An Introduction to

GIS and Remote Sensing

Practical Manual

Practical One:
Spatial data visualisation

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DAY 1: VISUALISING SPATIAL DATA IN A GIS

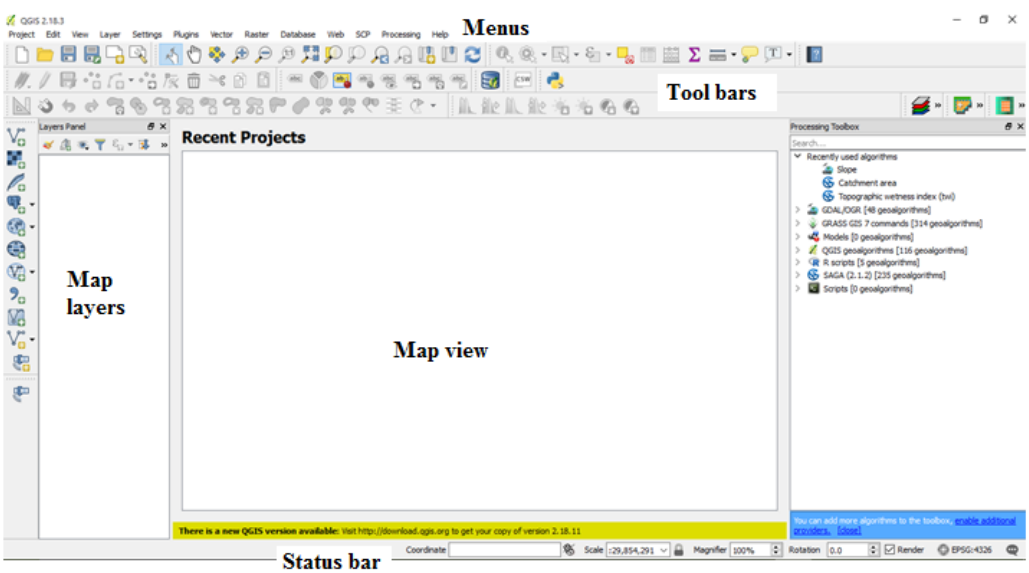
This practical will expose you to geographic layers of different data type.

The Quantum Geographic Information System.

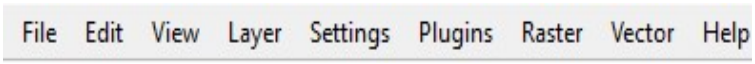
In this exercise you will familiarize yourself with the Quantum GIS (QGIS) Graphic User Interface (GUI).

Start Quantum GIS (QGIS) by double-clicking on the Desktop Icon. 

In the QGIS main GUI look at the various menus and toolbars.

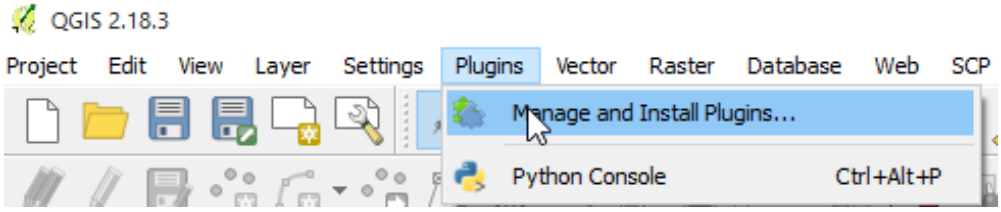


At the top of the QGIS window is the *Menu bar*.

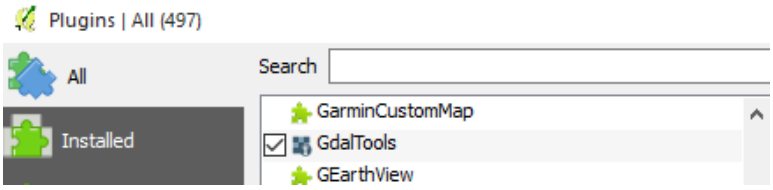


Below the *Menu bar* are the *toolbars* with different icons.

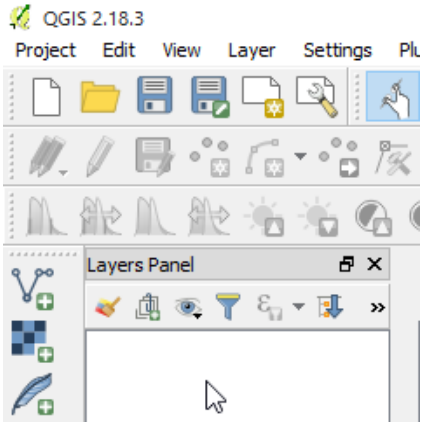
The number of tools available can be managed with the *QGIS Plugin Manager* by ticking and un-ticking the plugin.



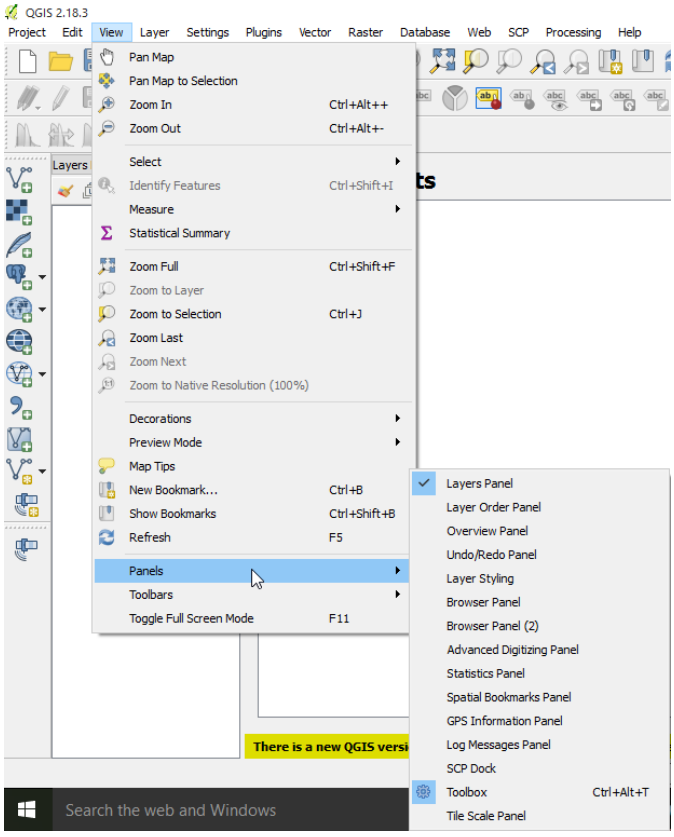
Now make sure you have the **GdalTools** plugin enabled.



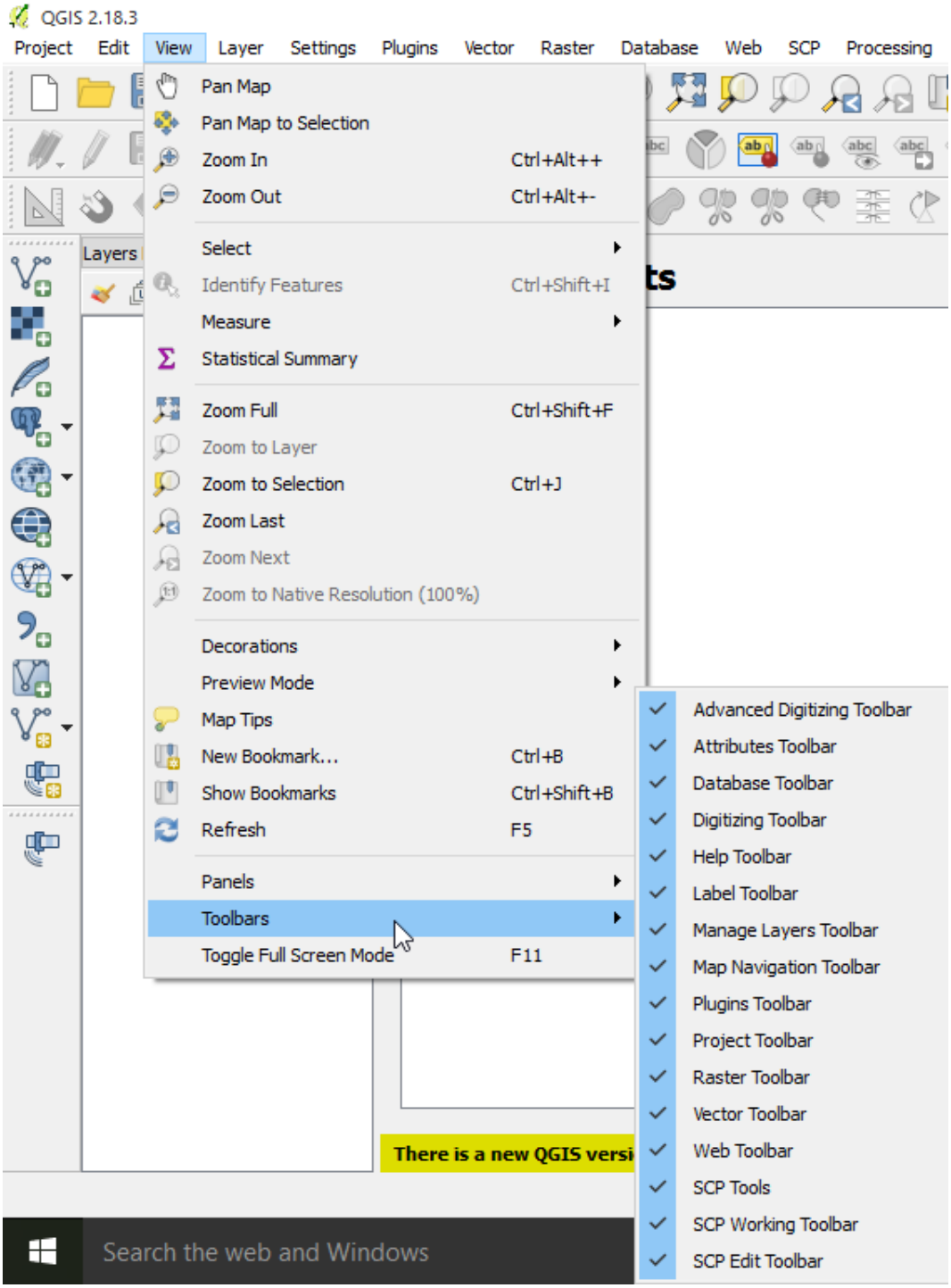
The Panels on the left part of the QGIS window, e.g. the *Layers* panel shows all layers loaded into the QGIS. When activated these will be displayed in the map view.



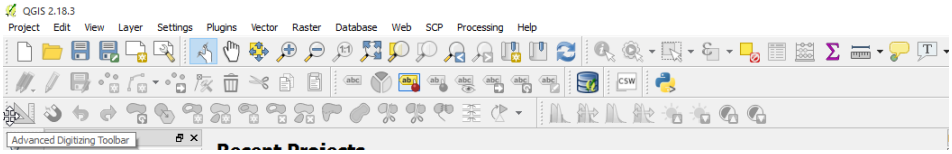
Panels and *Toolbars* can be (de)activated under the *View* menu.



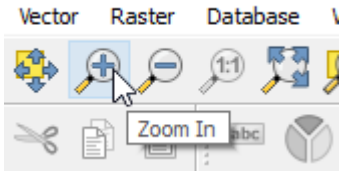
Make sure you have the *Attributes* and *Map Navigation Toolbars* activated.



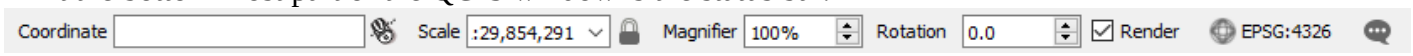
You will see them in the *Toolbar* of the QGIS Window.



If you hover your mouse curser over the tool a description of the tool will be shown. Please find out what this tool  does?



At the bottom most part of the QGIS window is the status bar.

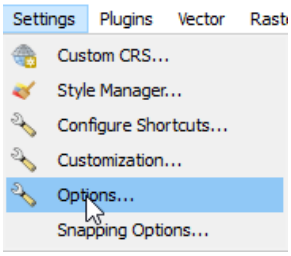


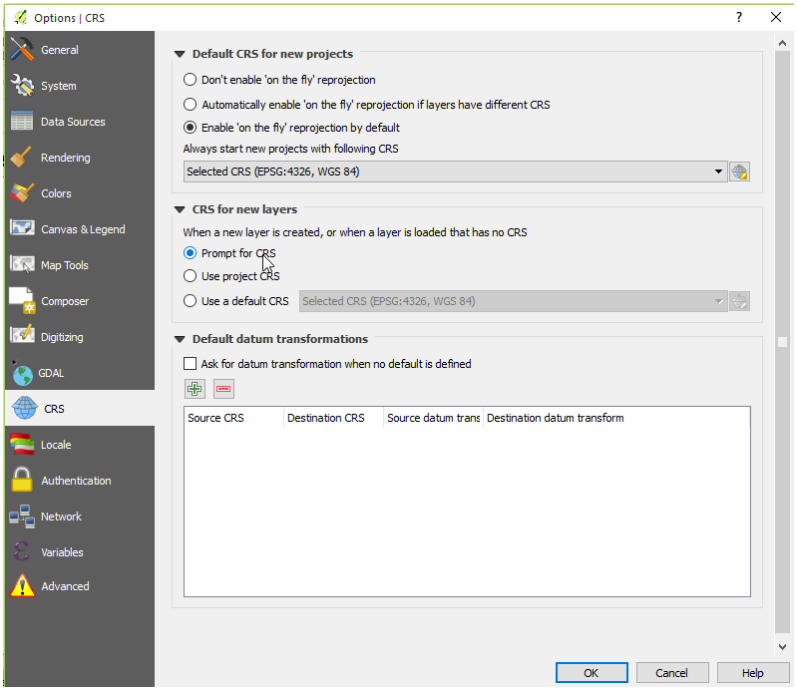
These are the major components of the Graphic User Interface of QGIS.

QGIS Settings.

In this exercise you will set the QGIS *Options* and *Project Properties*.

The *Options* dialog box allows you to select some basic options for QGIS.

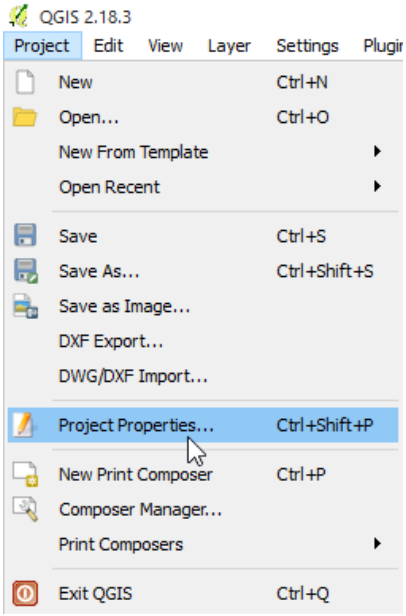


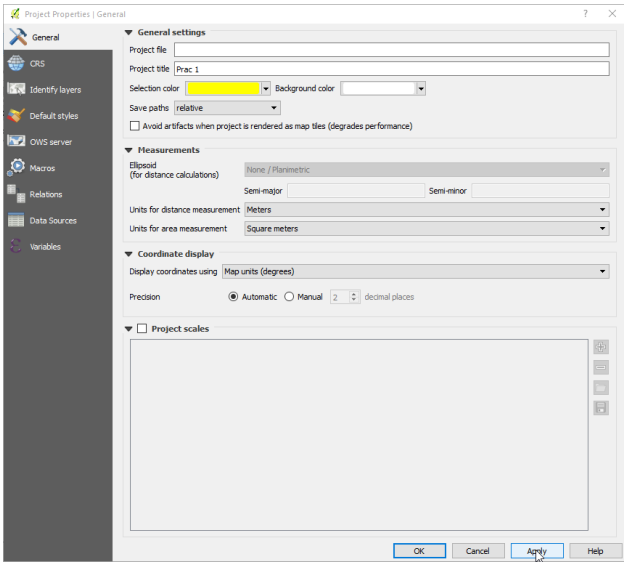


The *Project Properties* dialog allows you to set properties related to the project. A Project is a saved set of layers and their settings, as well as other information required to restore the project from disk.

Choose the *Settings>Options* menu to set the Coordinate Reference System (CRS) options to *Prompt for CRS,* when a new layer is created or when a new layer is loaded that has no Coordinate Reference System. Click *OK.*

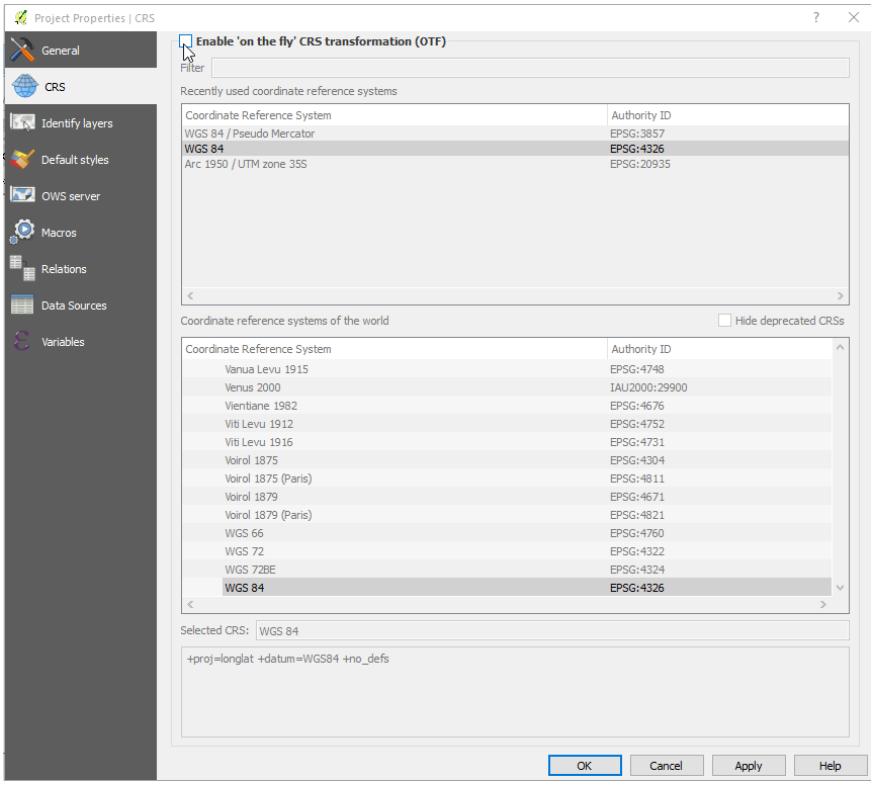
Now specify the project properties by clicking on *Project* and then selecting *Project Properties*





A properties window will appear on your screen. Select the *General Tab*. Type in a *Project Title*, e.g. **Day1.**
Later you can come back here to select the Map Units to be used -- this does depend on the coordinate system that is in use.

Now click on the *Coordinate Reference System (CRS) Tab* and tick on *Enable on the fly CRS transformation.* And click *OK.*



Visualize Geographic Data

Now follow the instructions and visualize the following geographic data in QGIS:

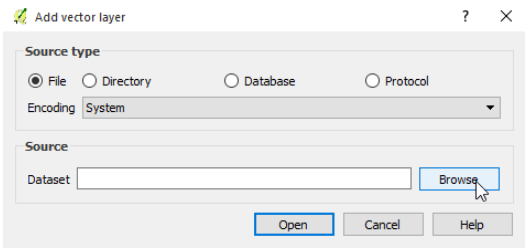
- **Airports.shp** point layer
- **Main_Roads.shp** Vector (line)
- **KZN_Vegetation.shp** Polygon layer
- **KZN_municipalities.shp** Polygon layer
- **DEM.tif**

Vector data provide a way to represent real world features within the Geographic Information System (GIS) environment. A feature is anything you can see on the landscape. Imagine you are flying in a plane and you look outside through the window. Looking down will see houses, roads, trees, rivers, etc. Each one of these things would be a feature when we represent them in a GIS. Vector features have attributes, which consist of text or numerical information that describe the features. These come in three different types. They can be **points, lines or polygons**.

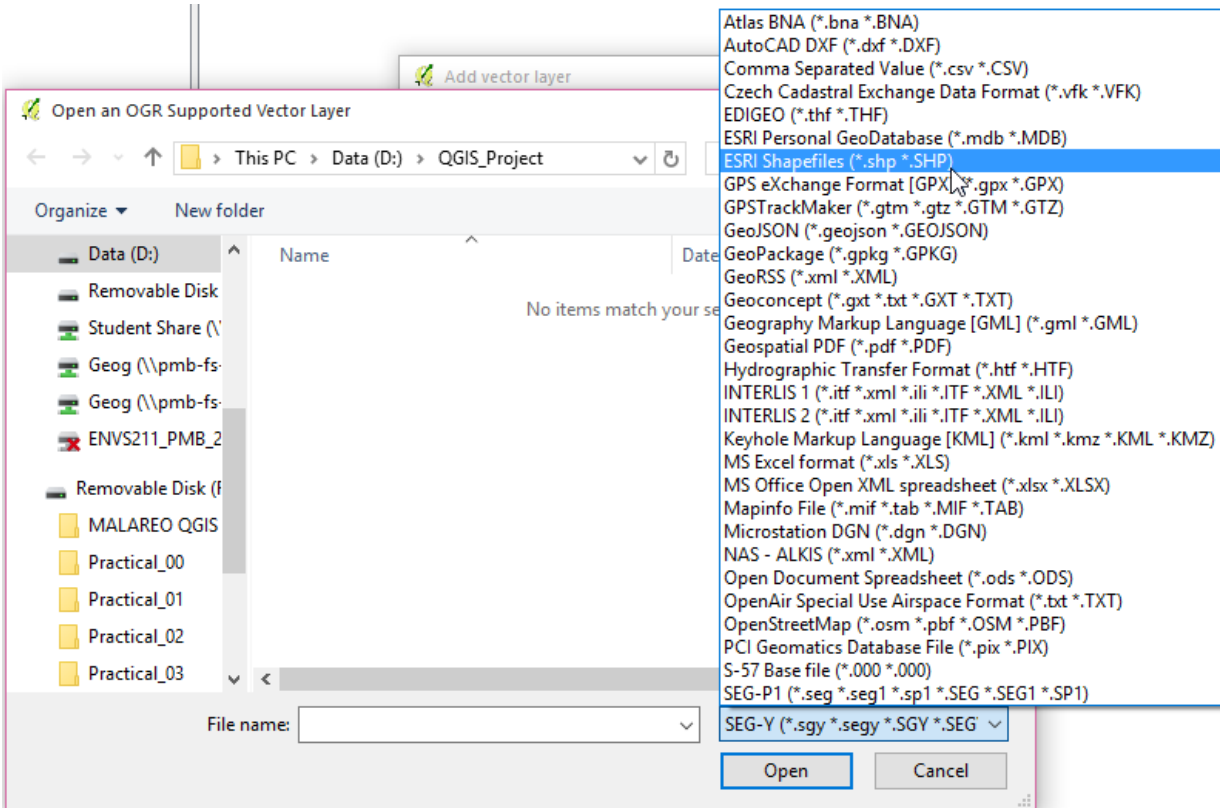
Task: Visualize Points

In the *Menu bar* click on the *Layer* drop down menu, select *Add Layer> Add Vector Layer*

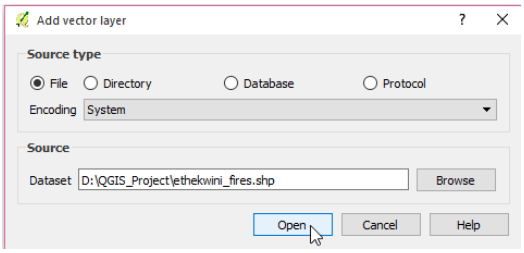
An A*dd vector layer* window will appear on your screen. In the *source type* box leave the default and in the *source* box click on *Browse* and navigate to the data folder e.g. C:\Local authorities training. Click on browse



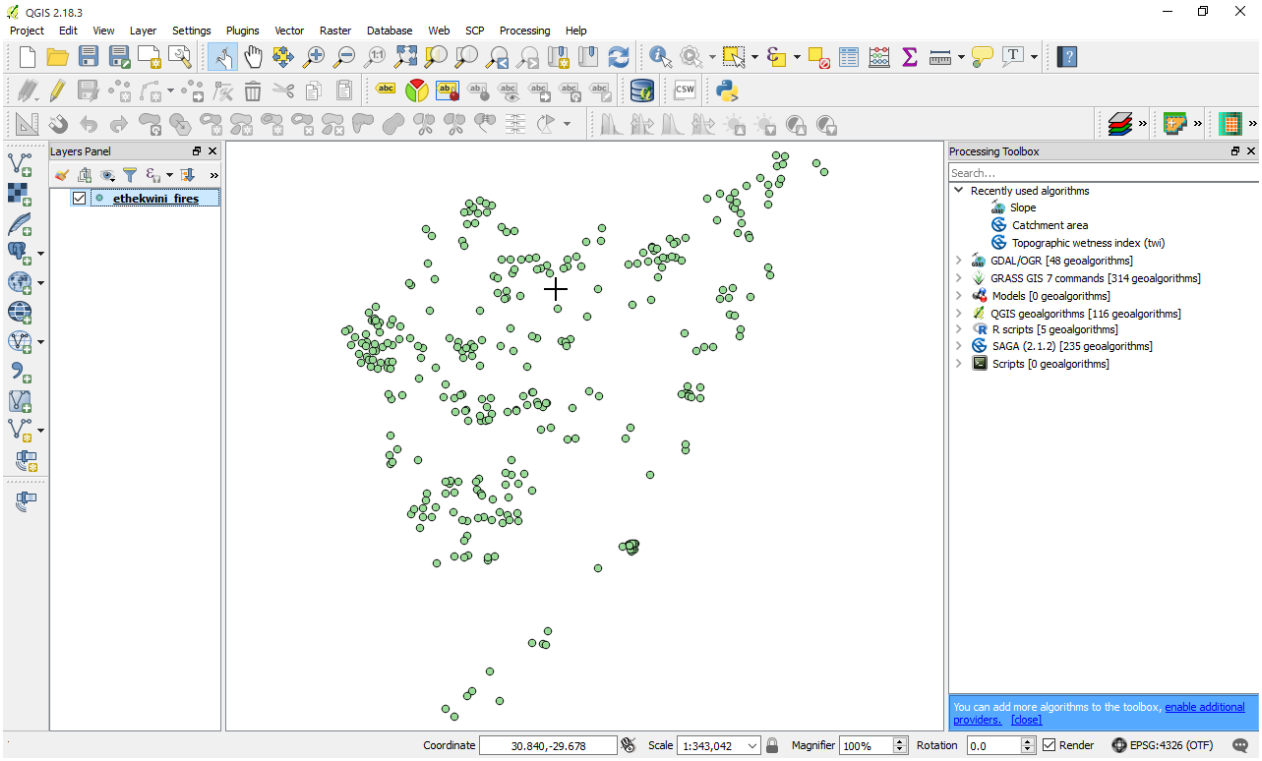
The following navigation dialogue box will pop up. Navigate to the folder **QGIS_Project** in the logical drive **D**. There might be many different files in different formats in the data folder, but you can select only the relevant type of files. In this case the data are **ESRI Shapefiles** with a file extension **.shp**.



Select the point map ethekwini_fires.shp.

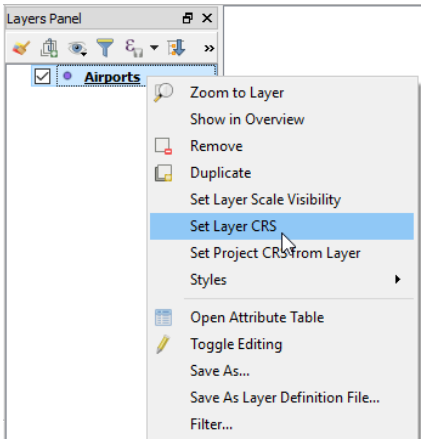


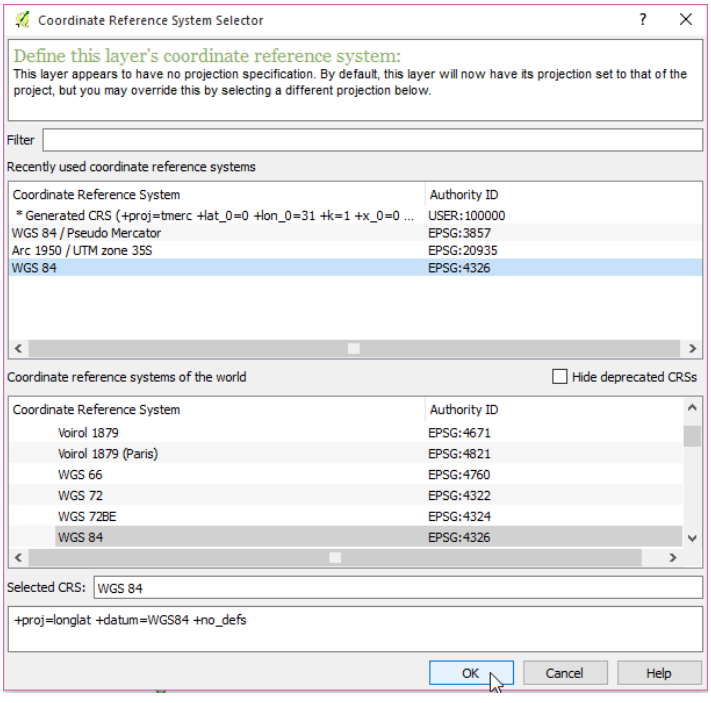
A point map will appear in the Map view or Graphic User Interface (GUI). This is a layer showing the places where there were fires in the province of KwaZulu-Natal.



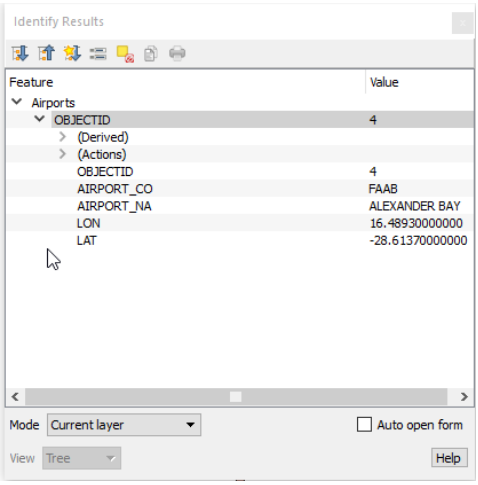
To check the coordinate system of the ethekwini_fires, ***right click*** on the layer ethekwini_fires on the ***layers panel***. Then navigate to **Set layer to CRS**.

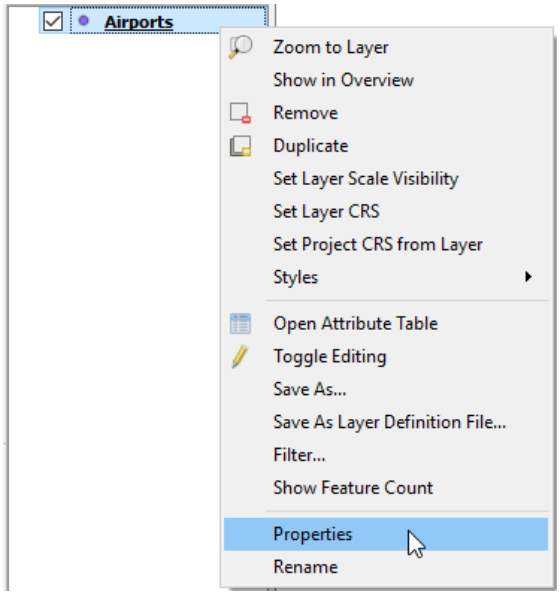
In the *Coordinate Reference System Selector* make sure that **WGS84 is s**elect and click *OK* as shown below.





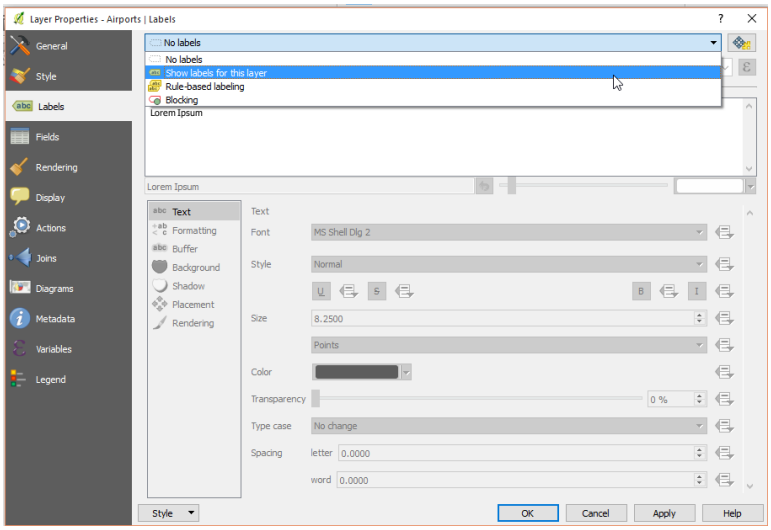
Use the Identify Features tool to click on the points and see their attributes.



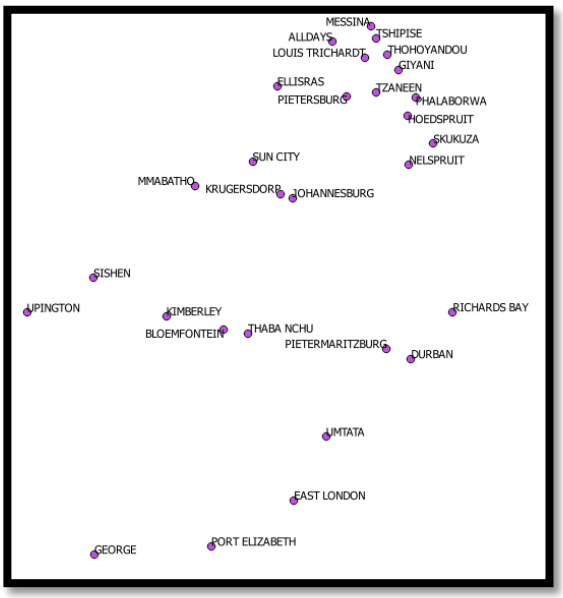


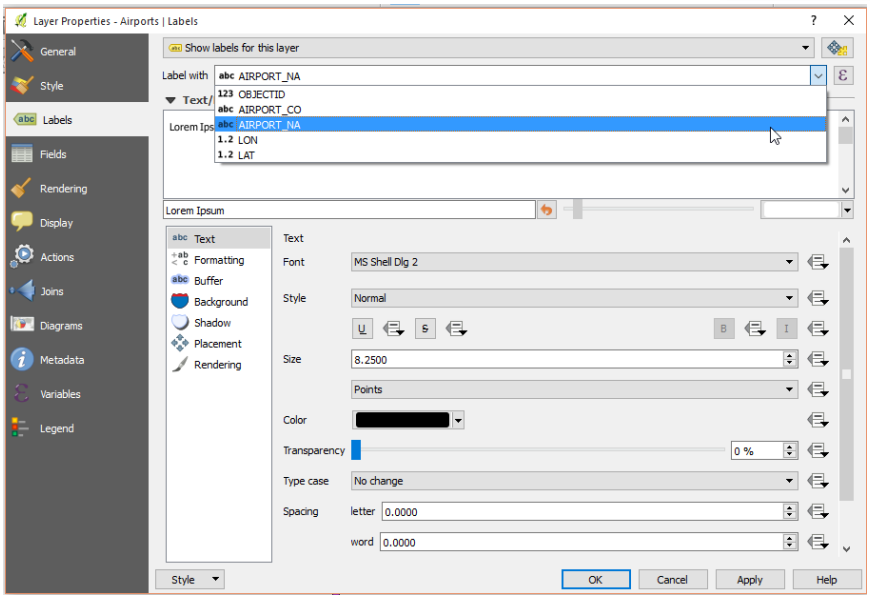
In order to label points in a view, go to *Layer Properties* by right-clicking on the **schools** layer and selecting *Properties.*

In the Layer properties window, activate the Label this layer with menu by ticking on it as shown below. Then select the Sch_Name option from the dropdown menu. You can choose fonts and placement options of your choice and click Apply and/or OK.

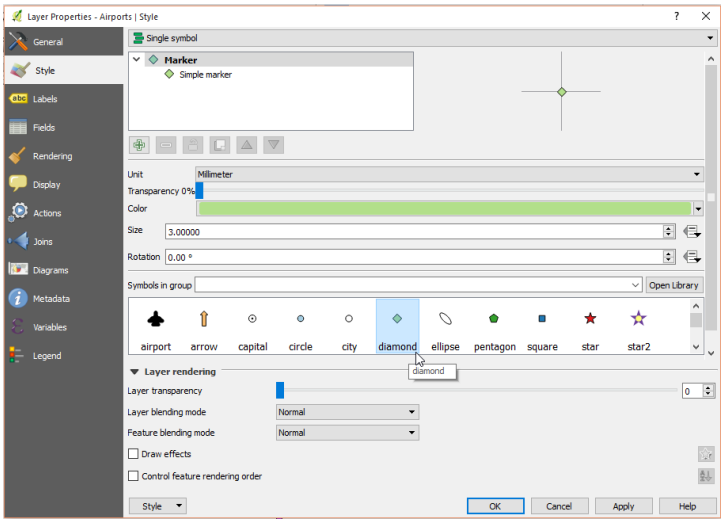


Label the airports with the feild **AIRPORT_NA**

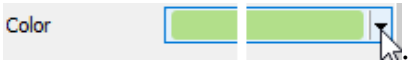




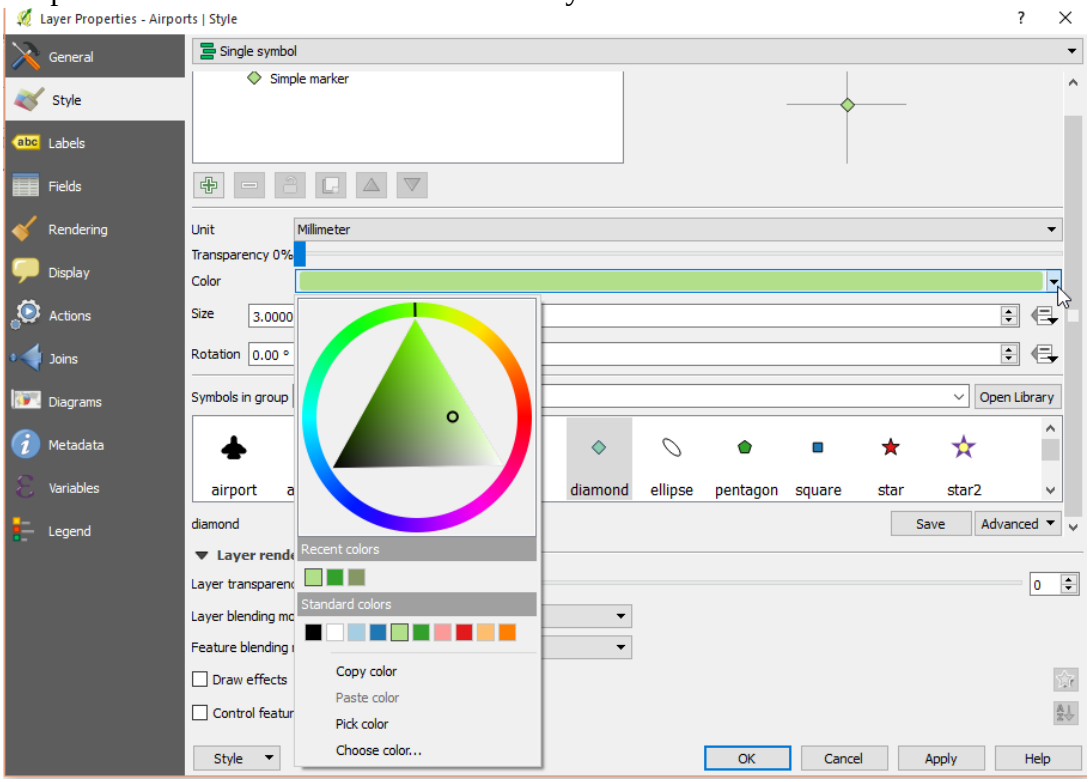
Look at the map now with the labelled points. Now you can change the symbols of the point map. To do this open the *Layer Properties* dialogue box and click on the *Styles* tab.



In the *Styles tab*, you can change point marker type by selecting the *Marker* shape by clicking on it. To finish editing maker, click on *Apply* and then *OK*.

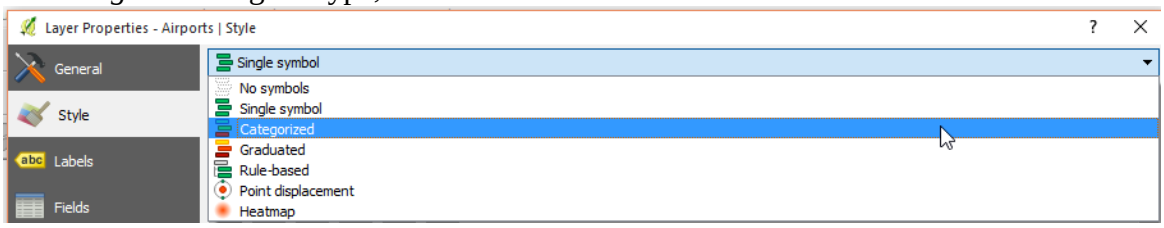
You can go on to change the colour of the markers. 

. Click the drop down menu and click on *Pick color* if your desired colour is not in the standard color array.

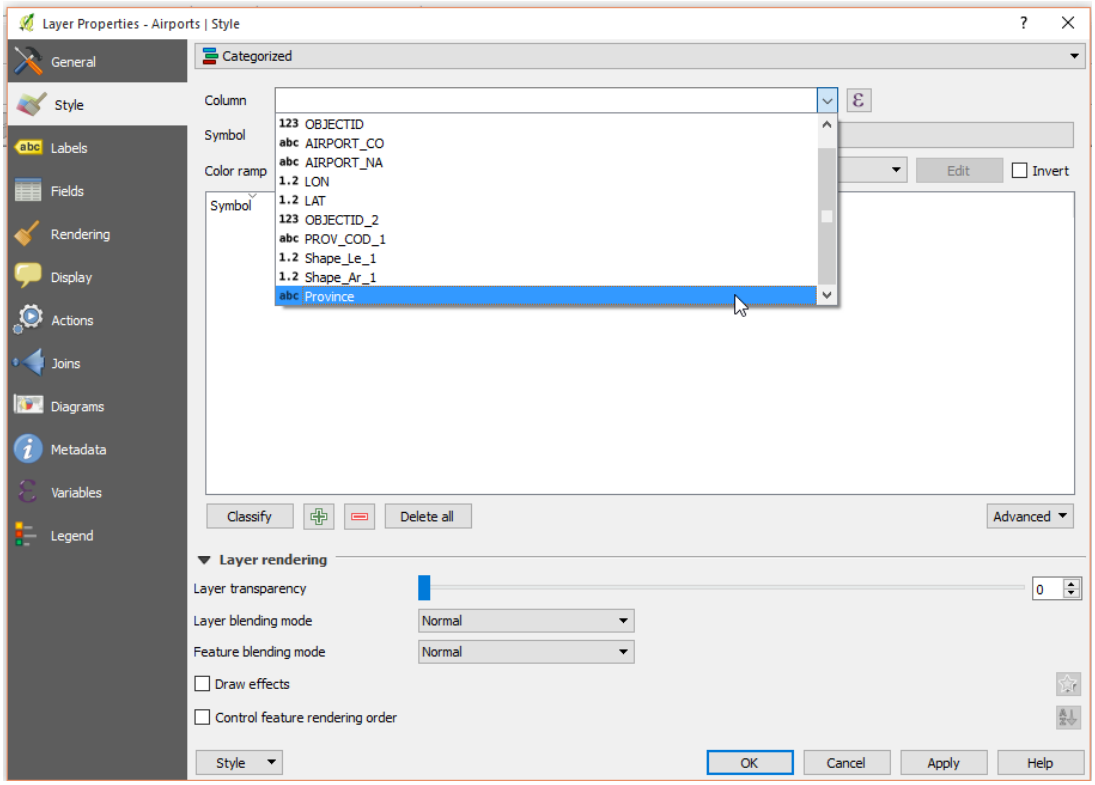


To see the effect of your changes to the markers click on *Apply* in the *Layer Properties* dialogue and look at point maps.

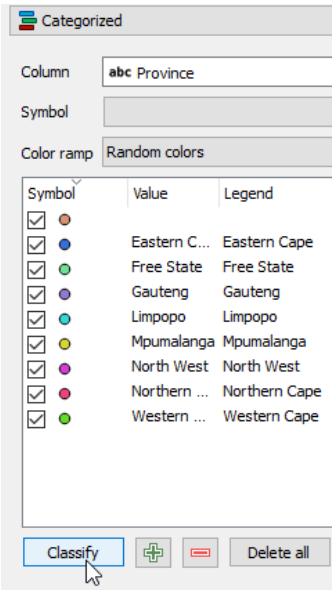
To change the markers of the points such that each point is *Categorised* according to the province where the Airport is located and displayed with a different symbol in the map, select the *Categorized* Legend type,



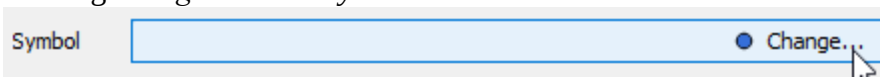
then choose an appropriate color from the *Color Ramp*, then you select the *Attribute Column* to use for the categories,



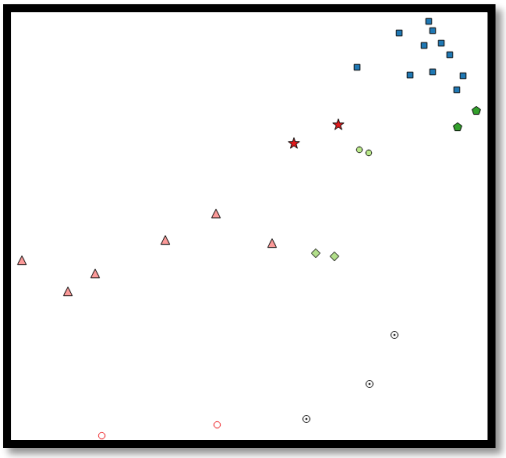
Click on *Classify* then click on *Apply* and lastly *OK*.

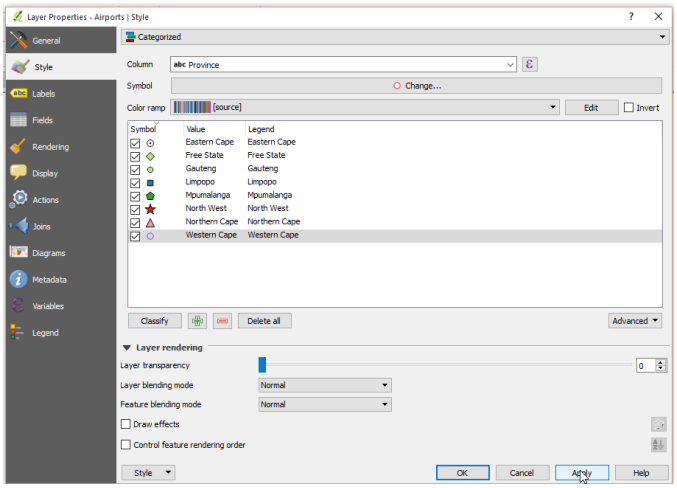


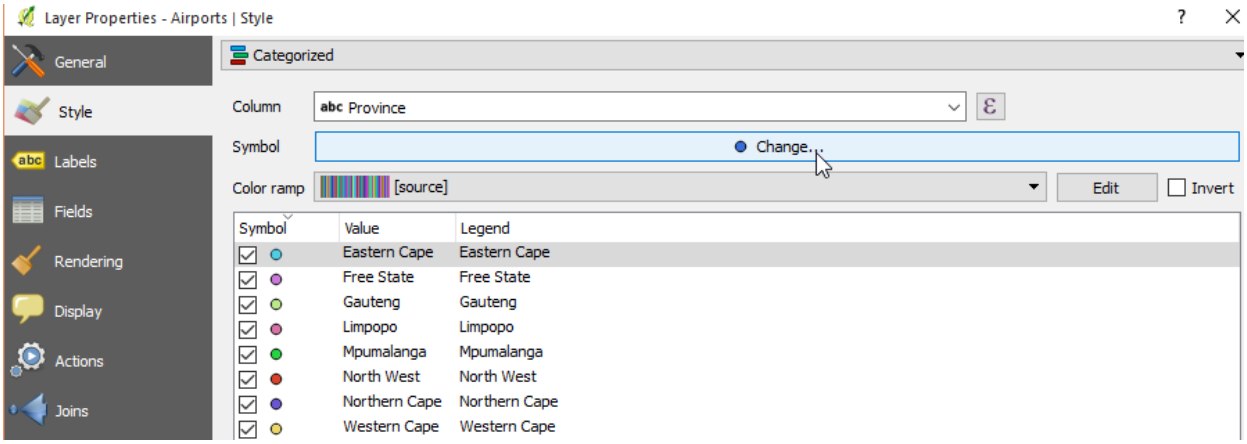
The Airports of different provinces (categories) appear in the styles dialogue box. Their symbols can now be individually changed by 1) clicking *change…* in the *Symbol Selector*



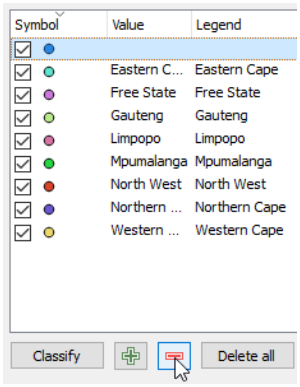
Or by symbol **double-clicking** on each symbol and as aforementioned.





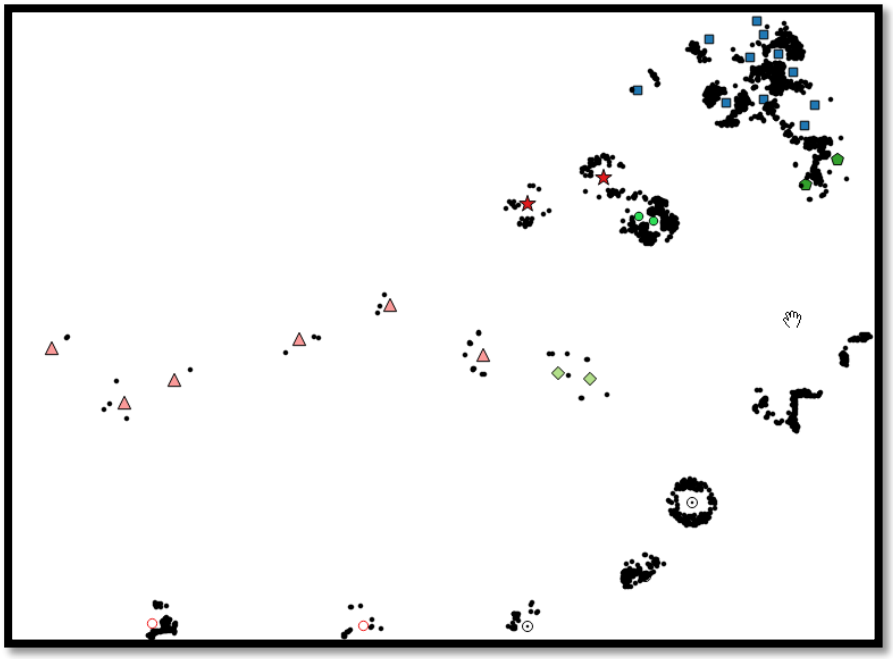


Note that the first Symbol does not belong to any province hence it has to be removed by highlighting it and clicking on delete 



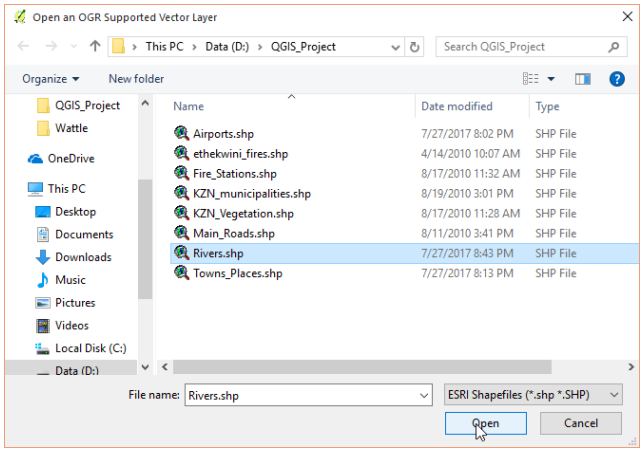
Also use different *Symbol layer types* to find a symbol marker that best symbolizes the features represented by the point. *Apply* the changes to the symbology, and look at them in the map to see the effect of your changes to the markers.

Now add the vector layer named **Towns_Places.shp.** And look the distribution of the towns and other places close to the Airports in each province. Make sure that you specify the coordinate system reference to *WGS 84* on the pop-up Coordinate System Reference Selector dialogue box. Now you can also set the colours and shapes of the points.

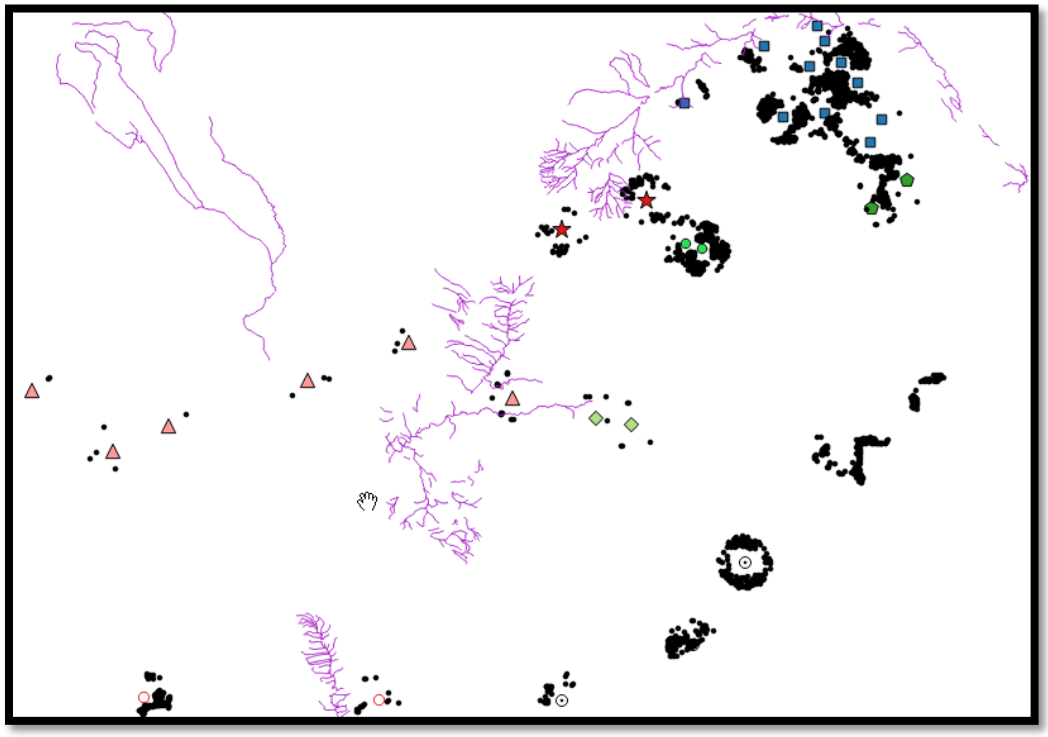


Task: Visualize Segments

To open a segment (line) layer click on *Layer>Add Layer > Add Vector Layer* and *browse* to the data folder and select the segment layer named **Rivers.shp** which shows the rivers in the two. Click *open*.

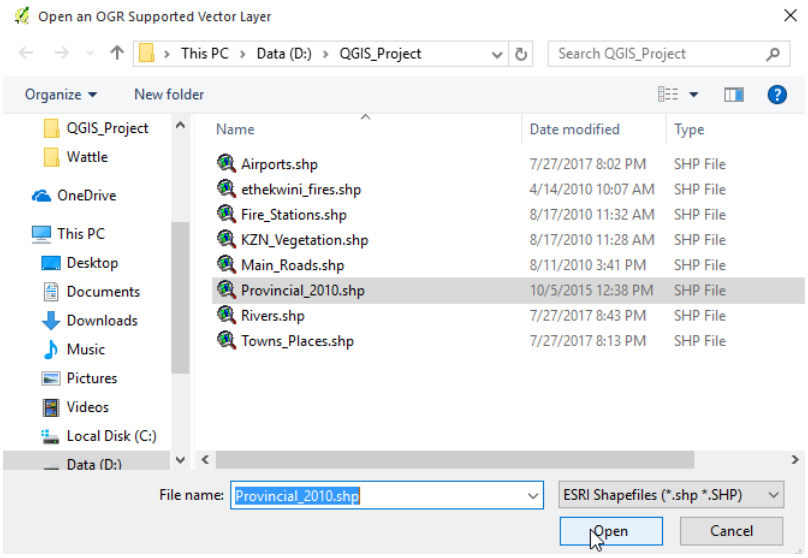


The rivers in the area will appear in the map window. Make sure you edit the color of rivers to be the conventional blue.

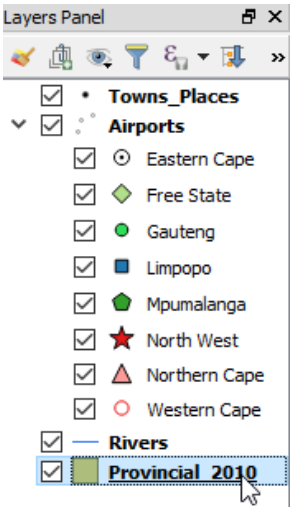


Task: Visualize Polygons

Now add a polygon layer named **Provincial_2010.shp** in WGS 84 CRS. To open a polygon layer click on *Layer>Add Layer > Add Vector Layer* in the working directory select the layer **Provincial_2010.shp.**



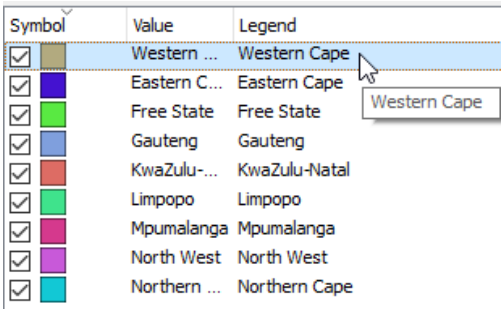
Make sure the polygon layer is at the bottom of the layer-stack, so that it does not hide the other layers in the map.



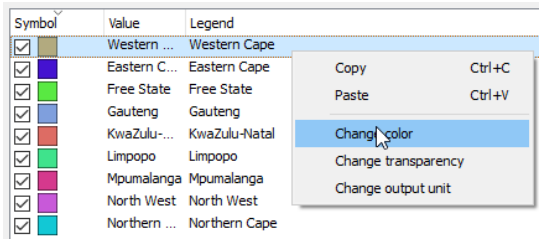
Provinces can also be presented in categories (different colors). To do that, go to the *layers panel* and click on *Provincial_2010.shp > Properties>Style* and change from *Single Symbol* to *Categorized.*

Meanwhile on *Style> Column* select ***PROVNAME.*** Then after click on *Classify.* Then click to *highlight the* item which does not have a name  and delete  it.

Now, you can change the order of the layers by dragging/dragging them using the mouse to the required position.

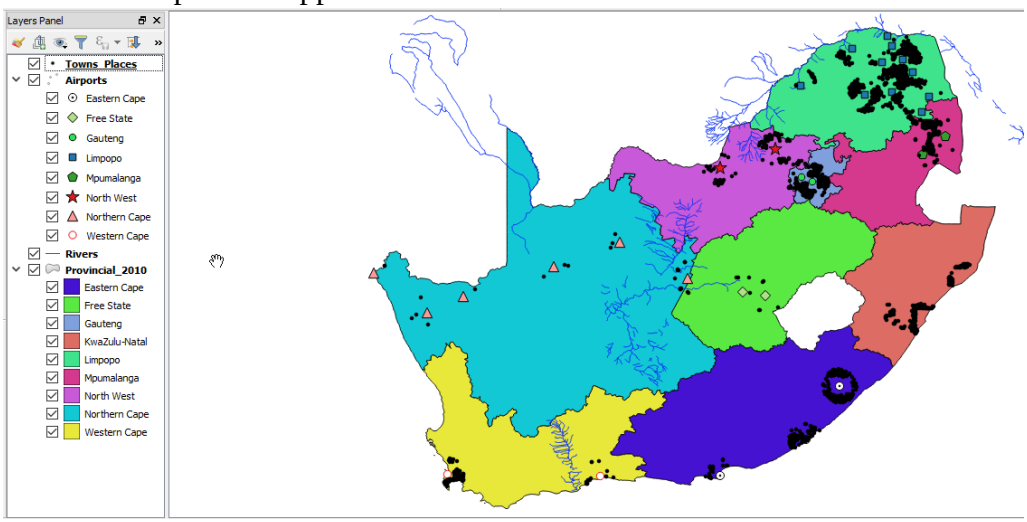


Their colors of Province (Polygon) can also be individually changed by right-clicking.



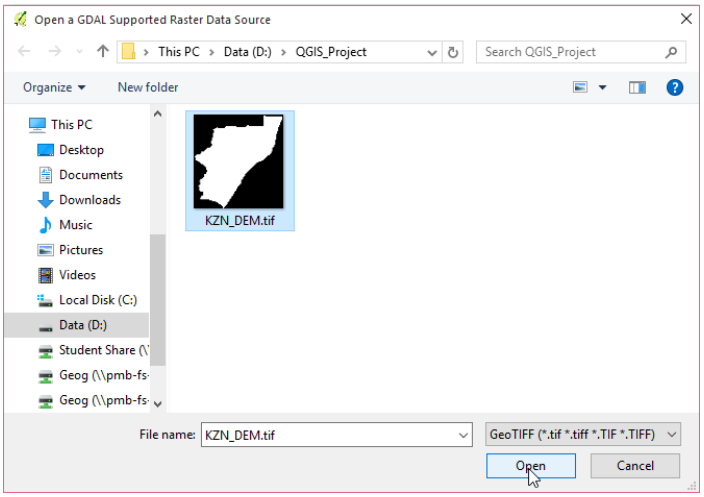
Then after click on *Apply> Ok.*

The Final map would appear almost as shown below.

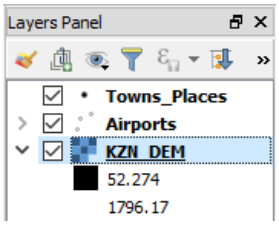


Task: Visualize a Raster layer

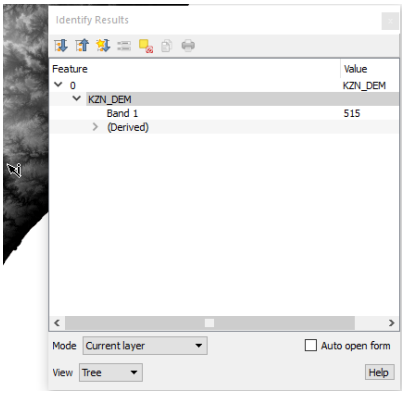
On the main window, click on add raster layer icon  to add a raster layer on to the view. Browse to your working directory and select the file called **KZN_DEM.tif**, a GeoTiff file format and click *open*.

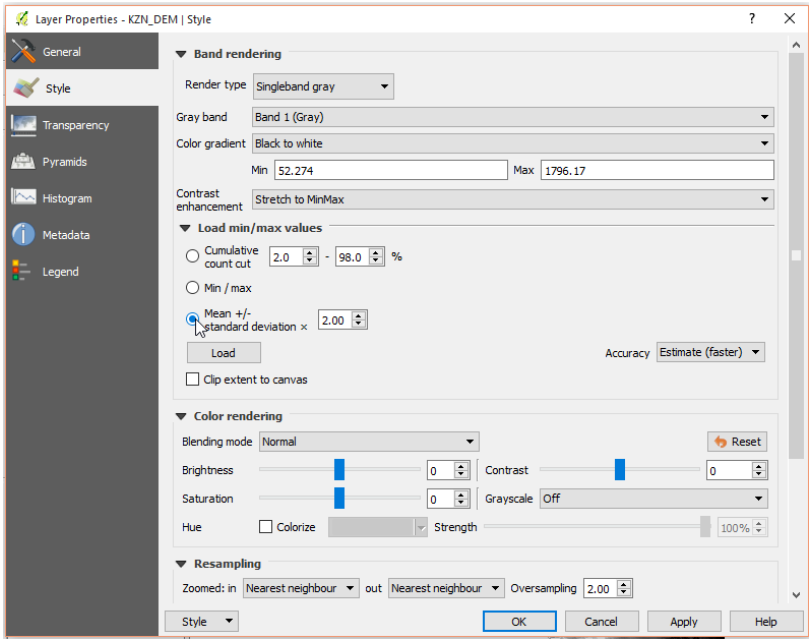


A Digital Elevation Model (DEM) of the KwaZulu Natal will appear in the map canvas. The DEM shows the height above sea level.

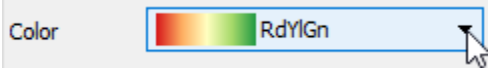


To identify the height at any location, select the **dem** in the *Layers* panel and use the *Identify features* tool  to click on the map. The height above sea level at that point will be displayed.



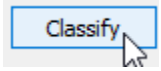


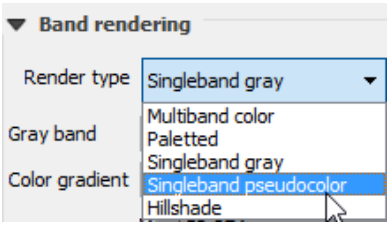
Go to the *Layer Properties* window of the **dem** layer and to the *style* tab, to change the way the DEM is displayed in the map. Now tick the *Use Standard Deviation* and apply to see how different stretches effect the ability to distinguish the elevation ranges.

Select Singleband pseudocolor for Render type
Now in the generate Color map from the drop down menu by selecting any combination you would like to display your dem in 

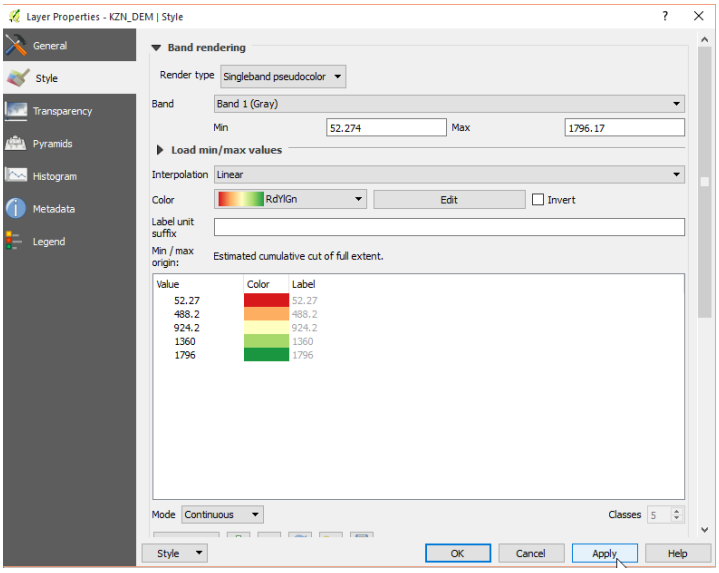
Then click click on *classify.* You can increase the number of classes by clicking on the mode drop down menu and selecting the option *equal intervals* and in the *classes,* select the number of classes that you want to present the data in and when you are done, Click *Classify*

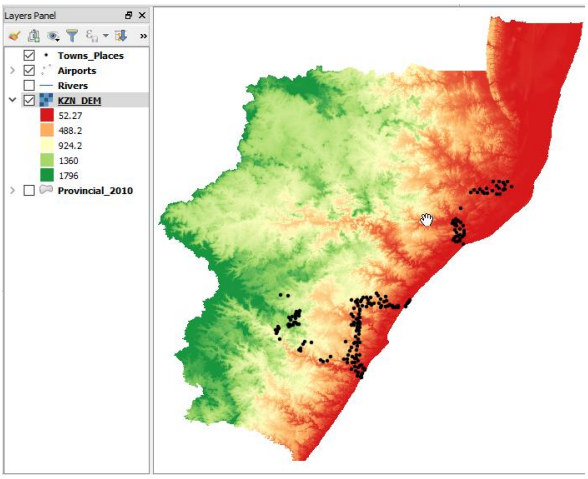
.





Then *Click apply* and *OK.* Then the DEM will be displayed.





Exit QGIS