

# Practical 1

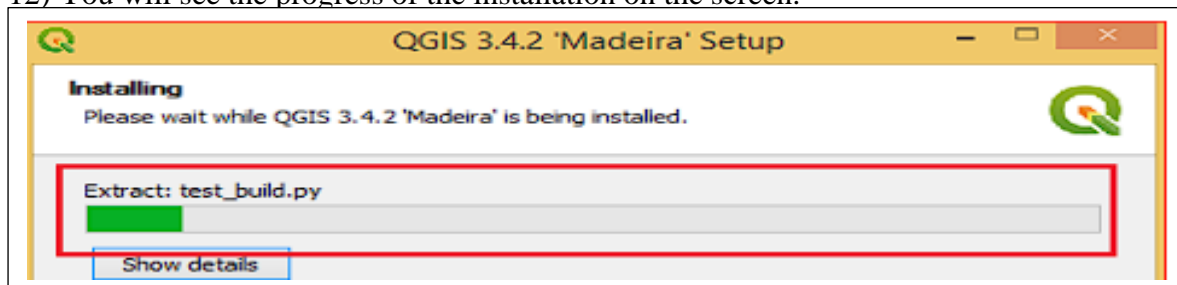
## Installation of QGIS

Step By step procedure

- 1) Create a folder on your D:/ drive on your computer called QGISlab by right clicking on the D: drive and navigating down to the New / Folder.
- 2) Go to the QGIS download page and download the latest 64bit version of QGIS for windows which is QGIS 3.4 'Madeira' by clicking once.
- 3) If you have a 32 bit machine or using another operating system search the bottom of the page for your operating system and download the correct operating system version of QGIS.  
<http://www.qgis.org/en/site/forusers/download.html>

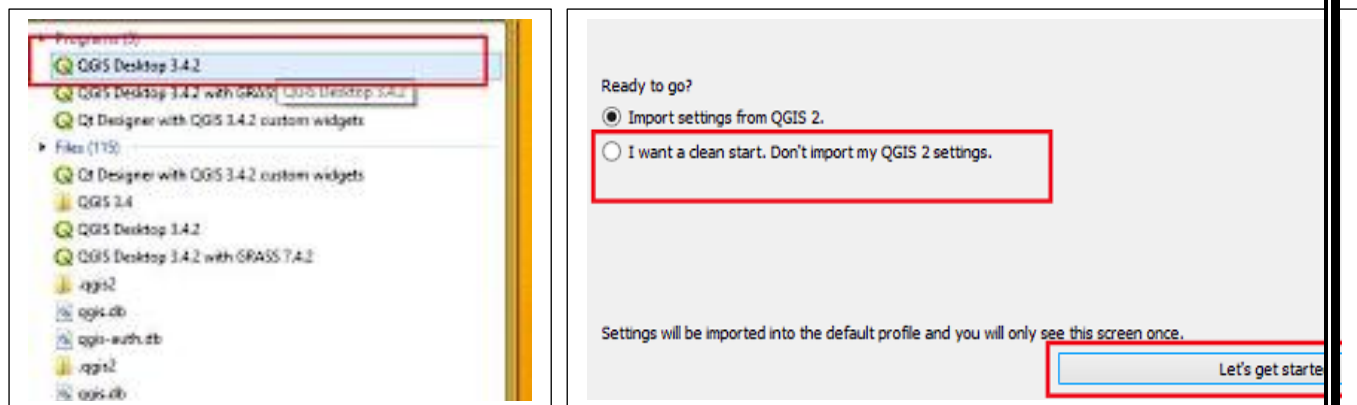


- 4) Your browser will download the file to the browser's default download directory. By pressing the control key and the letter J at the same time a popup window will show you the folder where the QGIS file has been downloaded. The QGIS file will be called: QGIS-OSGeo4W-3.4.2-1-Setup-x86.exe
- 5) Move or copy the above file to your C:/QGISlab folder and double click on the file. You will get a popup window with a security warning.
- 6) Hit the run button to start the installation process and follow the prompts. There is no need to install the data sets suggested by QGIS.
- 7) From the above window, click Next button and continue with the installation.
- 8) Please go through the license agreement and click on the button> I agree and proceed with the installation as shown in the screen.
- 9) As the software is very heavy it is advisable to install it in a different drive other than the windows drive. As per our example, we will be installing in QGIS folder on D:\ drive.
- 10) After browsing the folder click the Next button and proceed with the installation as shown in the above figure.
- 11) By default QGIS component is selected. Do not install any other data set at this point. Click Install to proceed with installation
- 12) You will see the progress of the installation on the screen.

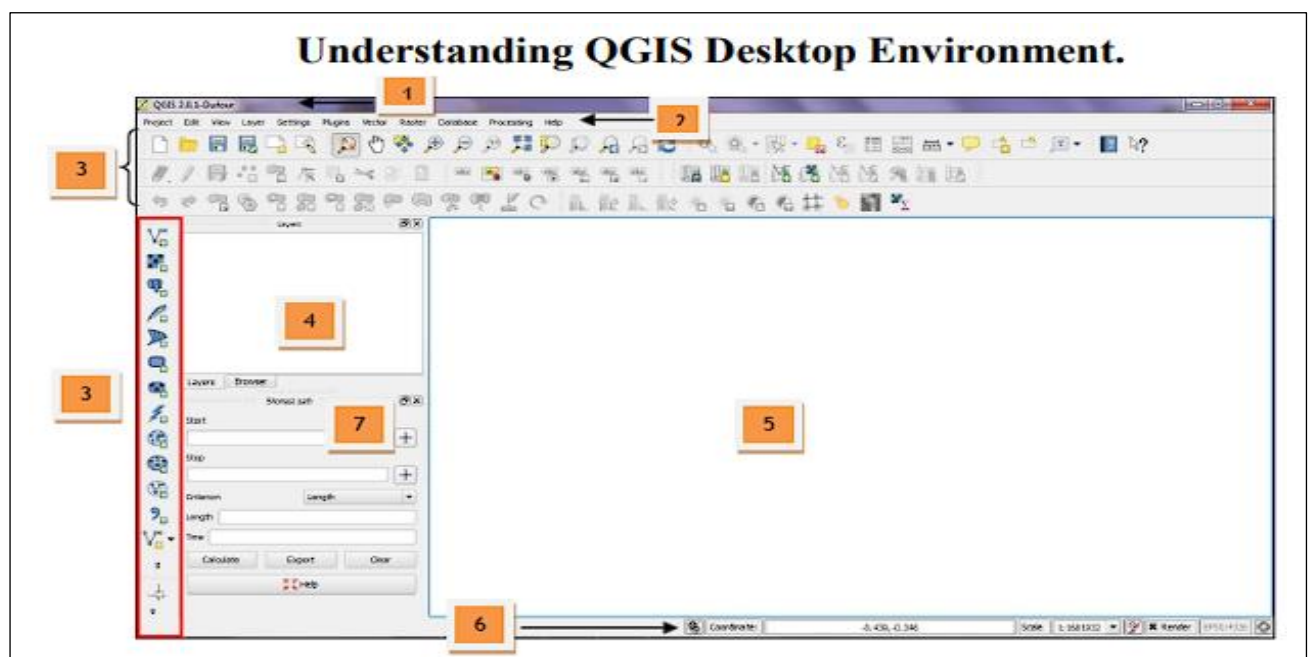


- 13) Please reboot your machine once the installation is completed. Click finish to complete the installation

14) After machine is restarted, type QGIS on Run and open QGIS Desktop 3.4.2



15) It will open a new wizard for the first time after installation as shown in the figure above



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.

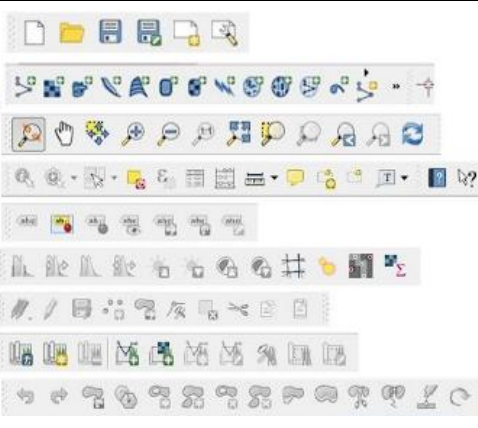
1. Title of the Project - Shows the title of project that you are going to view.
2. Menu Bar – This provides access to various Quantum GIS features using a standard hierarchical menu.
3. Toolbars – These provide access to most of the same functions as the menus, plus additional tools for interacting 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.

Quantum GIS toolbars and some other components

Toolbars are divided by thematic (greyed icons means they are inactive because the appropriate conditions to use them are not fulfilled). Some of them are included by default in QGIS and others can be added/removed from the interface:

<p><b>File</b></p> <p><b>Manage Layers (vertical)</b></p> <p><b>Map Navigation</b></p> <p><b>Attributes</b></p> <p><b>Label</b></p> <p><b>Raster</b></p> <p><b>Editing/Digitizing</b></p> <p><b>GRASS plugin</b></p> <p><b>Advanced Digitization</b></p>		<p><b>Table of Contents. Menu</b></p> <p><b>Turns layer on or off</b> Click the box to turn on <input checked="" type="checkbox"/> or off <input type="checkbox"/> the layer/s.</p> <p><b>Folder icon in the TOC</b> This represents a group of layers in the TOC. Grayed colour means only selected layers are visible in the group of layers.</p> <p><b>Navigation toolbars</b></p> <p><b>Zoom in</b> Click once in the map to zoom in or drag a box over the particular area.</p> <p><b>Zoom out</b> Click once in the map.</p> <p><b>Panning</b> Click in the map, hold down the mouse button, and drag in any direction.</p> <p><b>Zoom to Full</b> Click to return to default view or view the full map layer/s.</p> <p><b>Zoom to Selection</b> Click to view the selected part of map layer/s.</p> <p><b>Zoom to Layer</b> Click to view a particular map layer.</p> <p><b>Object Information</b></p> <p><b>Identify Features</b> Click to activate and point to the layers you want to view the information.</p> <p><b>Open Attribute Table</b> Click to open the attribute table of a layer.</p>
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## Key functions:

Here, you will learn how to QGIS" different mapping tools in this practical.

### File Options

#### New Project

Enables you to create a new project.



#### Open Project

Tool use to open an existing/previous project created in Quantum GIS.



#### Save Project

Enables you to save the project.



#### Save Project As

Enables you to save the project in another format.



#### New Print Composer

Enables you to print the map/layers including the title, TOC, map overview, scale bar, graph/attributes present in the layer, author and map information, logo, toolbar, and other components present in the main page of the project.



#### Composer Manager

Enables you to access to the different composition in progress and manage them; showing, removing, closing, and so on.



### Displaying Layers

#### Add Vector Layer

Enables you to add any readable existing vector format layer.



#### Add Raster Layer

Enables you to add any readable existing raster format layer.



## Practical -2

### AIM :- Creating and Managing Vector Data:

#### Adding vector layer

#### Setting properties

#### Vector Layer Formatting

#### Procedure:

Adding vector layers (Polygon, Line, Points)

Polygon layers (We have taken 2 layers Matunga, Garden)

Line layers (We have taken 3 layers Small\_Roads, Road, Flyover)

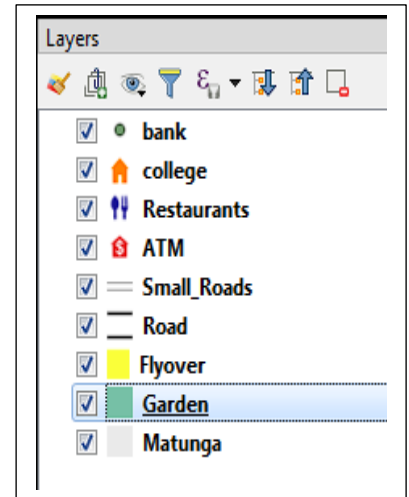
Point layers (We have taken 4 layers bank,college,Restaurants,ATM)

Setting properties (Labeling, Symbolism)

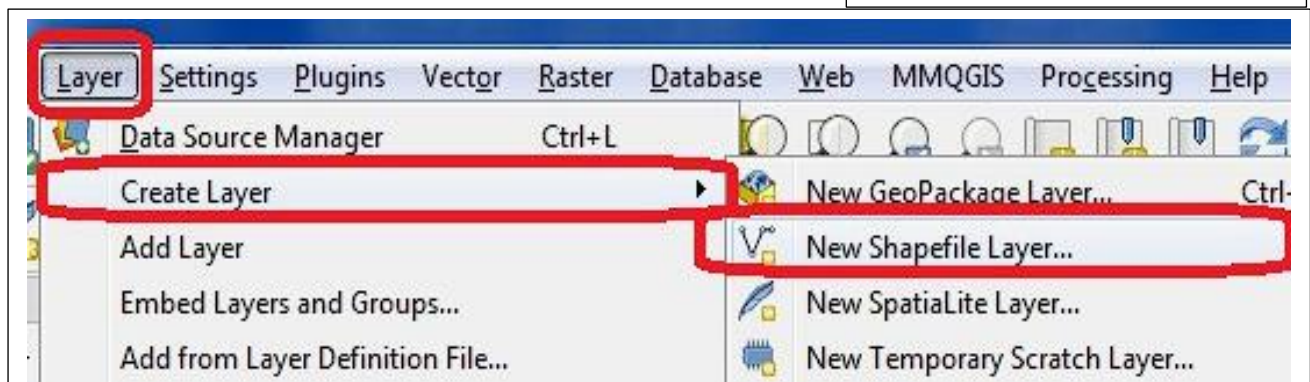
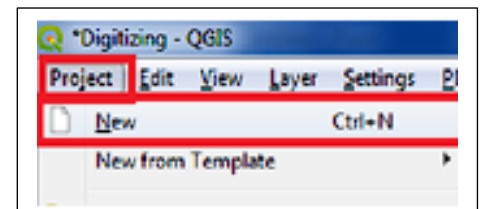
**Our aim is to create map representing a location and its surrounding as follows:**

creating Polygon vector layer

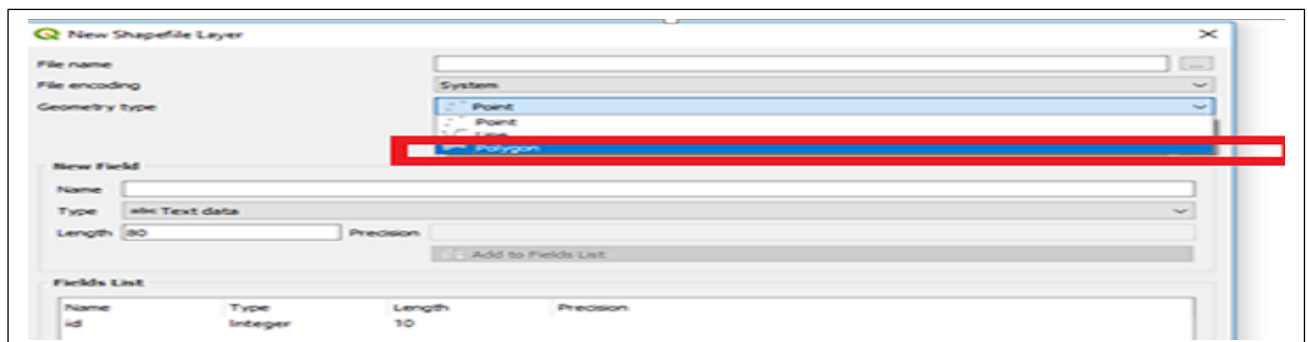
Select Project >New



Select Layer>create Layer>New Shapefile Layer



Following dialog box will appear on the screen. Select Polygon option from Geometry type

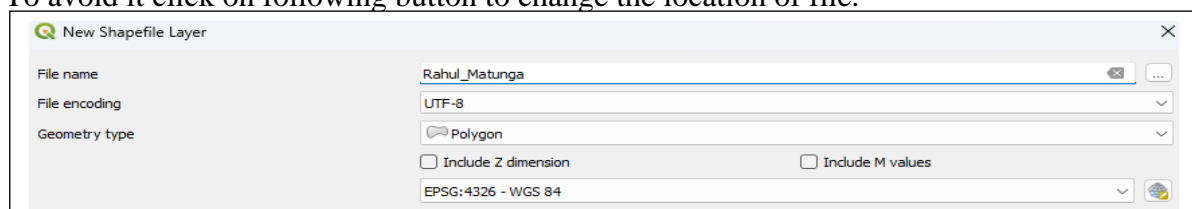


Fill the appropriate information in each text box.

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)

b. Specify Type (DataType:Text Data/Decimal Data/Whole Number/Date) of Attribute

c. Specify the Length of the Attribute. Specify Precision (If Data Type is Decimal)

File encoding: System  
Geometry type: Polygon  
☐ Include Z dimension ☐ Include M values  
EPSG:4326 - WGS 84

**New Field**  
Name: Name  
Type: abc Text data  
Length: 80 Precision:

**Fields List**

Name	Type	Length	Precision
id	Integer	10	

**Layers**  
Rahul matunga

SELECT GEOMETRY TYPE AS FOLLOWS

Click on the following button

File encoding: System  
Geometry type: Polygon  
☐ Include Z dimension ☐ Include M values  
EPSG:4326 - WGS 84

**New Field**  
Name: Name  
Type: abc Text data  
Length: 80 Precision:

**Fields List**

Name	Type	Length	Precision
id	Integer	10	

The CRS dialog box will appear on screen. Click on the WGS84 option and it will be selected as follows. click on OK

**Coordinate Reference System Selector**

Define this layer's coordinate reference system:  
This layer appears to have no projection specification. By default, this layer will now have its projection set to that of the project, but you may override this by selecting a different projection below.

Filter:

**Recently used coordinate reference systems**

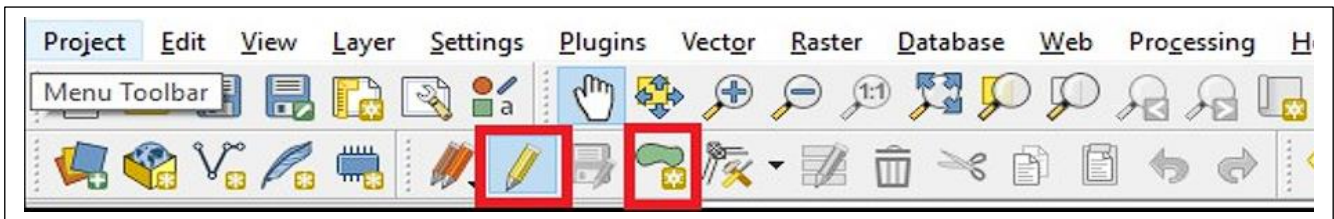
Coordinate Reference System	Authority ID
WGS 84	EPSG:4326



**Coordinate reference systems of the world** ☐ Hide deprecated CRSs

Coordinate Reference System	Authority ID
WGS 66	EPSG:4760
WGS 72	EPSG:4322
WGS 72BE	EPSG:4324
WGS 84	EPSG:4326

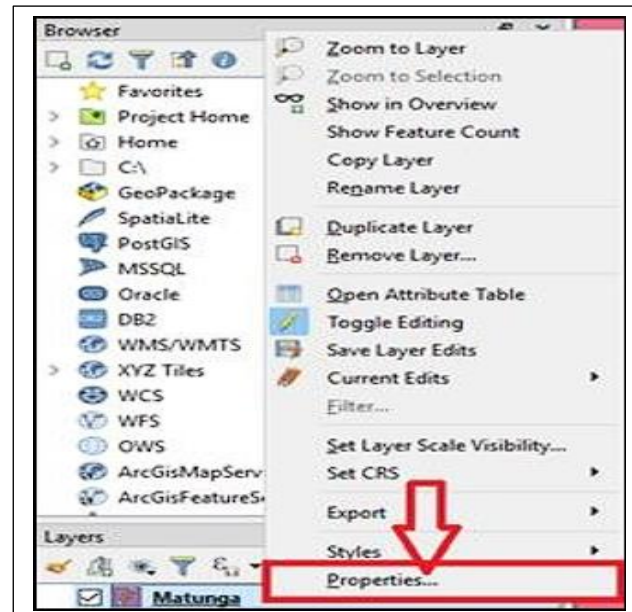
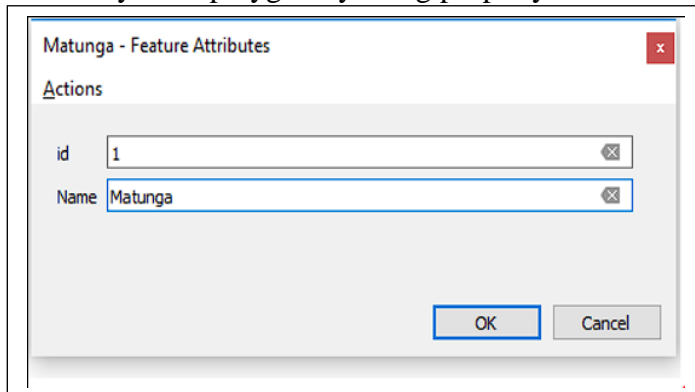
**Selected CRS** WGS 84  
Extent: -180.00, -90.00, 180.00, 90.00  
Proj4: +proj=longlat +datum=WGS84 +no\_defs

Follow the steps to plot Polygon features.  
Select the Polygon Feature from layer panel

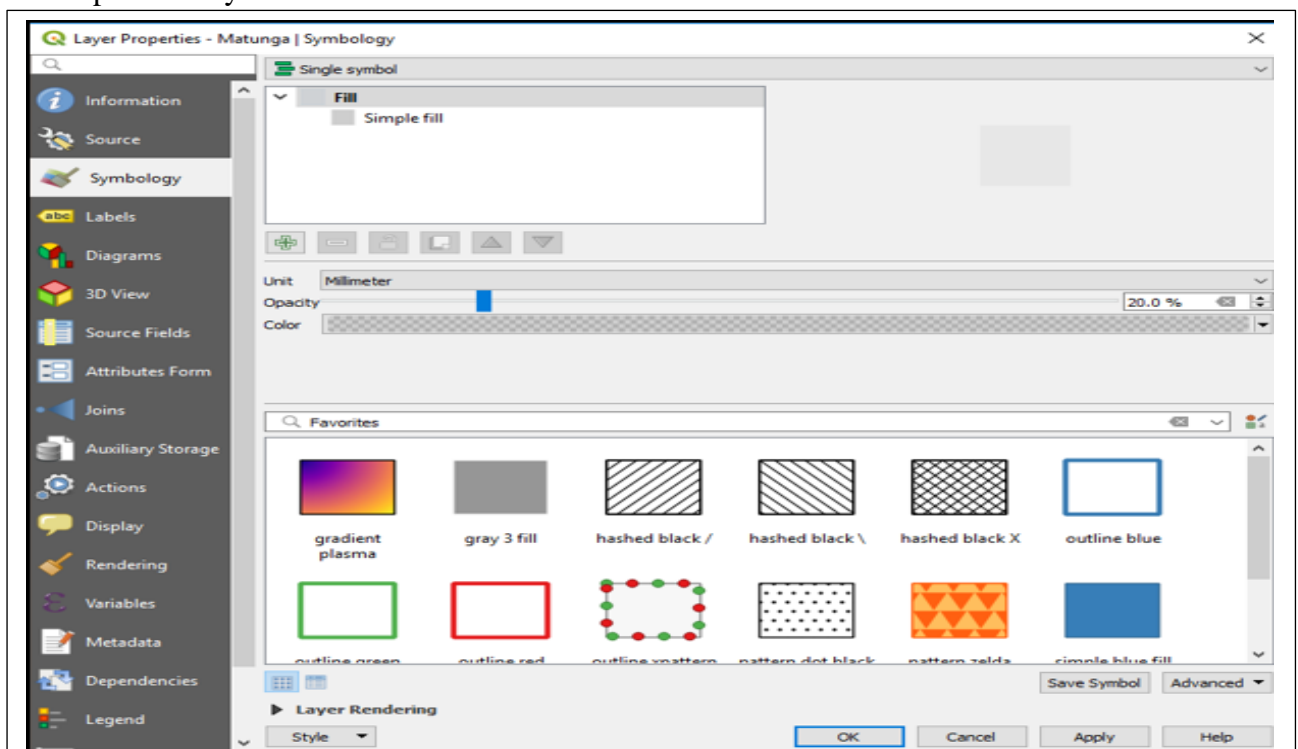


Click **Toggle Editing Button**  → Click on **Add Polygon**  → Now place the cursor at the location where you want to place the polygon. for **polygon** layer **minimum 3 points** should be selected

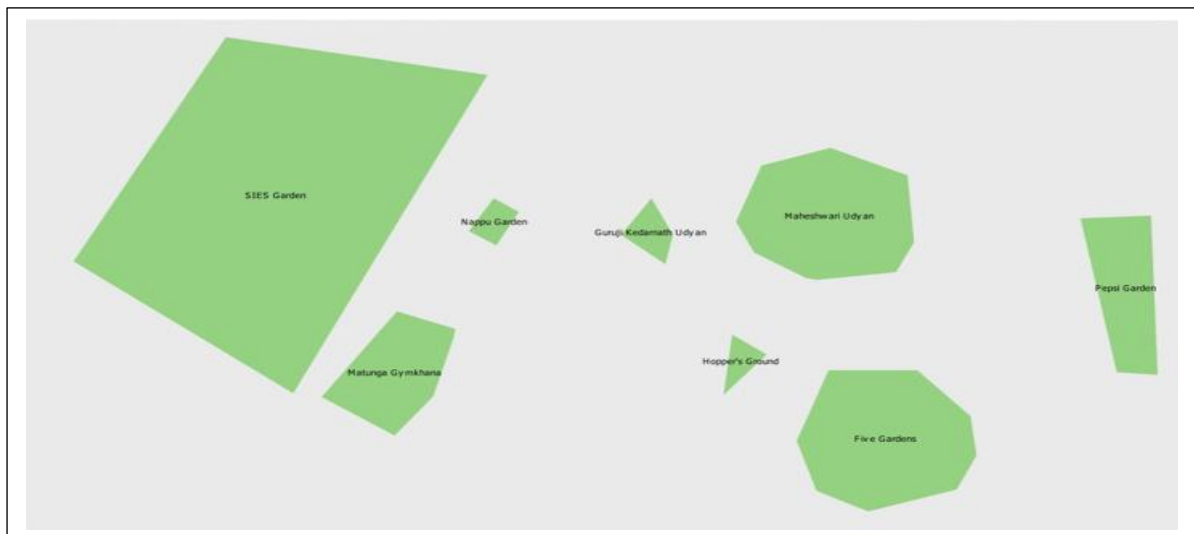
Save the newly added polygon as follows.  
Set style for polygon by using property window



Following screen will appear on the screen.  
Select pattern as you want and click on OK.



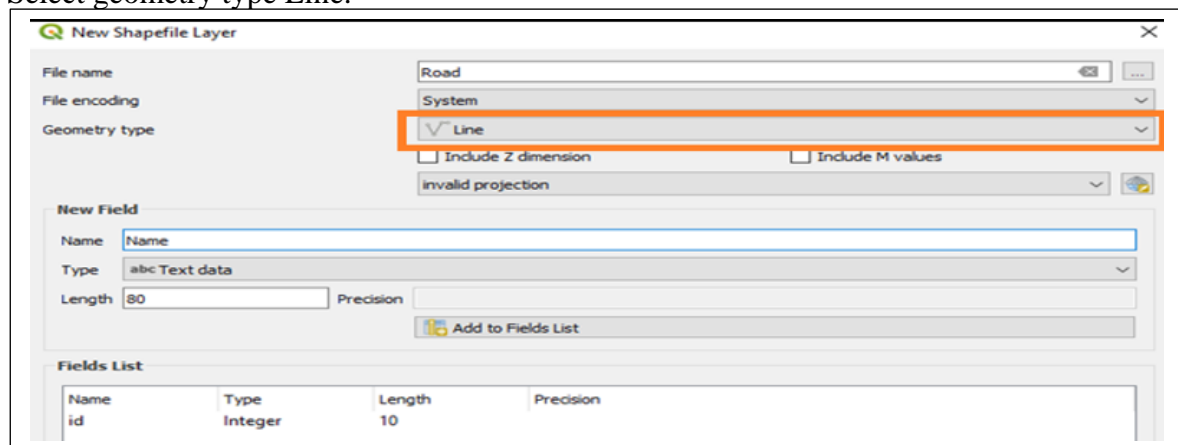
Same way we can add one more polygon layer for Gardens.



### Creating Line vector layer

Repeat the same steps as we have done for polygon layer.

Select geometry type Line.

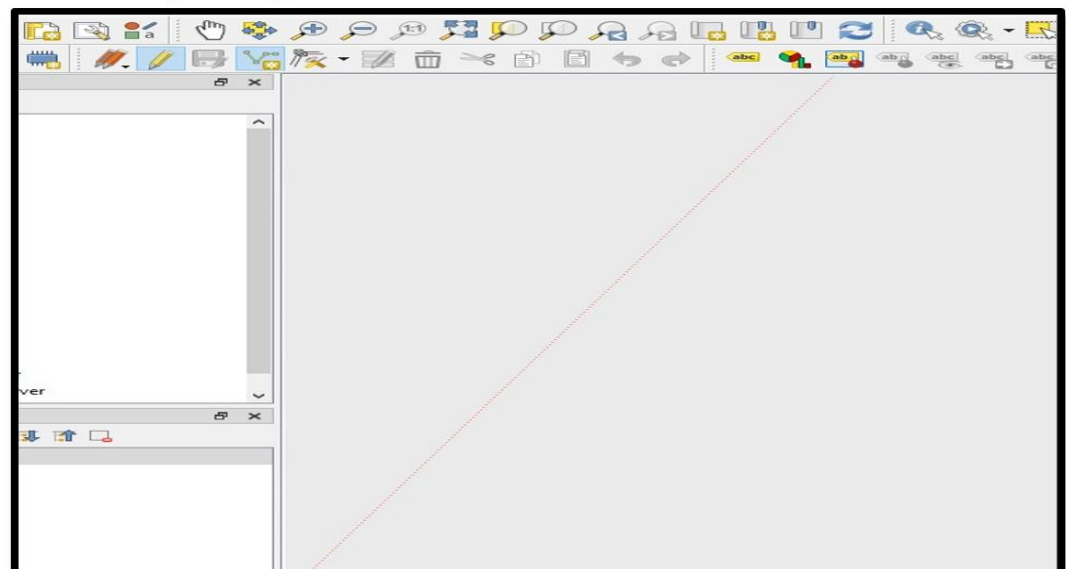


### Road layer :

- To plot road click on **Add Line Feature**.

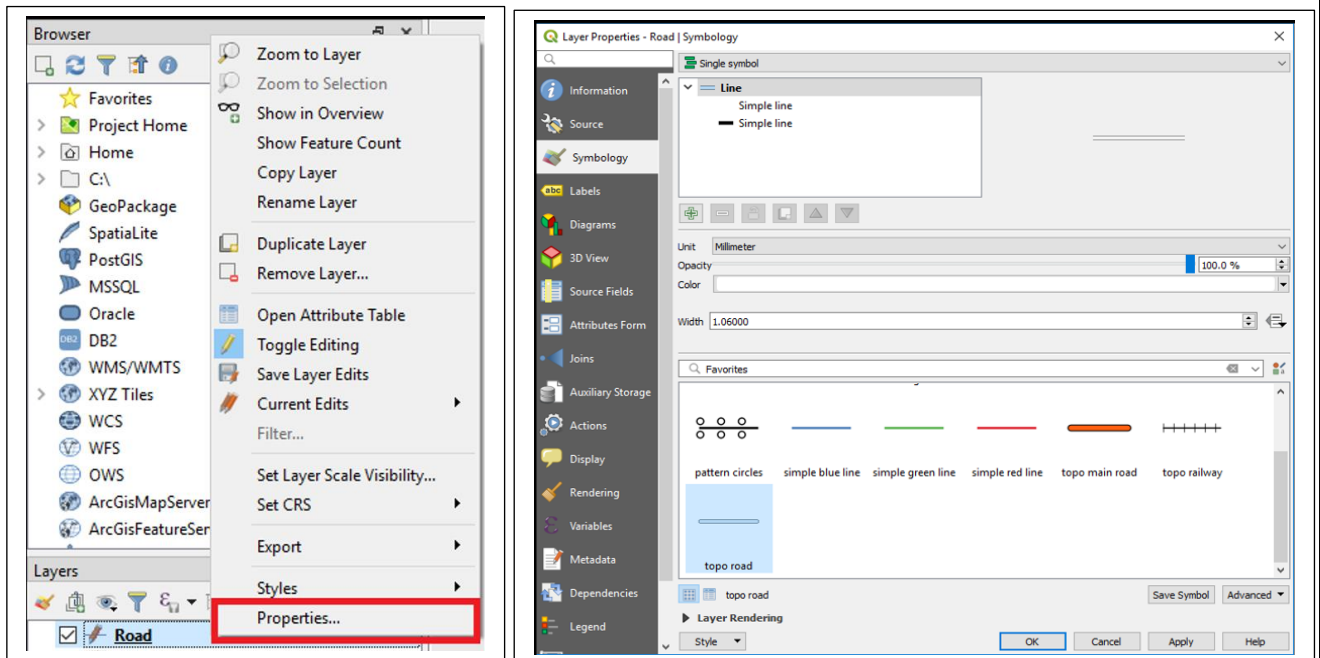


- Click on the map where you want to draw line.

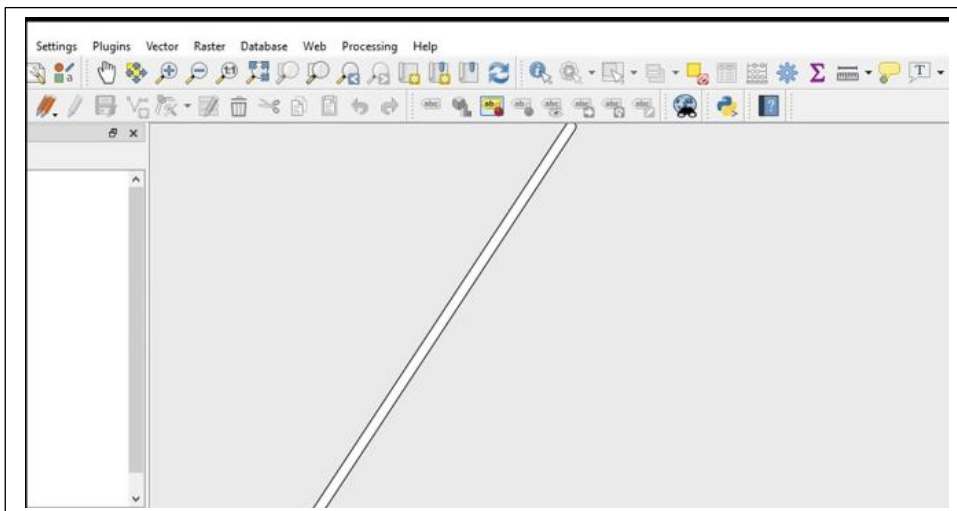


## Save your data

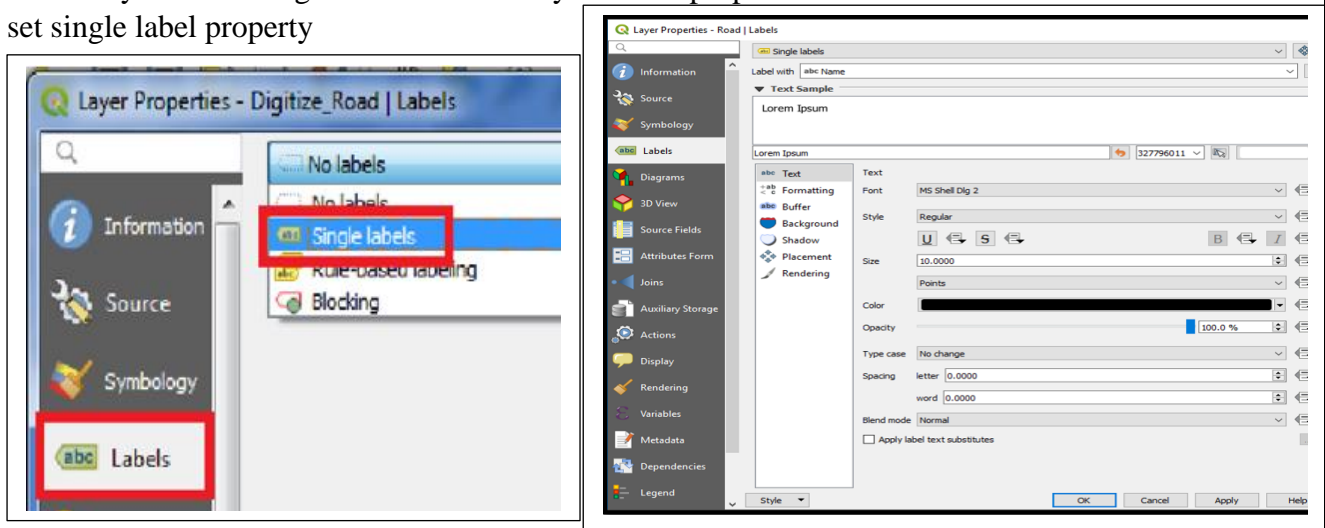
set style for Roads in the same way as we have done for polygon



will look as below



To label your roads Right click on Road layer .Go to properties window then select label and set single label property



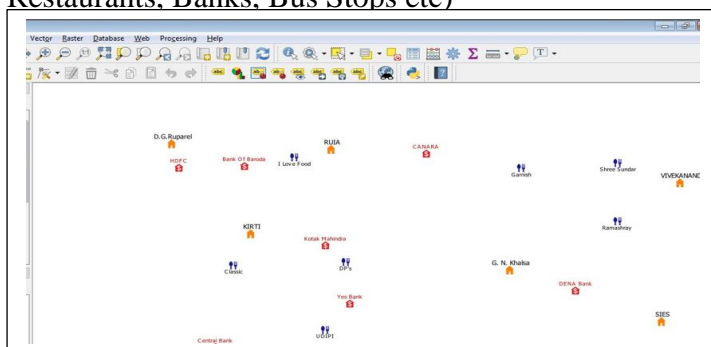


### Roads will look like these

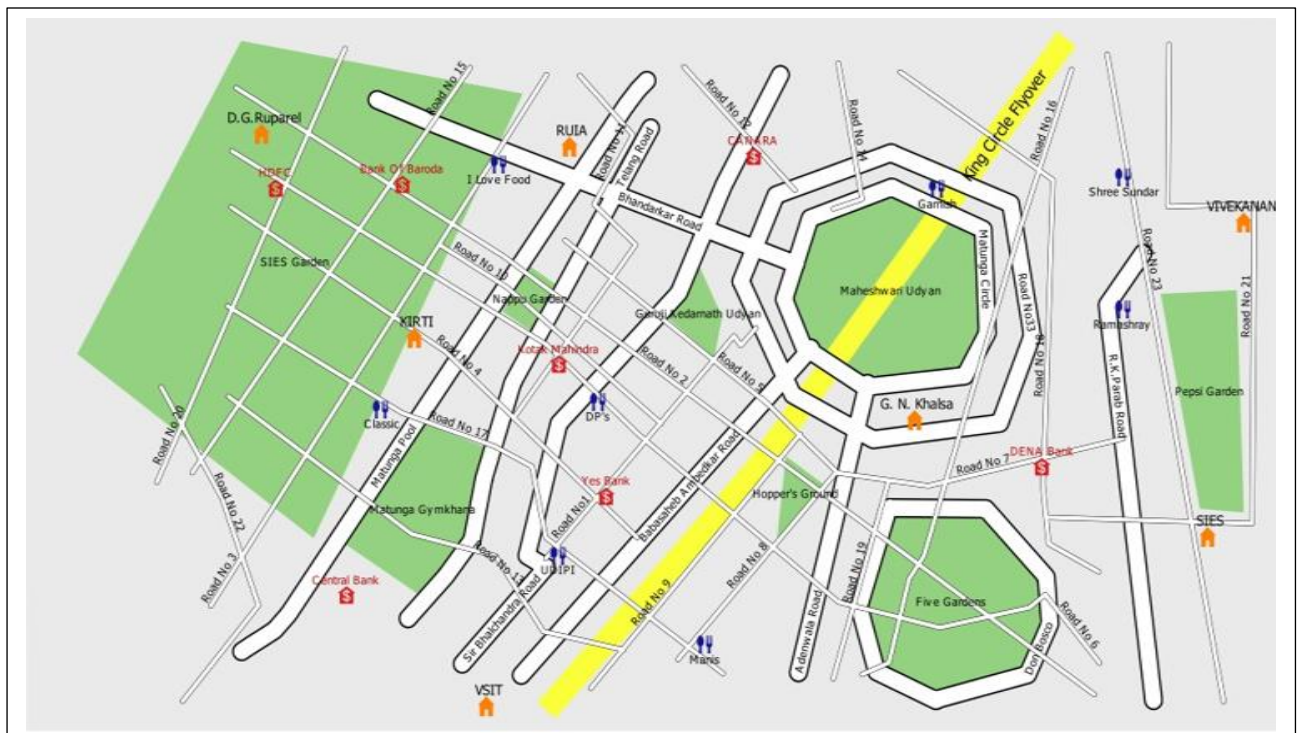


### Create Point vector layer

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



**Final output:**

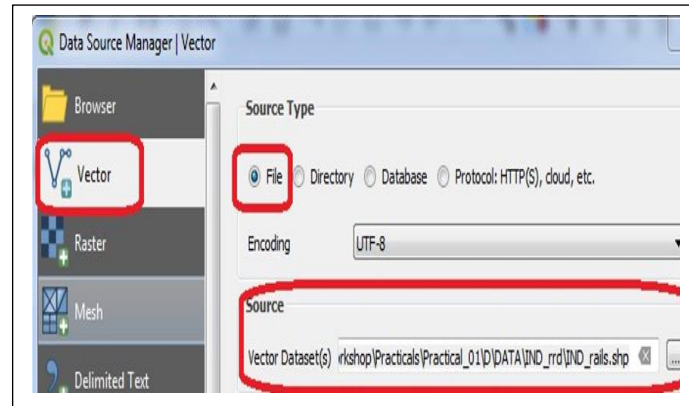


Calculating line lengths and statistics

Go to Layer > Add Layer > Add Vector Layer

Add the following file to project

"\\GIS\_Workshop\\Practicals\\Practical\_01\\D\\  
DATA\\IND\_rrd\\IND\_rails.shp" Press "ADD"

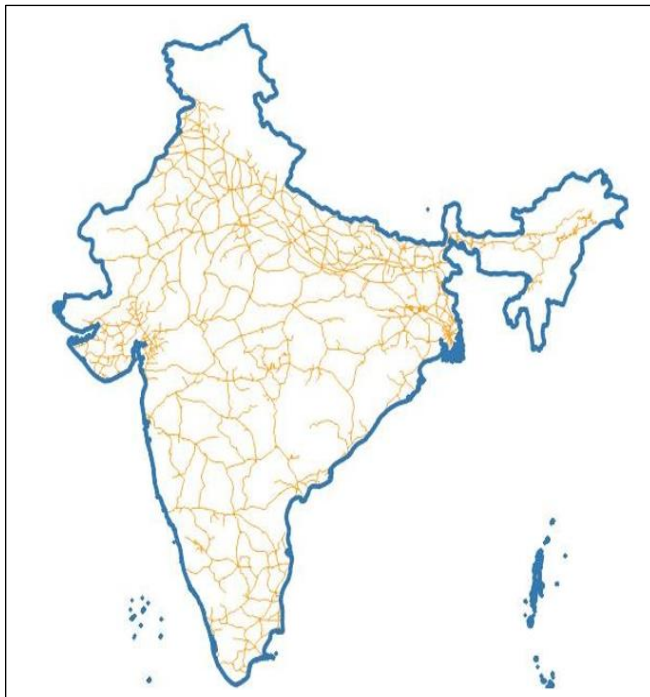


Also add India Administrative Map

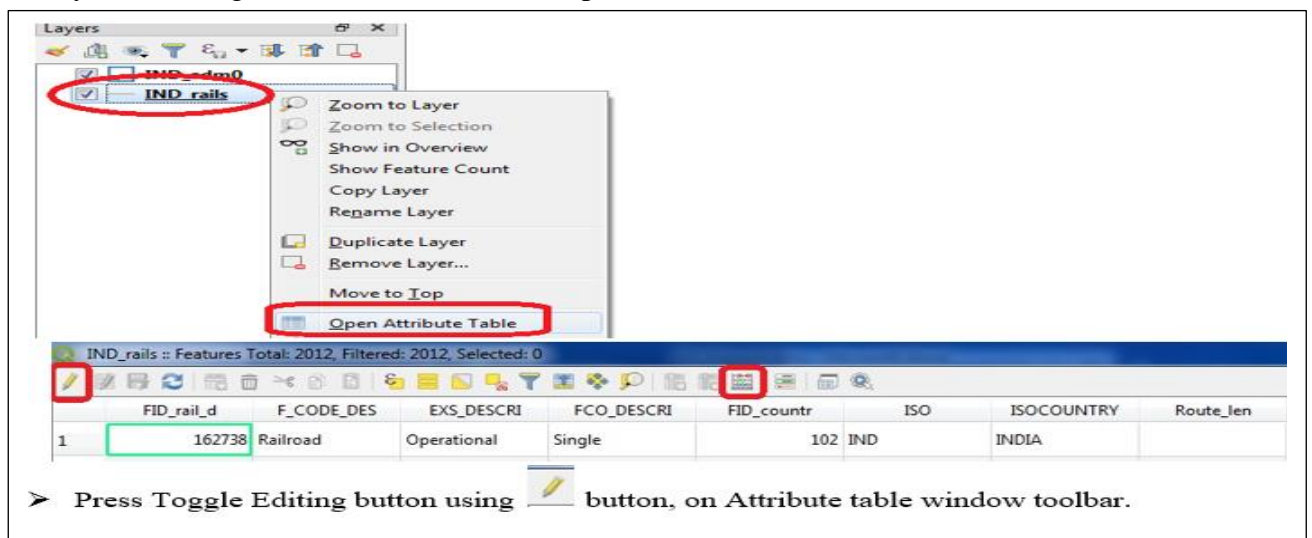
"\\GIS\_Workshop\\Practicals\\Practical\_01\\D\\DATA\\IND\_adm\\IND\_adm0.shp"

Double Click on IND\_adm0


Use symbology to give outline to the file




In Layer Pane, Right click on IND\_rails □ Open Attribute Table



FID_rail_d	F_CODE_DES	EXS_DESCRI	FCO_DESCRI	FID_countr	ISO	ISOCOUNTRY	Route_len
1	162738	Railroad	Operational	Single	102	IND	INDIA

➤ Press Toggle Editing button using  button, on Attribute table window toolbar.

- Press Open Field Calculator using  button.
- Set the output field as “Track\_Len”, field type to “Decimal Number”.

☒ Create a new field

☐ Create virtual field

Output field name: Track\_Len

Output field type: Decimal number (real)

Output field length: 10 Precision: 2

Expression    Function Editor

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

Expression    Function Editor

= + - / \* ^ || ( ) √

Search...

- row\_number
- Aggregates
- Arrays
- Color
- Conditionals
- Conversions
- Date and Time
- Fields and Values
- Fuzzy Matching
- General
- Geometry**
- Map Layers
- Maps
- Math
- Operators
- Rasters
- Record and Attributes
- String
- Variables
- Recent (fieldcalc)

Output preview:

- Set expression as

Expression    Function Editor

= + - / \* ^ || ( ) √

\$length / 1000

Press “OK”

- A new column is added to the attribute table with value representing the length of track in KM.

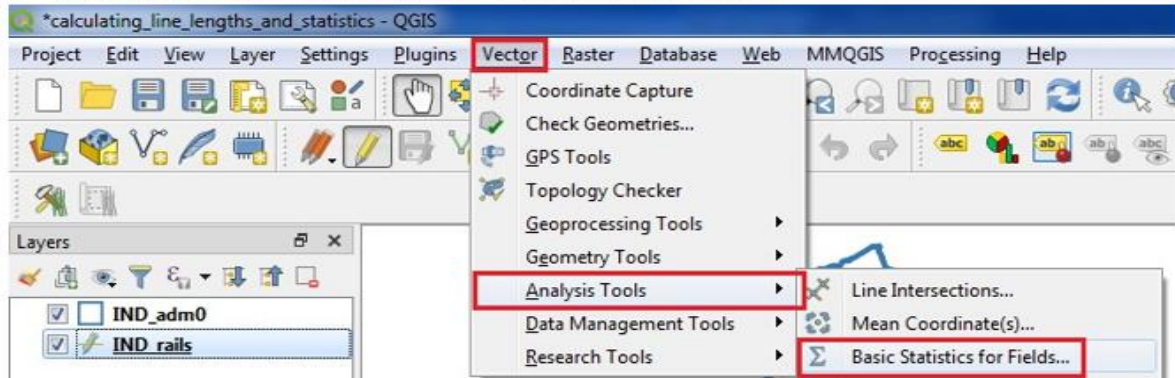
Press CTRL+S or click on Save Edits option on tool bar

tr	ISO	ISOCOUNTRY	Track_Len
102	IND	INDIA	29.01
102	IND	INDIA	66.13
102	IND	INDIA	2.33
102	IND	INDIA	63.81
102	IND	INDIA	92.71
102	IND	INDIA	22.24

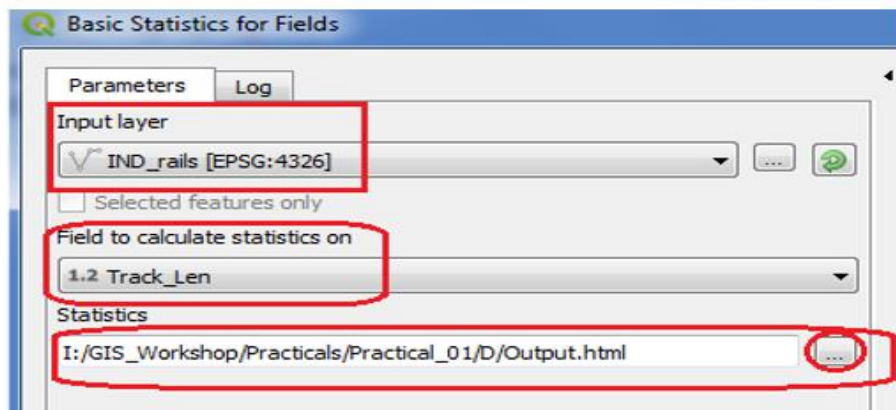
IND\_rails :: Features Total

123 FID\_rail\_d = €

- 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

Output :

- 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**

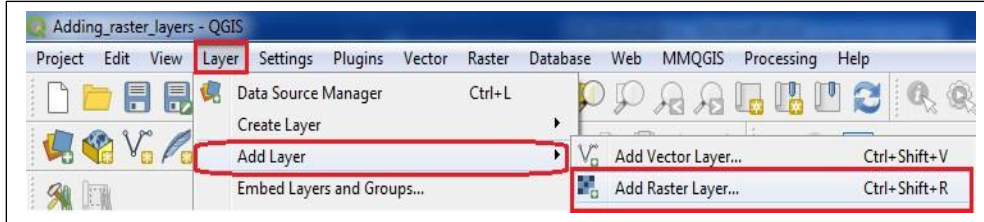


## PRACTICAL - 3

### Exploring and Managing Raster data:

#### a) Adding raster layers

- From menu bar select Layer ☐ Add Layer ☐ Add Raster Layer



- Select Gridded Population of the World (GPW) v3 dataset from Columbia University, Population Density Grid for the entire globe in ASCII format and for the year 1990 and 2000.

“\GIS\_Workshop\Practicals\Practical\_02\A\Data\gl\_gpwv3\_pdens\_90\_ascii\_one\glds90ag60.asc”

“\GIS\_Workshop\Practicals\Practical\_02\A\Data\gl\_gpwv3\_pdens\_90\_ascii\_one\glds00ag60.asc”

- Go to Project ☐ Properties OR Press the option on bottom right corner.

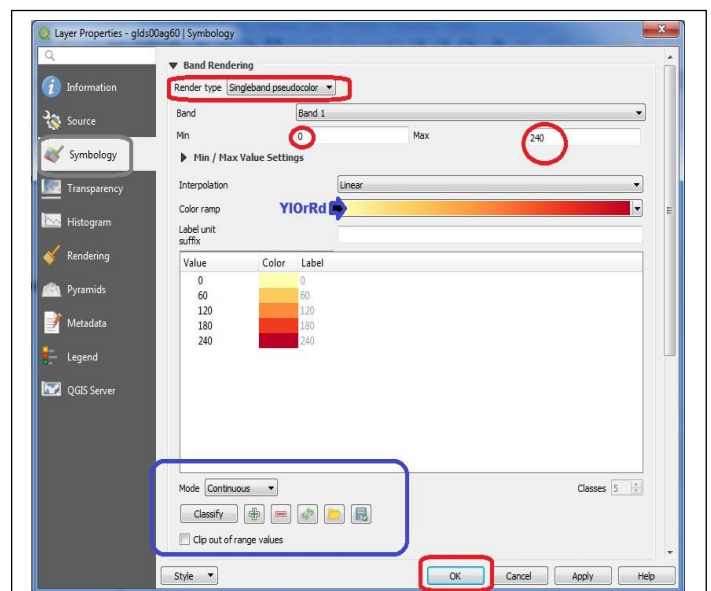
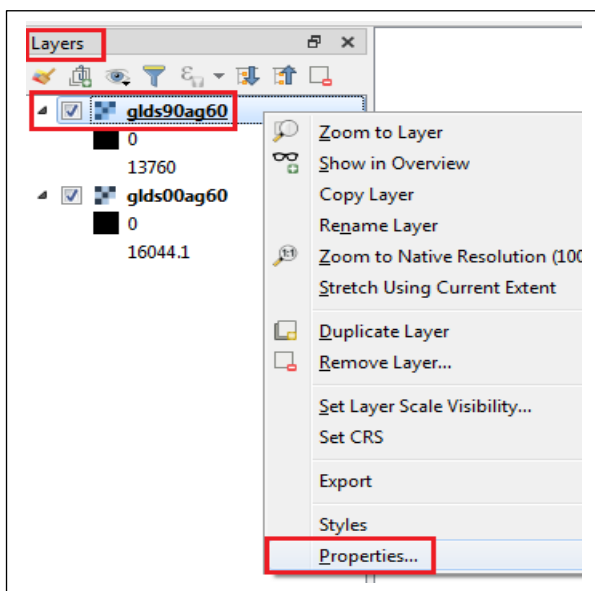
Select WGS 84 EPSG: 4326 and Press OK



Set CRS

#### 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



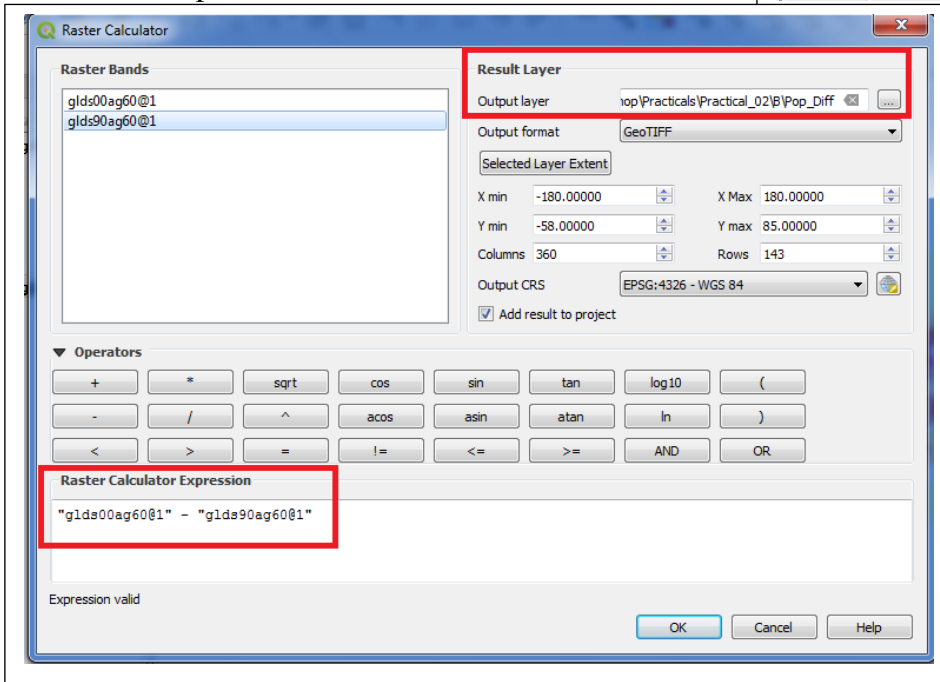
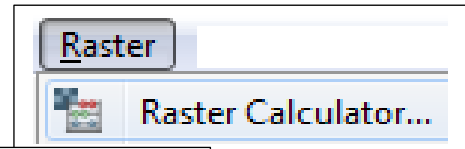
Layer output after applying style.

The objective this experiment is to analyze raster data, as an example we will find areas with largest population change between 1990 and 2000, by calculating the difference between each pixel values.

Go to Raster > Raster Calculator

>Put the expression "glds00ag60@1" - "glds90ag60@1"

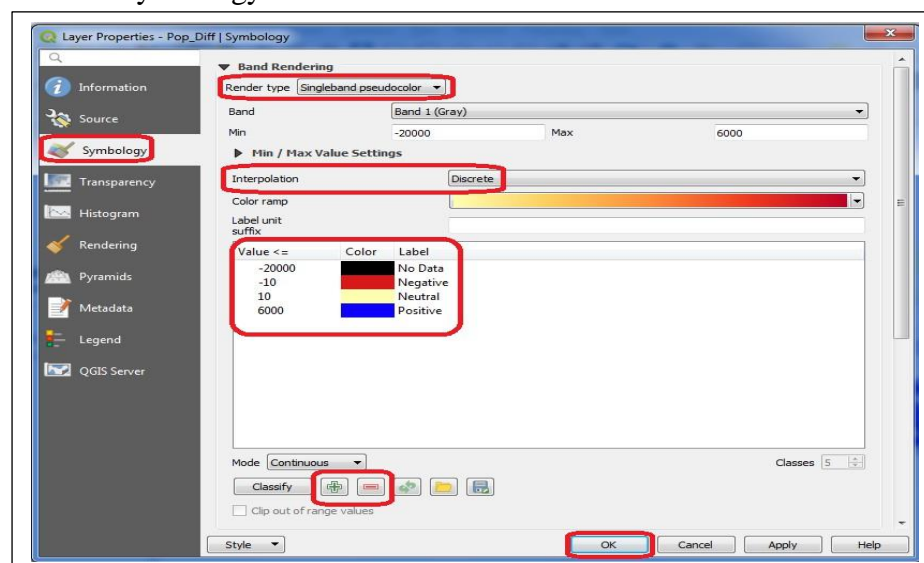
>Select the output file location & name and Press OK.



remove the other two layers i.e. glds00ag60.asc and glds90ag60.asc

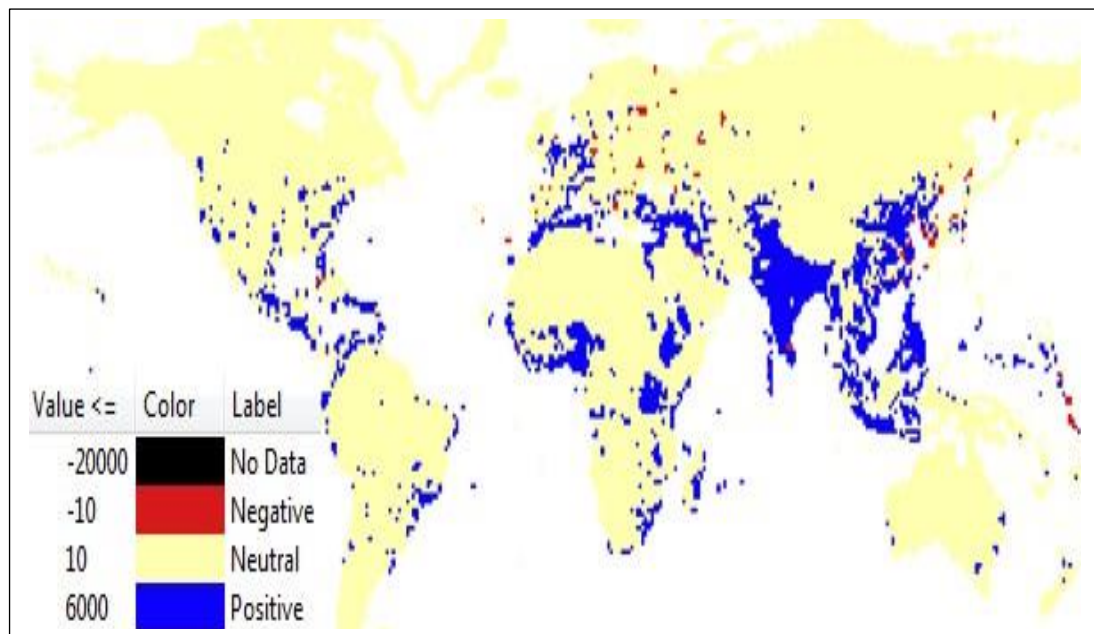
> Double click on pop\_diff layer.

> Select Symbology



>Set Render Type to "Single band Pseudo color", Interpolation as Discrete, and remove all classification and add as shown in figure above using button. After all settings press "OK".

>Layer will appear like



### c) Raster Mosaicking and Clipping

A **mosaic** is a combination or merge of two or more images.

In GIS, a single raster dataset can be created from multiple raster datasets by mosaicking them together.

Go to Layer ☐ Add Layer ☐ Add Raster Layer

- Select the following “.tif” raster images for India from data folder.

FAS\_India1.2018349.terra.367.2km.tif

FAS\_India2.2018349.terra.367.2km.tif

FAS\_India3.2018349.terra.367.2km.tif

FAS\_India4.2018349.terra.367.2km.tif

> Press open

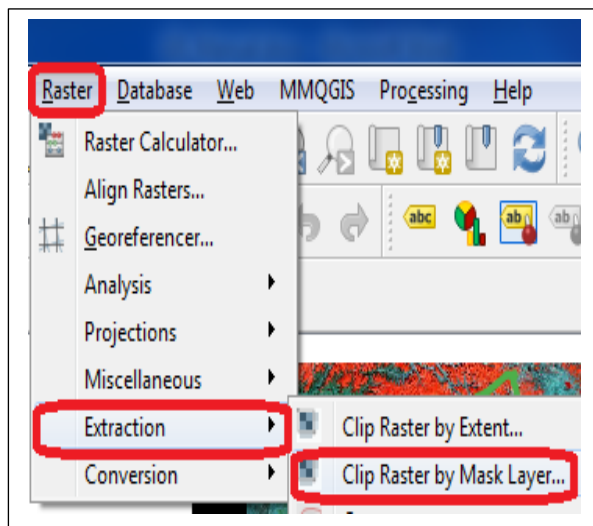
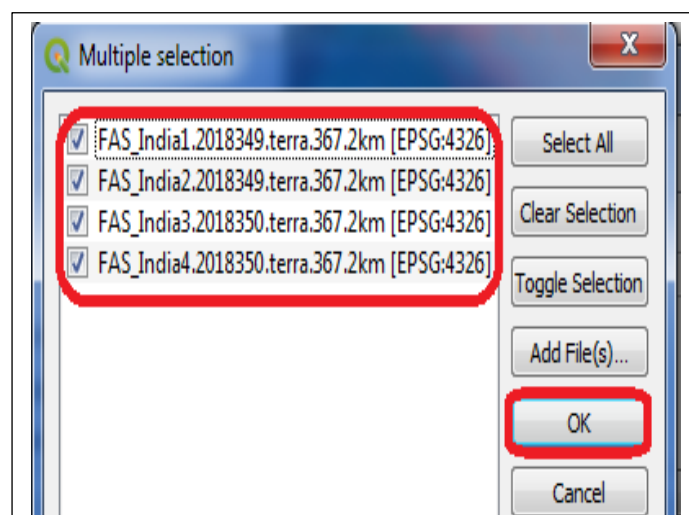
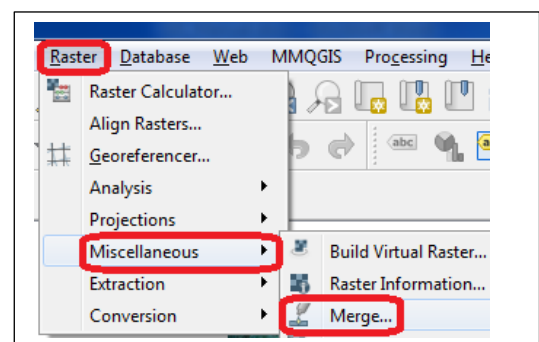
> In data source manager >Raster window click Add.

> Go to Raster ☐ Miscellaneous ☐ Merge

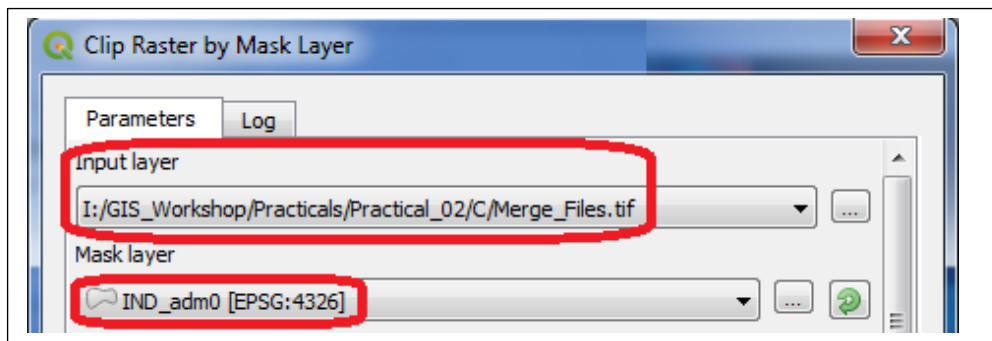
> In the Merge dialog window

> Select all layers and Press OK.

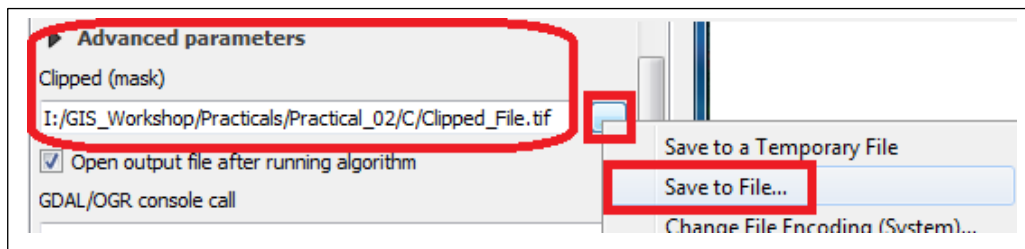
> Raster → Extraction → Clip Raster by Mask Layer



- Select the merge raster image as input and Ind\_adm0 as mask layer



- Select a file name and location for clipped raster as Practical\_02/C/Clipped\_File.tif.



- Press RUN.

