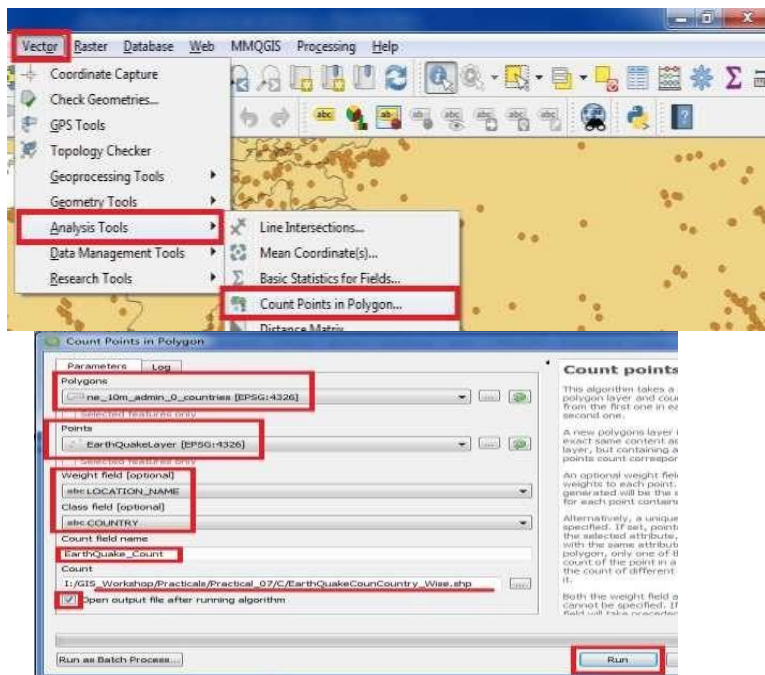


c) Points in polygon analysis

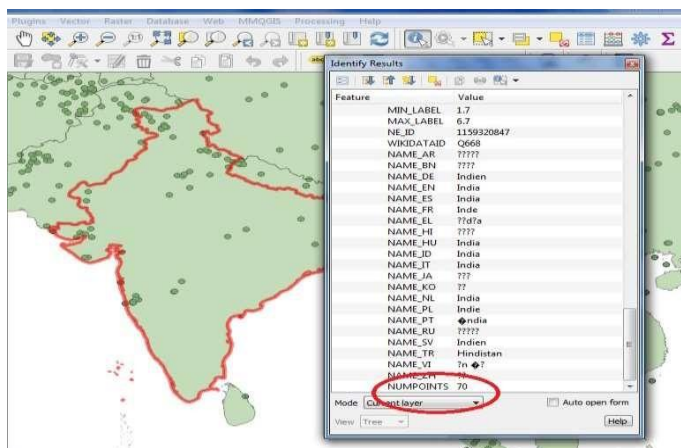
Go to Layer □ Add Layer □ Add DelimitedText Layer Select “EarthQuakeDatabase.txt”



Go to Layer ☐ Add Layer ☐ Add Delimited Text Layer
 “I:\GIS_Workshop\Practicals\Practical_07\C\Data\ne_10m_admin_0_countries.zip”



Use the select Feature button to check country wise counting of Earthquakes.

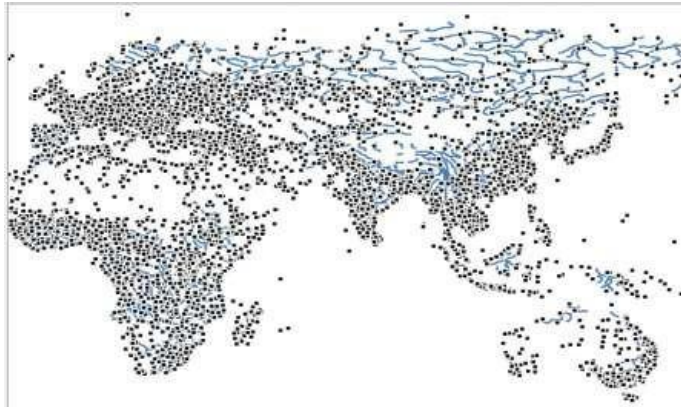


Also a new column is added to attribute table “NumPoints” indicating number of earthquake points in each country

NUMPOINTS	
0	
64	
53	
13	
0	
9	
0	
10	
5	
57	
0	
12	
4	
0	
2	
5	
8	
152	
0	

d) Performing spatial queries

- Go to Layer ▢ Add Layer ▢ Add Vector Layer and load
“I:\GIS_Workshop\Practicals\Practical_07\D\Data\ne_10m_populated_places_simple\ne_10m_populated_places_simple.shp” and
“I:\GIS_Workshop\Practicals\Practical_07\D\Data\ne_10m_rivers_lake_centerlines\ne_10m_rivers_lake_centerlines.shp” from project data folder.



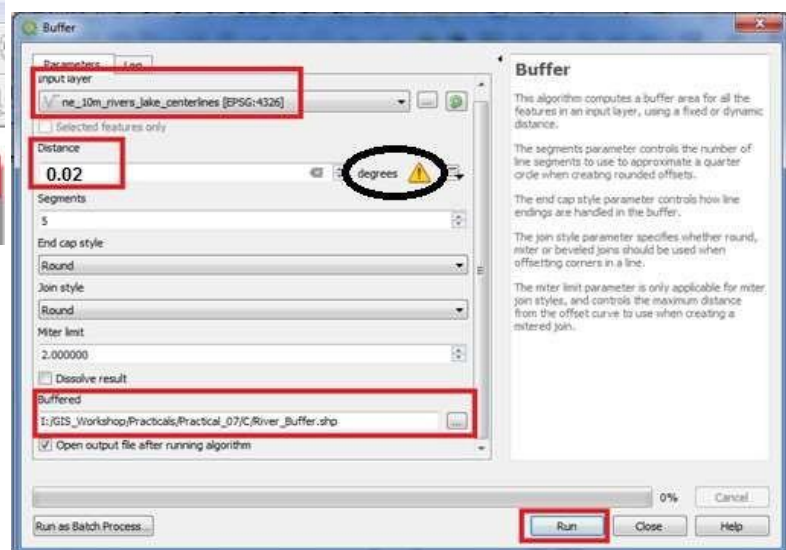
- Open project Properties ▢ Set CRS “World_Azimuthal_Equidistant EPSG54032” .
The map will be re-projected as



Go to Vector ▢ Geoprocessing Tool ▢



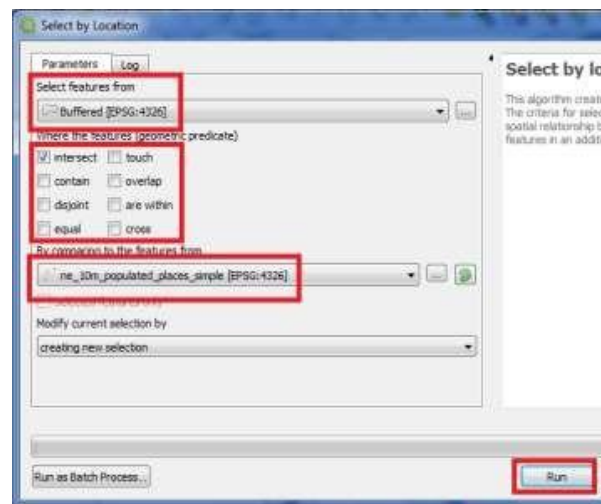
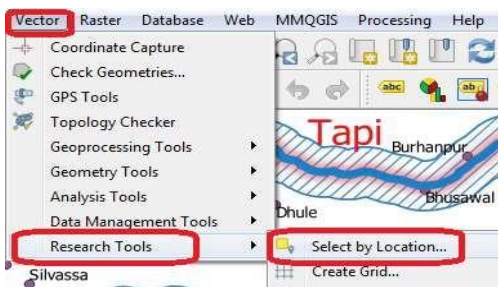
Repeat the step to create River Buffer



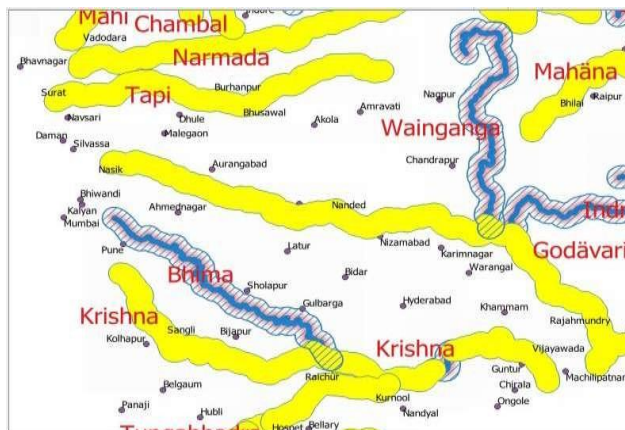
➤ Create a buffer for River



Go to Vector ☐ Research Tool ☐ Select By->location



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

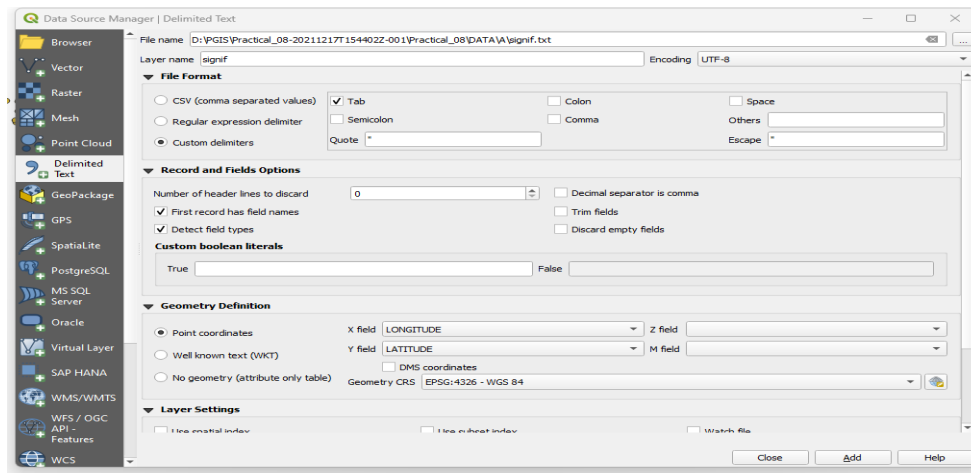


PRACTICAL - 8

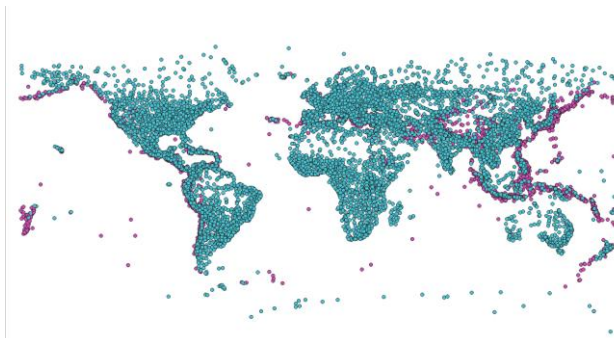
Advanced GIS Operations 1:

a) Nearest Neighbor Analysis

Go to Layer → add Layer → add Delimited Text Layer and load “signif.txt” from data file.

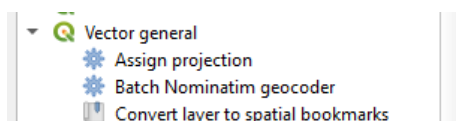


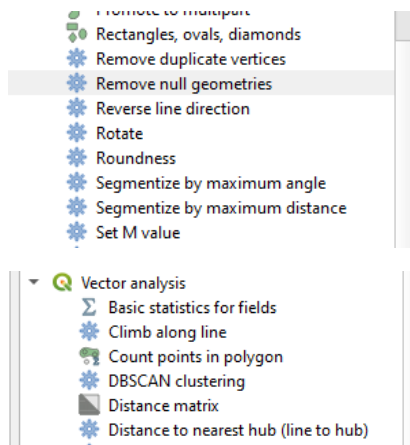
Go to Layer → Add Layer → Add vector Layer and from data folder “\GIS_Workshop\Practicals\Practical_08\A\DATA\ne_10m_populated_places_simple.zip” load the layer to the project and remove all rows from attribute table other than India



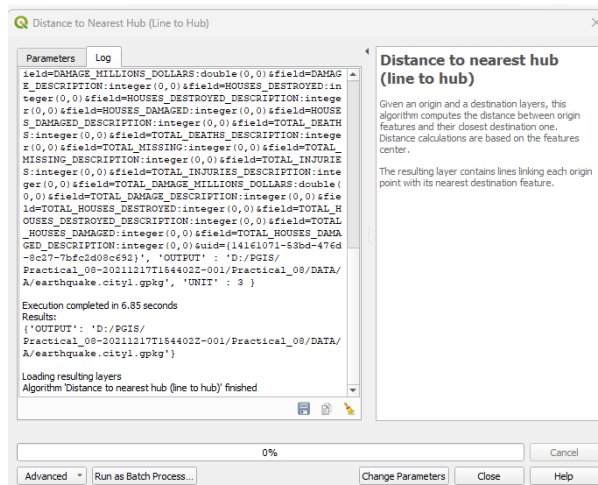
Calculate the Distance matrix and perform Nearest Neighbor Analysis

Now you will be able to see the content of our results. The InputID field contains the field name from the Earthquake layer. The TargetID field contains the name of the feature from the Populated Places layer that was the closest to the earthquake point. The Distance field is the distance between the 2 points.

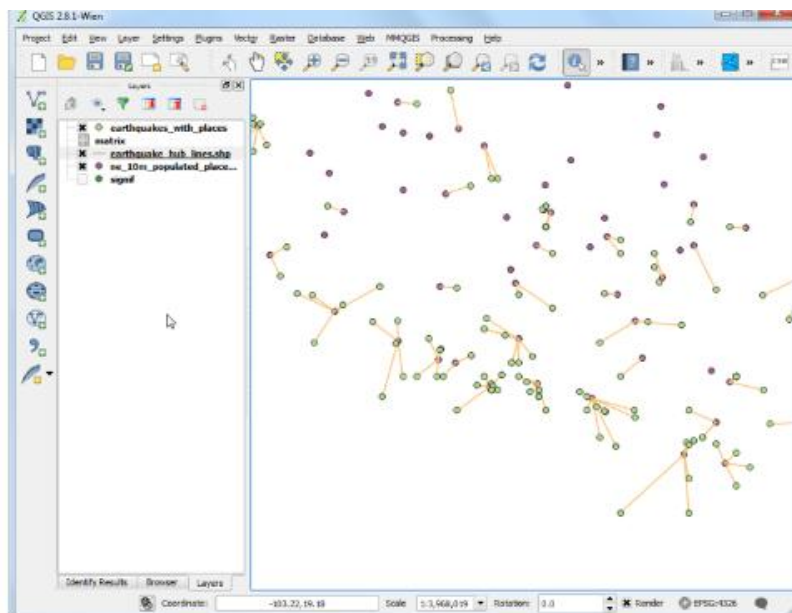




Once the processing finishes, click the Close button in the Distance Matrix dialog. You can now view the matrix.csv file in Notepad or any text editor. QGIS can import CSV well, so files as well, so we will add it to QGIS and view it there. Go to Layer ►Add Layer ►Add Delimited Text

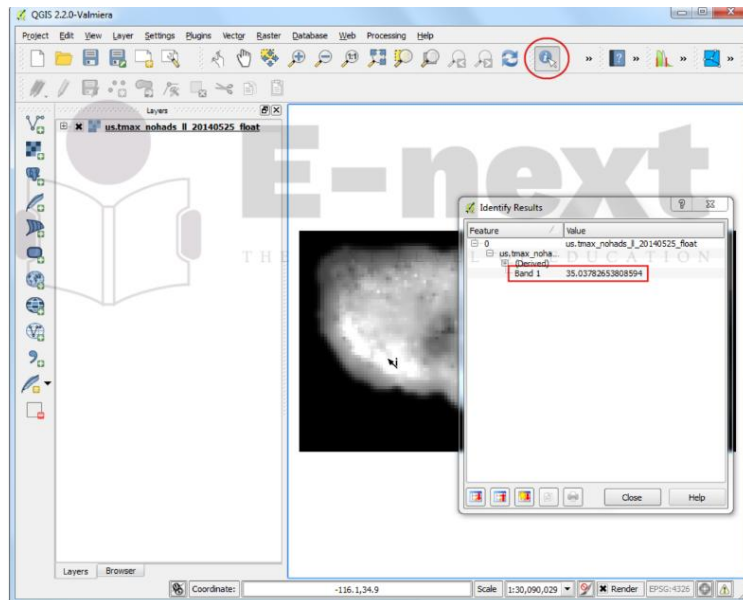


And, This is the final output.

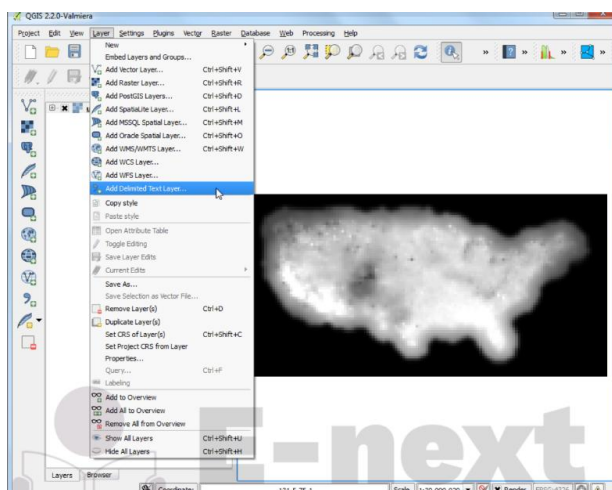


B) Sampling Raster Data using Points or Polygons

1. Go to Layer ►Add Raster Layer and browse to the downloaded us.tmax_nohads_II_{YYYYMMDD}_float.tif file and click Open.
2. Once the layer is loaded, select the Identify tool and click anywhere on the layer. You will see the temperature value in celsius as the value or Band 1 at that location.



Now unzip the downloaded 2013_Gaz_ua_national.zip file and extract the 2013_Gaz_ua_national.txt file on your disk. Go to Layer ►Add Delimited Text Layer.

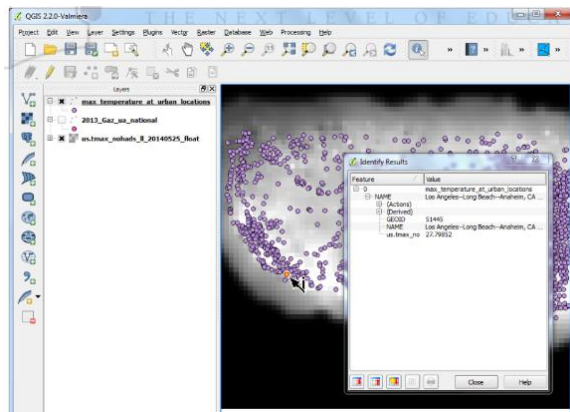


Now we are ready to extract the temperature values from the raster layer. Install the Point Sampling Tool plugin. See Using Plugins for details on how to install plugins.

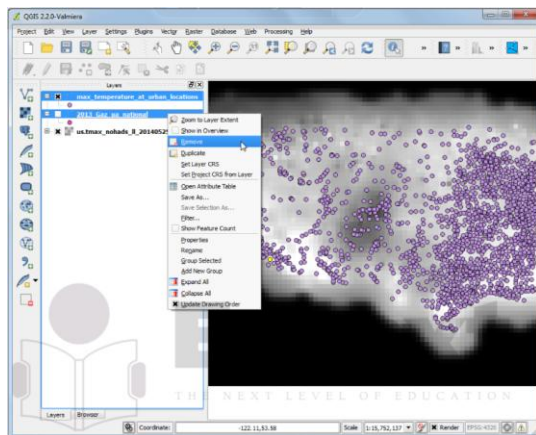
In the Point Sampling Tool dialog, select 2013_Gaz_ua_national as the Layer containing sampling points.

We must explicitly pick the fields from the input layer that we want in the output layer. Choose GEOID and NAME fields from the 2013_Gaz_ua_national layer. We can sample values from multiple raster band at once, but since our raster has only 1 band, choose the us.tmax_nohads_II_{YYYYMMDD}_float: Band 1.

Name the output vector layer as max_temperature_at_urban_locations.shp. Click the OK to start the sampling process. Click Close once the process finishes.



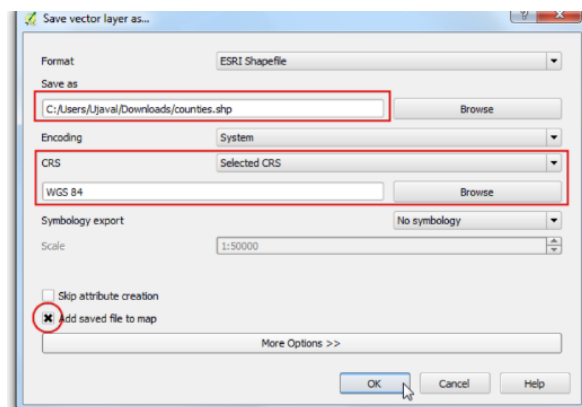
First part of our analysis is over. Let's remove the unnecessary layers. Hold the Shift key and select max_temperature_at_urban_locations and 2013_Gaz_ua_national layers. Right-click and select Remove to remove them from QGIS TOC.



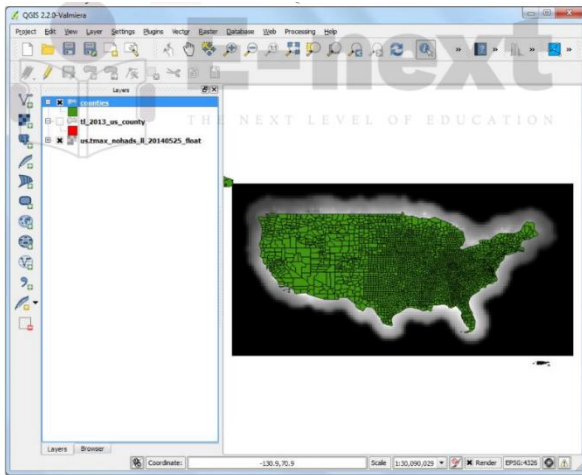
In the Save Vector layer as.. dialog, click Browse and name the output file as counties.shp.

Choose Selected CRS from the CRS dropdown menu. Click Browse and select WGS 84 as the

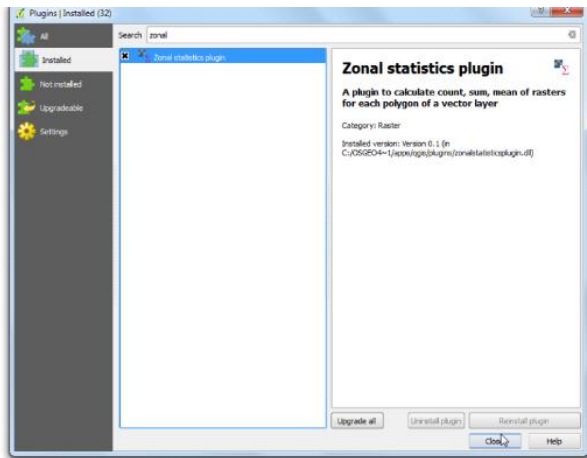
CRS. Check the Add saved file to map and click OK.



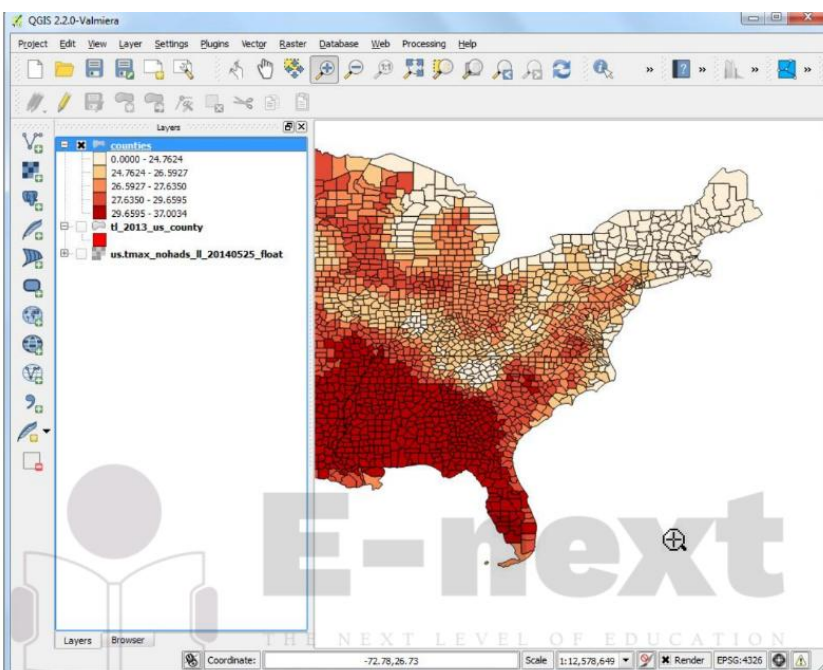
A new name countries will be added to QGIS.



Enable the Zonal Statistics Plugins. This is a core plugin so it is already installed. See Using Plugins to know how to enable core plugins.



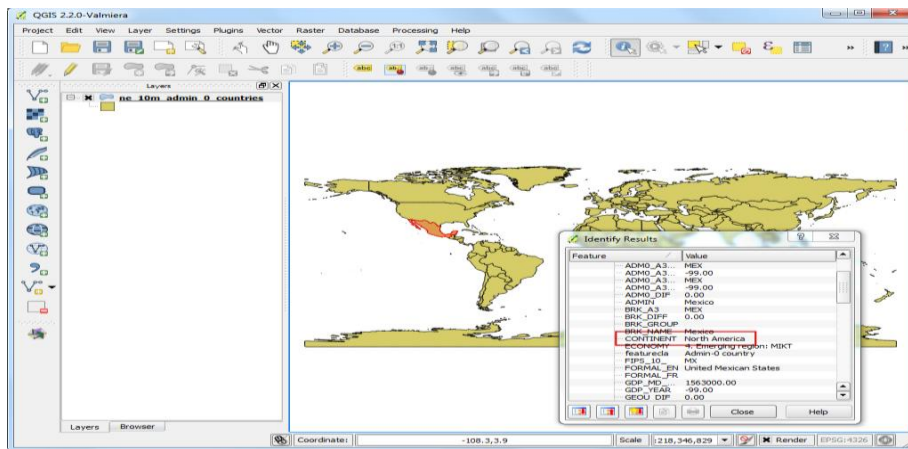
22. You will see the county polygons styled using average maximum temperature extracted from the raster grid.



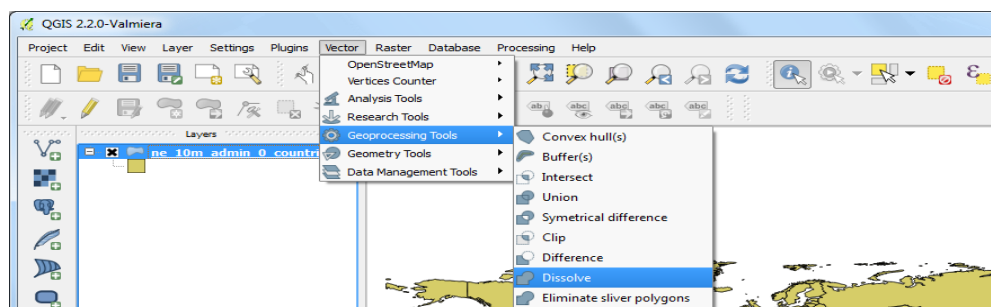
Practical 9 : Advance GIS Operations 2:

(A) Batch Processing using Processing Framework Procedure

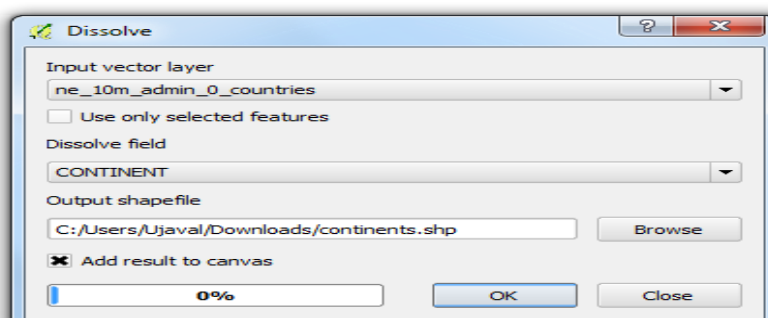
- Go to Layer ► Add Vector Layer.
- Browse to the downloaded Admin 0 Countries shapefile **ne_10m_admin_0_countries.shp** and click Open.
- As our task is to clip the global layers to the boundary of Africa, we need to first prepare a layer containing a polygon for the entire continent. The countries layer has an attribute called **CONTINENT**. We can use a geoprocessing concept called *Dissolve* to merge all countries that have the same continent value and merge them to a single polygon.



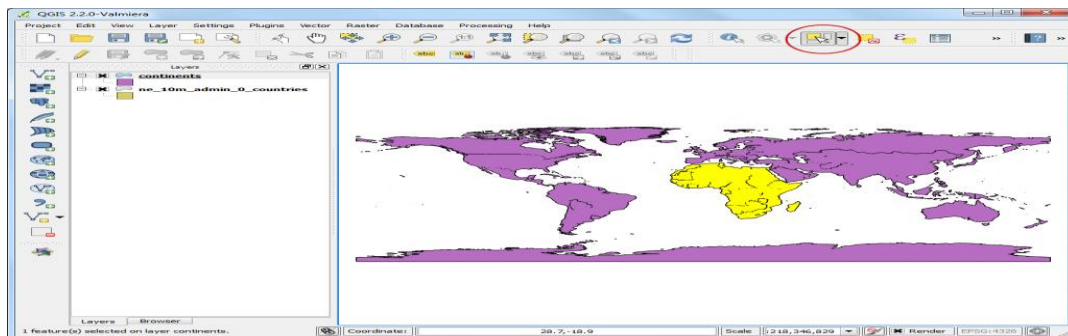
Open the Dissolve tool from Vector ► Geoprocessing Tools ► Dissolve



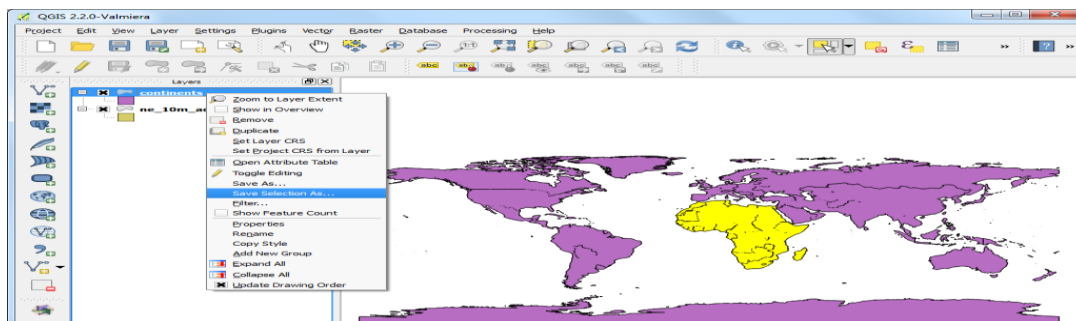
Select **ne_10m_admin_0_countries** as the Input vector layer. The Dissolve field would be **CONTINENT**. Name the output file as **continents.shp** and check the box next to Add result to canvas.



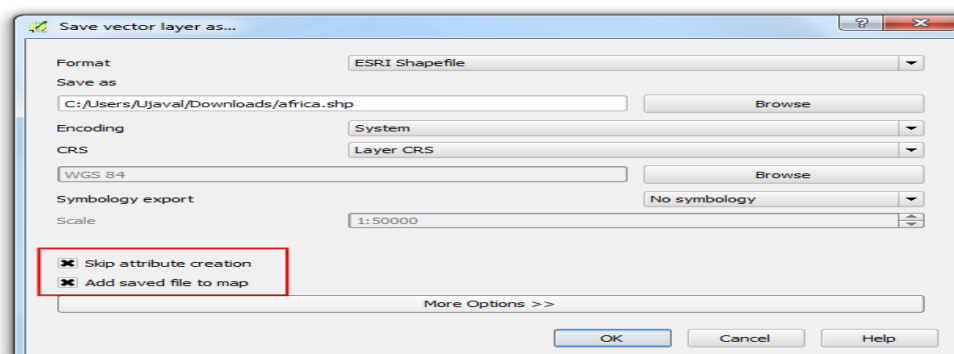
The dissolve processing may take a while. Once the process finishes, you will see the new **continent** layer added to QGIS. Use the Select Single Feature tool from the toolbar and click on Africa to select the polygon representing the continent.



Right-click the **continents** layer and select Save Selection As...

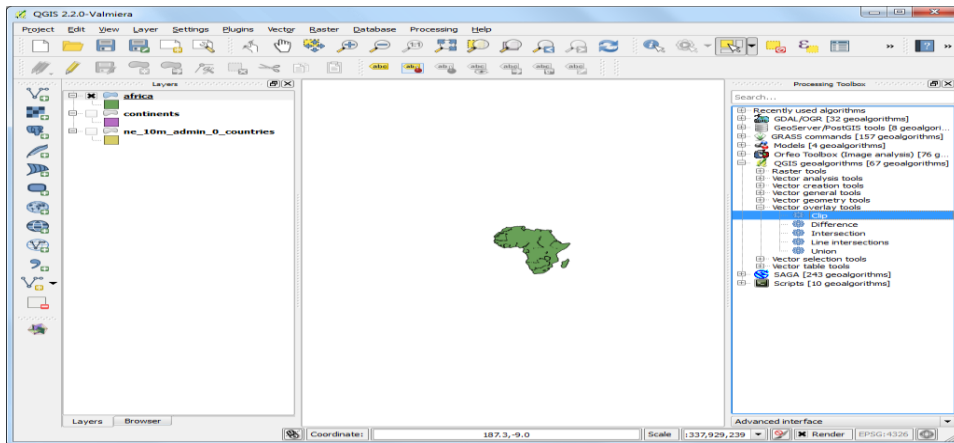


Name the output file as **africa.shp**. Since we are only interested in the shape of the continent and not any attributes, you may check the Skip attribute creation. Make sure the Add saved file to map box is checked and click OK.

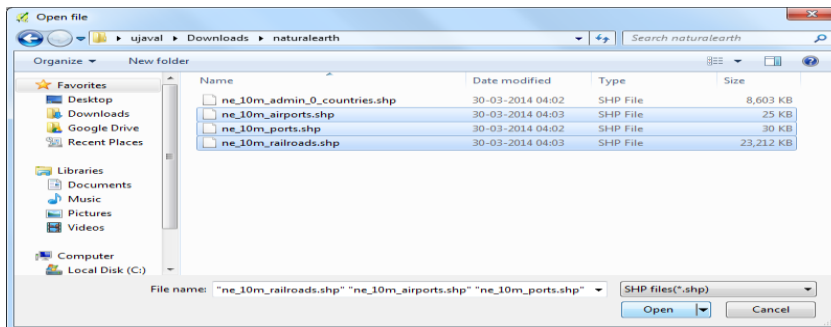


Now you will have the **africa** layer loaded in QGIS containing a single polygon for the entire continent. Now, it's time to start our batch clip process. Open Processing ► Toolbox.

Browse all available algorithms and find the Clip tool from QGIS geotools ► Vector overlay tools ► Clip. You may also use the Search box to easily find the algorithm as well.

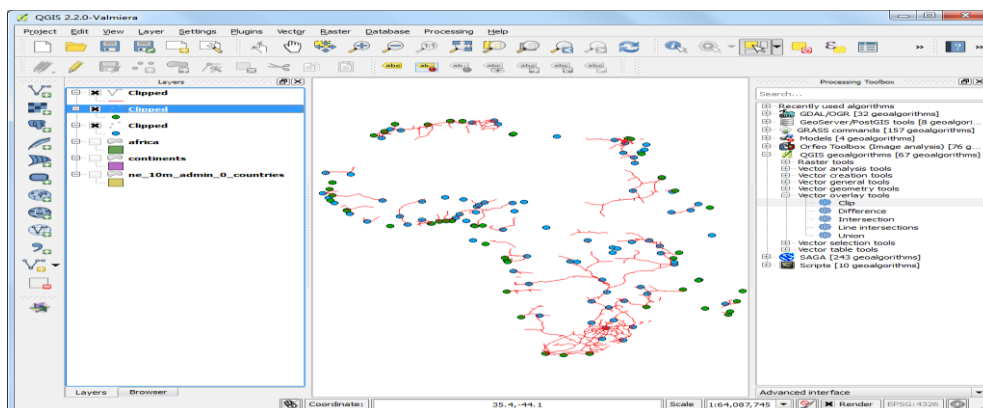


Browse to the directory containing the global transportation layers that you had downloaded. Hold the **Ctrl** key and select all the layers that you want to clip. You may also use **Shift** or **Ctrl-A** to make multiple selection. Click Open.



Browse the the directory where you want your output layers. Type the filename as **clipped_** and click Save.

The clip algorithm will run for each of the inputs and create output files are we have specified. Once the batch process finishes, you will see the layers added to QGIS canvas. As you will notice, all the global layers are properly clipped to the continent boundary that we had specified



B) Automating Complex Workflows using Processing Modeler

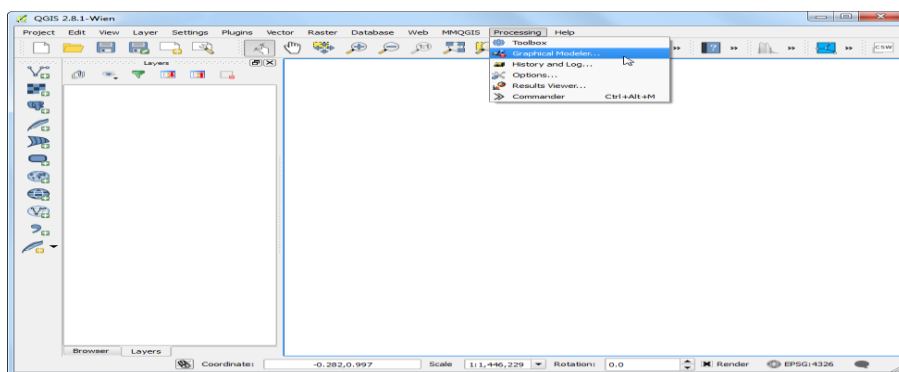
Procedure

Our workflow for this exercise will have the following steps.

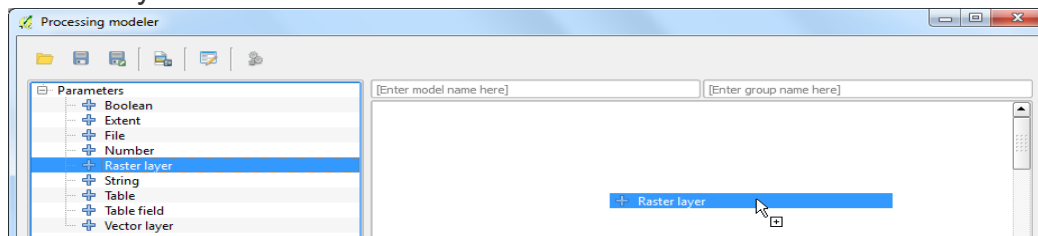
- Apply a **Majority Filter** algorithm to the input landcover raster. This will reduce noise in our output by eliminating isolated pixels.
- Convert the resulting raster to a polygon layer.
- Query for a class value from the attribute table of the polygon layer and create a vector layer for that class.

The following steps outline the process to code the above process into a model and run it on the downloaded datasets.

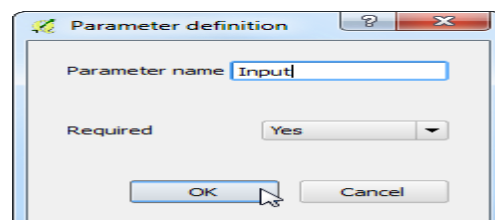
1. Launch QGIS and go to Processing ► Graphical Modeler....



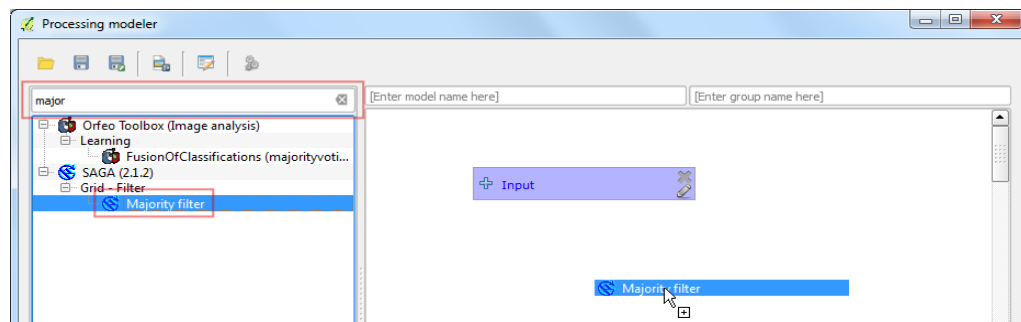
The Processing modeler dialog contains a left-hand panel and a main canvas. Select the Inputs tab in the left-hand panel and drag the + Raster layer to the canvas.



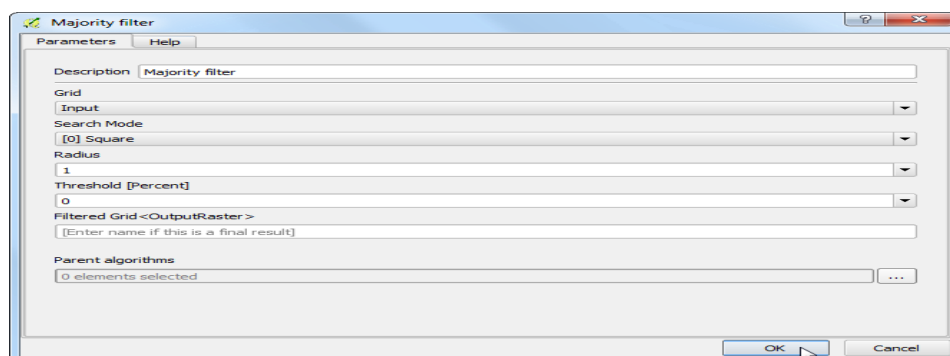
A Parameter definition dialog will pop-up. Enter **Input** as the Parameter name and mark **Yes** to Required. Click OK.



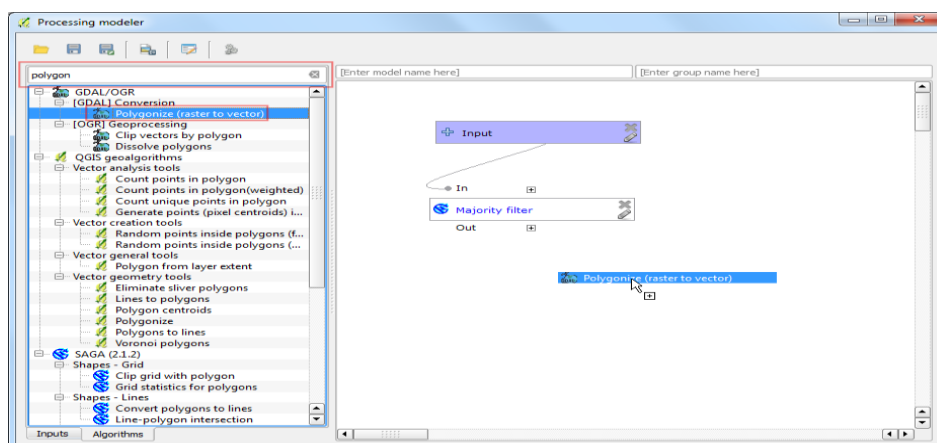
You will see a box with the name Input appear in the canvas. This represents the landcover raster that we will use as input. Next step is to apply a **Majority filter** algorithm. Switch to the Algorithm tab from the bottom-left corner. Search for the algorithm and you will find it listed under SAGA provider. Drag it to the canvas.



A configuration dialog for Majority Filter will be presented. Leave the values to their default and click OK.

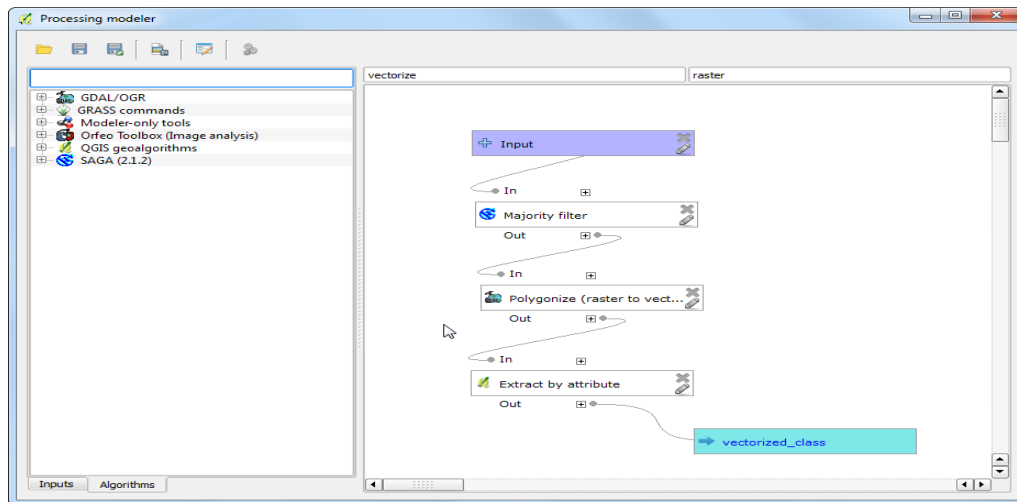


You will note that there is now a new box named Majority Filter in the canvas and it is connected to the Input box. This is because the Majority Filter algorithm uses the Input raster as its input. The next step in our workflow is to convert the output of majority filter to vector. Find the **Polygonize (raster to vector)** algorithm and drag it to the canvas.



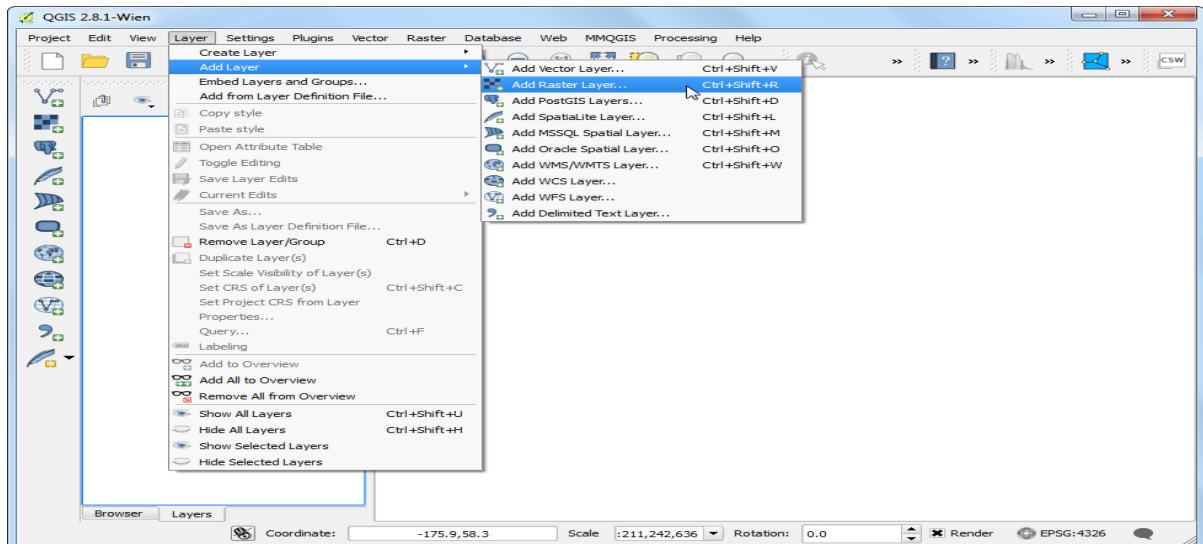
corresponding pixel value for this class will be 12. (see [Code Values](#)). Enter **DN** as the Selection attribute and **12** as the value. As the output of this operation will be the final result, we need to name the output. Enter **vectorized class** as the Output.

Enter the Model name as **vectorize** and Group name as **raster**. Click the Save button.

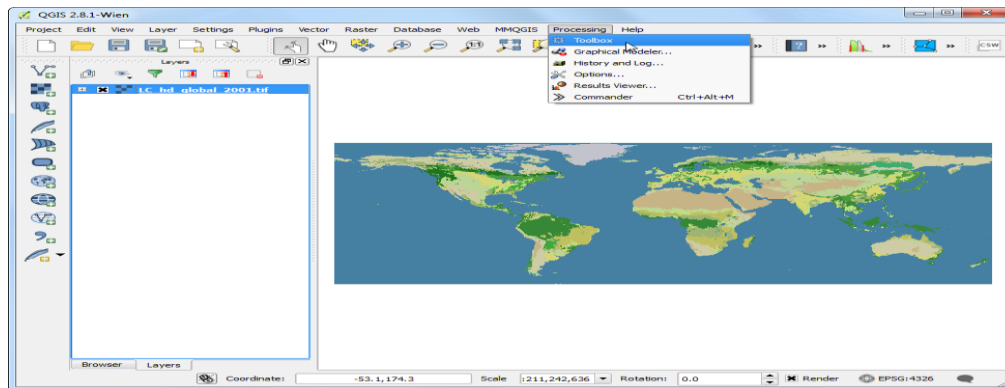


Name the model **vectorize** and click Save.

Now it is time to test our model. Close the modeler and switch to the main QGIS window. Go to Layer ► Add Layer ► Add Raster Layer....

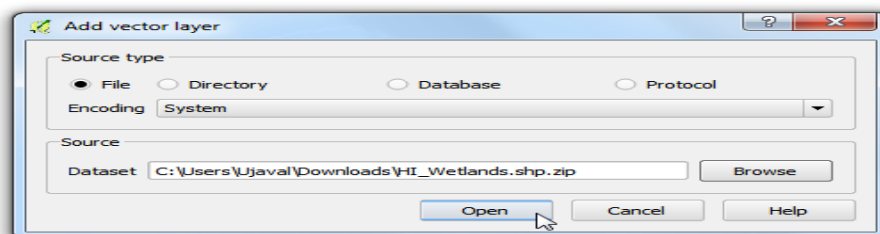


Browse to the downloaded **LC_hd_global_2001.tif.gz** file and click Open. Once the raster is loaded, go to Processing ► Toolbox



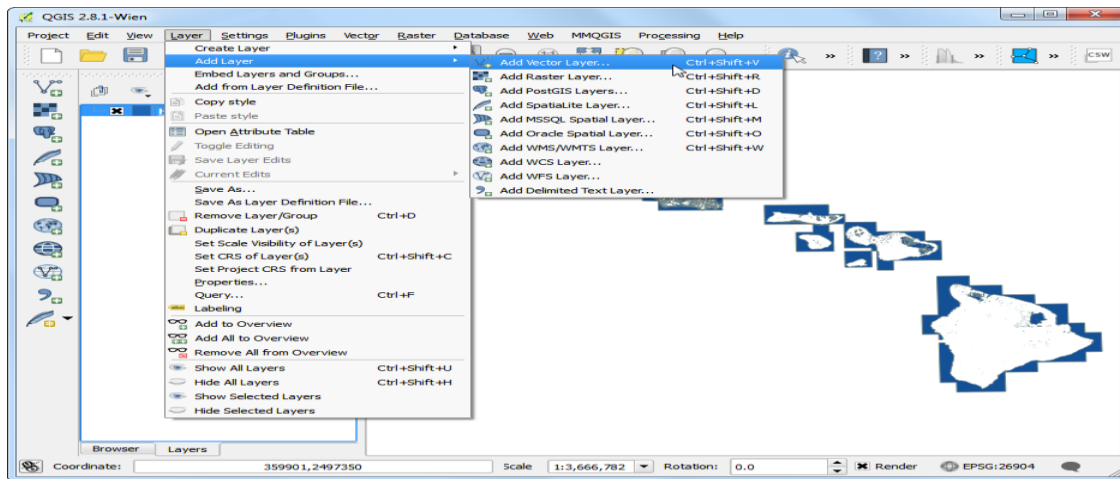
C) Automating Map Creation with Print Composer Atlas Procedure

Launch QGIS and go to Layer ► Add Layer ► Add Vector Layer. Browse to the **HI_Wetlands.shp.zip** file and click Open.

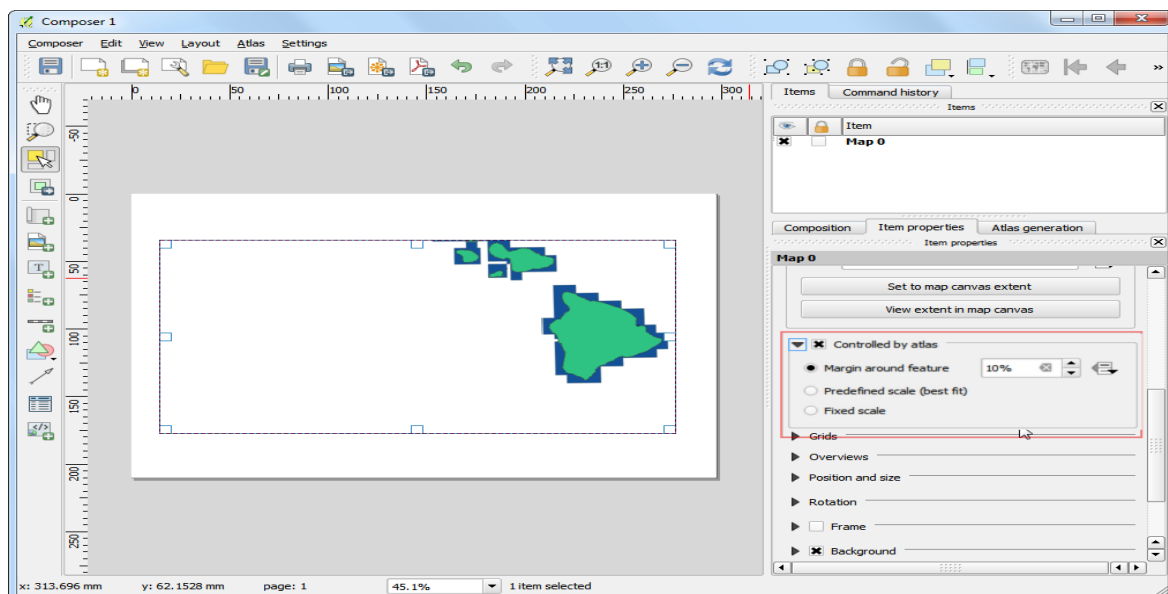


Select the **HI_Wetlands_Poly** layer and click OK.

You will see the polygons representing the wetlands in the entire state of Hawaii. Since we want to make separate wetlands map for each county in the state, we will need the county boundaries layer. Go to Layer ► Add Layer ► Add Vector Layer and browse to the **county10.shp.zip** file. Click Open.



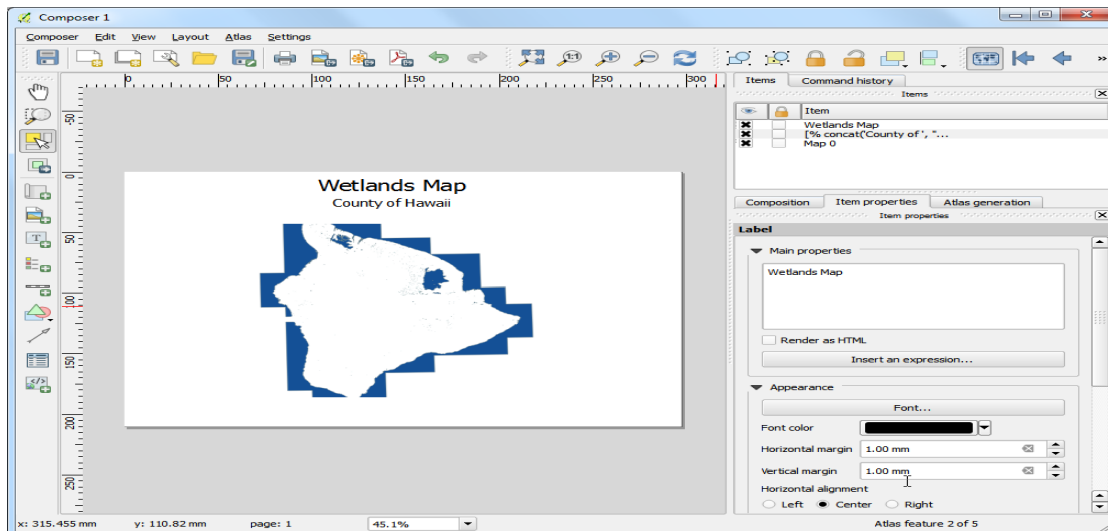
Go to Project ► New Print Composer Scroll down in the Item Properties tab and check the Controlled by atlas box. This will indicate the composer that the extent of the map displayed in this item will be determined by the **Atlas** tool.



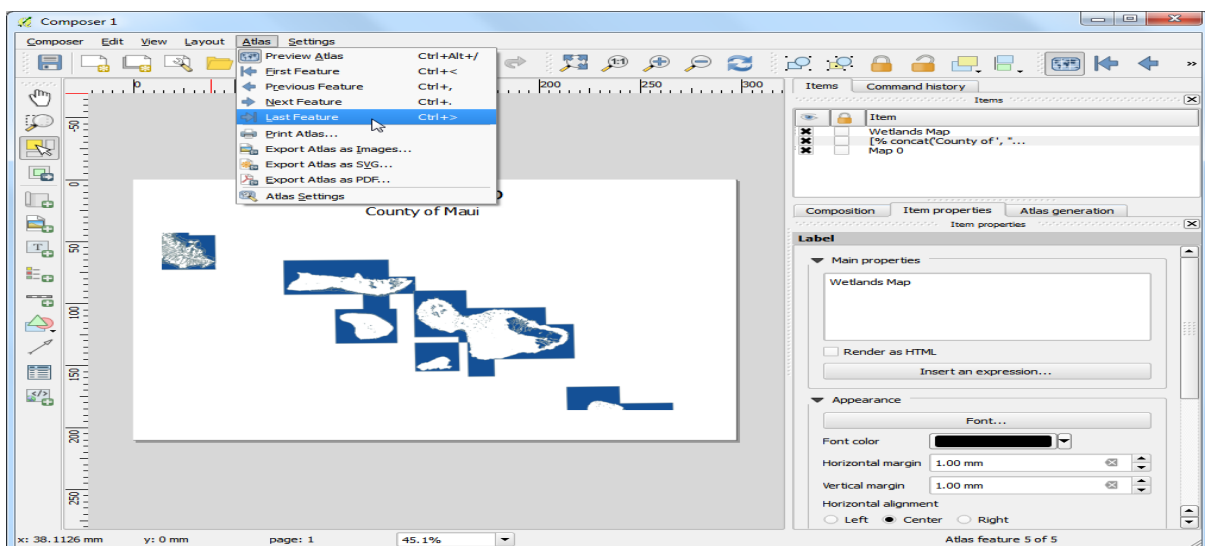
Now you will see the map refresh and show how individual map will look like. Notice that it shows the current feature number from the coverage layer at the bottom right.

Atlas will render the map to the extent of the next feature in the coverage

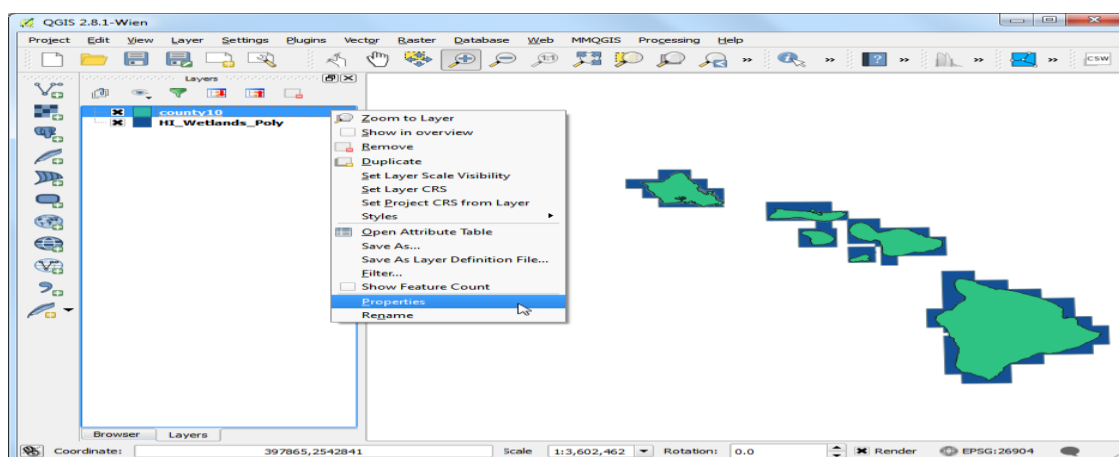
Add another label and enter **Wetlands Map** under the Main properties. Since there is no expression here, this text will remain the same on all maps.



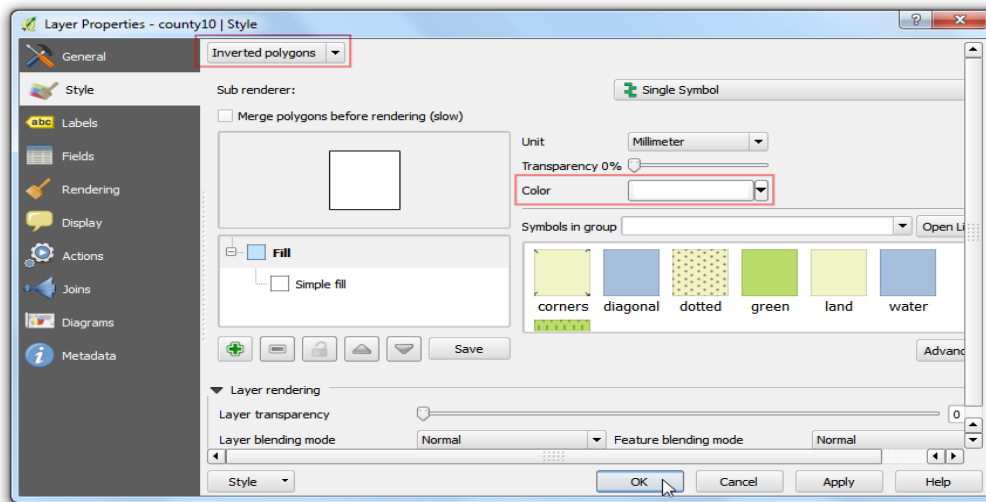
Go to Atlas ► Last Feature and verify that the map labels do work as intended. You will notice that the wetland map has polygons extending out in the ocean that looks ugly. We can change the style to that areas outside the county boundaries are hidden.



Switch to the main QGIS window. Right-click the **county10** layer and select Properties.

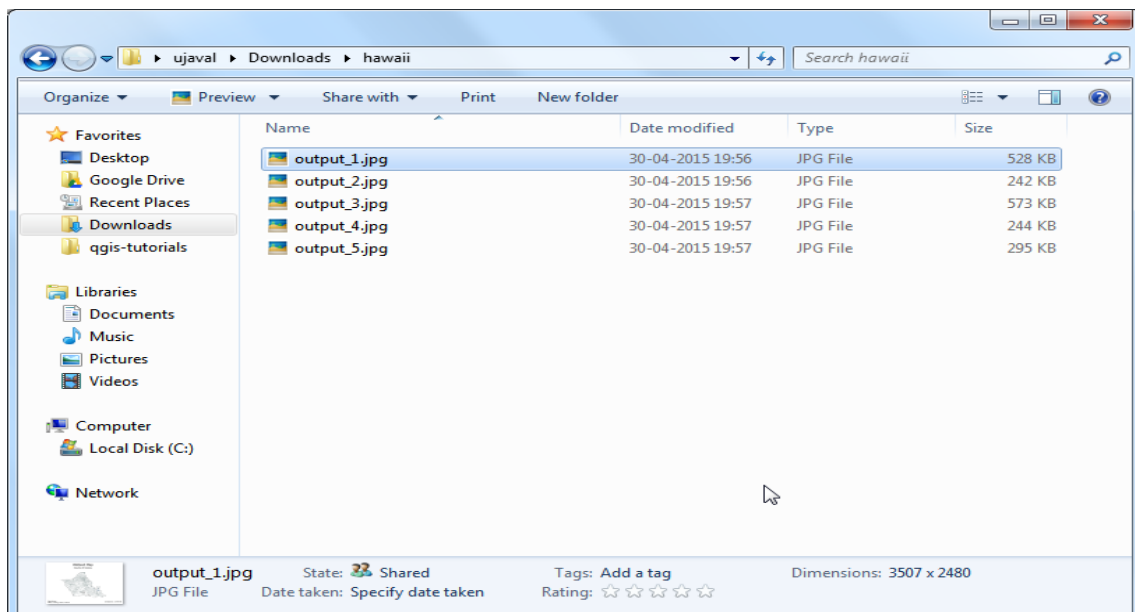


In the Style tab, select the Inverted polygons renderer. This renderer styles the *outside* of the polygon - not inside. Select white as the fill color and click OK

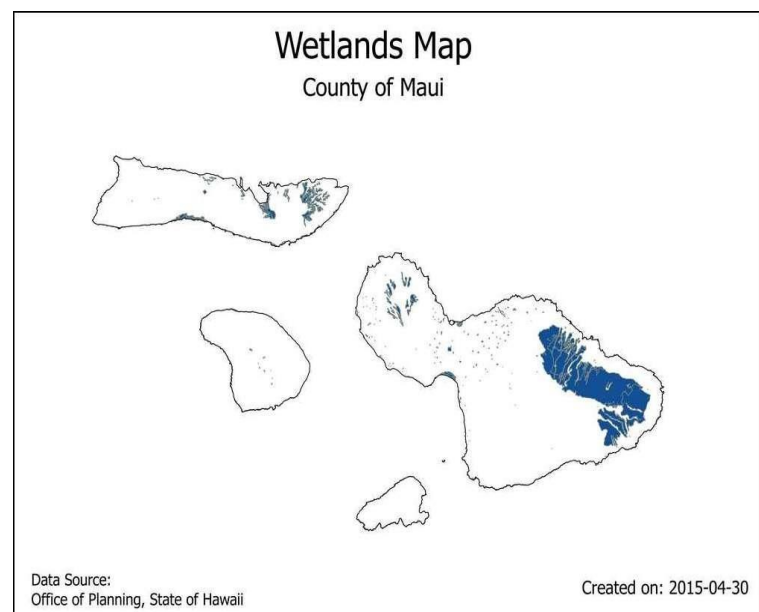
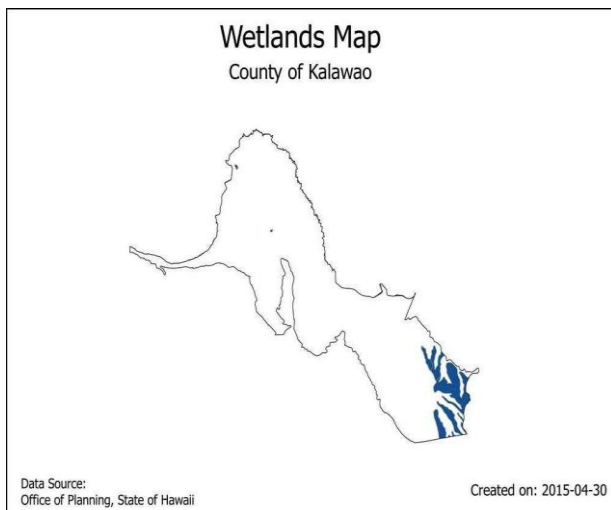
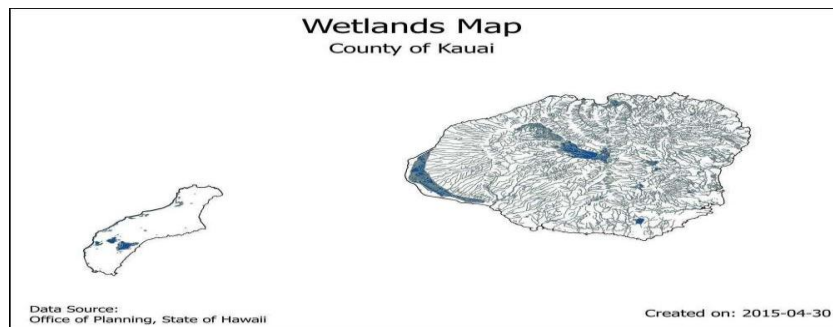
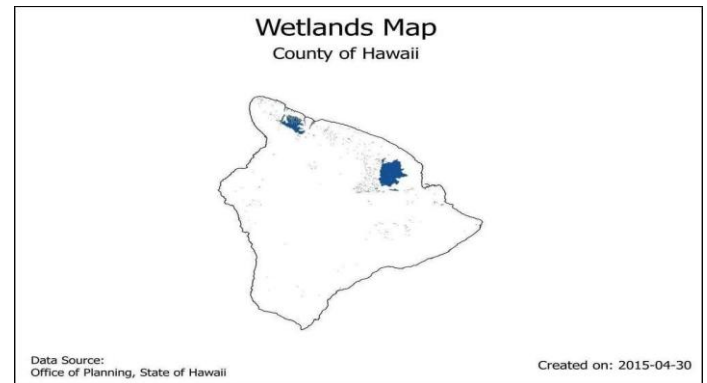
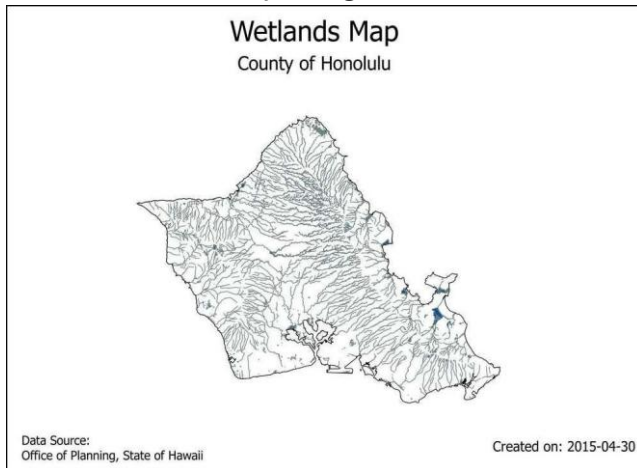


Once you are satisfied with the map layout, go to Atlas ► Export Atlas as Images.

Select a directory on your computer and click Choose. The Atlas tool will now iterate through each feature in the coverage layer and create a separate map image based on the template we created. You can see the images in the directory once the process completes



Here are the map images for refeence



Practical 10

A. Validating Map Data.

AIM: To validate Map data using Excel and QGIS.

Software Used: QGIS Desktop 3.4.2 and Microsoft Excel 2013.

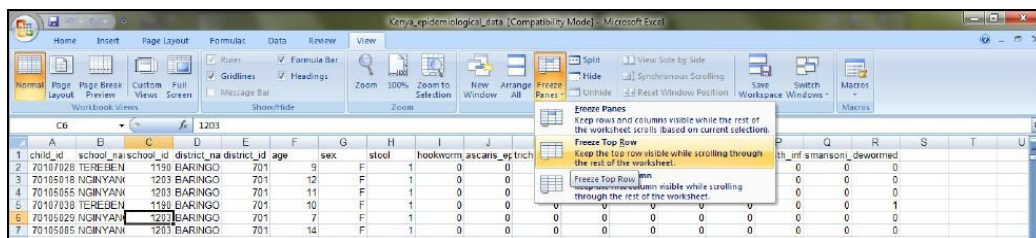
Datasets Used: The following datasets are used

1. Kenya_epidemiological_data.xls
2. Kenya_epidemiological_dict.xls

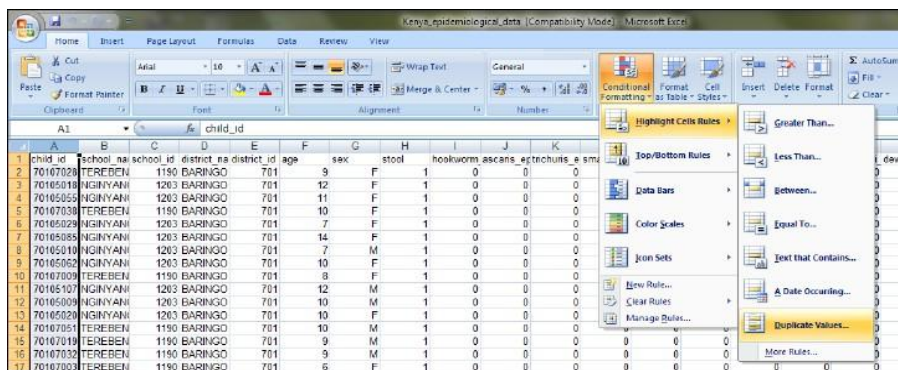
Shape Files used: Kenya admin.

2A Format of the database

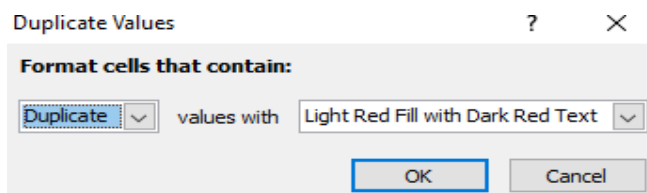
Open *Kenya_epidemiological_data.xls* in excel. Go to the View tab, click Freeze Panes and choose Freeze Top Row.



select the entire "child_id" column(first column), Under Home Tab, click on Conditional formatting > Highlight Cell Rules > Select Duplicate values

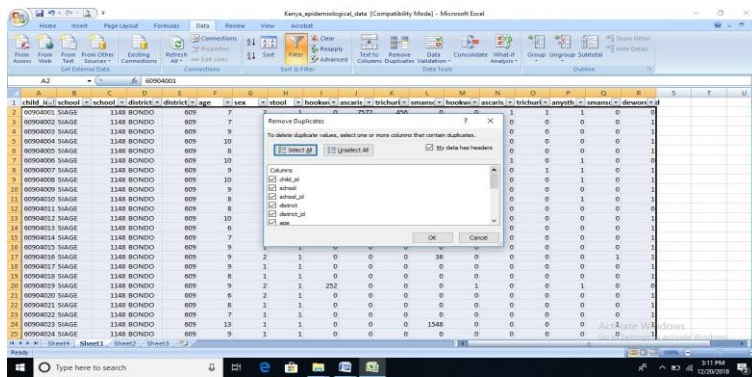


Now select the first combo box and select Duplicate and select Light red fill with Dark red text in the next combo box as shown in figure



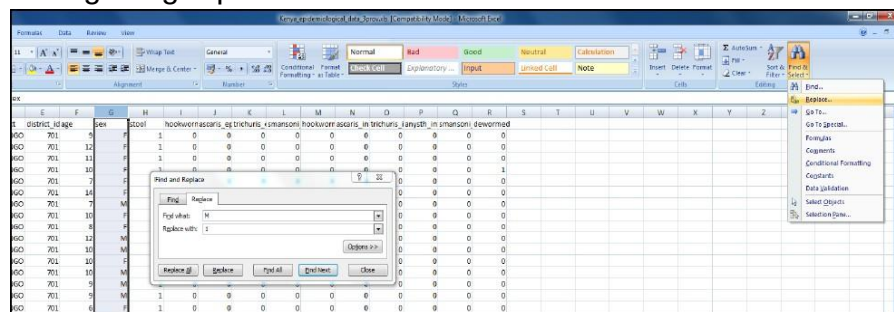
2B Removing Duplicates

Select all the columns of existing worksheet, Now go to Data Tab and select Remove Duplicates



2C Coding of variables

In the current worksheet, select the sex column. Now type Ctrl+F and use Replace Function and Replace as follows M-1 F-2 Please keep track of how many values are getting replace.



Step 3 Verifying the plausibility of data

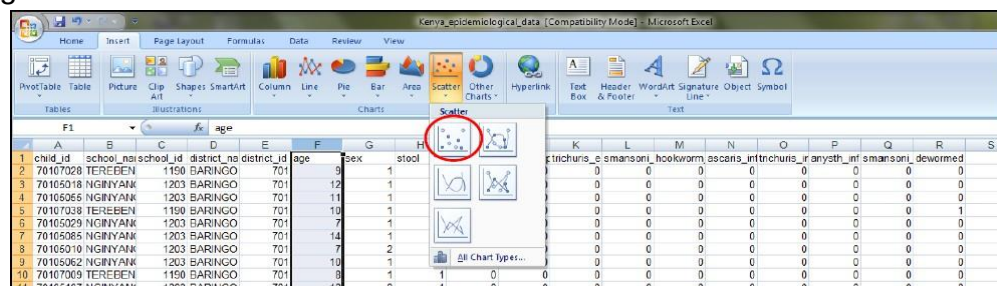
In this step, we perform two basic operations

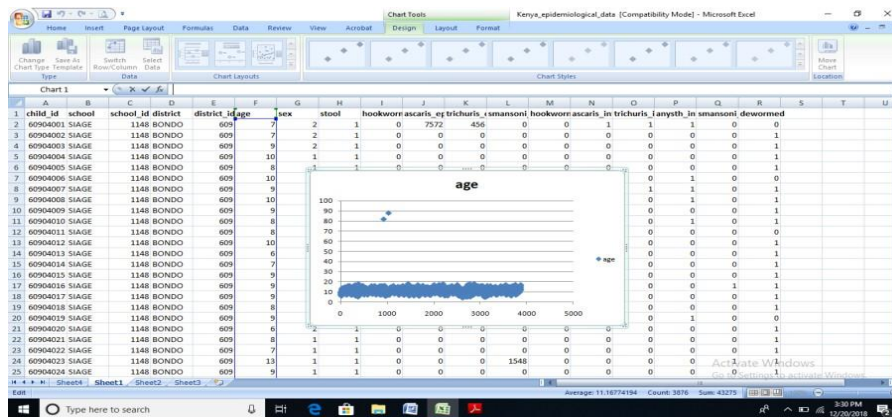
- A. Coding of variables
- B. Using a filter to detect outliers

3A Coding of variables

Select the age column in the existing worksheet.

Now go to Insert tab and select Scatter. You will set chart as shown below





3B Using a filter to detect outliers

First go to the Home Tab>Sort and Filter>Filter. Click and apply the filter to all the columns of the worksheet. Now click on age filter and click on Number Filter> Greater Than option and type the value 20 in greater than field.

Custom AutoFilter

Show rows where:

age

is greater than 20

Use ? to represent any single character
Use * to represent any series of characters

OK Cancel

Step 4: Logical Data checks

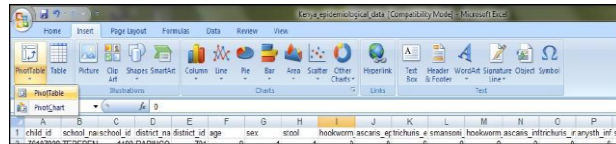
In this step, we perform two basic operations

- Cross Tabulations
- Formulas

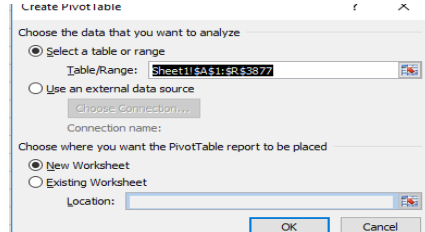
4A. Cross Tabulations

Open the existing worksheet. Now go to Insert Tab and select Pivot table

function.



Select New Worksheet and click OK



An empty table is inserted in a new sheet and a window will open on the right hand side named PIVOT TABLE FIELD LIST.

From the PivotTable Field List, drag the "stool" item and drop it into the "Row Label" field as show above. Similarly, Click on *anysth_inf* and draw it into the "Column labels" and "Σ Values" field. To include the count of observations in the table you might need to change the value field settings to count. Click on the combo box Sum of stools and Click on Value Field Settings. Change the value in Summarize value filed by to Count and click OK. Table is updated with count values as shown below

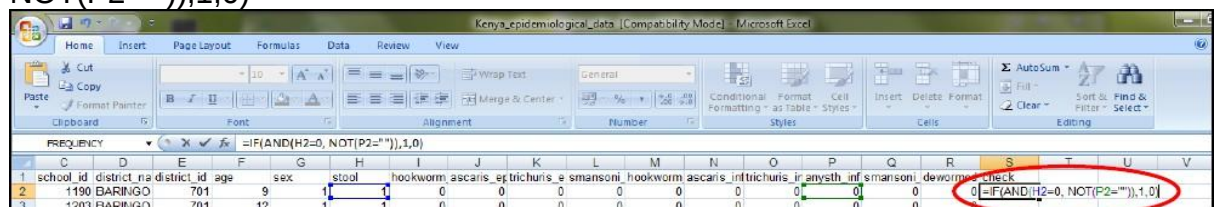
	A	B	C	D
1	Drop Page Fields Here			
2				
3	Count of stool	anysth_inf		
4	stool	0	1	Grand Total
5	0	2		2
6	1	3410	464	3874
7	Grand Total	3412	464	3876

4B Formulas

Open the existing worksheet

Create a new column with the variable called check

Type the following formula in S2 column of worksheet =IF(AND(H2=0, NOT(P2="")),1,0)



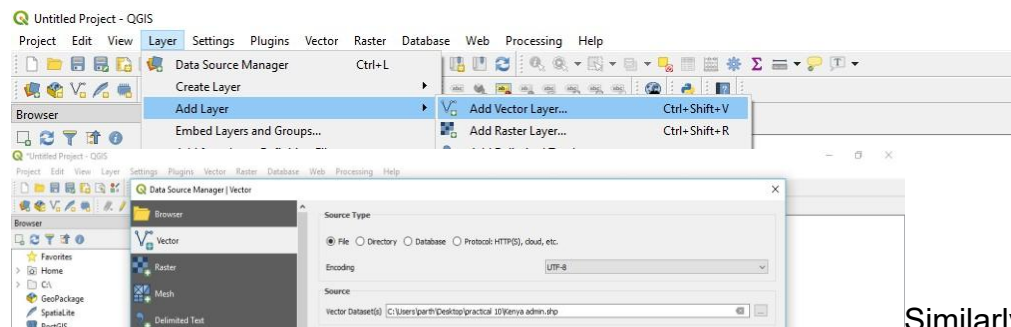
Now copy the formula to all other cells (ensure that the formula is copied to all rows in your dataset) Now use the filter to show only entries with a check value of 1.

Step 5: Verifying the coordinates of mapping data

Create a New Project in

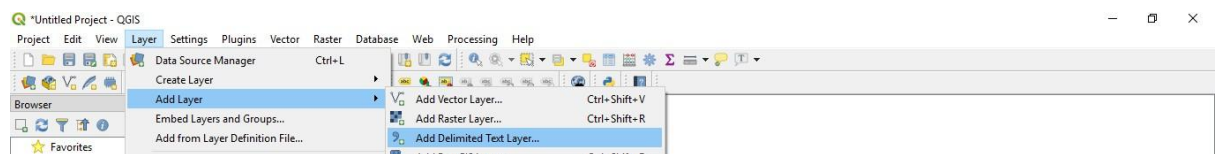
QGIS Desktop 3.4.2. Let's
add the files!

Navigate to Add Vector Layer and add file: Kenya_admin.shp

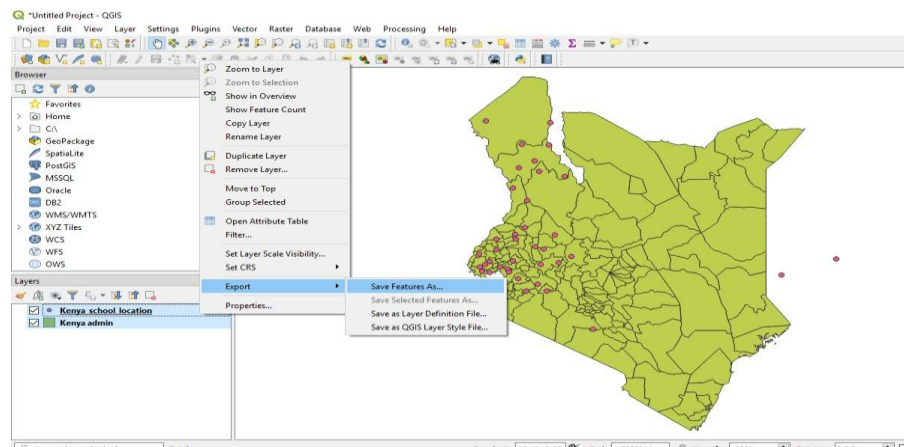


Similarly, navigate

to Add Delimited Text Layer.

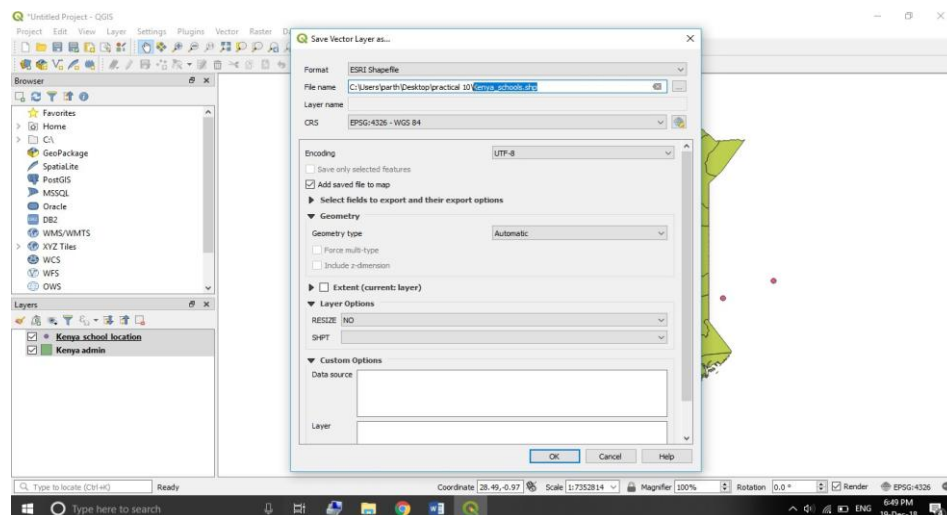


Here we have to add file: Kenya_school_location.csv. In the Geometry Definition section, there is a field called Geometry CRS, in that we have to select WGS84 as coordinate system. As you can see 2 points are not on the map. To examine this, we need to save these layers as a Shapefile, to do that select both the layers Kenya_school_location and Kenya admin, then right click on them and choose SaveFeatures As...

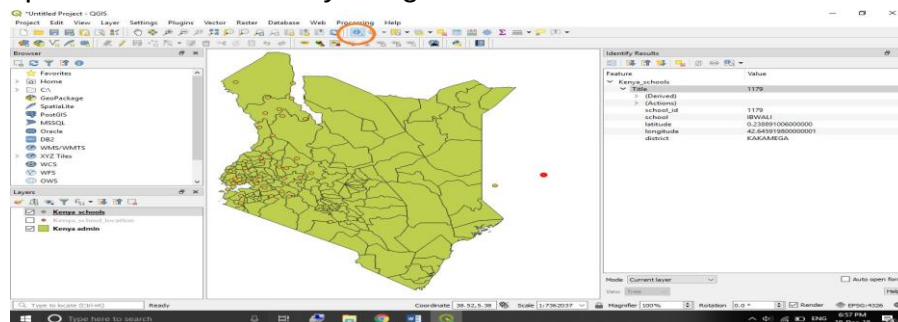


In the menu

that comes up, set Format as ESRI Shapefile and put File Name as Kenya_schools.shp After this is done you can uncheck the Kenya_school_location in the layers section.

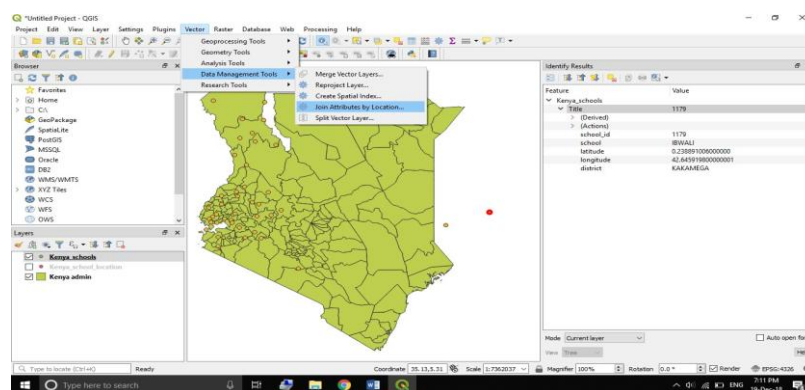


Let's try and get the details of these 2 points that are not on the map, select the Kenya_schools layer, click on the Identify Features Tool button and then click on the points outside of Kenya to get their details.

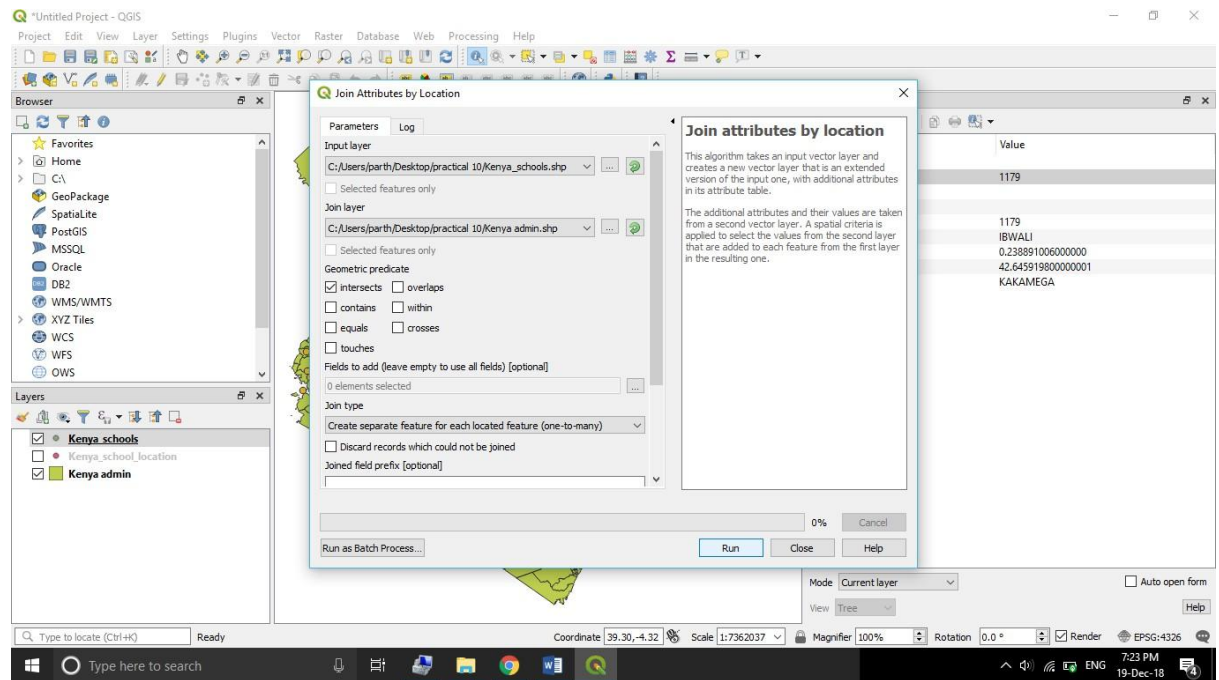


Now we want to add the district information to the map. Therefore, we will join information based on the geographical localization.

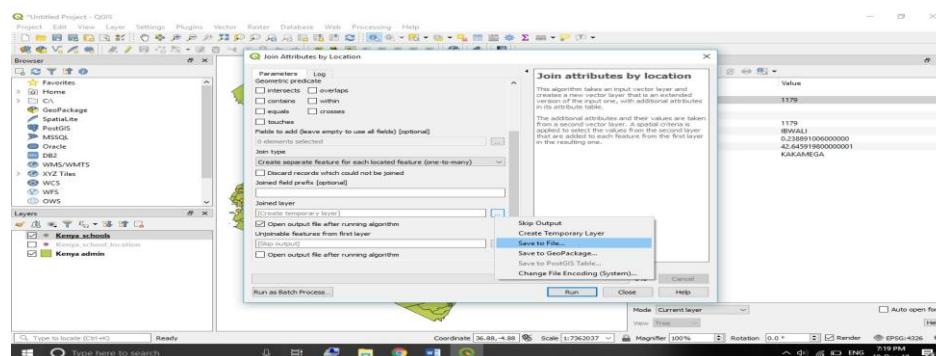
In the menu click on Vector, then Data Management Tools, then select Join attributes by location.



Then select Kenya_schools as Input layer and Kenya_admin as Join layer.



We also need to save the output so in Joined Layer, click “...”button to Browse location.



Save as Kenya_school_district.csv

And then click run.

After it is done...

Navigate to the location of saved file Kenya_school_district.csv and open it, you should now be able to compare both district and Name for discrepancies.

We need to change the co-ordinate of those 2 points which were not on the map.
So, open the file
Kenya_school_location.csv and make the following changes, set:

IBWALI: Longitude 34.6459198
SIWOT: Longitude 35.35437012

Save the file as:

Kenya_school_location2.csv. Step

6: Preparing data for mapping

Open Kenya_epidemiological_data_2.xls, select the entire sheet, go to Insert tab to create new

Pivot Table.

Tick New Worksheet to tell Excel that you want to place the table in a new sheet

Now click on school_idtodragand drop it in the “Row labels” field at the bottom.

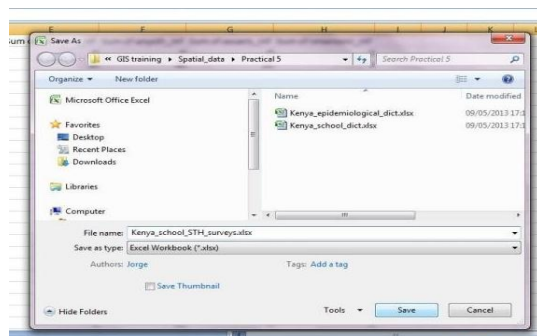
Add district_id to “Σ Values” and click on it, a drop down list will open, click on Value Field Settings. Choose Average as type of calculation, because all children in the same school will have same district_id.

school_id	Average of district_id	Count of child_id	Sum of hookworm_inf	Sum of trichuris_inf	Sum of anyth_inf	Sum of ascaris_inf	Sum of smansoni_inf
1091	704	105	0	0	0	0	0
1119	615	109	22	18	45	21	8
1123	712	105	3	0	3	2	0
1124	702	110	17	9	34	27	0
1125	610	107	34	8	39	11	1
1133	710	109	0	1	1	0	0
1139	616	106	1	3	6	2	68
1141	706	108	1	2	13	13	0
1143	706	109	0	0	0	0	0
1145	611	109	3	3	6	1	8
1146	614	66	10	2	14	3	2
1148	609	106	15	4	23	7	10
1150	611	63	5	3	9	2	7
1155	808	110	1	3	9	8	0
1156	615	69	15	8	30	17	2
1163	615	110	5	10	25	19	3
1164	707	108	0	0	1	1	0
1169	707	108	3	1	4	0	0
1175	803	108	15	28	37	19	0
1178	711	108	1	1	20	19	0
1179	804	106	6	3	22	18	0

Now drag and drop child_id into the “Σ Values” field, click on Value Field Settings and choose Count to summarize the results. So, we come to know how many children per school are infected. Similarly, Drag and drop anysth_inf into the field, click on Value Field Settings and choose Sum. As, infected is 1 and not affected is 0, the sum will give us the total number of infected children. Now copy the table, open a new Excel file and paste the values into the new spreadsheet. Therefore, click Paste in the Home tab, then choose Paste special and paste only the values.

Remove the last row which has Grand Total and other values

Save this new data table as Kenya_school_STH_surveys.xlsx



Now we need to know the total count of infected children, that is, the prevalence of STH.

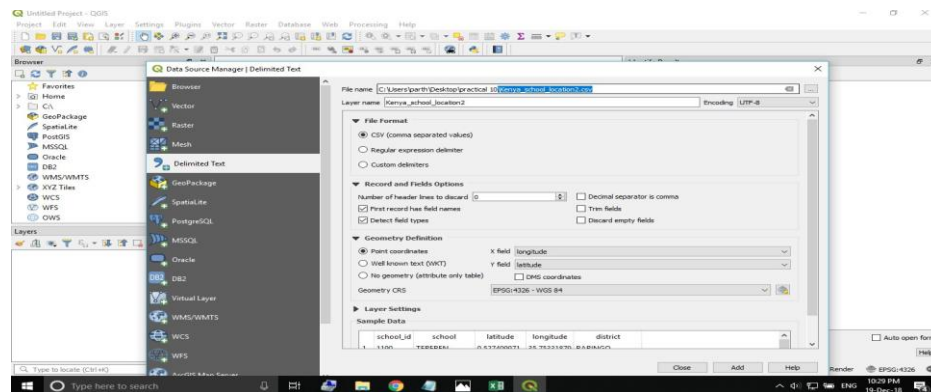
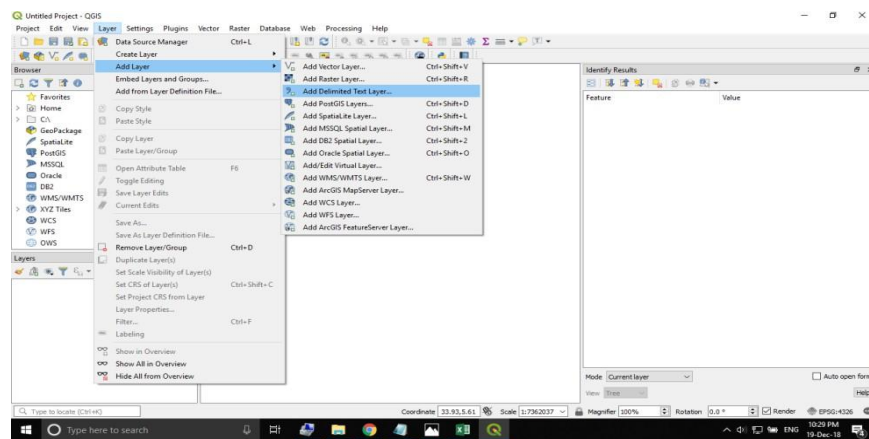
So, we create a new column: sth_preval which we are going to be dividing the number of infected children by the number of children and multiplying by hundred to obtain a value in percent (%).

In the first cell under the heading type $=F2/C2*100$ (this assumes that your number of children is in row C and the number of infected children in row F; you will need to adjust the column label accordingly); then copy the formula to the other cells in the column.

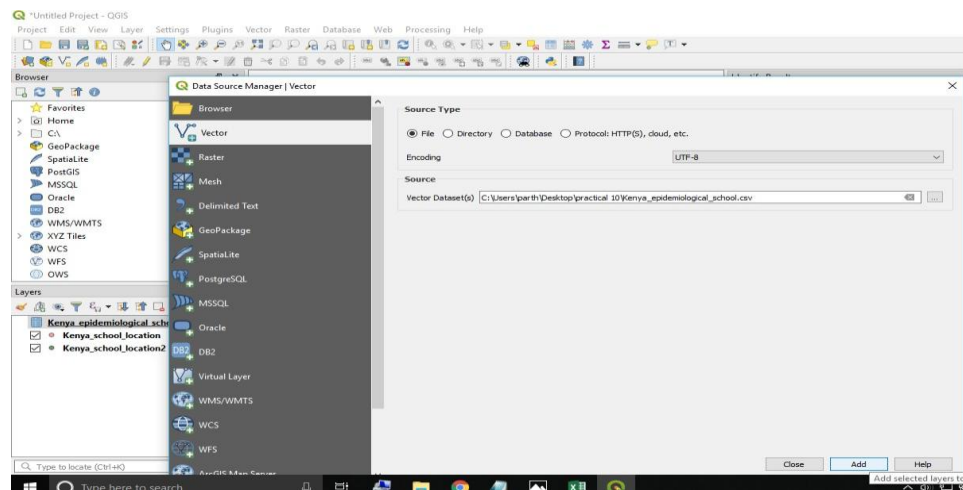
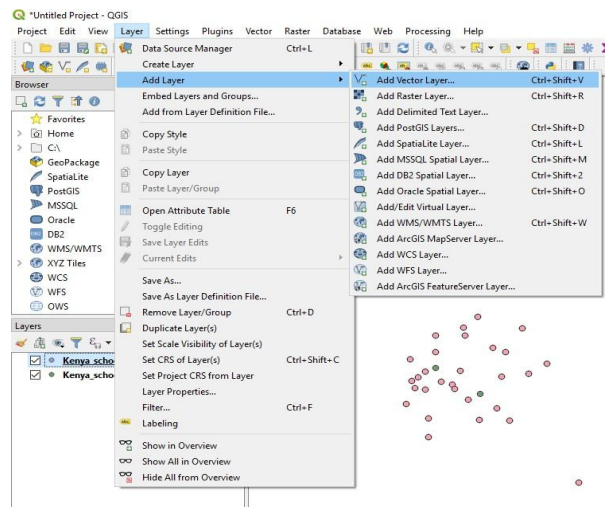
The screenshot shows a Microsoft Excel window titled 'Kenya_schoolSTH_surveys.xlsx'. The formula bar contains the formula: $=I2 + (1.96 * (\text{SQRT}((I2 * 100 - I2) / C2)))$. The spreadsheet has columns A through M. Column A contains 'school_id', B contains 'Average of district_id', C contains 'Count of child_id', D contains 'Sum of hookworm_inf', E contains 'Sum of trichuris_inf', F contains 'Sum of anyth_inf', G contains 'Sum of ascaris_inf', H contains 'Sum of smanson_inf', I contains 'sth_prev', J contains 'CILOW', K contains 'CIUP', L is empty, and M is empty. Rows 2 through 6 contain data for schools 1091, 1119, 1123, 1124, and 1125 respectively.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	school_id	Average of district_id	Count of child_id	Sum of hookworm_inf	Sum of trichuris_inf	Sum of anyth_inf	Sum of ascaris_inf	Sum of smanson_inf	sth_prev	CILOW	CIUP		
2	1091	704	105	0	0	0	0	0	0.00				
3	1119	613	109	22	18	45	21	8	41.28				
4	1123	712	105	3	0	3	2	0	2.86				
5	1124	702	110	17	9	34	27	0	30.91				
6	1125	610	107	34	8	39	11	1	36.45				

Save this file as Kenya_epidemiological_school.csv Now that all the datasets are ready, let's add them. Open a new QGIS project. First, add Kenya_school_location2.csv to the project. Click on Add Delimited text layer in the menu, and browse to select the file.



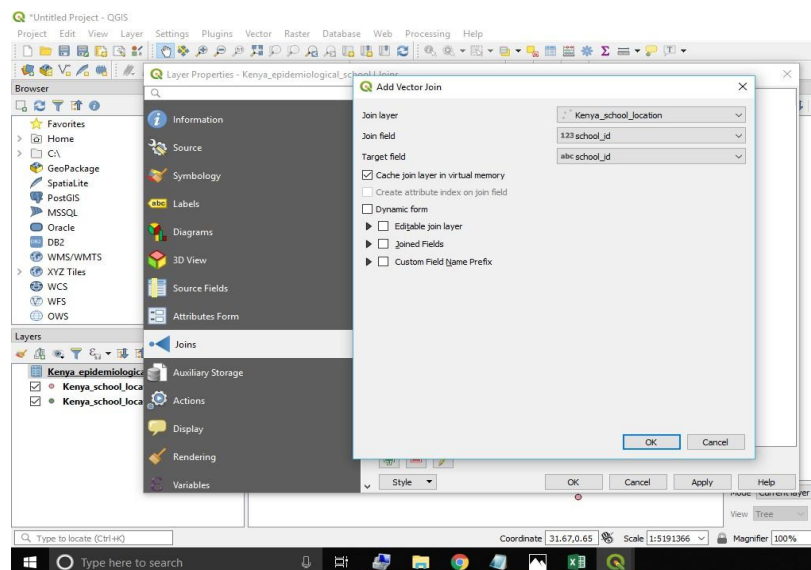
Similarly, Add Vector Layer and add Kenya_epidemiological_school.csv



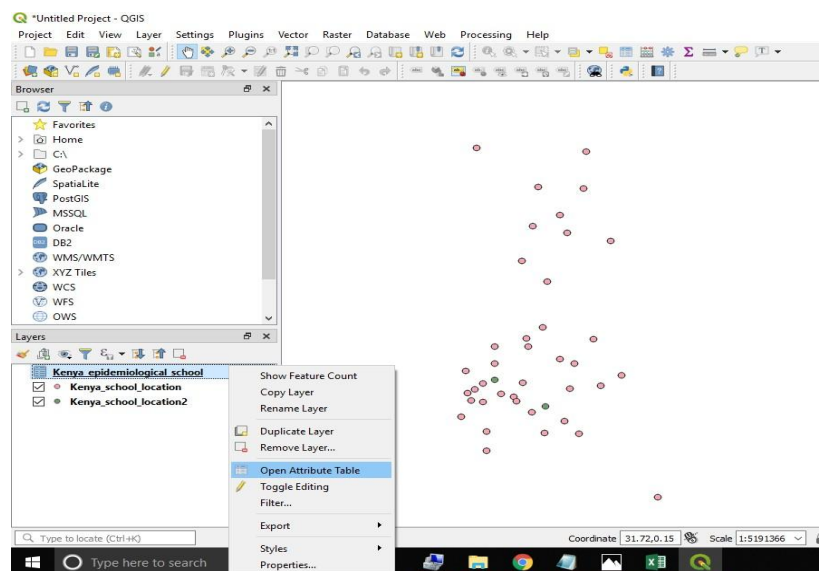
Now we'll join the data. Right click on Kenya_school_location2 layer and click on Properties

Go to the Joins section and click on the plus(+) button at the bottom

For "Join layer" choose Kenya_epidemiological_school and for "Join field" and "Target field" choose school_id. Then click on OK.



Right click on Kenya_school_location2 layer and select Open Attribute Table.



You will see that the epidemiological variables are included.

Kenya_epidemiological_school: Features Total: 41, Filtered: 41, Selected: 0

	school_id	average of district...	Count of child_id	Sum of anyth_inf	ith_prev	Ciup	Cilow	_school_location_	_school_location_	_school_location_	_school_location_
1	1199	806	106	29	27.3549057	35.84524498	18.87173615	SACHO RC	0.815196991	34.63658989	MT. ELGON
2	1198	805	106	6	5.660377358	10.05959917	1.261185543	MTORRI	0.811269999	35.10525131	LUGARI
3	1193	705	109	0	0	0	0	SONGETO	0.592299998	35.55437088	KEYO
4	1190	701	71	2	2.816901408	6.665548517	-1.0317457	TEREBEN	0.527409971	35.75331879	BARINGO
5	1189	801	70	22	31.42857143	42.30386453	20.55327833	MABUUSI RCEA	0.517359972	34.63671112	BURGOMA
6	1182	802	106	32	30.18867925	38.92821015	21.44914834	INDOLI	0.390608996	34.24145889	BUSIA
7	1180	708	23	0	0	0	0	GATAMI	0.313997	36.41159058	LAIKIPIA
8	1179	804	106	22	20.75471698	28.47526728	13.03416668	IBWALI	0.238891006	42.6459198	KAKAMEGA
9	1178	711	108	20	18.51851852	25.84468481	11.19235223	KIMONDI	0.192570001	35.03781128	NAINDI
10	1175	803	108	37	34.25925926	43.20982475	25.30869377	SHIATSALA	0.17746	34.47684097	BUTERE/MUMIAS
11	1169	707	108	4	3.703703704	7.265483806	0.141923601	NGENDALEL	0.141354993	36.1152916	KOIBATEK
12	1164	707	108	1	0.925925926	2.732319281	-0.880467429	KAPCHOLOI	0.092550002	35.68682098	KOIBATEK
13	1163	615	110	25	22.72727273	30.55880083	14.89574462	USULA	0.080600001	34.36790085	SIAYA
14	1234	719	106	0	0	0	0	AIC LOPIDIRI	4.206360204	34.39040097	TURKANA
15	1233	719	57	0	0	0	0	NARIOKTOME	4.14414978	35.91397858	TURKANA
16	1231	719	95	0	0	0	0	MAKUTANO	3.535870075	35.249913	TURKANA
17	1230	719	95	1	1.052631579	3.104902021	-0.999638863	NATOLE	3.51651001	35.7963867	TURKANA
18	1227	719	70	0	0	0	0	NAOTIN	3.057399988	35.54711914	TURKANA
19	1226	719	48	1	2.083333333	6.123908071	-1.957241405	LOCHOR EKUY...	2.869719982	35.17766953	TURKANA
20	1225	719	111	1	0.900900901	2.658894771	-0.85689297	LOCHOR EMOIT	2.757560015	35.64710999	TURKANA
21	1224	719	76	0	0	0	0	KANGIRISAE	2.618520021	36.25392151	TURKANA

We are finally done, now we just have to save the files!!
Select all the layers, right-click on them and in Export select Save Features As.

Select Format as ESRI Shapefile and File Name as: Kenya_school_epidata.shp

