

# Environmental Analysis and Landscape Mapping

Landscape Architecture / Land Landscape Heritage

## TUTORIAL 1

### Thematic mapping with Qgis

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## Aims

In the following tutorial QGIS basic operations are introduced while explaining the main tools of the program. Data from the Lombardy Geoportale are selected in order to create a series of thematic maps, which can help to explore and become familiar with the sw. The datasets used contain information of the Lombardy Region, such as administrative boundaries, Municipalities, Mountain Communities and Census tracts data.

As a final result, a map of *Number of Empty Houses in Bergamo Province* is produced. Particular attention is given to the layers symbology as essential to use a GIS correctly and generate maps and information that people will be able to use.

### **The goals for this tutorial:**

- To learn about the structure of vector data, and how to load vector datasets into a map.
- To be able to modify the symbology for the vector layers.
- To explore the attribute data of an object.
- To learn how to classify vector data.
- To apply useful labels to a layer.
- To learn how to add Google satellite maps as a base.
- To use the tool print layout to create and export a map.

# Index

## Part 1) How to start: Add Vector Layers and Symbology

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- Layer Properties: *Symbology*

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- Select Features: *Attribute Table*
- Geoprocessing: *Clip*
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## Part 3) Number of empty houses in Bergamo province

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- Add Base Map: *Google Satellite Map*
- Layer Properties: *Transparency*
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## Part 4) Create a Layout and Print

- Layout Manager: *Create a New Layout*
- Layout Manager: *Export as...*

## Data source

<http://www.geoportale.regione.lombardia.it/>

- Comunità Montane\_2018
- Province\_2018
- Comuni\_2018\_poligonal
- Rete Ferroviaria
- Strade Principali
- Elementi Idrici

<https://www.istat.it/>

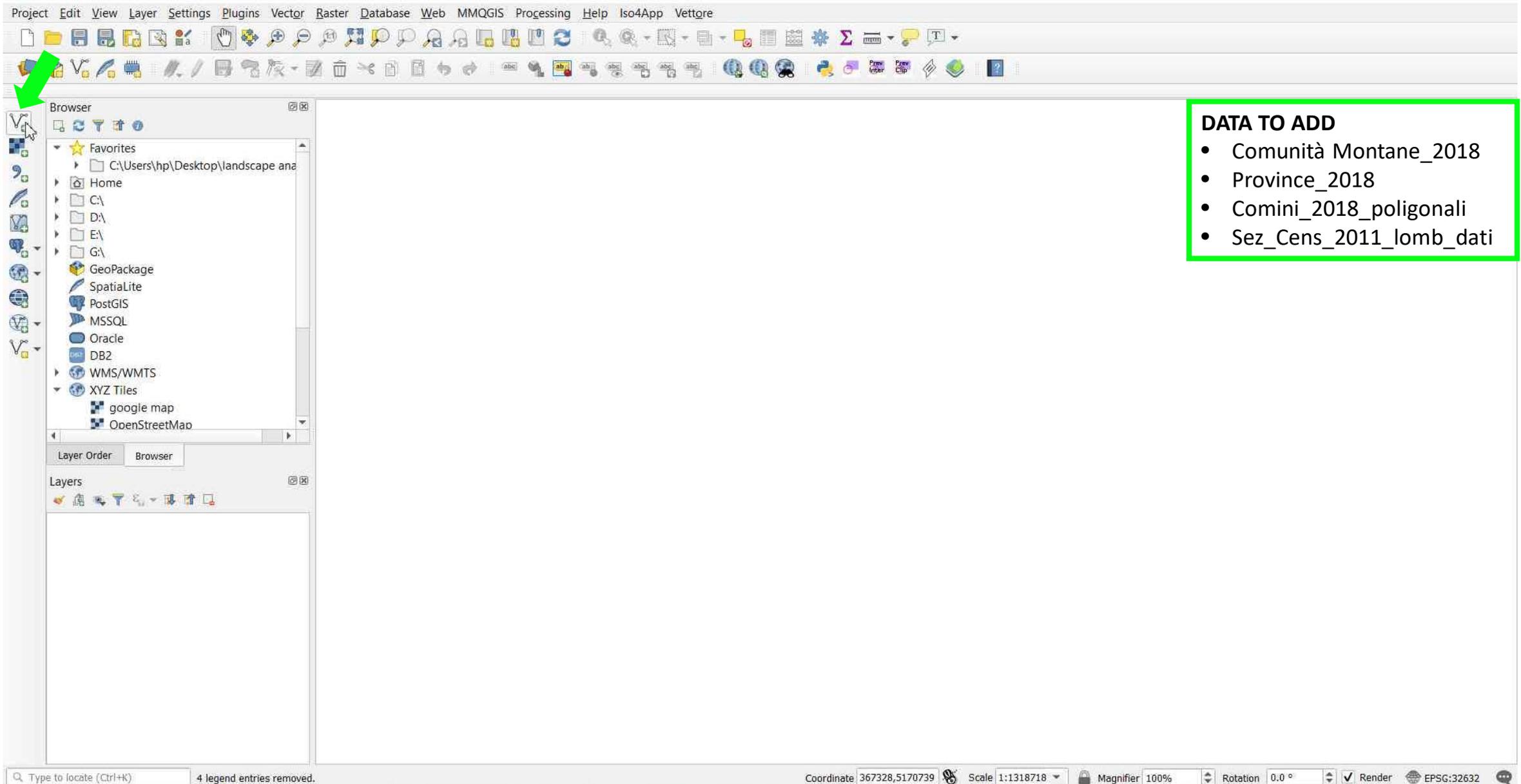
- Sez\_Cens\_2011\_lomb\_dati

Specific data elaboration: join processing between census sections and istat variables

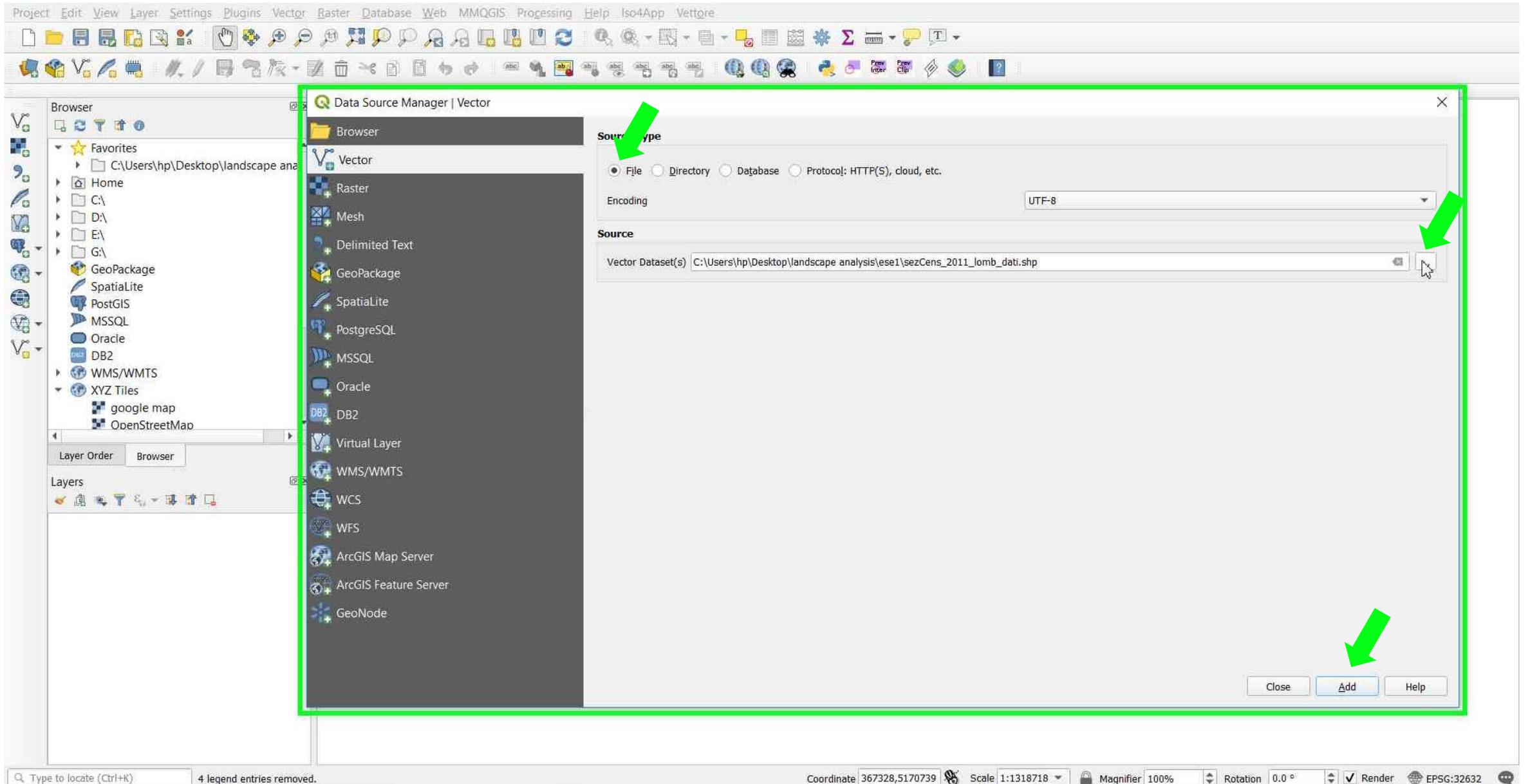
## PART 1

- **Manage Layer Toolbar → Add Vector Layers**
- **Layer Properties → Symbology**

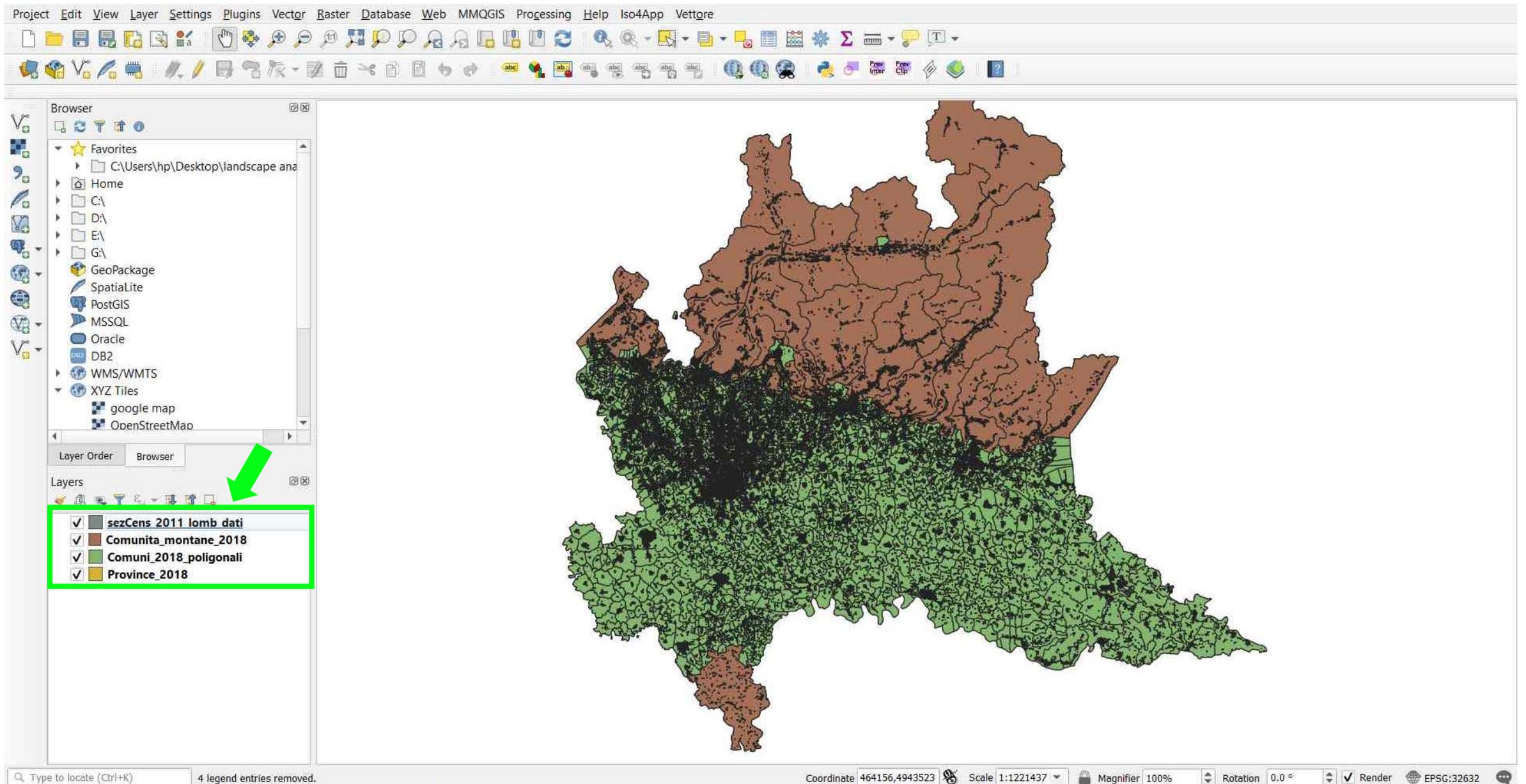
**ADD VECTOR LAYERS** → Press the 'Add vector Layer...' button in the **Manage Layer** toolbar to upload the vector files



**ADD VECTOR LAYERS** → Ensure the '**Source type**' is set to File → Press '**Source**' to choose the layers you wish to add from the source dataset → '**Add**'



**ADD VECTOR LAYERS** → The data are added to your current map window and displayed using a default palette

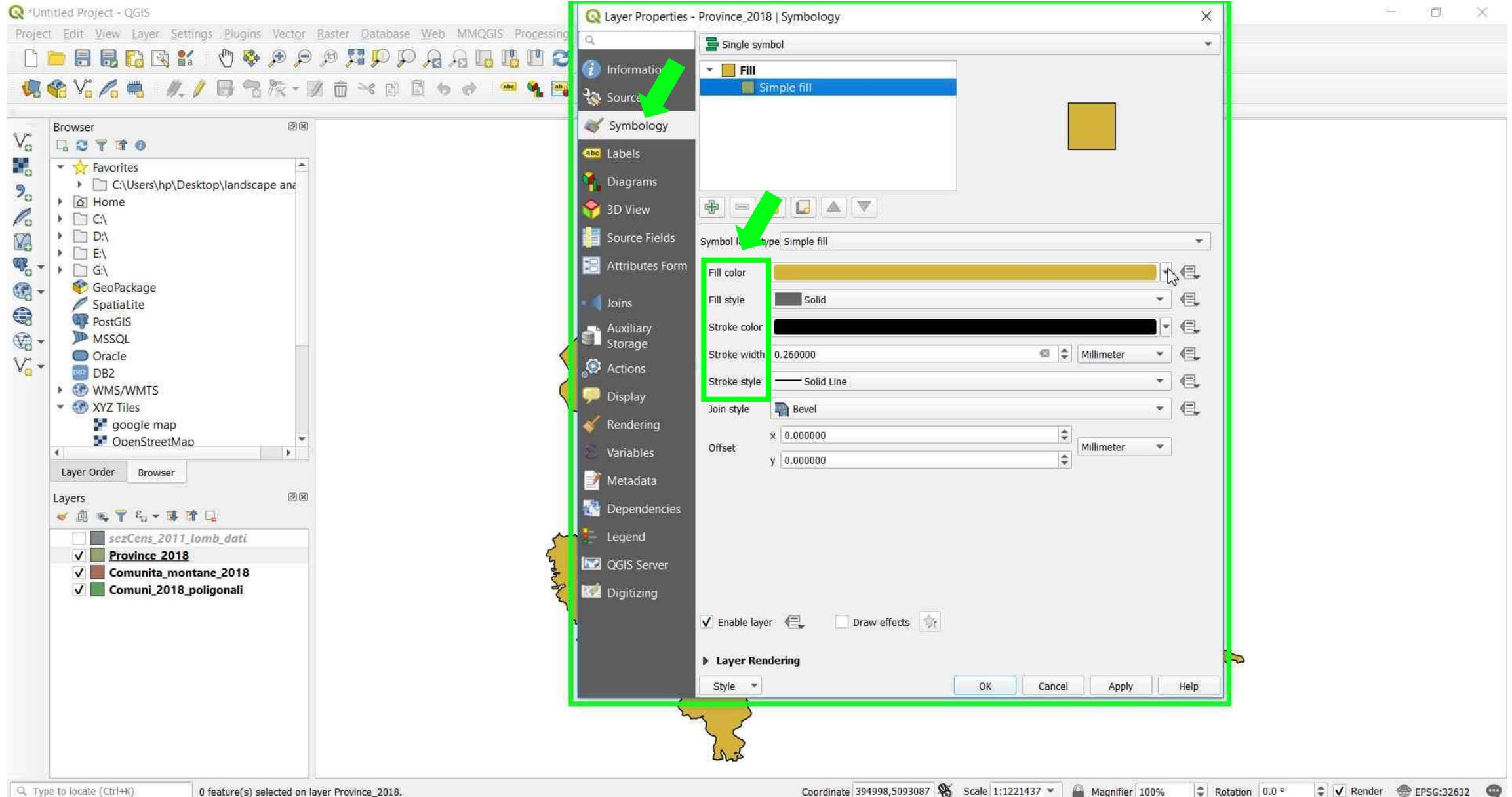


## CHANGE LAYERS SYMOLOGY → Right-click to open the layer 'Properties...' window → let's begin with the *Province\_2018* layer

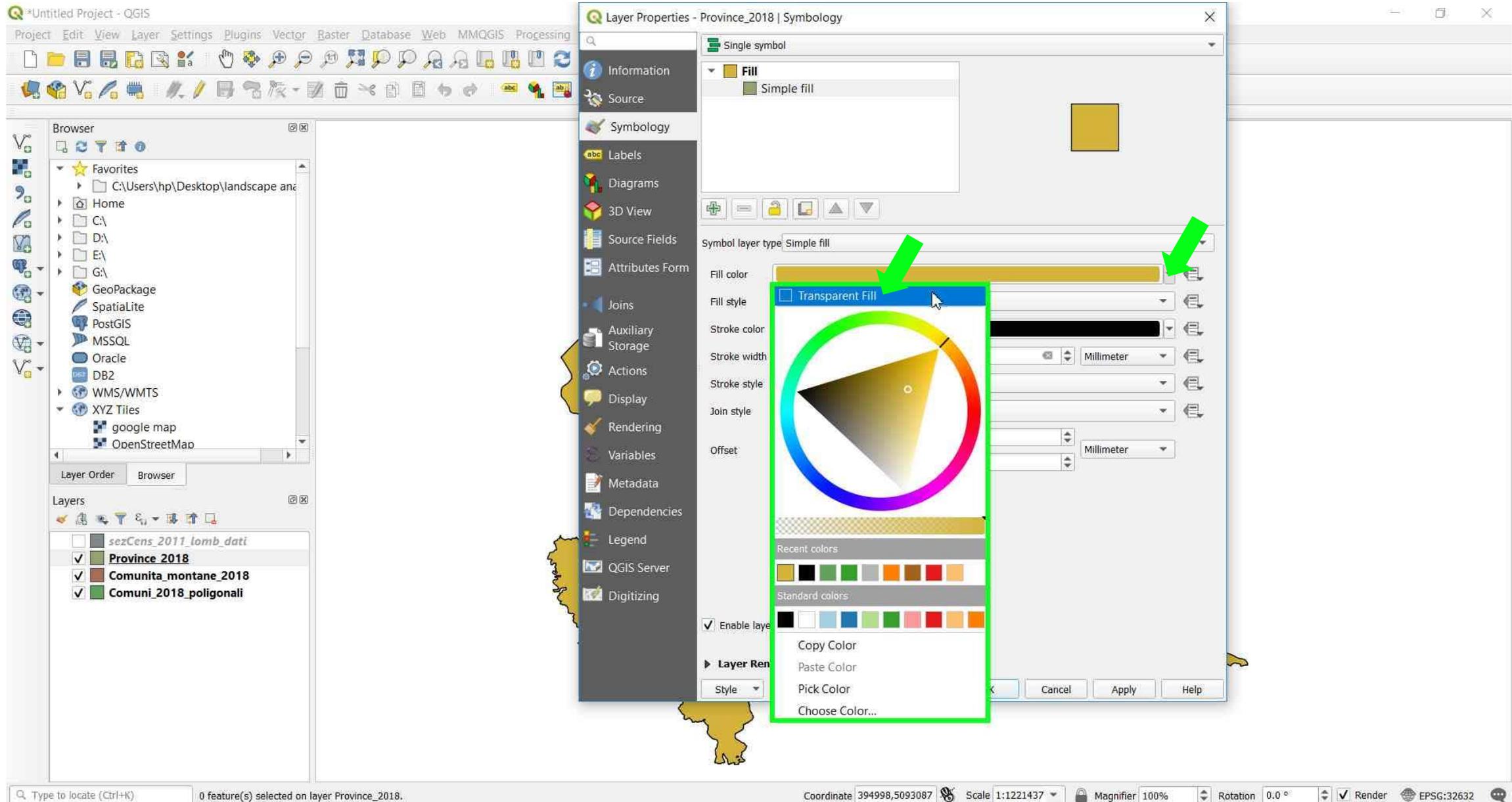
The screenshot displays the QGIS software interface. The main map area shows a yellow-shaded map of a region with black outlines representing administrative boundaries. On the left, the 'Layers' panel is visible, listing several layers: 'se2', 'Pro...', 'Comunita\_montane\_2018', and 'Comuni\_2018\_poligonali'. The 'Pro...' layer is selected. A right-click context menu is open over this layer, listing various actions such as 'Zoom to Layer', 'Copy Layer', and 'Properties...'. A green arrow points to the 'Properties...' option. A green box highlights the 'Properties...' option and the 'Pro...' layer in the Layers panel. The top toolbar and menu bar are also visible.

**NOTE:**  
The symbology of a layer is its visual appearance on the map.

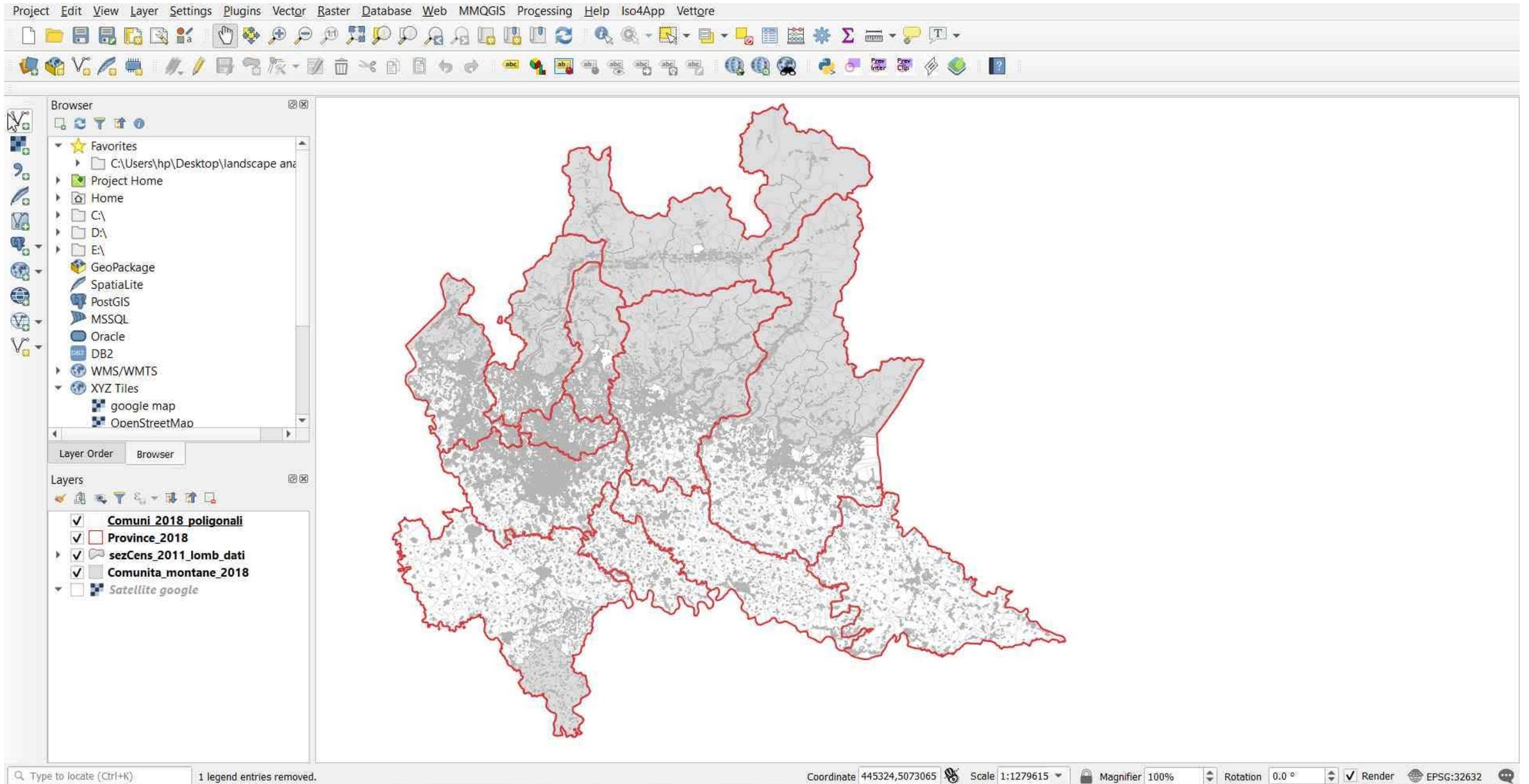
**CHANGE LAYERS SYMBOLOGY** → Select **'Symbology'** → **'Simple fill'** to change Fill colour, Fill style, Stroke width etc.



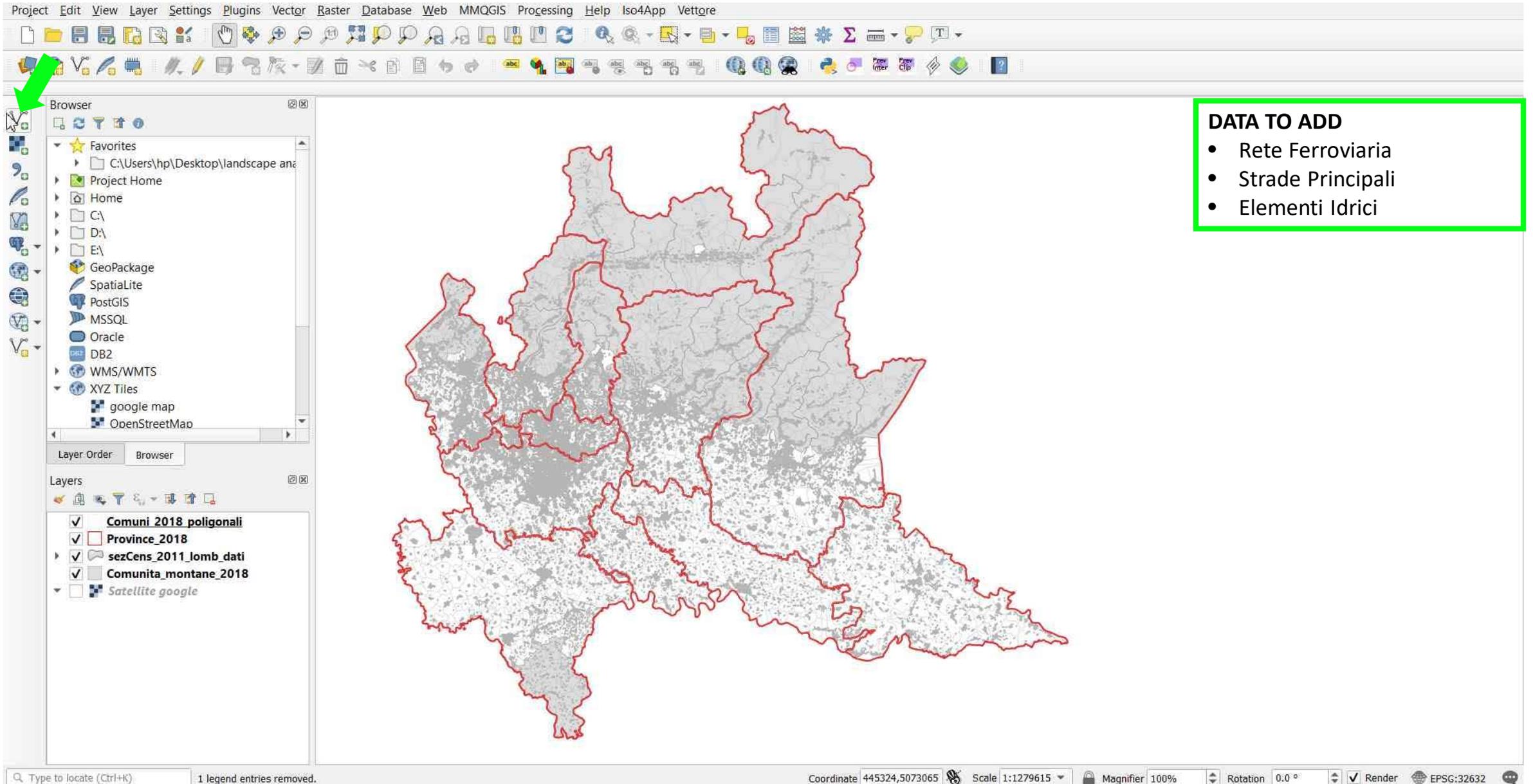
# CHANGE LAYERS SYMBOLOGY → Press the 'Fill colour' bar for Transparent Fill → Apply



**CHANGE LAYERS SYMBOLOGY** → Repeat for the remaining layers and apply to see the colour change being applied to the layers.



## ADD BASE VECTOR LAYERS



The screenshot displays the QGIS desktop environment. The top toolbar contains various icons for file operations and editing. A green arrow points to the 'Add New Layer' icon (a blue square with a white plus sign). The left sidebar shows the 'Browser' panel with a tree view of file systems and data sources. Below it is the 'Layers' panel, which lists the following layers:

- Comuni 2018 poligonali
- Province\_2018
- sezCens\_2011\_lomb\_dati
- Comunita\_montane\_2018
- Satellite google

The main map area shows a grayscale satellite-style map of a region, overlaid with red outlines representing administrative boundaries. A green box on the right side of the interface contains the following text:

**DATA TO ADD**

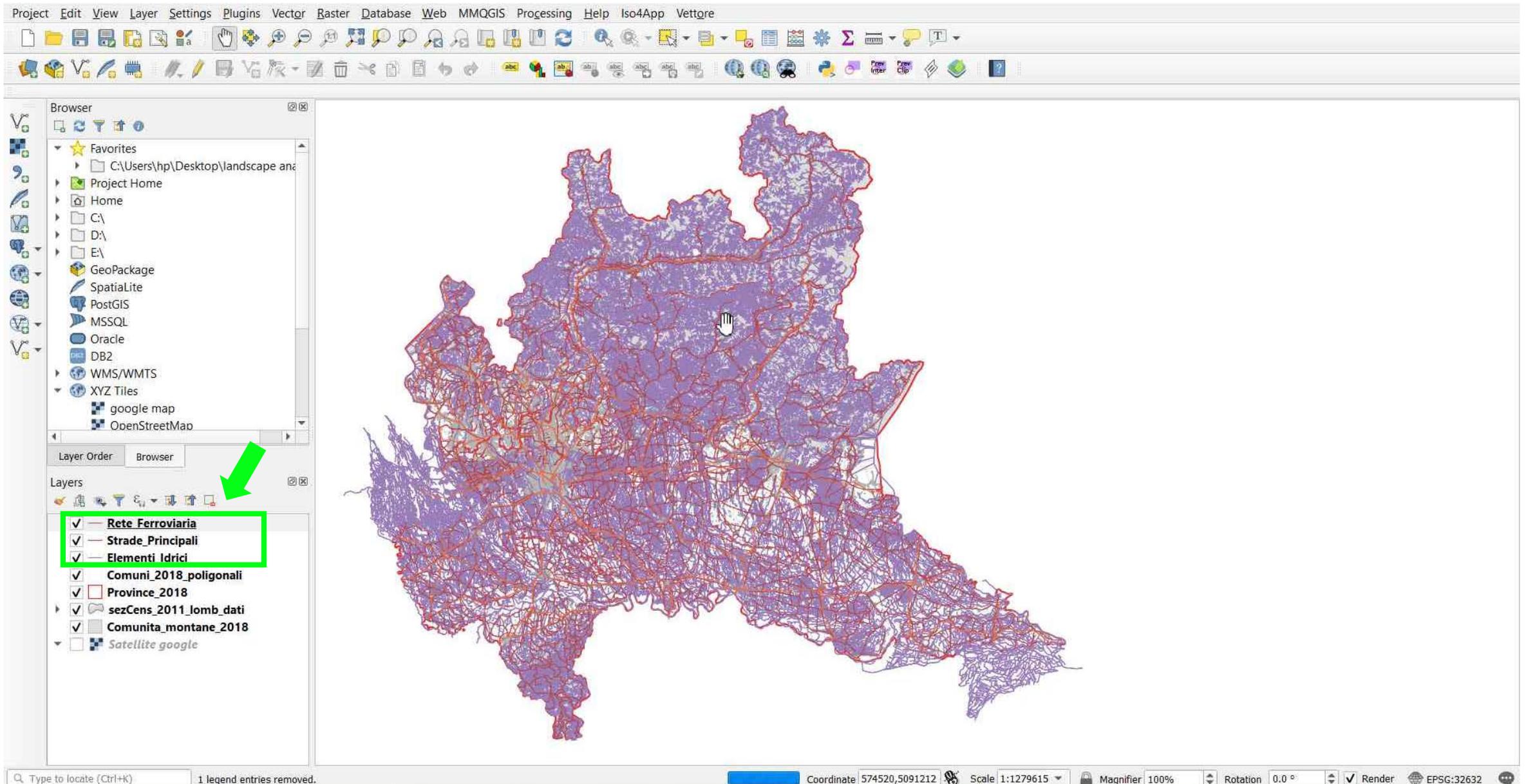
- Rete Ferroviaria
- Strade Principali
- Elementi Idrici

The bottom status bar shows the coordinate 445324,5073065, a scale of 1:1279615, a magnifier of 100%, a rotation of 0.0°, and the EPSG:32632 projection.

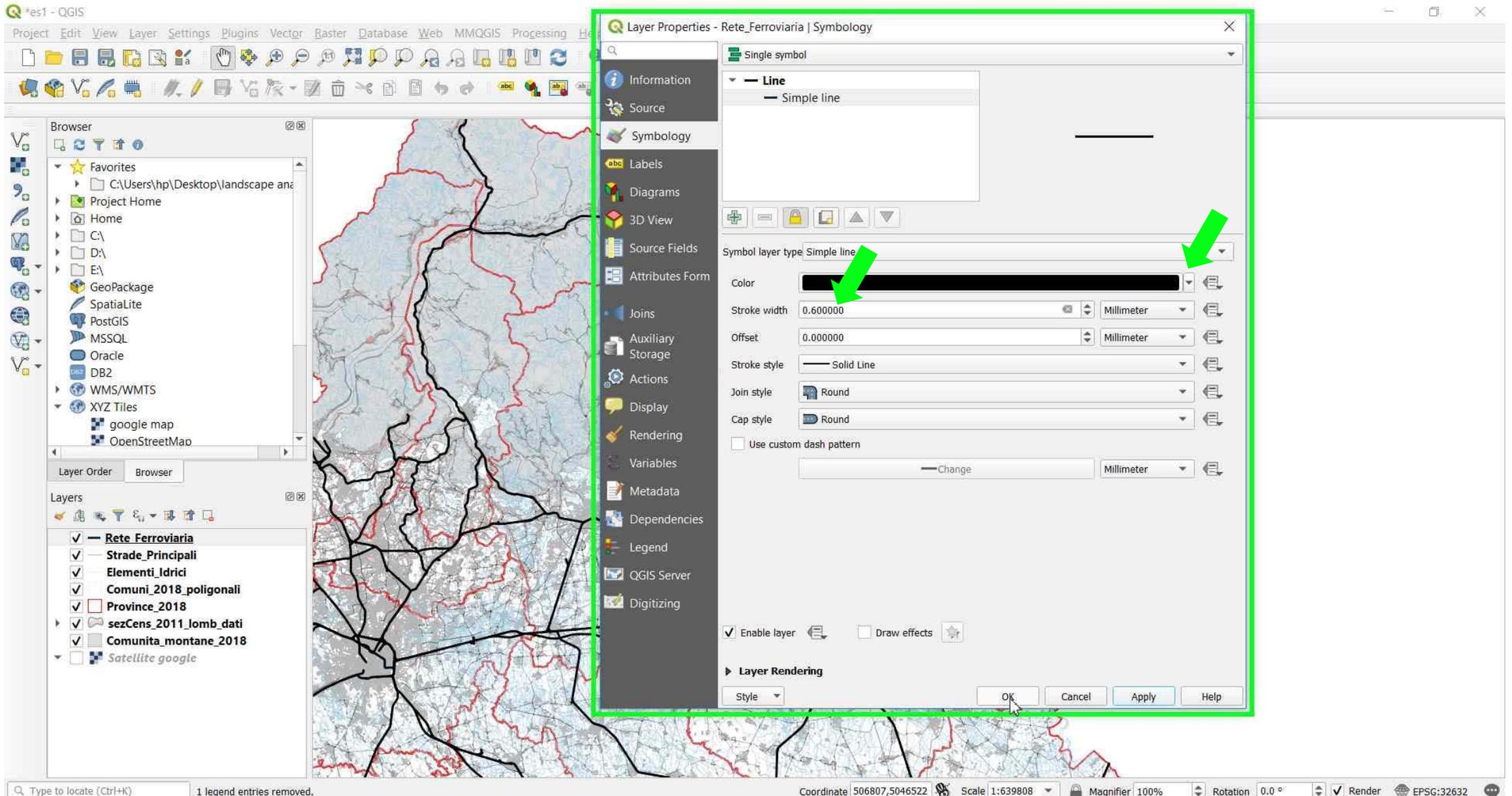
## ADD BASE VECTOR LAYERS → Click Source and choose the data source → Add

The screenshot shows the QGIS Data Source Manager dialog box, which is used to add new data sources to the project. The dialog is titled "Data Source Manager | Vector" and is currently set to the "Vector" source type. The "Source Type" section has radio buttons for "File", "Directory", "Database", and "Protocol: HTTP(S), cloud, etc.", with "File" selected. The "Encoding" is set to "UTF-8". The "Source" section contains a text field with the path "Vector Dataset(s) s:\ese1\REGIONE\_LOMBARDIA (4)\Rete\_Ferroviaria.shp" and another path "C:\Users\hp\Desktop\landscape analysis\ese1\REGIONE\_LOMBARDIA (4)\Strade\_Principali.shp". A green arrow points to the ellipsis button next to the second path. At the bottom right, there are buttons for "Close", "Add", and "Help", with a green arrow pointing to the "Add" button. The background shows the QGIS interface with the "Browser" panel on the left and a map view at the bottom.

**ADD BASE VECTOR LAYERS** → The data are added to your current map window and displayed using a default palette



**CHANGE LAYERS SYMBOLOGY** → Right-click to layer **Properties** → Select **Symbology** → **Simple fill** to change **Color**, **Stroke width** etc.



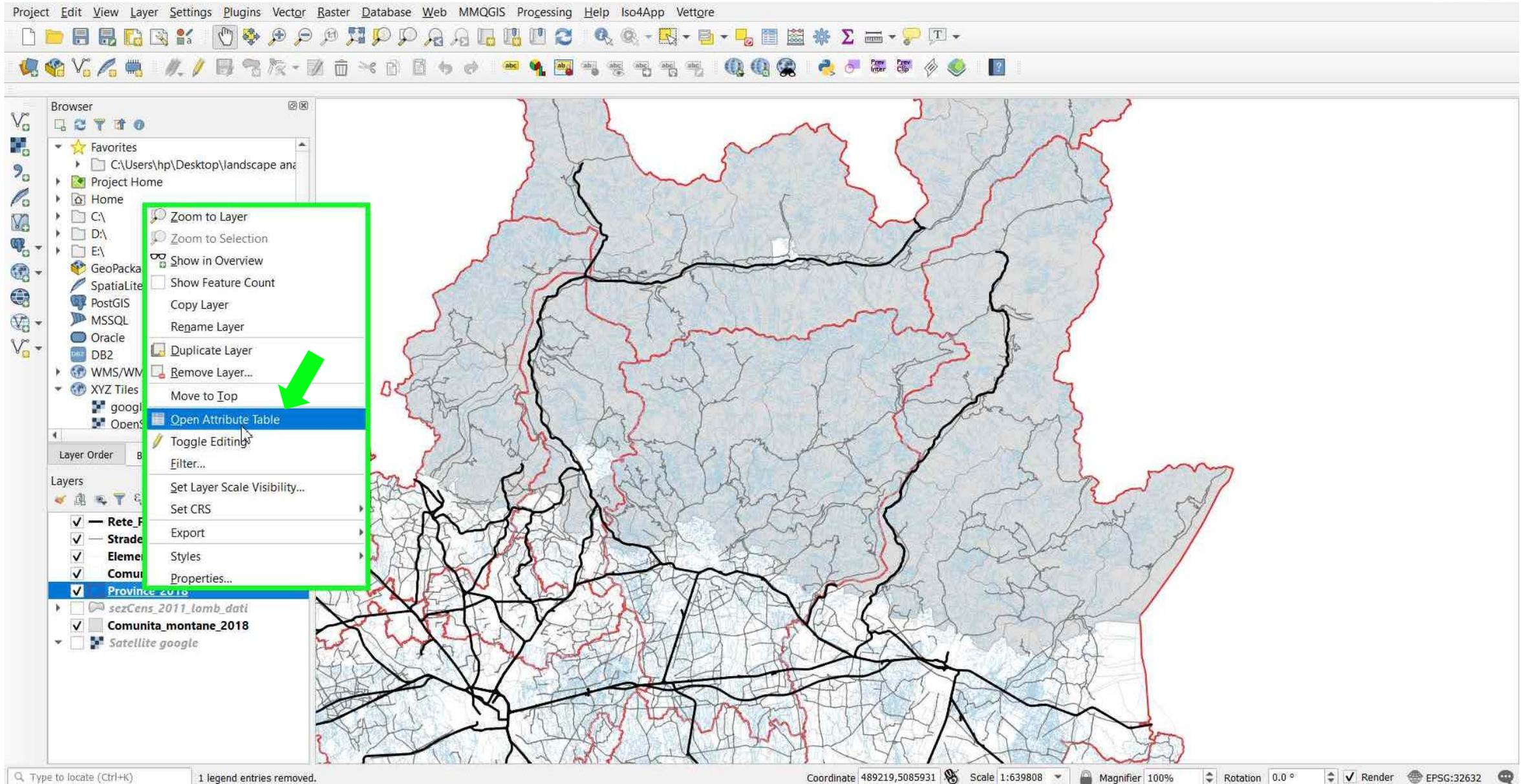
## CHANGE LAYERS SYMBOLOGY → Changing the symbology for the different layers has transformed a collection of vector files into a legible map.

The screenshot displays the QGIS desktop environment. The main map area shows a geographical region with several overlaid layers: a red outline representing provincial boundaries, a grey shaded area for mountain communities, a light blue area for census data, and a network of black lines representing the railway network. The interface includes a menu bar at the top with options like Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Database, Web, MMQGIS, Processing, Help, Iso4App, and Vettore. Below the menu is a toolbar with various icons for map navigation and editing. On the left side, there is a 'Browser' panel showing a file system tree and a 'Layers' panel listing the active layers with their respective symbology icons. The 'Layers' panel includes: Rete Ferroviaria (black line), Strade Principali (grey line), Elementi Idrici (blue line), Comuni\_2018\_poligonal (red outline), Province\_2018 (grey fill), sezCens\_2011\_omb\_dati (light blue fill), Comunita\_montane\_2018 (grey fill), and Satellite google (satellite image). The status bar at the bottom shows the coordinate (570728,5051939), scale (1:1279615), magnifier (100%), rotation (0.0°), and projection (EPSG:32632).

## PART 2

- **Select Features → Attribute Table**
- **Geoprocessing → Clip**
- **Export → Save Selected Features As...**

**SELECT FEATURES** → To open the **Attribute Table** right-click on the layer *Province\_2018* and choose **'Open Attribute Table'**



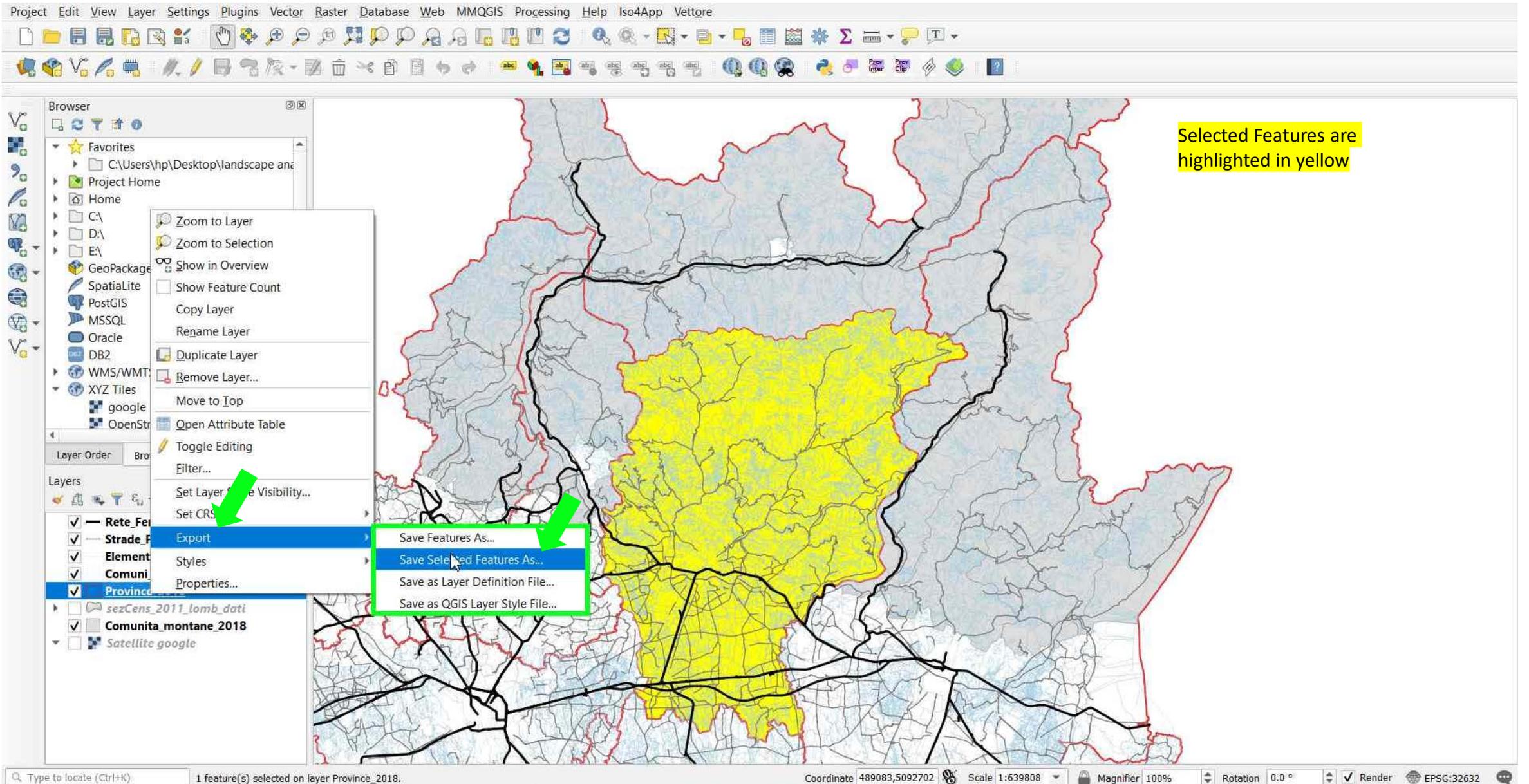
**SELECT FEATURES** → click on the row number on the left side of the row to select **BERGAMO (BG)** province administrative boundaries

Province\_2018 :: Features Total: 12, Filtered: 12, Selected: 1 *The number of features and the number of selected features are shown in the attribute table title.*

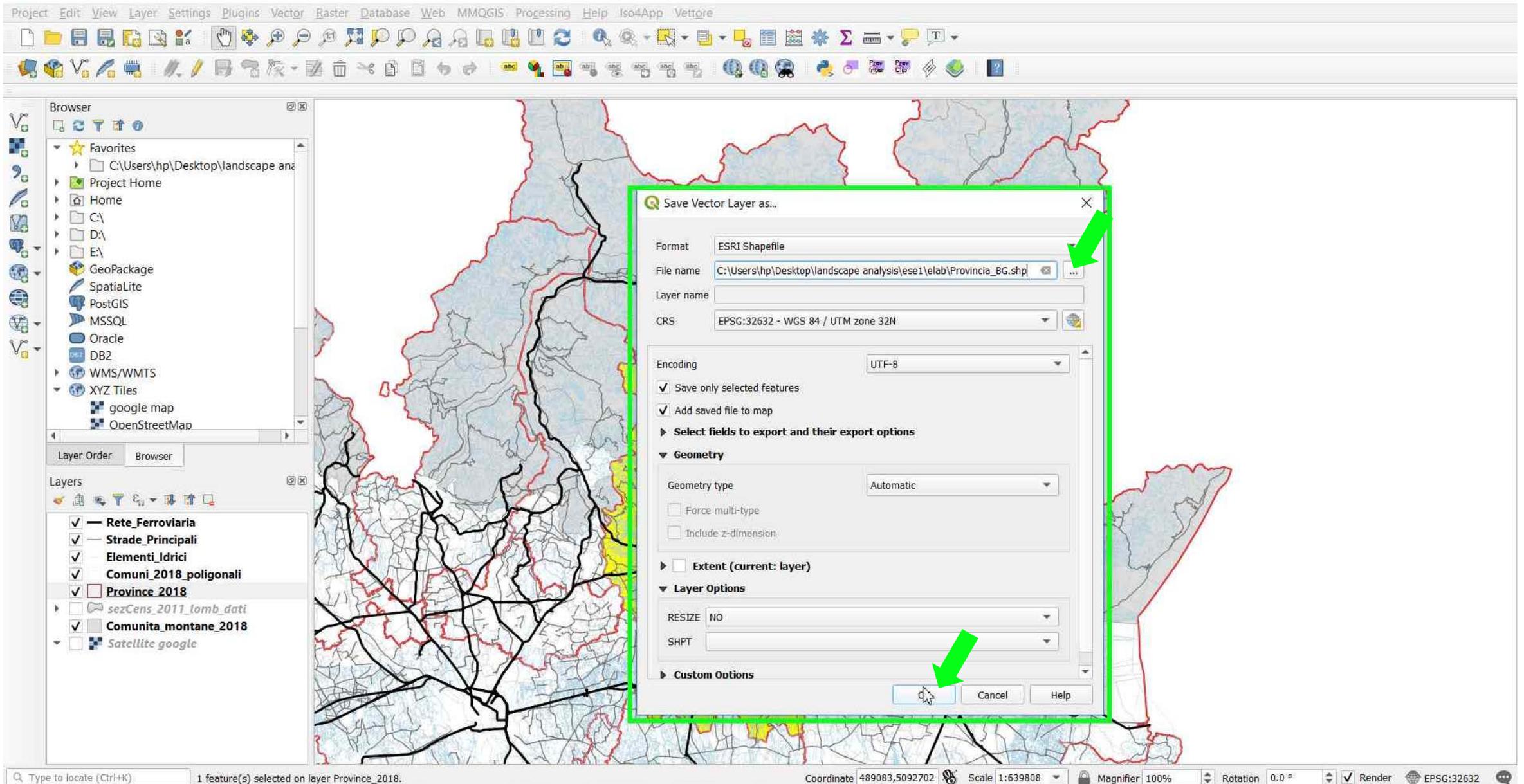
	CODICE	NOME	SIGLA	SHAPE_AREA	SHAPE_LEN
1	12	VARESE	VA	1201486479.44...	284815.530303...
2	13	COMO	CO	1280148602.74...	305238.227489...
3	18	PAVIA	PV	2970499772.09...	543075.793743...
4	19	CREMONA	CR	1771276914.43...	425726.691178...
5	16	BERGAMO	BG	2758677916.73...	346412.560590...
6	17	BRESCIA	BS	4780654558.17...	496553.030961...
7	98	LODI	LO	782536292.016...	286432.697124...
8	108	MONZA E DELL...	MB	405098838.223...	171077.475478...
9	20	MANTOVA	MN	2342367173.09...	423350.498231...
10	97	LECCO	LC	802600222.560...	211704.169897...
11	14	SONDRIO	SO	3197567876.19...	501946.481342...
12	15	MILANO	MI	1575253549.72...	393438.424132...

**NOTE:**  
The attribute table displays features of a selected layer. Each row in the table represents one map feature, and each column contains a particular piece of information about the feature. Features in the table can be searched, selected, moved or even edited.

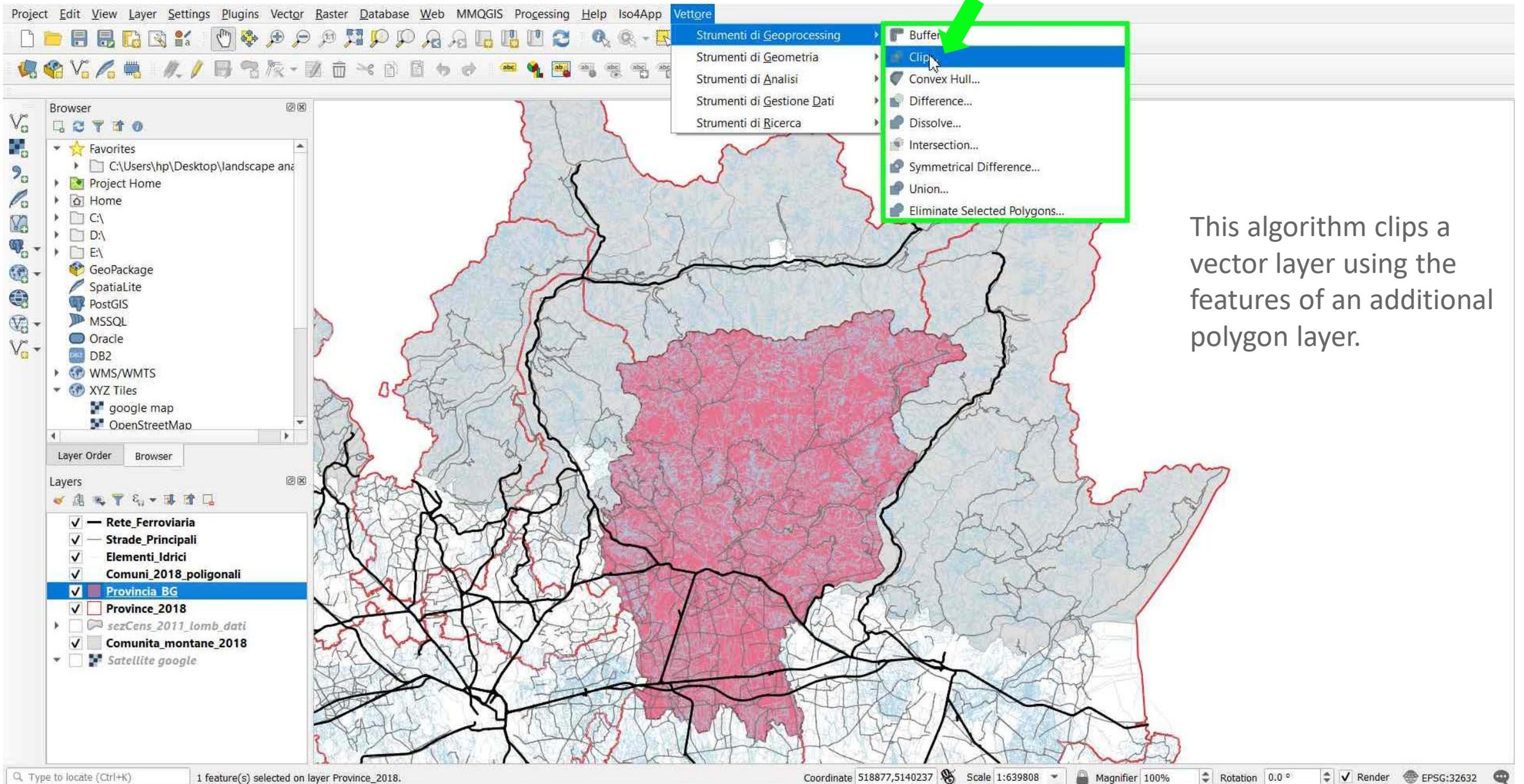
**EXPORT** → Once the features have been selected, right click on the layer to export by choosing the option ‘Save Selected Features As..’.



**EXPORT** → From the interface select the desired file format then open the 'File name' window to select the directory and name the vector layer → **OK**



## CLIP VECTORS → Vector → Geoprocessing Tools → 'Clip'



The screenshot displays the QGIS interface. The 'Vettore' menu is open, and the 'Strumenti di Geoprocessing' sub-menu is selected. Within this sub-menu, the 'Clip' tool is highlighted. A green arrow points to the 'Clip' option. The main map area shows a red-shaded polygon representing the 'Provincia BG' layer, which is being used to clip other vector layers. The 'Layers' panel on the left shows the following layers: Rete Ferroviaria, Strade Principali, Elementi Idrici, Comuni 2018 poligonali, Provincia BG (selected), Province\_2018, sezCens\_2011\_lomb\_dati, and Comunita\_montane\_2018. The status bar at the bottom indicates '1 feature(s) selected on layer Province\_2018'.

This algorithm clips a vector layer using the features of an additional polygon layer.

**CLIP VECTORS** → Select the **Input Layer** to clip (es. *Comunità\_Montane*) → **Overlay Layer** is *Provincia\_BG* (Bergamo Province) → **Run**

The screenshot displays the QGIS interface with the 'Clip' dialog box open. The dialog box is highlighted with a green border. It contains the following elements:

- Parameters** tab and **Log** button.
- Input layer**: A dropdown menu showing 'Comunita\_montane\_2018 [EPSG:32632]' with a green arrow pointing to it.
- Overlay layer**: A dropdown menu showing 'Provincia\_BG [EPSG:32632]' with a green arrow pointing to it.
- Clipped**: A text input field containing '[Create temporary layer]'.
- Open output file after running algorithm**: A checked checkbox.
- Run** button: A green arrow points to this button.
- Cancel**, **Close**, and **Help** buttons.
- Run as Batch Process...** button.
- Progress bar**: Shows 0% completion.

The background map shows a geographical area with a red-shaded region representing the province of Bergamo. The 'Layers' panel on the left lists several layers, including 'Rete Ferroviaria', 'Strade Principali', 'Elementi Idrici', 'Comuni\_2018 poligonali', 'Provincia\_BG', 'Province\_2018', 'sezCens\_2011\_lomb\_dati', 'Comunita\_montane\_2018', and 'Satellite google'. The status bar at the bottom indicates '1 feature(s) selected on layer Province\_2018.' and provides coordinate, scale, and magnification information.

## CLIP VECTORS → *Comunità\_Montane* selected within Bergamo Province

The screenshot displays the QGIS desktop environment. The main map window shows a purple-shaded area representing the municipalities of Bergamo Province. The left sidebar contains the 'Browser' and 'Layers' panels. The 'Layers' panel lists several layers, with 'Clipped' selected. The status bar at the bottom indicates that one feature is selected on the 'Provincia\_2018' layer.

Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help Iso4App Vettore

Browser

- ★ Favorites
  - C:\Users\hp\Desktop\landscape and
- Project Home
- Home
- C:\
- D:\
- E:\
- GeoPackage
- SpatialLite
- PostGIS
- MSSQL
- Oracle
- DB2
- WMS/WMTS
- XYZ Tiles
  - google map
  - OpenStreetMap

Layer Order Browser

Layers

- Rete\_Ferroviaria
- Strade\_Principali
- Elementi\_Idrici
- Comuni\_2018\_poligonali
- Clipped
- Clipped
- Clipped
- Clipped
- Clipped
- Provincia\_BG
- Province\_2018
- sezCens\_2011\_lomb\_dati
- Comunita\_montane\_2018
- Satellite google

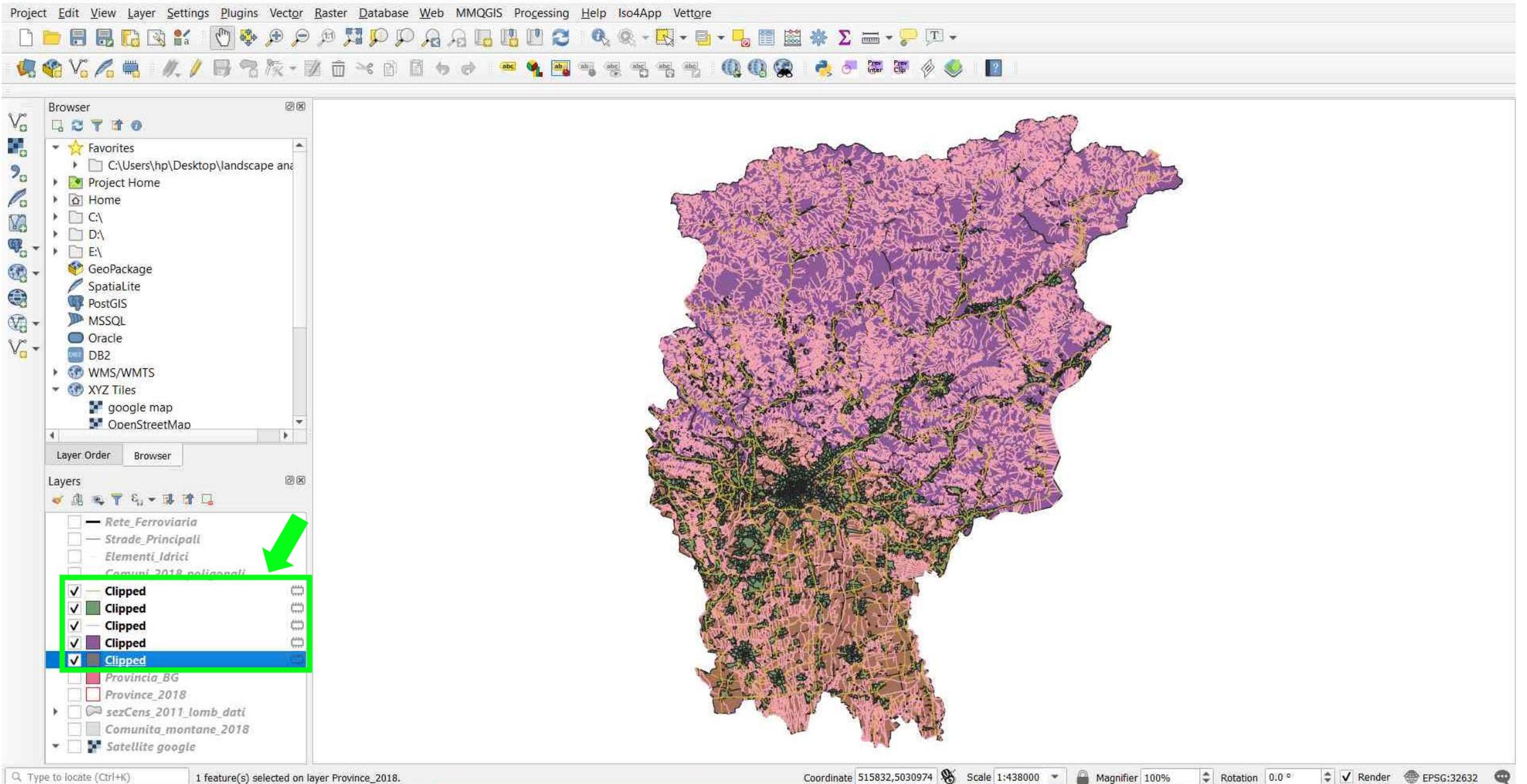
1 feature(s) selected on layer Provincia\_2018.

Coordinate 488948,5066565 Scale 1:639808 Magnifier 100% Rotation 0.0° Render EPSG:32632

**CLIP VECTORS** → Repeat the same operation by selecting a new **Input Layer** to clip → **Overlay Layer** is always *Provincia\_BG*

The screenshot displays the QGIS interface with the 'Clip' dialog box open. The dialog box is titled 'Clip' and has two tabs: 'Parameters' and 'Log'. The 'Parameters' tab is active. The 'Input layer' dropdown menu is set to 'Elementi\_Idrici [EPSG:32632]'. The 'Overlay layer' dropdown menu is set to 'Provincia\_BG [EPSG:32632]'. The 'Clipped' field is set to '[Create temporary layer]'. The 'Open output file after running algorithm' checkbox is checked. The 'Run' button is highlighted with a mouse cursor. A green arrow points to the 'Input layer' dropdown menu. The background shows a map with various layers, including 'Rete Ferroviaria', 'Strade Principali', 'Elementi\_Idrici', 'Comuni\_2018\_poligonali', 'Clipped', 'Provincia\_BG', 'Province\_2018', 'sezCens\_2011\_lomb\_dati', and 'Comunita\_montane\_2018'. The status bar at the bottom indicates '1 feature(s) selected on layer Province\_2018.' and 'Coordinate 544202,5117891 Scale 1:639808 Magnifier 100% Rotation 0.0° Render EPSG:32632'.

## CLIP VECTORS → Repeat for **all the layers** to make a Bergamo Province Clip Mask



The screenshot displays the QGIS interface with a map of Bergamo Province. The map shows a complex network of roads and land parcels, with a pinkish-purple clip mask overlaid. The Layers panel on the left lists several layers, including 'Rete Ferroviaria', 'Strade Principali', 'Elementi Idrici', 'Comuni 2018 poligonali', and 'Clipped'. A green arrow points to the bottom-most 'Clipped' layer. The status bar at the bottom indicates '1 feature(s) selected on layer Province\_2018'.

Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help Iso4App Vettore

Browser

- ★ Favorites
  - C:\Users\hp\Desktop\landscape and
- Project Home
- Home
- C:\
- D:\
- E:\
- GeoPackage
- SpatialLite
- PostGIS
- MSSQL
- Oracle
- DB2
- WMS/WMTS
- XYZ Tiles
  - google map
  - OpenStreetMap

Layer Order Browser

Layers

- Rete Ferroviaria
- Strade Principali
- Elementi Idrici
- Comuni 2018 poligonali
- Clipped
- Clipped
- Clipped
- Clipped
- Clipped
- Provincia\_BG
- Province\_2018
- sezCens\_2011\_lomb\_dati
- Comunita montane\_2018
- Satellite google

Type to locate (Ctrl+K) 1 feature(s) selected on layer Province\_2018. Coordinate 515832,5030974 Scale 1:438000 Magnifier 100% Rotation 0.0° Render EPSG:32632

CHANGE LAYER SYMBOLOGY → Right-Click → Styles → Copy Styles → Select the vector layer to change symbology → Paste Styles

The screenshot displays the QGIS desktop environment. The main map window shows a geographical area with a red boundary and various vector layers. The 'Layers' panel on the left lists the following layers:

- Rete\_Ferroviaria
- Strade\_Principali
- Elementi\_Idrici
- Comuni\_2018\_poligonali
- Provincia\_BG
- sezCens\_BG
- Streets\_BG
- Idrog\_BG
- Comunità\_montane\_BG
- Comuni\_Bg\_clip
- Province\_2018
- sezCens\_2011\_lomb\_dati
- Comunità\_montane\_2018
- Satellite google

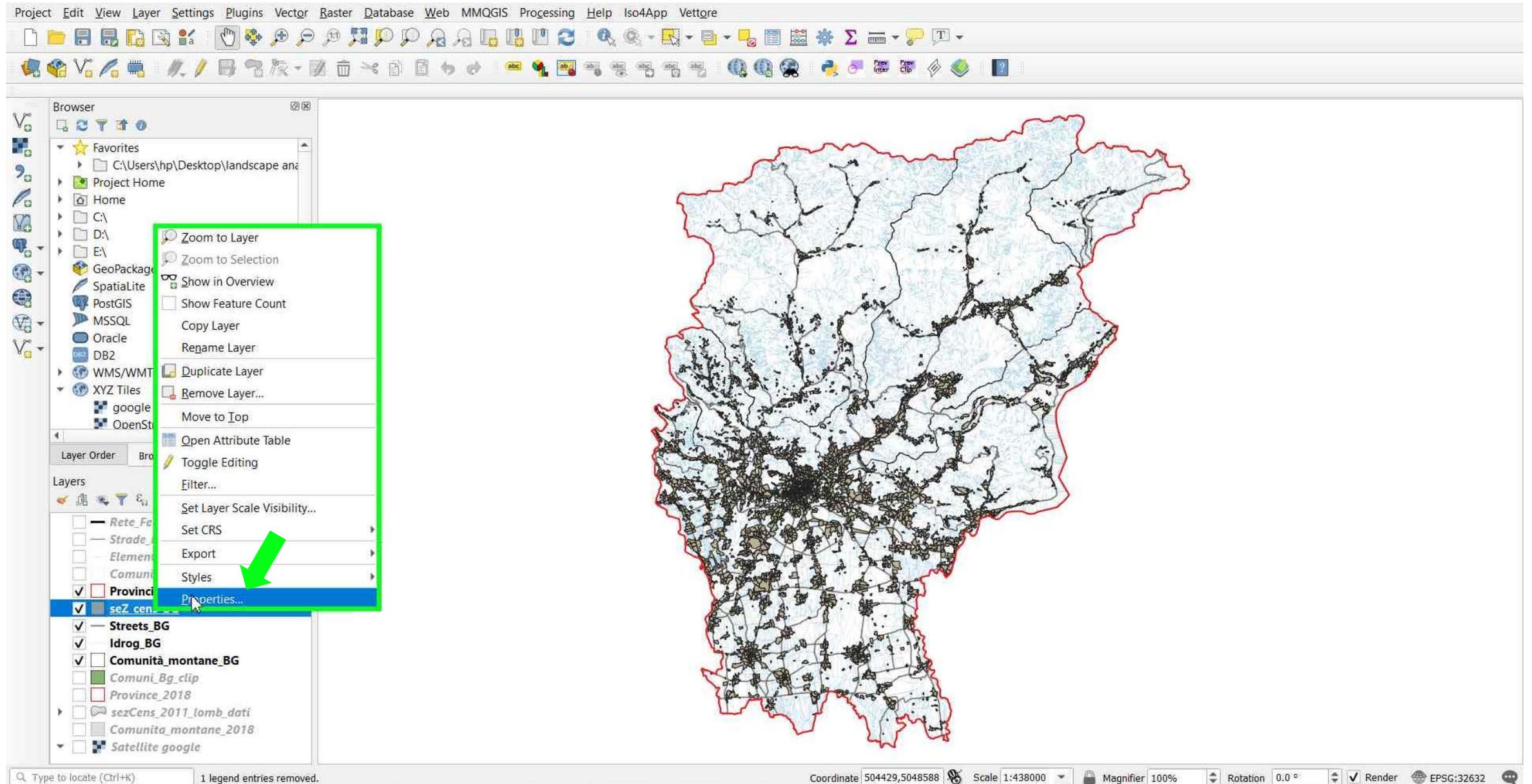
The status bar at the bottom indicates the following information:

- Coordinate: 496178,5090123
- Scale: 1:438000
- Magnifier: 100%
- Rotation: 0.0 °
- Render:
- EPSG:32632

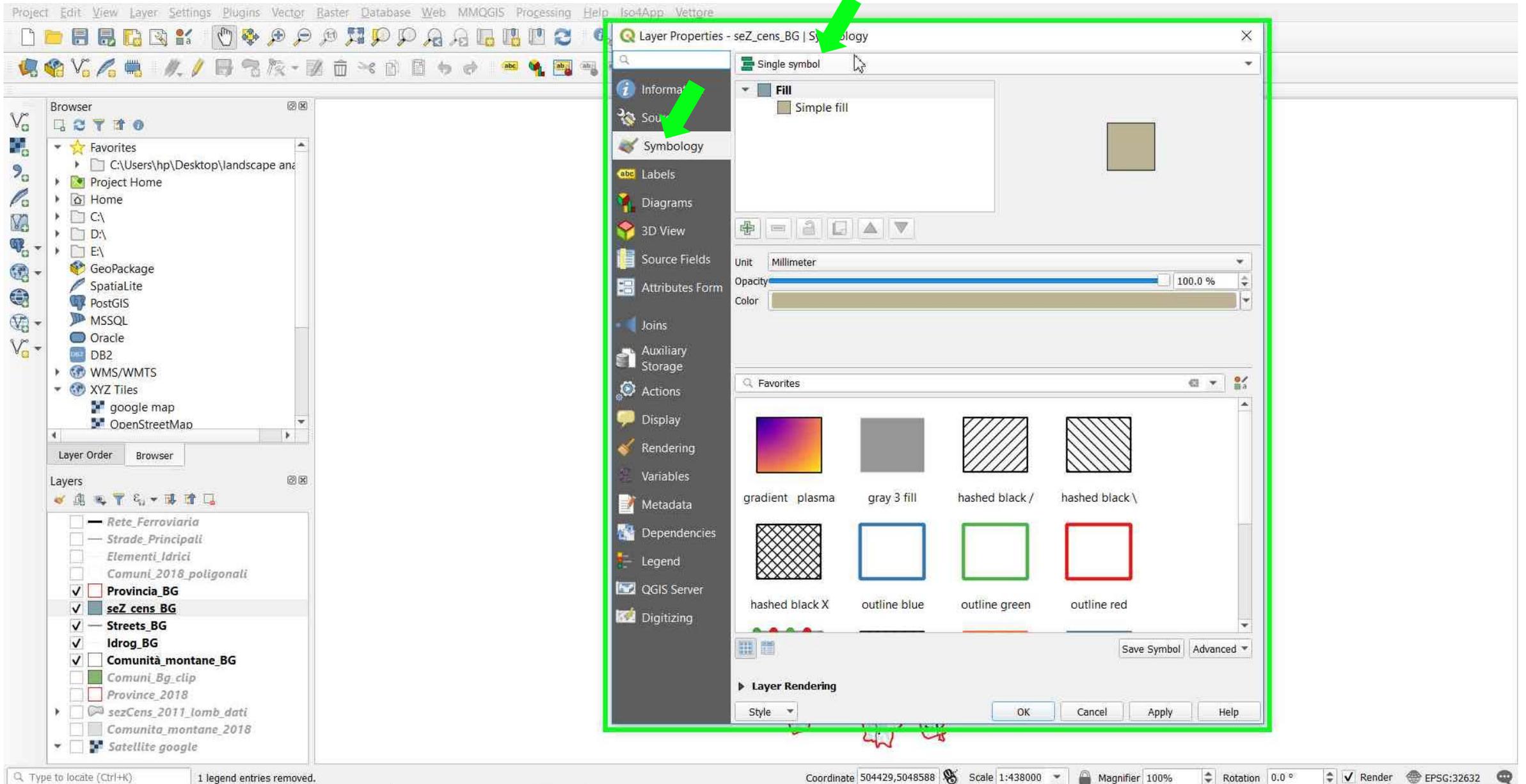
## PART 3

- **Layer Properties → Graduated Symbology**
- **Add Base Map → Google Satellite Map**
- **Layer Properties → Transparency**
- **Layer Properties → Labels**

## GRADUATED SYMBOLOGY → Right-click on the layer *Sez\_cens\_BG* → Properties...



**GRADUATED SYMOLOGY** → go to layer **Symbology** → click on the Single Symbol window



# GRADUATED SYMOLOGY → select Graduated

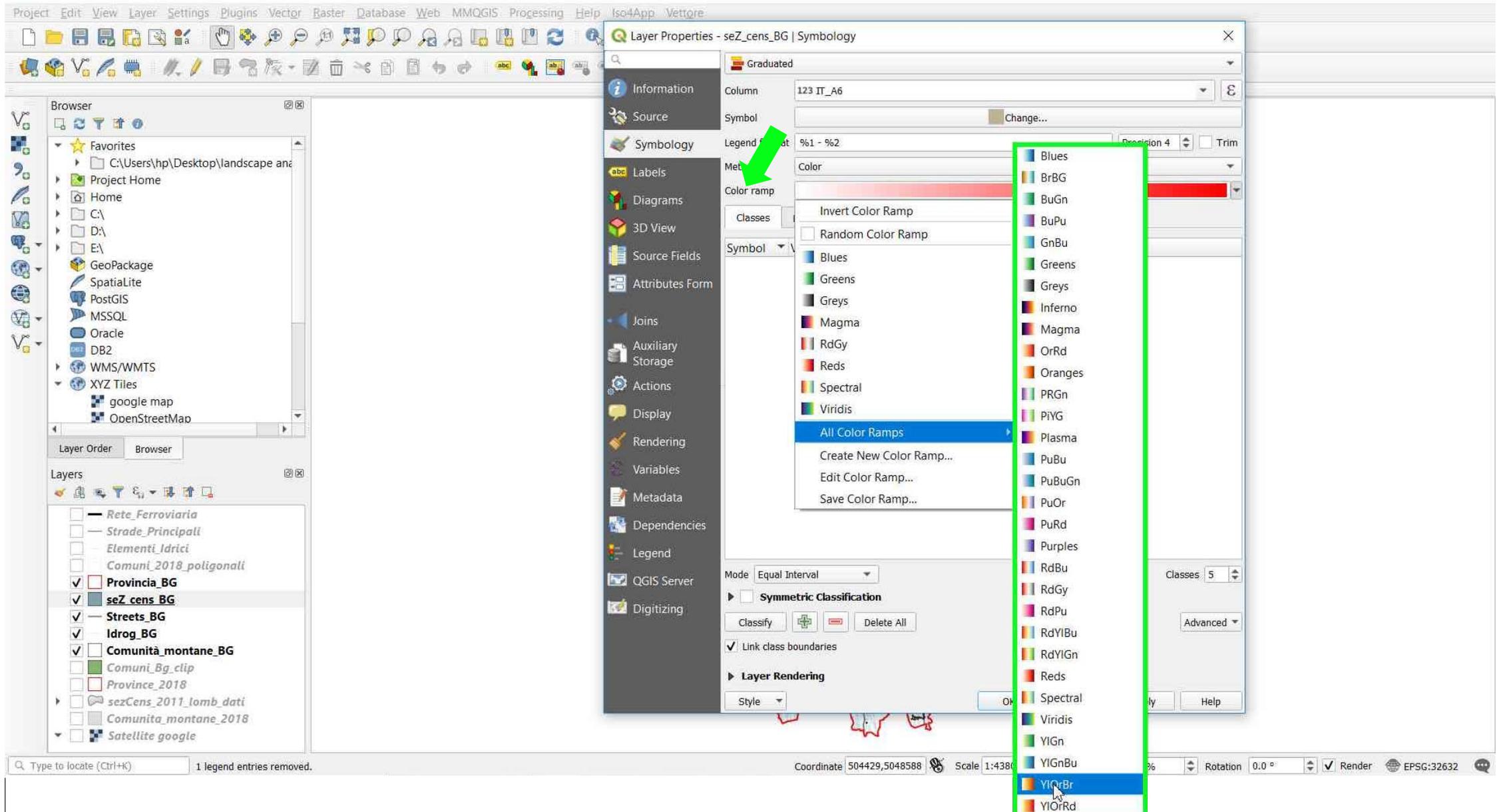
The screenshot shows the QGIS interface with the Layer Properties dialog box open for the 'seZ\_cens\_BG' layer. The 'Symbology' tab is active, and the 'Graduated' option is selected, highlighted with a green box and a green arrow. The 'Information' tab is also visible on the left side of the dialog. The 'Layer Rendering' section at the bottom shows the 'Style' dropdown set to 'Graduated'. The 'Favorites' section displays various symbol styles, including 'gradient plasma', 'gray 3 fill', 'hashed black /', 'hashed black \', 'hashed black X', 'outline blue', 'outline green', and 'outline red'. The 'Layer Order' and 'Layers' panels are visible on the left, and the status bar at the bottom shows the coordinate system as EPSG:32632.

**GRADUATED SYMOLOGY** → Select Column **IT\_A6\*** → This Attribute Field represents the number of **empty houses** within each Census Tracts

The screenshot shows the QGIS interface with the 'Layer Properties' dialog for the layer 'seZ\_cens\_BG'. The 'Symbology' tab is selected, and the 'Column' dropdown is set to 'IT\_A6'. A list of attribute fields is displayed, with 'IT\_A6' highlighted in blue. A yellow text box explains that 'IT\_A6' represents 'Abitazioni vuote (Empty Houses)'. The background shows the QGIS interface with the 'Layers' panel on the left and the main map area on the right.

**\*IT\_A6 - Abitazioni vuote (Empty Houses)**  
Variabile censuaria delle Abitazioni

GRADUATED SYMOLOGY → Select Color Ramp → All Color Ramps → Select from the list



# GRADUATED SYMOLOGY → Mode → Natural Breaks (Jenks)

The screenshot shows the QGIS interface with the 'Layer Properties' dialog for the layer 'seZ\_cens\_BG'. The 'Symbology' tab is active, showing a 'Graduated' symbology type. The 'Column' is set to '123 IT\_A6'. The 'Method' is set to 'Color'. A color ramp is visible. The 'Mode' dropdown is open, and 'Natural Breaks (Jenks)' is highlighted with a green box and a green arrow. Other modes include 'Equal Interval', 'Quantile (Equal Count)', 'Standard Deviation', and 'Pretty Breaks'. The 'Classes' are set to 5. The 'Layer Rendering' section is also visible at the bottom of the dialog.

Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help Iso4App Vettore

Layer Properties - seZ\_cens\_BG | Symbology

Graduated

Column: 123 IT\_A6

Symbol: Change...

Legend format: %1 - %2 Precision 4 Trim

Method: Color

Color ramp

Classes Histogram

Symbol Values Legend

Mode: Equal Interval, Quantile (Equal Count), **Natural Breaks (Jenks)**, Standard Deviation, Pretty Breaks

Classes: 5

Layer Rendering

Style

OK Cancel Apply Help

Browser

- Project Home
- Home
- C:\
- D:\
- E:\
- GeoPackage
- SpatialLite
- PostGIS
- MSSQL
- Oracle
- DB2
- WMS/WMTS
- XYZ Tiles
  - google map
  - OpenStreetMap

Layer Order Browser

Layers

- Rete\_Ferroviaria
- Strade\_Principali
- Elementi\_Idrici
- Comuni\_2018\_poligonali
- Provincia\_BG
- seZ\_cens\_BG
- Streets\_BG
- Idrog\_BG
- Comunità\_montane\_BG
- Comuni\_Bg\_clip
- Province\_2018
- sezCens\_2011\_lomb\_dati
- Comunita\_montane\_2018
- Satellite google

Type to locate (Ctrl+K) 1 legend entries removed.

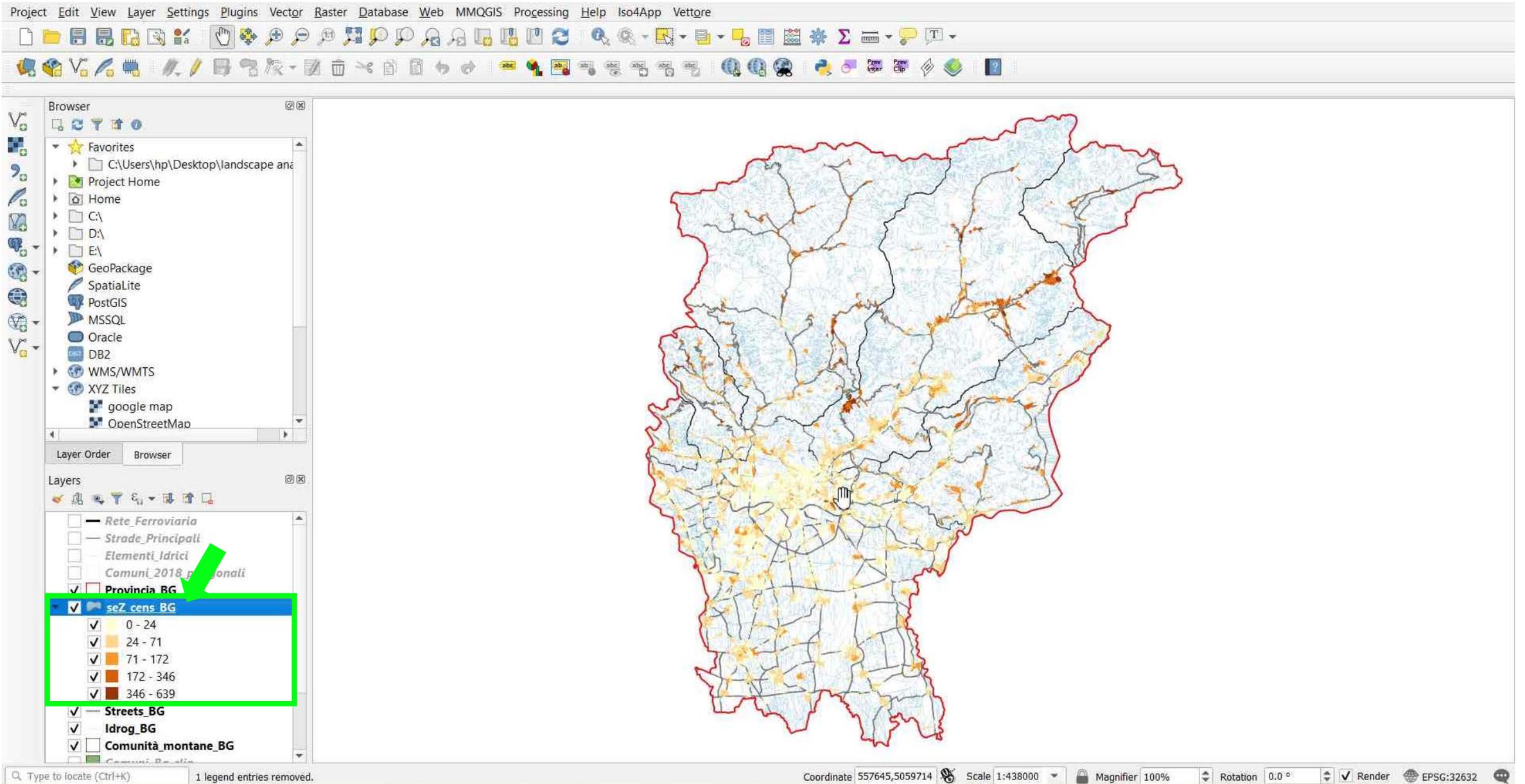
Coordinate: 504429,5048588 Scale: 1:438000 Magnifier: 100% Rotation: 0.0° Render EPSG:32632

# GRADUATED SYMOLOGY → Click **Classify** → Apply

The screenshot shows the QGIS interface with the 'Layer Properties - seZ\_cens\_BG | Symbology' dialog box open. The dialog is highlighted with a green border. The 'Symbology' tab is selected, showing a 'Graduated' symbology type. The 'Column' is set to '123 IT\_A6'. The 'Legend format' is '%1 - %2'. The 'Method' is 'Color'. The 'Color ramp' is a gradient from light yellow to dark red. The 'Classes' tab is selected, showing a legend table with 5 classes. A green arrow points to the 'Classify' button, and another green arrow points to the 'Apply' button.

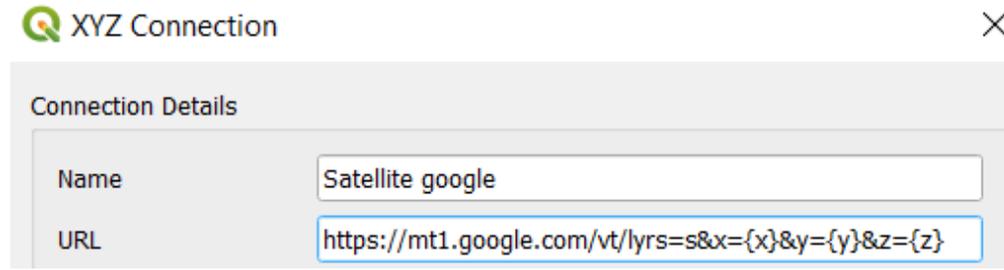
Symbol	Values	Legend
<input checked="" type="checkbox"/>	0.00 - 24.00	0 - 24
<input checked="" type="checkbox"/>	24.00 - 71.00	24 - 71
<input checked="" type="checkbox"/>	71.00 - 172.00	71 - 172
<input checked="" type="checkbox"/>	172.00 - 346.00	172 - 346
<input checked="" type="checkbox"/>	346.00 - 639.00	346 - 639

# GRADUATED SYMBOLOGY → Number of Empty Houses in Bergamo Province By Census Tracts



**ADD GOOGLE SATELLITE MAP** → Right-click on 'XYZ Tiles' in the Browser Panel → Select 'New Connection' → Paste the URL below

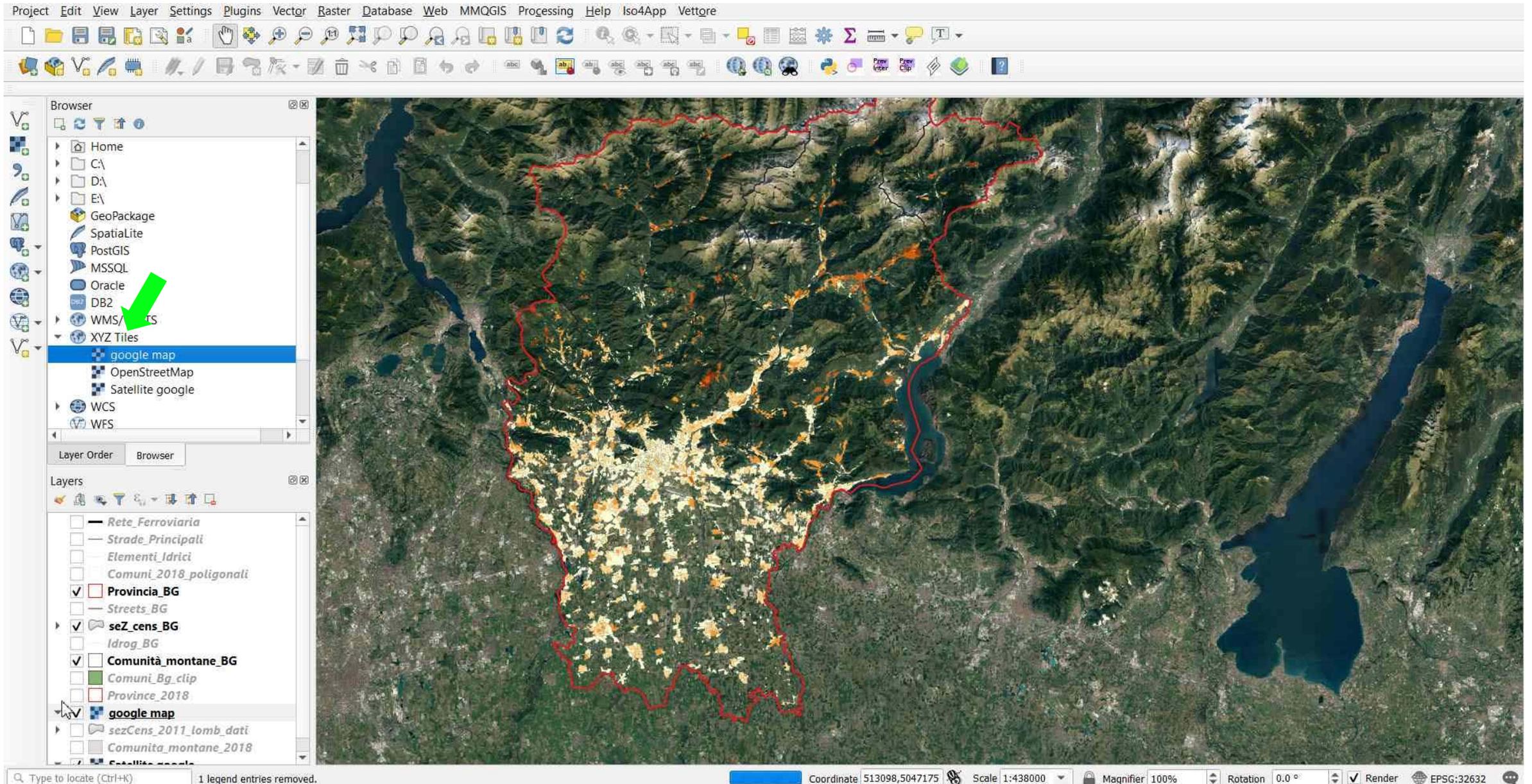
<https://mt1.google.com/vt/lyrs=s&x={x}&y={y}&z={z}>



The image shows a dialog box titled "XYZ Connection" with a close button (X) in the top right corner. Below the title bar is a section labeled "Connection Details" containing two input fields:

Name	<input type="text" value="Satellite google"/>
URL	<input type="text" value="https://mt1.google.com/vt/lyrs=s&amp;x={x}&amp;y={y}&amp;z={z}"/>

## ADD GOOGLE SATELLITE MAP → The Google map now appears on the map canvas



# TRANSPARENCY → Properties → Transparency → Global Opacity → Change to 60-70%

The screenshot displays the QGIS software interface. On the left, the 'Browser' panel shows a tree view of data sources, with 'google map' selected under 'XYZ Tiles'. Below it, the 'Layers' panel lists several layers, including 'Provincia\_BG', 'seZ\_cens\_BG', 'Comunità\_montane\_BG', and 'google map', with a green arrow pointing to 'google map'. The main map area shows a satellite view of a mountainous region with a semi-transparent yellow/orange overlay. A 'Layer Properties' dialog box is open over the map, titled 'Layer Properties - google map | QGIS Server | Transparency'. The 'Transparency' tab is active, and the 'Global Opacity' slider is set to 60.0%. The 'No Data Value' section is unchecked, and the 'Custom Transparency Options' section is empty. The dialog has 'OK', 'Cancel', 'Apply', and 'Help' buttons at the bottom.

# TRANSPARENCY

The screenshot displays the QGIS desktop environment. At the top, the menu bar includes Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Database, Web, MMQGIS, Processing, Help, Iso4App, and Vettore. Below the menu is a toolbar with various icons for file operations, navigation, and analysis. The main window is divided into several panels:

- Browser:** Shows a file system tree with folders like Home, C:\, D:\, E:\, GeoPackage, Spatialite, PostGIS, MSSQL, Oracle, DB2, WMS/WMTS, and XYZ Tiles. Under XYZ Tiles, 'google map' is selected.
- Layer Order:** A tab for managing the stack of layers.
- Layers:** A list of loaded layers with checkboxes and symbols. The layers include:
  - Comunità\_montane\_BG**
  - Rete Ferroviaria**
  - Strade Principali**
  - Elementi Idrici*
  - Comuni\_2018\_polygonali*
  - Provincia\_BG**
  - Streets\_BG*
  - sez\_cens\_BG**
  - Idrog\_BG*
  - Comuni\_Bg\_clip*
  - Province\_2018*
  - google map**
  - sezCens\_2011\_lomb\_dati*
  - Comunita\_montane\_2018*

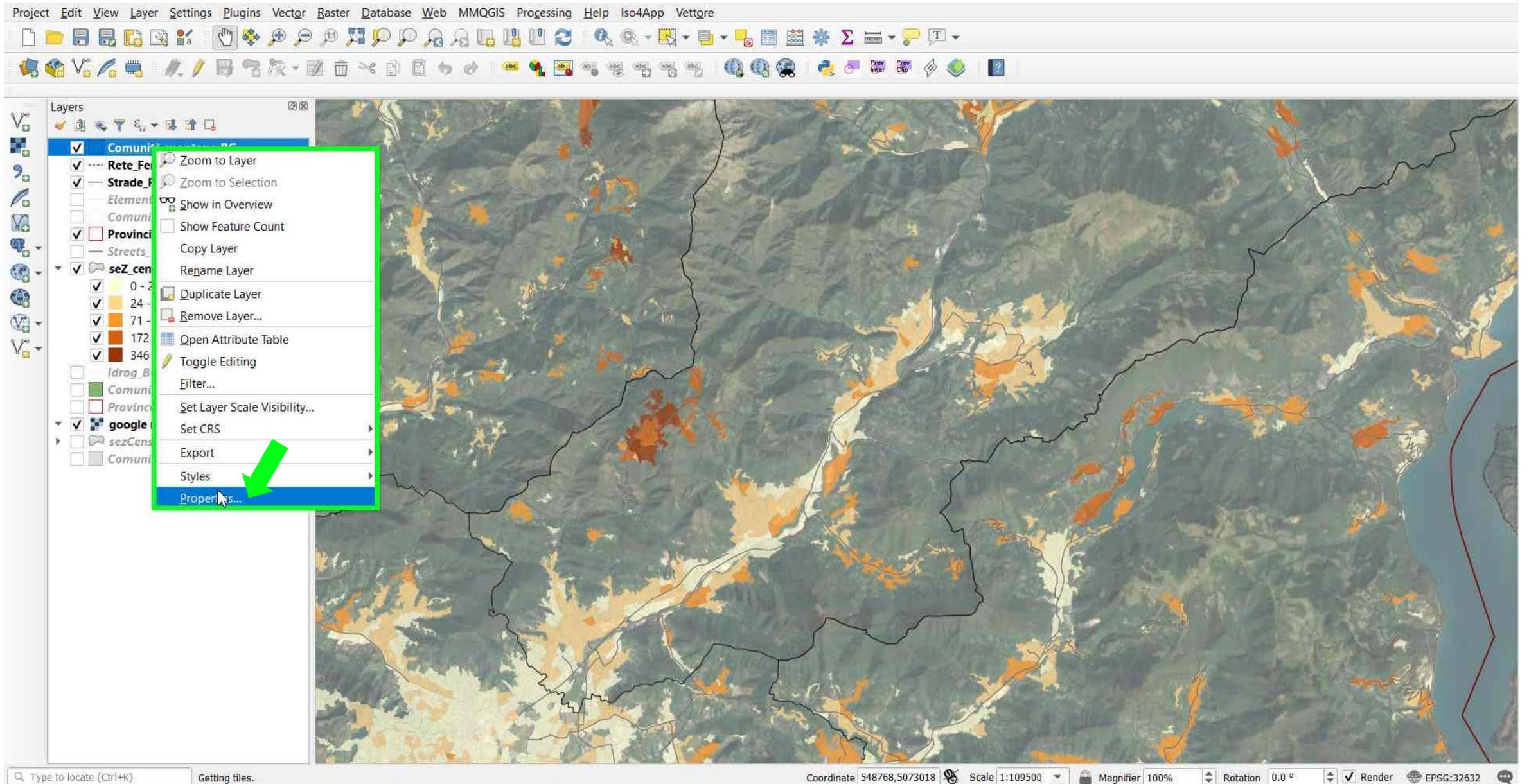
The map area shows a satellite view of a region with a large lake on the right. Overlaid on the map are several layers: a red outline representing the provincial boundary, a black outline for the railway network, and a semi-transparent orange and yellow layer representing the 'sez\_cens\_BG' data. The 'google map' layer is visible as a grid pattern.

At the bottom of the interface, there is a search bar with the text 'Type to locate (Ctrl+K)', a status bar showing 'Getting tiles.', and a coordinate display showing 'Coordinate 532984,5059969'. Other status information includes 'Scale 1:219000', 'Magnifier 100%', 'Rotation 0.0 °', 'Render', and 'EPSG:32632'.

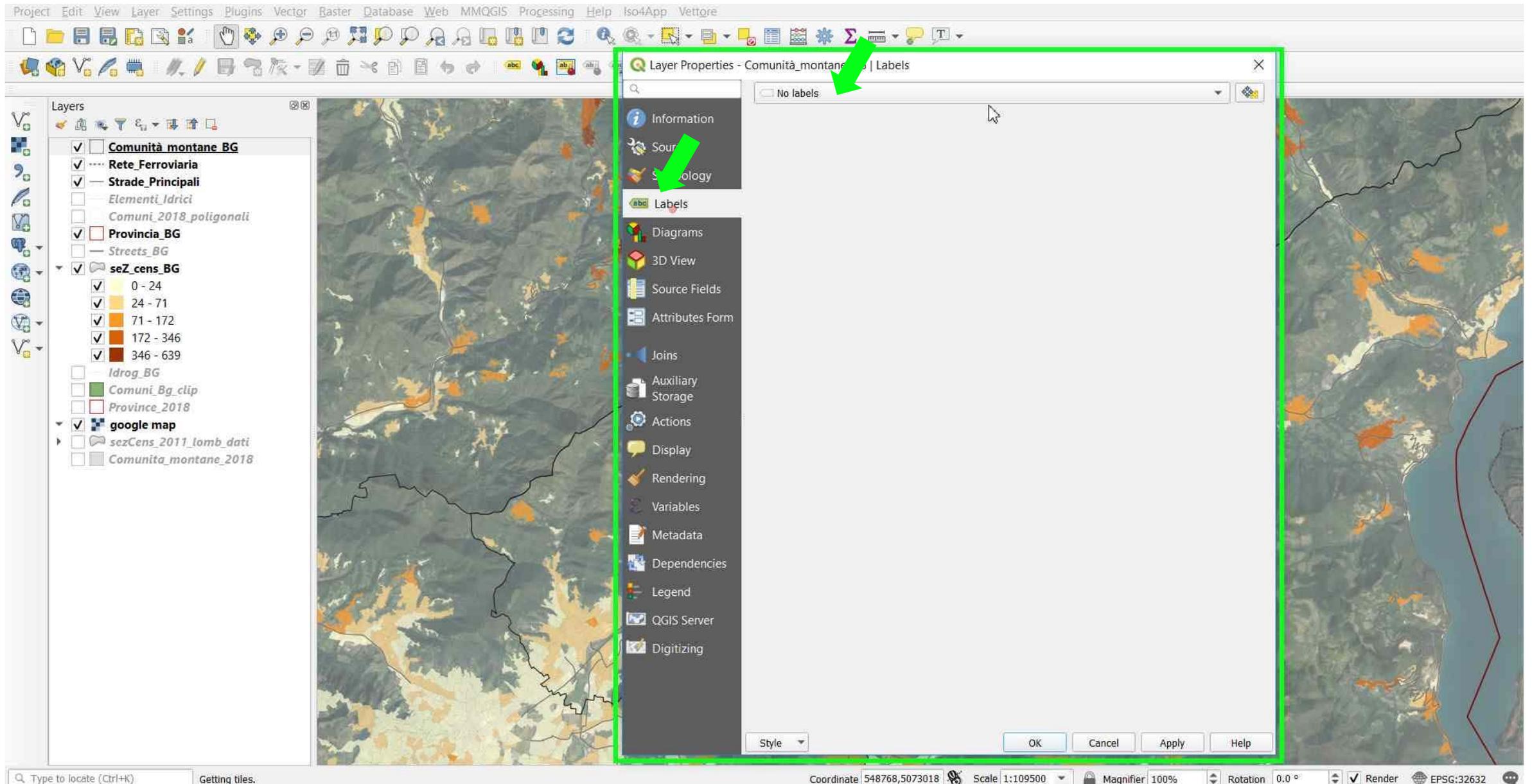
## TRANSPARENCY → Repeat **Global Opacity 60%** to layer *Sez\_Cens\_BG*

The screenshot displays the QGIS desktop environment. The top menu bar includes Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Database, Web, MMQGIS, Processing, Help, Iso4App, and Vettore. Below the menu is a toolbar with various icons for file operations, navigation, and analysis. The main window is divided into a Layers panel on the left and a map canvas on the right. The Layers panel shows a list of layers with checkboxes and symbols. A green arrow points to the 'sez\_cens\_BG' layer, which is currently selected and highlighted in blue. Below this layer, a legend shows five color-coded categories: 0 - 24 (lightest), 24 - 71, 71 - 172, 172 - 346, and 346 - 639 (darkest). Other layers listed include 'Comunita\_montane\_BG', 'Rete\_Ferroviaria', 'Strade\_Principali', 'Elementi\_Idrici', 'Comuni\_2018\_polygonali', 'Provincia', 'Streets', 'Idrog\_BG', 'Comuni\_Bg\_clip', 'Province\_2018', 'google map', 'sezCens\_2011\_lomb\_dati', and 'Comunita\_montane\_2018'. The map canvas shows a satellite-style map with the 'sez\_cens\_BG' layer overlaid, showing various colored areas. The bottom status bar displays the coordinate 548768,5073018, scale 1:109500, magnifier 100%, rotation 0.0°, and EPSG:32632.

**LABELS** → to access the Label tool right-click on the layer → 'Properties...'



**LABELS** → select 'Labels' from the Layer Properties menu → Click on the Labels dialog



## LABELS → Choose 'Simple labels'

The screenshot displays the QGIS interface with the 'Layer Properties - Comunità\_montane\_BG' dialog box open. The 'Labels' tab is selected, and the 'Simple labels' option is highlighted with a blue background and a green arrow. The 'No labels' option is also highlighted with a green box. The 'Layers' panel on the left shows a list of layers, including 'Comunità\_montane\_BG', 'Rete\_Ferroviaria', 'Strade\_Principali', 'Elementi\_Idrici', 'Comuni\_2018\_poligonal', 'Provincia\_BG', 'Streets\_BG', 'sez\_cens\_BG' (with a legend for population ranges: 0-24, 24-71, 71-172, 172-346, 346-639), 'Idrog\_BG', 'Comuni\_Bg\_clip', 'Province\_2018', 'google map', 'sezCens\_2011\_lomb\_dati', and 'Comunita\_montane\_2018'. The main map area shows a satellite view of a mountainous region with a river and a lake. The status bar at the bottom indicates the coordinate (548768,5073018), scale (1:109500), magnifier (100%), rotation (0.0°), and projection (EPSG:32632).

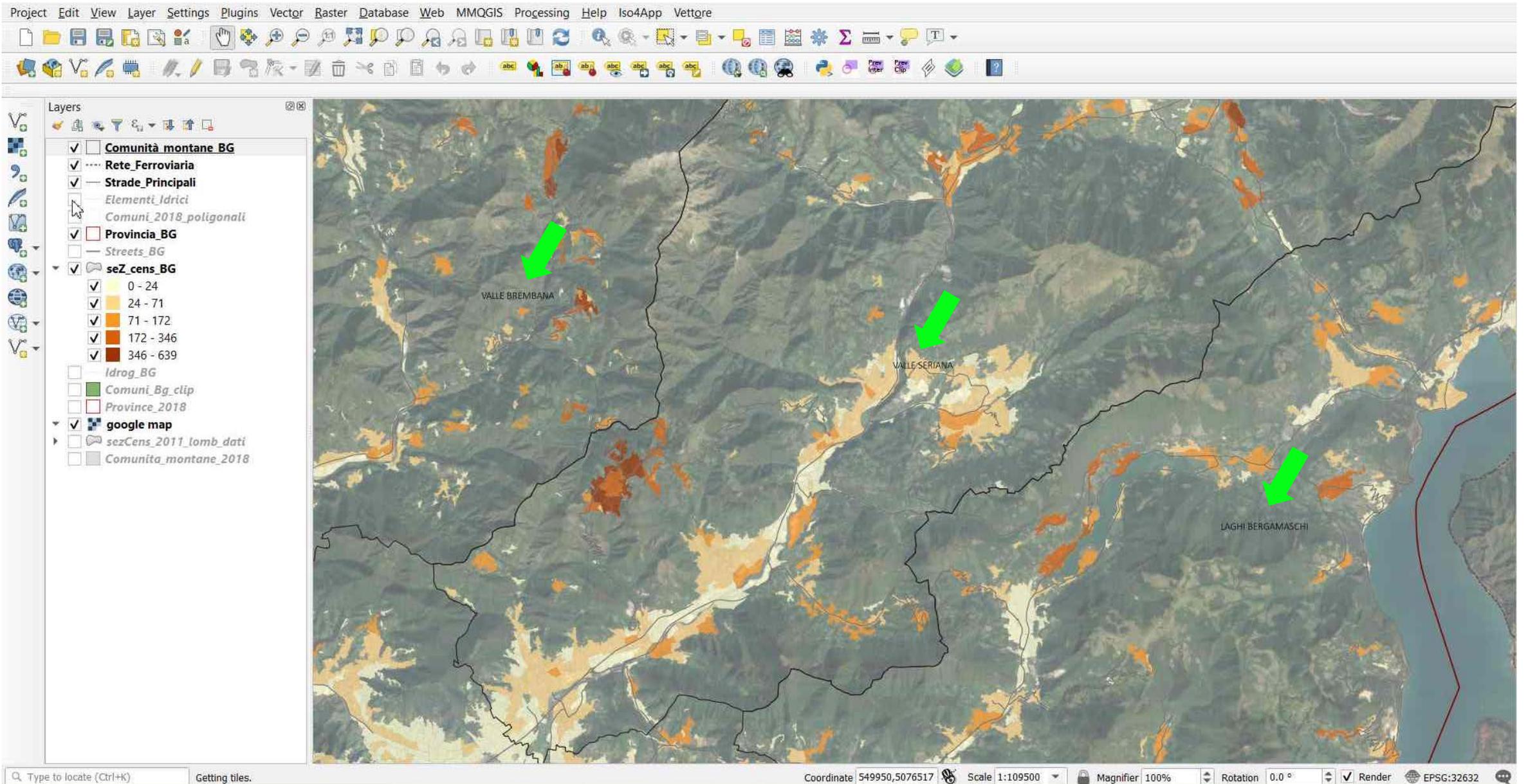
**LABELS** → Select *NOME* from the 'Label with' list to choose which field in the attributes will be used for the labels

The screenshot displays the QGIS software interface. On the left, the 'Layers' panel shows a list of layers, including 'Comunità\_montane\_BG' which is checked. The main map area shows a satellite-style map with orange and yellow overlays. The 'Layer Properties' dialog box is open for the 'Comunità\_montane\_BG' layer. The 'Labels' tab is selected in the left sidebar of the dialog. The 'Label with' dropdown menu is set to 'abc NOME', indicated by a green arrow. Below this, the 'Text Sample' section shows 'Lorem Ipsum' text. The 'Text' section includes settings for Font (Calibri Light), Style (Regular), Size (8.0000), Color (black), and Opacity (100.0%). The 'Placement' section includes options for Type case (No change), Spacing (letter and word), and Blend mode (Normal). The 'Apply label text substitutes' checkbox is unchecked. At the bottom of the dialog, there are buttons for 'Style', 'OK', 'Cancel', 'Apply', and 'Help'. The QGIS status bar at the bottom shows the coordinate '548768,5073018', scale '1:109500', and other settings.

# LABELS → Change the label Style, Size, Colour as desired → Apply

The screenshot displays the QGIS software interface. On the left, the 'Layers' panel shows a list of layers including 'Comunità\_montane\_BG', 'Rete\_Ferroviaria', 'Strade\_Principali', 'Elementi\_Idrici', 'Comuni\_2018\_poligonali', 'Provincia\_BG', 'Streets\_BG', 'sezCens\_BG', 'Idrog\_BG', 'Comuni\_Bg\_clip', 'Province\_2018', 'google map', 'sezCens\_2011\_lomb\_dati', and 'Comunita\_montane\_2018'. The main map area shows a satellite-style map with various colored regions and labels like 'VALLE BREMBANA' and 'MAMASCHI'. The 'Layer Properties - Comunità\_montane\_BG | Labels' dialog is open, showing the 'Labels' tab. The 'Text Sample' section contains 'Lorem Ipsum'. The 'Text' section is highlighted with a green box, showing settings for 'Font' (Calibri Light), 'Style' (Regular), 'Size' (8.0000), 'Color' (black), and 'Opacity' (100.0 %). The 'Apply' button at the bottom right of the dialog is also highlighted with a green arrow. The status bar at the bottom shows 'Coordinate 548768,5073018', 'Scale 1:109500', 'Magnifier 100%', 'Rotation 0.0 °', 'Render', and 'EPSG:32632'.

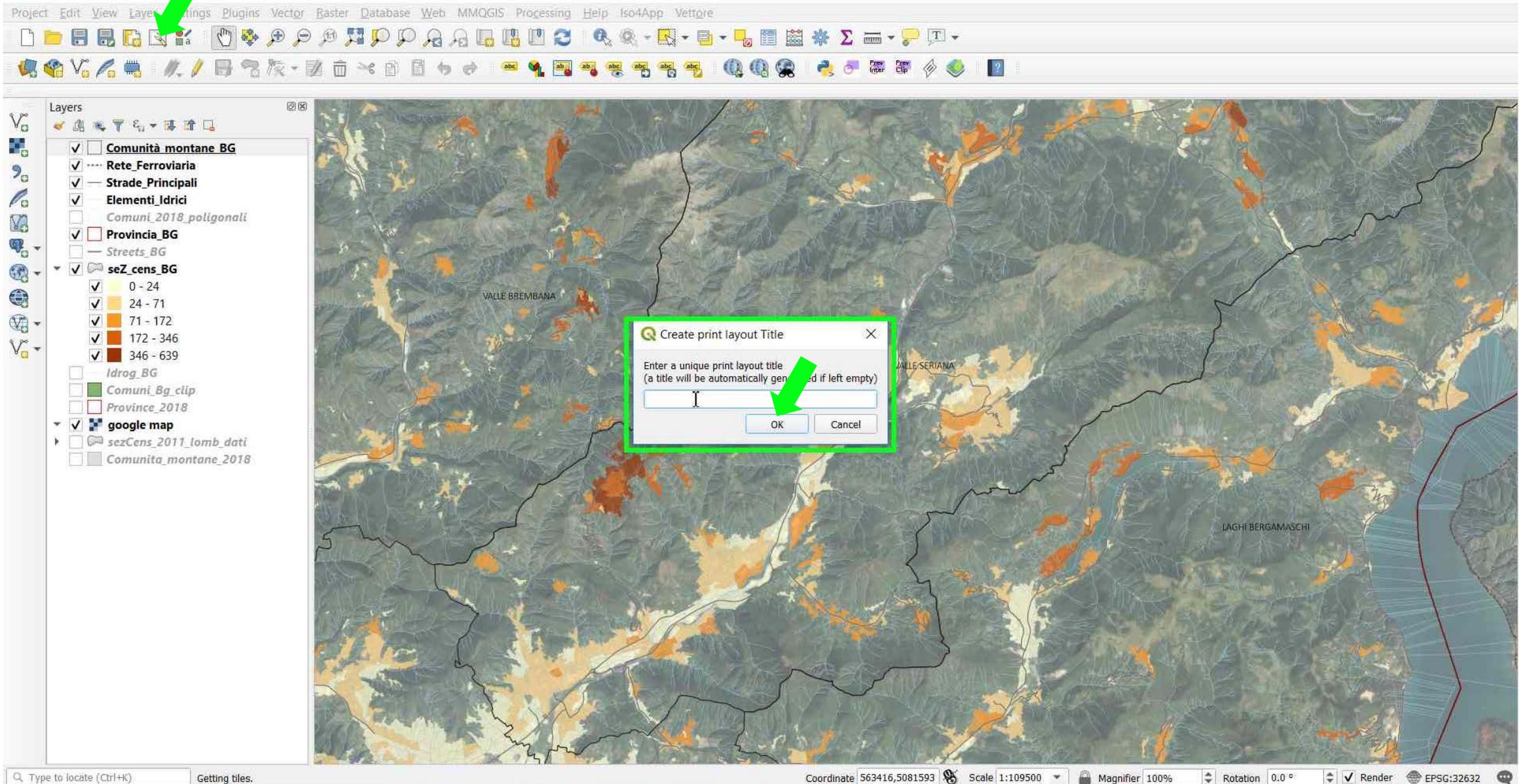
## LABELS → The map should now have labels



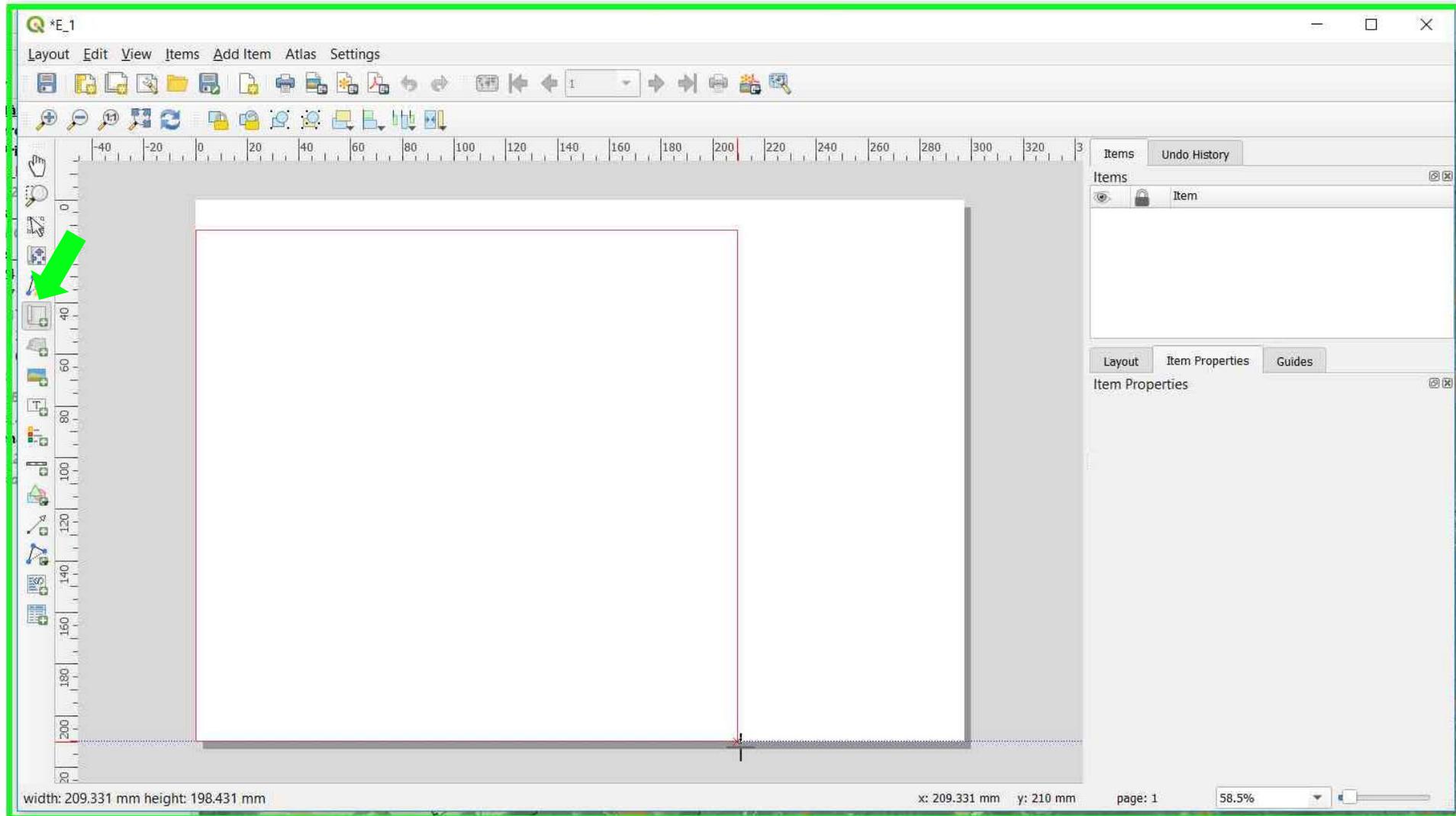
## PART 4

- **Layout Manager → Create a new Layout**
- **Layout Manager → Export as...**

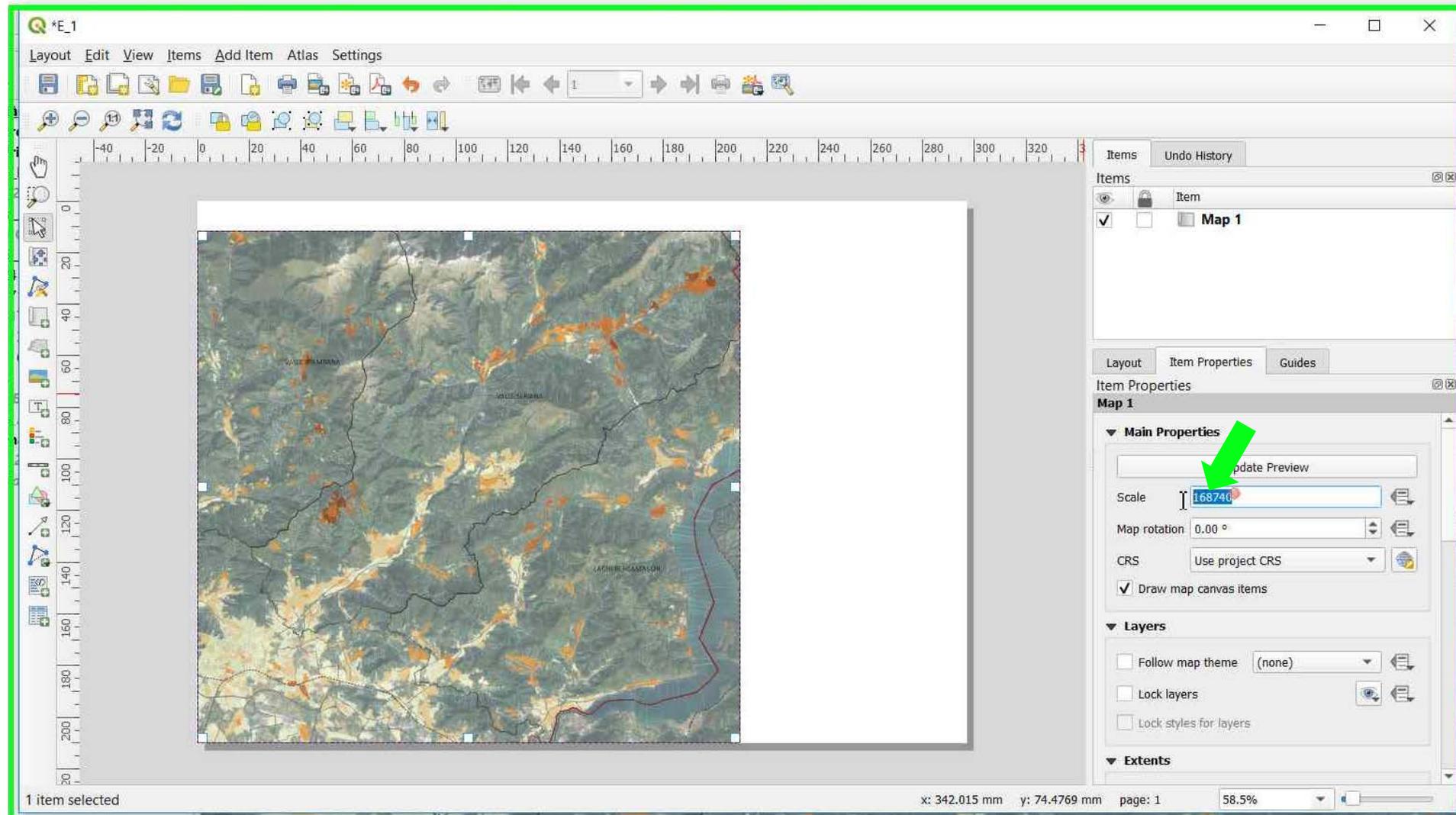
**PRINT LAYOUT** → Click on the 'Show Layout Manager' button → Create the print layout Title → Click OK



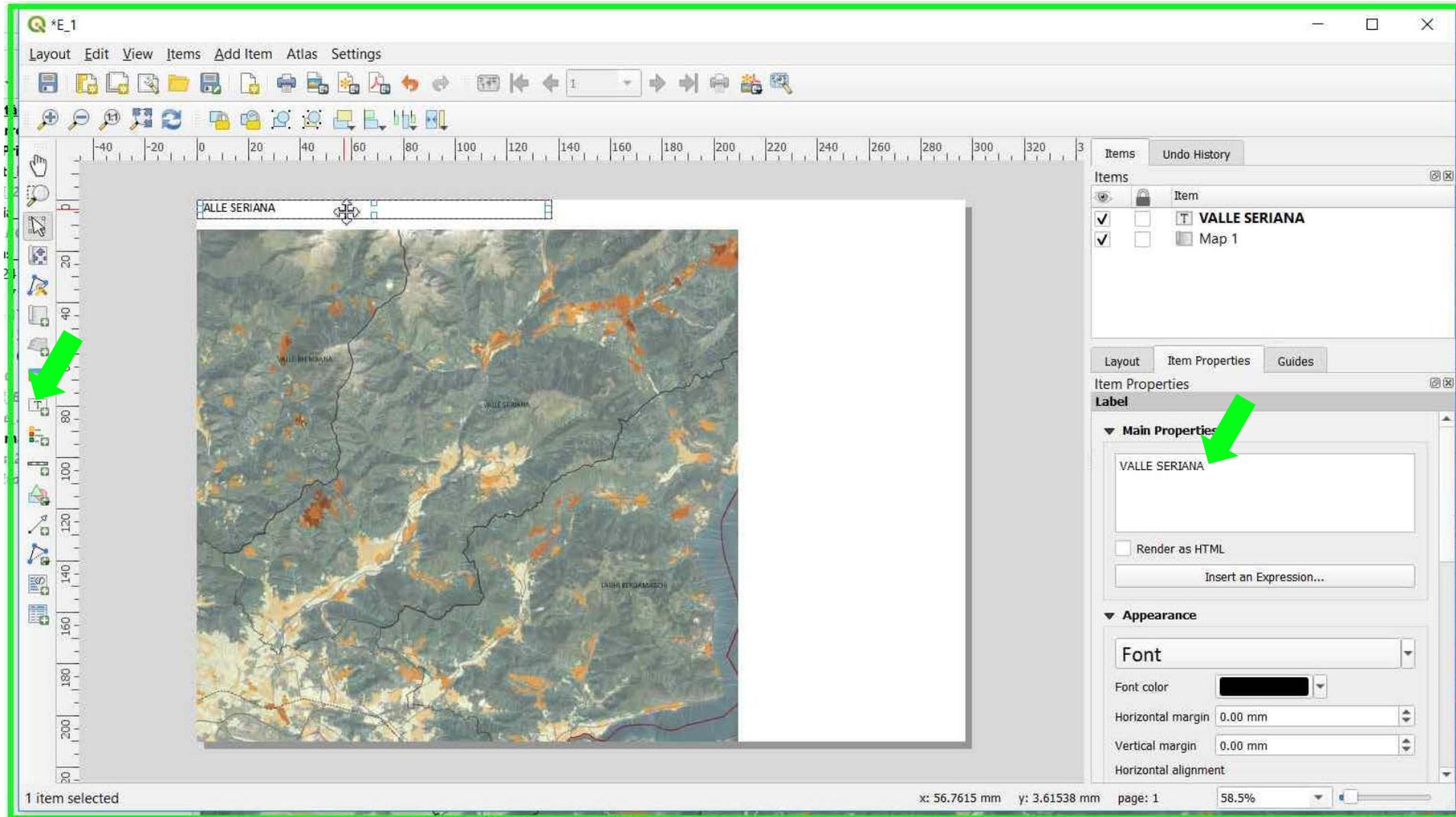
**PRINT LAYOUT** → Clicks on the **'Add new Map'** button → click and drag a box on the blank page to place the map



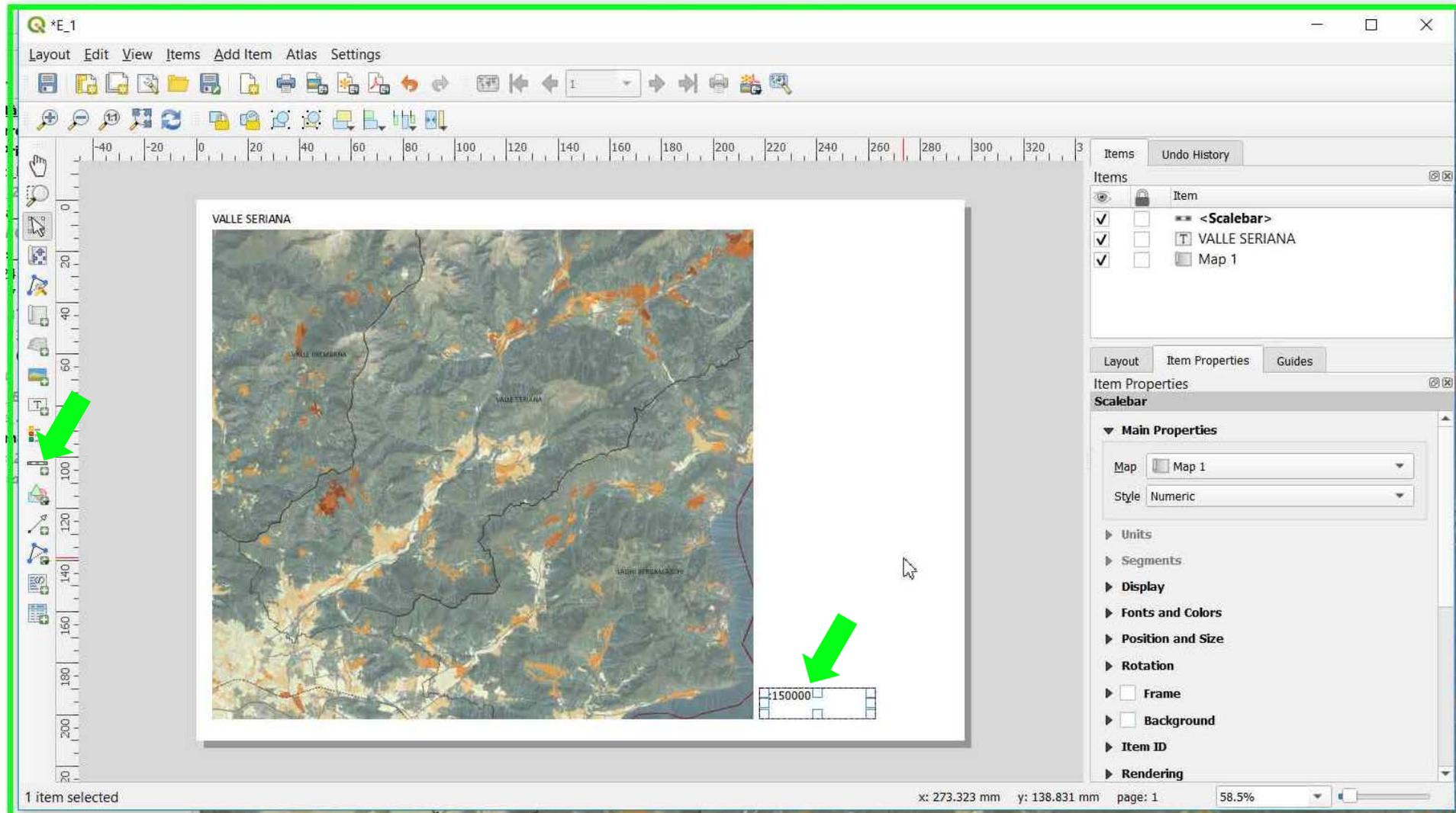
**PRINT LAYOUT** → Move the map by clicking and dragging it around → Set the map **Scale** from 'Item Properties' window



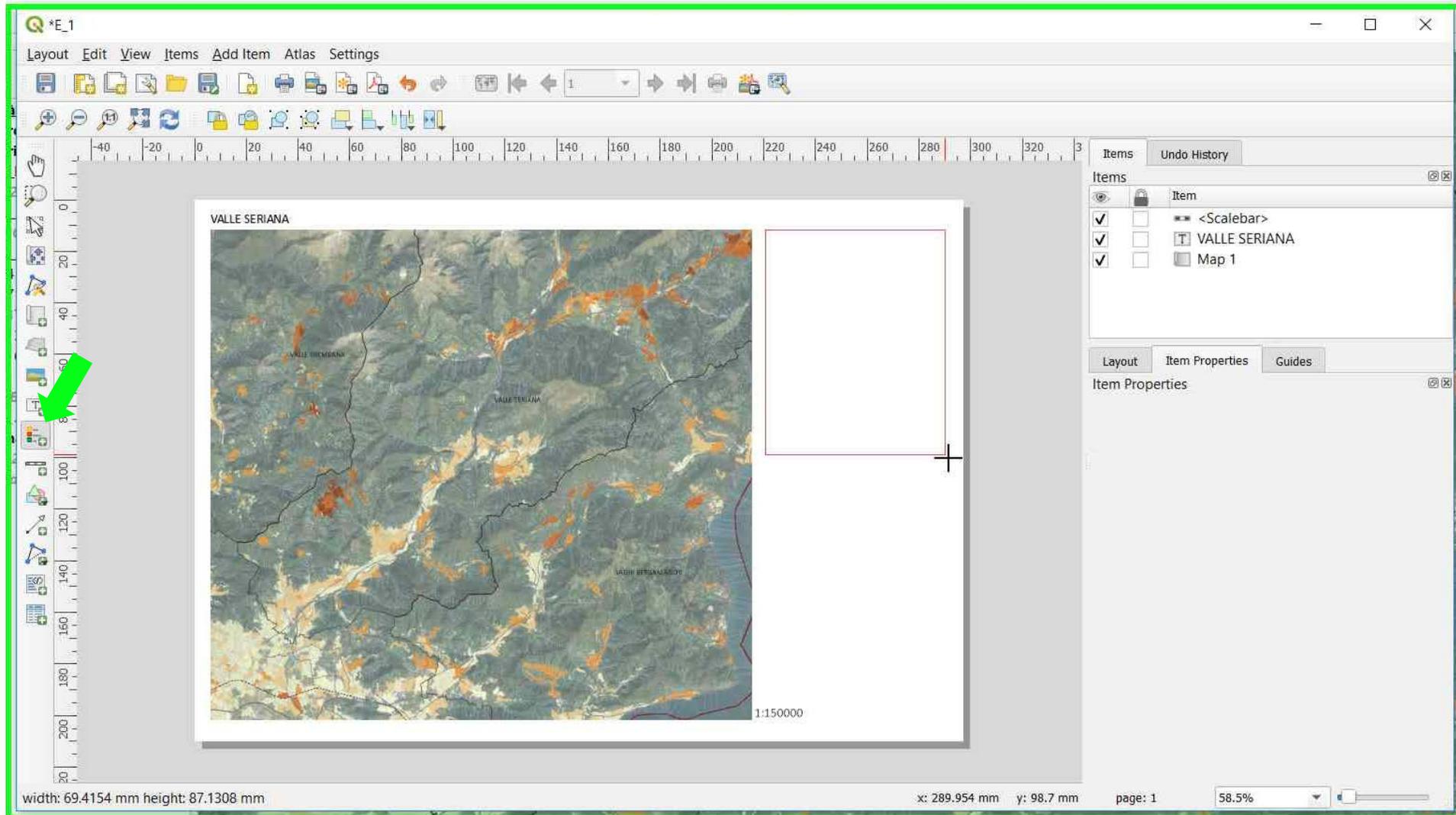
**PRINT LAYOUT** → To add a **title** to the map click the **'Add a new Label'** button → type the text within the window and modify the **Appearance** as wished



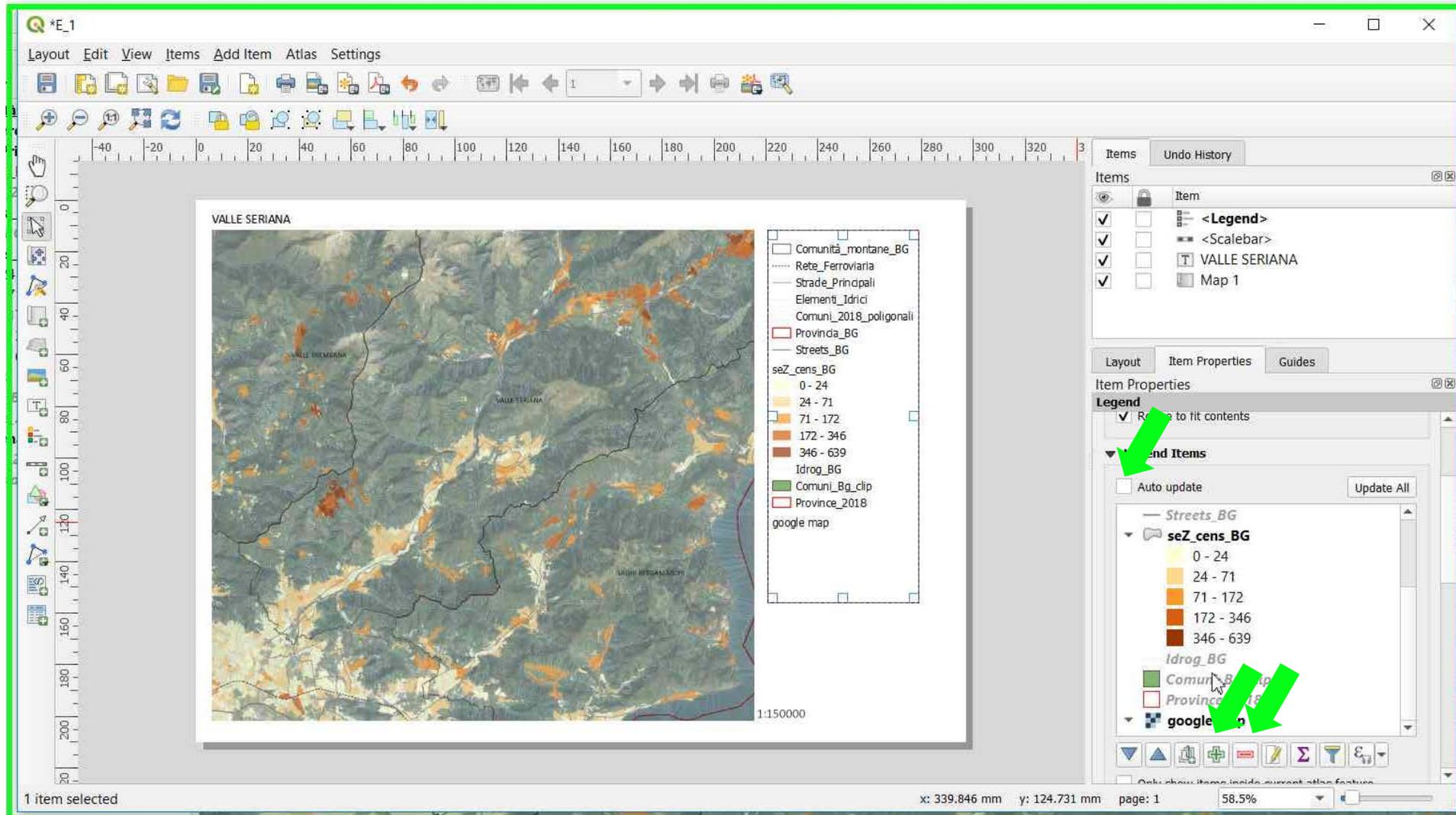
**PRINT LAYOUT** → Click the 'add new Scale bar' button to add the **Scale bar** to the layout



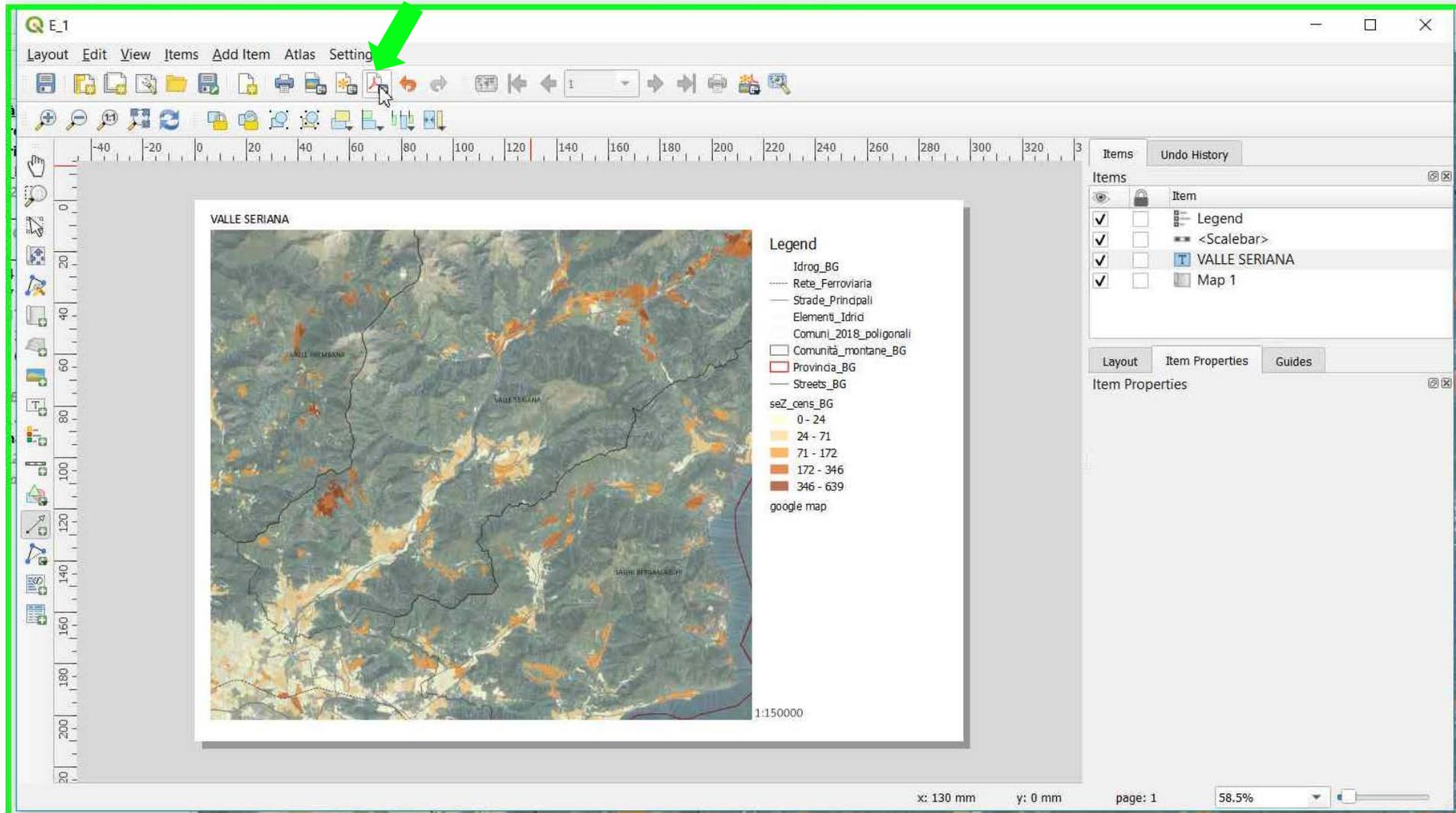
**PRINT LAYOUT** → To add the **Legend** click the 'Adds a new Legend' button and move it where you want it.



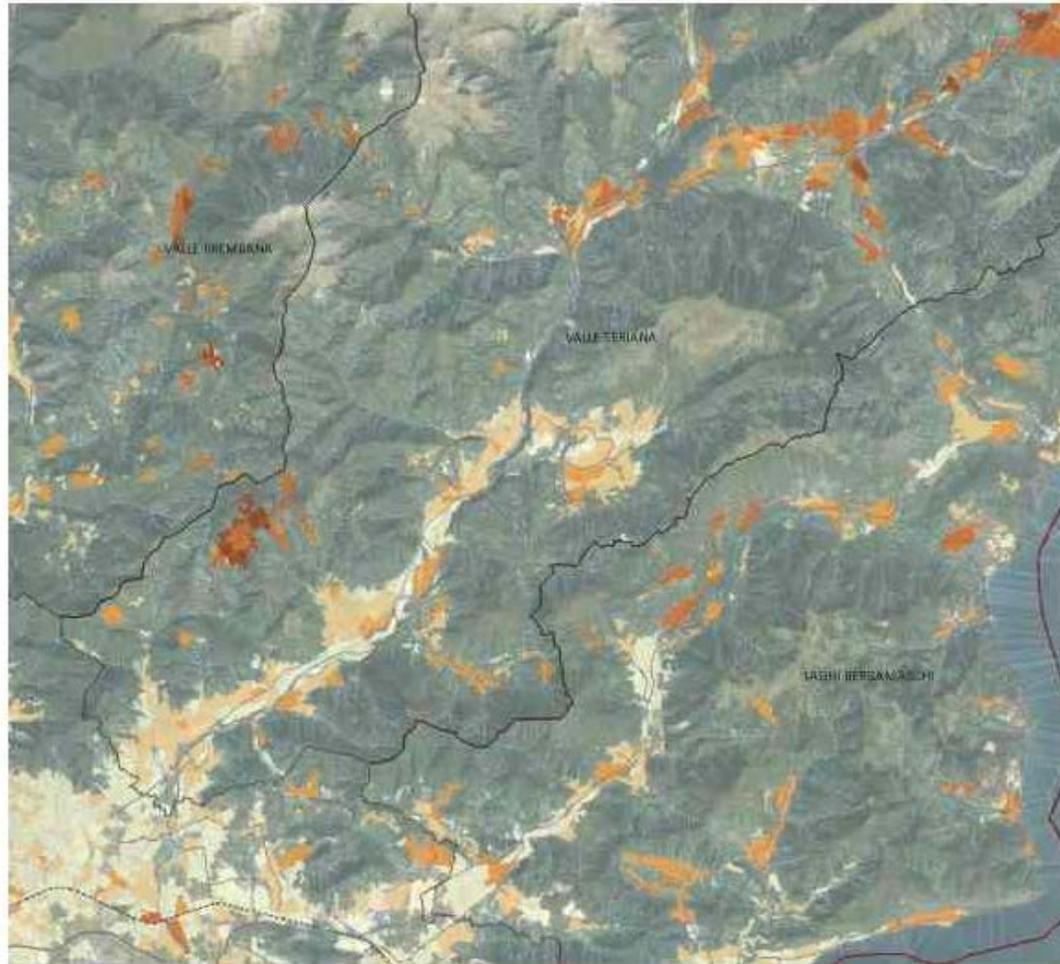
**PRINT LAYOUT** → Unselect the auto update box to customise the legend → Click + to Add or - to remove unwanted items.



**PRINT LAYOUT** → When the map is ready click the 'Export as Pdf...' button to export it



VALLE SERIANA



Legend

- Idrog\_BG
- Rete\_Ferroviaria
- Strade\_Principali
- Elementi\_Idrici
- Comuni\_2018\_poligonali
- Comunità\_montane\_BG
- Provincia\_BG
- Streets\_BG
- seZ\_cens\_BG
  - 0 - 24
  - 24 - 71
  - 71 - 172
  - 172 - 346
  - 346 - 639
- google map

1:150000