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DEVELOPMENT OF A TRAINING PROGRAM FOR ENHANCING THE USE OF ICT TOOLS IN THE IMPLEMENTATION OF PRECISION AGRICULTURE

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Training package 2

Practical activity. Introduction to QGIS

Student guidelines

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1 Objective

The aim of this practical activity is to learn about the use of the QGIS software. In this practice you will learn to work with the QGIS software and different type of data.

2 Guidelines

These guidelines were prepared using the material available at QGIS Documentation (<https://www.qgis.org/en/docs/index.html>) and the database from the Openstreetmap (<https://www.openstreetmap.org/>).

Before starting this practice, QGIS software must be installed on the computer. To install the QGIS follow the instructions provided in the following video: <https://youtu.be/7aK1nT7iBlc>. Also you can find it in your training directory (Download and Install QGIS 3.4 On Windows 10.mp4).

The screenshots showed during this practice, were taken in QGIS 3.4.15 running on Windows. Depending on your setup, the screenshots you encounter may well appear somewhat different. However, all the same buttons will still be available, and the instructions will work on any Windows.

3 QGIS user Interface (GUI)

To start to know the QGIS program, the first step we will do is to open the program. To do this:

1. Open QGIS by clicking on the desktop icon or go to Start> Programs> QGIS Desktop 3.4.15.
2. The default QGIS interface user will appear.

The default QGIS user interface is shown below (Figure 1). The numbers from 1 to 6 indicate the principal areas of the user interface.

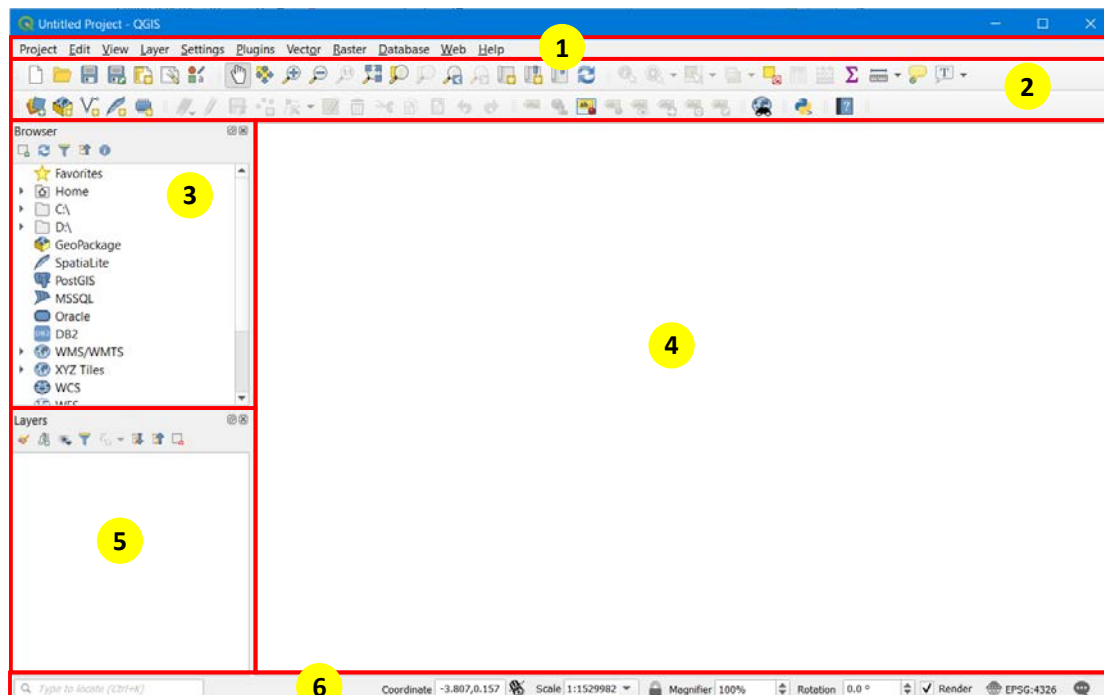


Figure 1: QGIS user interface (GUI)

The elements identified in the Figure 1 are:

- 1- Menu Toolbar
- 2- Toolbars
- 3- Browser Panel
- 4- Map canvas
- 5- Layers List
- 6- Status bar

Try to identify the interface elements showed in the Figure 1 in your screen. The following is a brief description of each of the elements showed.

Menu toolbar

This provides access to all QGIS functions in the conventional form - drop-down menus.

Toolbars

Menu functions are grouped into logical toolsets and placed as buttons in bars to provide handy access to all the necessary tools.

Browser panel

The Browser panel provides quick navigation and access to the various local, server, or online data sources. You can close or shrink a panel using special buttons in its top-right corner. You can also drag and drop it to a place handily. Panels can be turned on or off by going to View | Panels. Similarly, you can right-click anywhere on the upper bar of the workspace, and a window with toggles will pop up. This window is divided by a horizontal line and the panels toggles are located in its upper part.

Map canvas

This is the largest section of the interface window, and is designed for data map display and visual exploration.

Layer list

In the Layers list, you can see a list, at any time, of all the layers available to you.

Expanding collapsed items (by clicking the arrow or plus symbol beside them) will provide you with more information on the layer's current appearance.

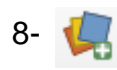
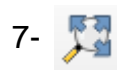
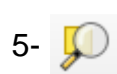
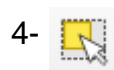
Right-clicking on a layer will give you a menu with lots of extra options. You will be using some of them before long.

Status bar

Shows you information about the current map. Also allows you to adjust the map scale and see the mouse cursor's coordinates on the map.


Exercise 1:

Try to identify the following tools in your screen and explain shortly the usage of each one of them.




4 Adding your first layer

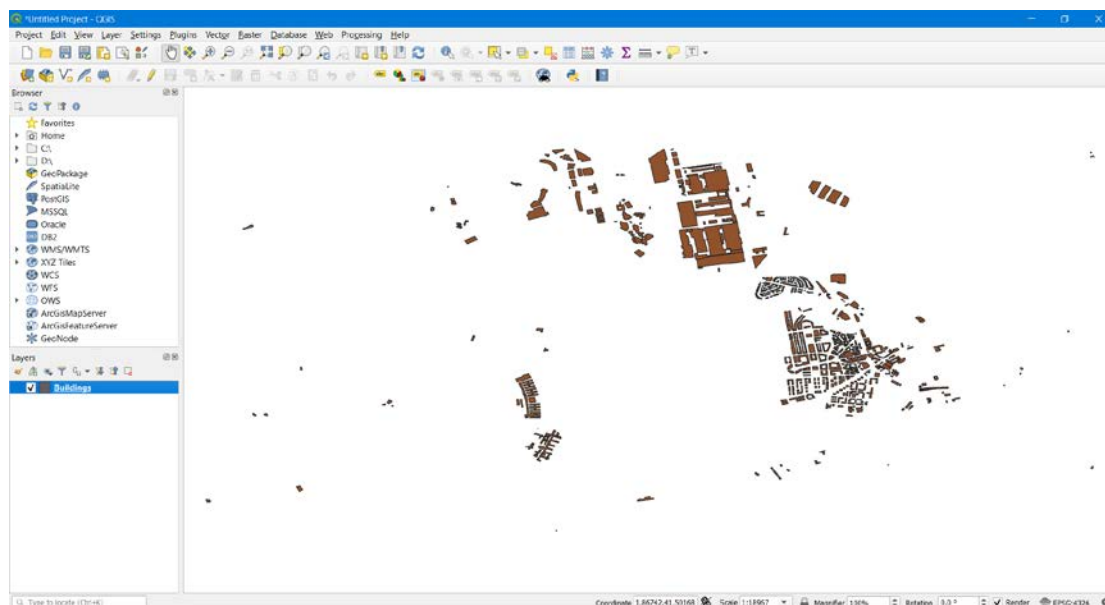
Open QGIS. You will have a new blank map.

The Data Source Manager dialog allows you to choose the data to load depending on the data type. We'll use it to load our dataset: click on the “Data Source Manager” button 


If you can't find the icon, check that the Data Source Manager toolbar is enabled in the View ▶ Toolbars menu.

Load the `Buildings.shp` vector dataset from your training directory. Follow the next steps to load the file in QGIS.

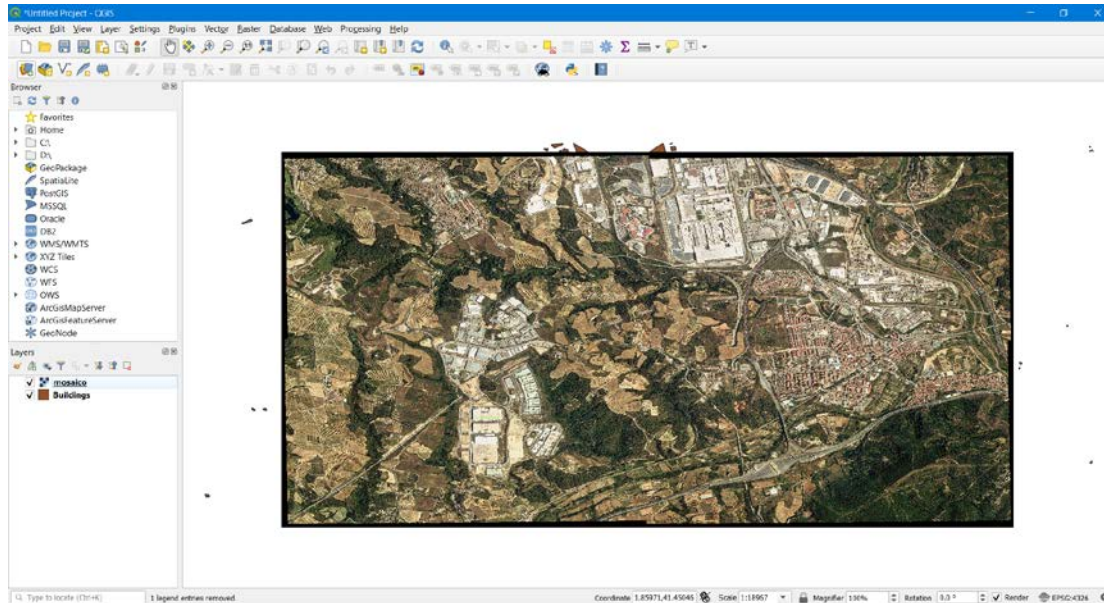
1. Click on the Vector tab. in the “Data Source Manager”.
2. Enable the “File” source type.
3. Press the  button in the Source section.
4. Select the `Buildings.shp` file in your training directory.
5. Click “Open”. You will see the original dialog, with the file path filled in.
6. Click “Add”. The data you specified will now load: you can see a Buildings item in the Layers list (bottom left) with its features shown in the main map canvas.



Load the `Mosaico.tif` raster dataset from your training directory. Follow the next steps to load the file in QGIS.

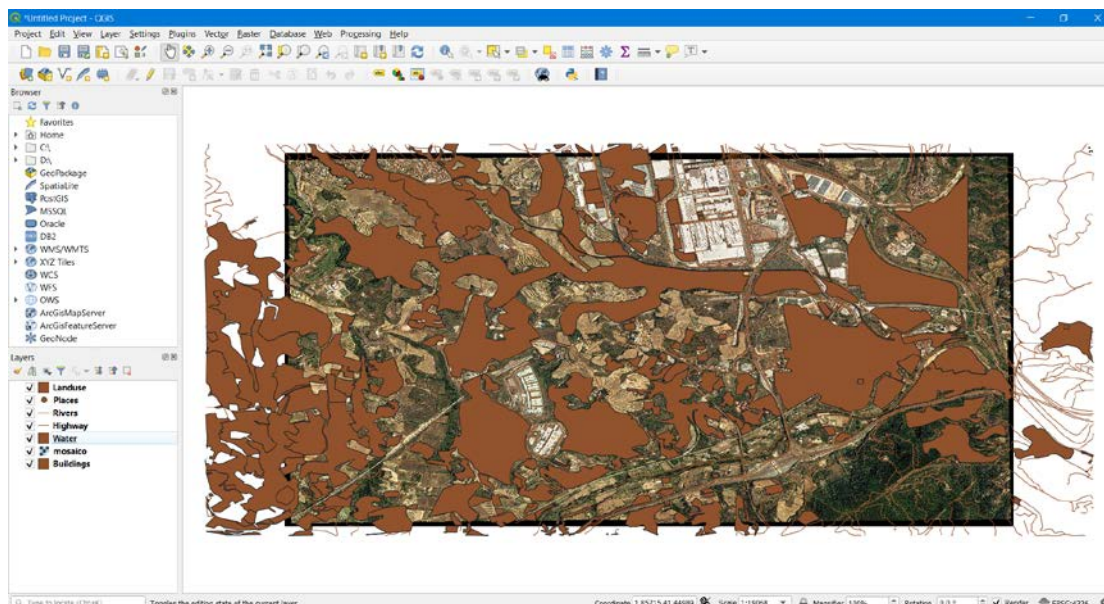
1. Click on the Raster tab. in the “Data Source Manager”.
2. Enable the “File” source type.
3. Press the  button in the Source section.
4. Select the `Mosaico.tif` file in your training directory.
5. Click “Open”. You will see the original dialog, with the file path filled in.

- Click “Add”. The data you specified will now load: you can see a Mosaico item in the Layers list (bottom left) with its features shown in the main map canvas.



You can load files in QGIS dragging the files into the map canvas.

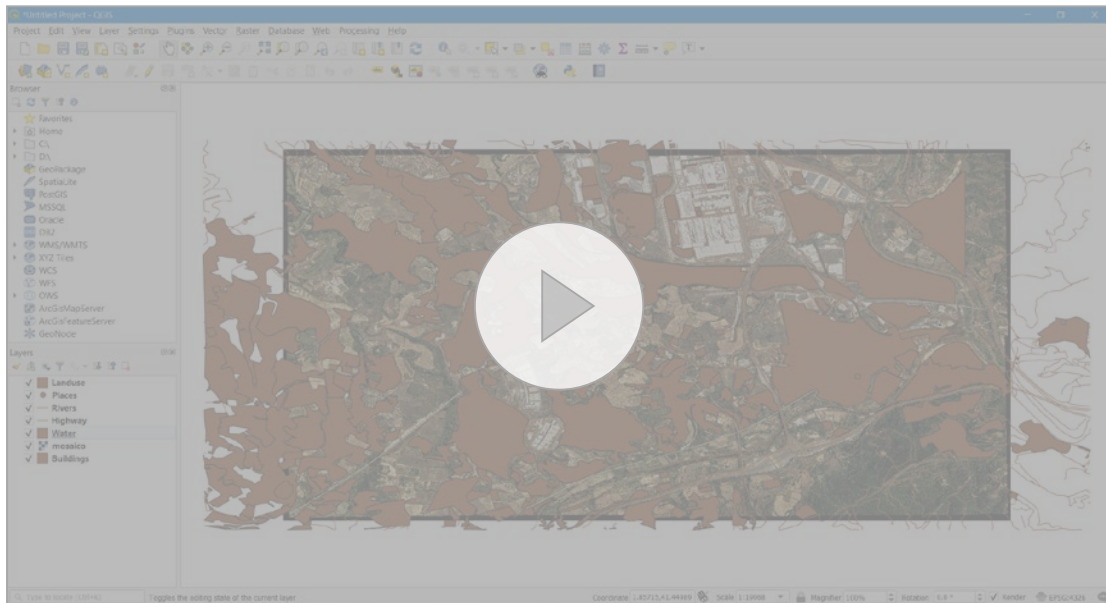
Add the `Water.shp`, `Highway.shp`, `Rivers.shp`, `Places.shp` and `Landuse.shp` layers from your training directory dragging the files into the map canvas.




Subsequently, we are going to arrange the loaded layers so that we can visualize all of them and take advantage of them. To do this we will manually move the layers in the layer panel.

We select the layer to move and drag it to the position we want. While we are dragging the layer a black line appears where the layer will be placed.

The following video shows how the layers must be moved. Also you can find it in your training directory (`Layer_movement.mp4`).



Congratulations! You now have a basic map. Now would be a good time to save your work.

1. Click on the “Save As” button: 
2. Create a folder in your training directory and call it Solution.
3. Save the map in the solution folder and call it basic_map.qgz.

5 Attribute data

The strength of GIS is that all the objects that are visible on the map also have attributes. Maps in a GIS are not just pictures. They represent not only objects in locations, but also information about those objects.

To open the attribute table for the `Landuse` layer, right-click on the layer name in the layers list. Click on the attribute table and a new window will open with the attributes associated with the objects.

6 Symbology

The symbology of a layer is its visual appearance on the map. The basic strength of GIS over other ways of representing data with spatial aspects is that with GIS, you have a dynamic visual representation of the data you are working with.

Having proper symbology is not a luxury or just nice to have. In fact, it is essential for you to use a GIS properly and produce maps and information that people will be able to use.

To change a layer's symbology, open its "Layer Properties". Let's begin by changing the color of the `Buildings` layer. Follow the next to change the color of the layer.

1. Right-click on the `Buildings` layer in the Layers list.
2. Select the menu item Properties in the menu that appears.
3. Select the "Symbology menu" at the extreme left.
4. Click the color select button next to the "Color" label. A "Select Color" menu will appear.
5. Choose a gray color (R: 64; G: 66; B: 71) and click "OK".
6. Click "OK" again in the "Properties" window, and you will see the color change being applied to the layer.

Repeat the process in order to change the color to the other layers, using the following RGB codes for each layer:

`Landuse`: R: 149; G: 151; B: 158.

`Rivers`: R: 20; G: 6; B: 216.


`Highway`: R: 162; G: 57; B: 31.

`Water`: R: 55; G: 126; B: 184.

`Places`: R: 13; G: 239; B: 175 (Change also the size to 1.4).

Now that you know how to change the color for layers, the next step is to create more complex symbology. QGIS allows you to do this using symbol layers.

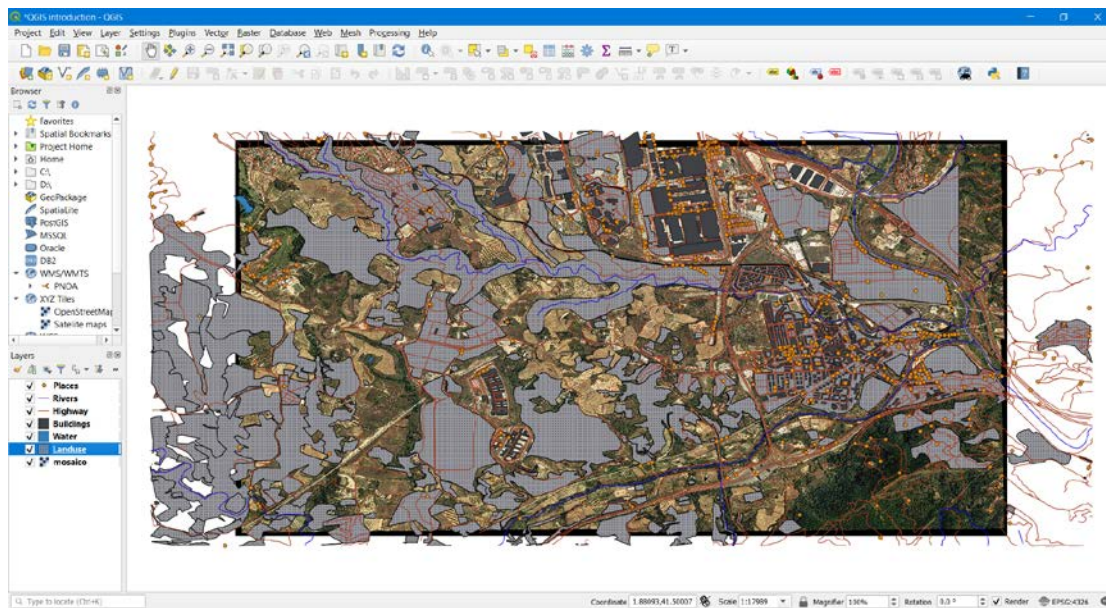
We will add more symbol layers to the `Landuse` layer. For this we will open the Symbology properties panel.

Select the "Fill" and then click in the "Add symbol layer" button .

Now there is a second symbol layer. Being a solid color, it will of course completely hide the previous kind of symbol. Clearly this symbol has to be changed.

With the new "Simple Fill" layer selected:

1. Change the "Symbol layer type" to "Point pattern fill"
2. Change the "Horizontal" and "Vertical" distance to 1 mm.
3. Finally change the size of the points. Click on the "Marker" and change the size to 0.2.
4. Click "OK". You can find a map similar to the map showed below.



Congratulations! You have a basic map with a specifically symbology. Now it would be a good time to finally your work saving the map.