

# **LESSON 4   Mapping Spatial Results for Effective Communication**

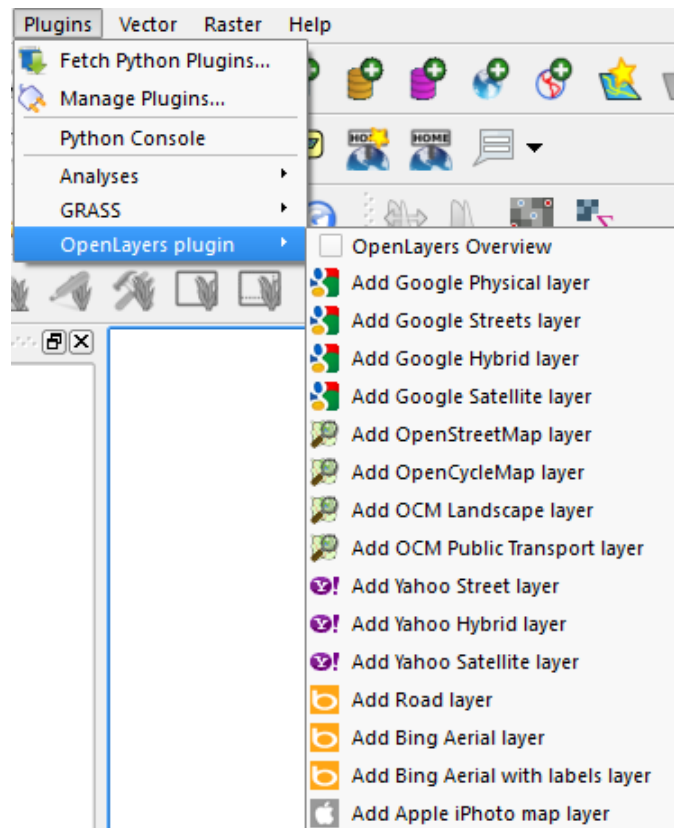
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

In the past few exercises we used QGIS to visualize and symbolize data, analyze existing data, and create new data. Today we will use what we have learned about symbology and displaying data to communicate spatial information in a map composition. Maps can contain spatial information, figures, images, graphs, and other elements to communicate information. In this exercise we will create a map showing distribution of ozone concentrations in Mexico City.

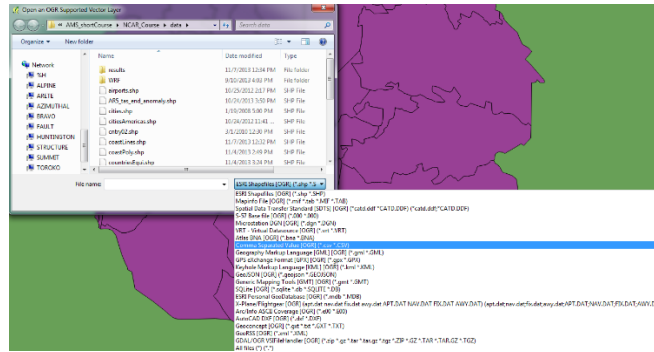
The print composer is the tool in QGIS we will use in order to make a nice looking map. It allows you to add map elements such as legends, scale bars, and titles to your map page.

### **STEP 1 Adding Basemap (Google, OpenStreetMap, Yahoo, Bing)**

- Start QGIS desktop.
- In the blank map document click the **Plugins > Fetch Python Plugins...**
- In the Filter text box type in **OpenLayers**.
- Click the option **OpenLayers Plugin 1.0.0**.
- Click the **Install plugin** button.
- Click **OK**, once the installation has completed successfully.
- **Close** the QGIS Python Plugin Installer.
- Click **Plugins > OpenLayers Plugin**.
- Select **Add Google Streets layer**.




- Using the **Zoom In**  tool, zoom into Mexico City.
- Click the **Add vector layer**  button.
- Click the **Browse** button.
- Navigate to **<your working directory>/data** and add **Mexico\_City.shp** and **airquality.shp**.
- Click **Open** to add the layers to your map.
- Click **Add vector layer**  and navigate to **<your working directory>/data**.
- Change the file type to **Comma Separated Value [OGR]**.



- Then double-click on **Mexico\_City\_Demographic\_Data.csv**.
- Click **Open**.
- Right-click on the layer *Mexico\_City* in the TOC and select **Properties**.
- In the Layer Properties click on the **Joins** tab.

Currently, there are no joins for this layer.

- Click the  button to add a join.
- In the Join dialog make sure that **Join layer** is set to *Mexico\_City\_Demographic\_Data*.
- Change the *Join Field* to **ID**.
- Change the *Target field* to **ID**.
- Keep all other defaults and click **OK**.
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Remember that the Mexico City and airquality data are in UTM Zone 14 projection and the Google web service is in Web Mercator projection.

- Click **Settings > Project Properties** (windows) or **File > Project Properties** (Mac).
- Check the box to **“Enable ‘on the fly’ CRS transformation”**.
- Click the **Google Mercator** to set the projection your map will use.
- Click **OK** to close the Project Properties dialog box.

You should now see the Mexico City municipalities and the airquality layers overlaid on the Google web service. Make sure that airquality is the top layer in your TOC and that the Google layer is at the bottom.

Spend some time and bring in any other web service basemaps.

## STEP 2 Creating new fields

- Using the skills you have learned create a new field called `child_den` as a decimal number (real) in the `Mexico_City` layer. In order to population this field with values, use the following calculation.

$$(Age\_0\_4 + Age\_5\_9) / Area\_km\_2$$

- Symbolize *Mexico\_City* on the field `child_den`, using a quantitative classification method.
- Set the transparency to 2. (HINT: Look in the **Change** button for symbol)
- Symbolize *airquality* based on the field `O3_level` in order to show which stations have the highest levels of O3.
- Make any changes you would like to your map. It is your decision if you would like to keep the Google basemap turned on or if you would like to add a different basemap.

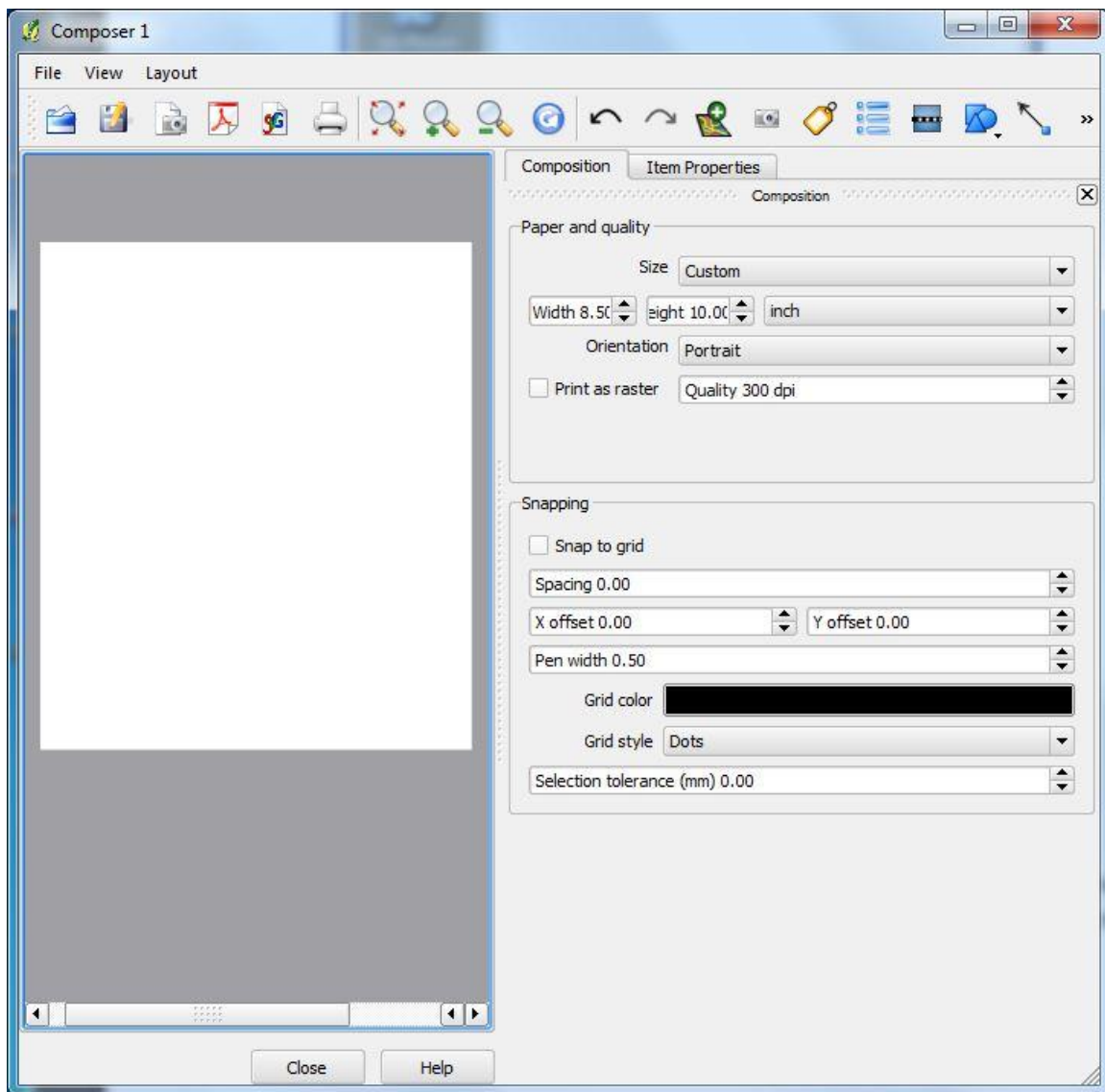
Make your map your own.

## STEP 2 Becoming familiar with print composer in QGIS

Once your map is to your liking we will start composing our layout. The print composer provides you with a blank canvas to which you can add your current QGIS map, legend, scalebar, images, arrows, and text.



- Click **File > New Print Composer**.

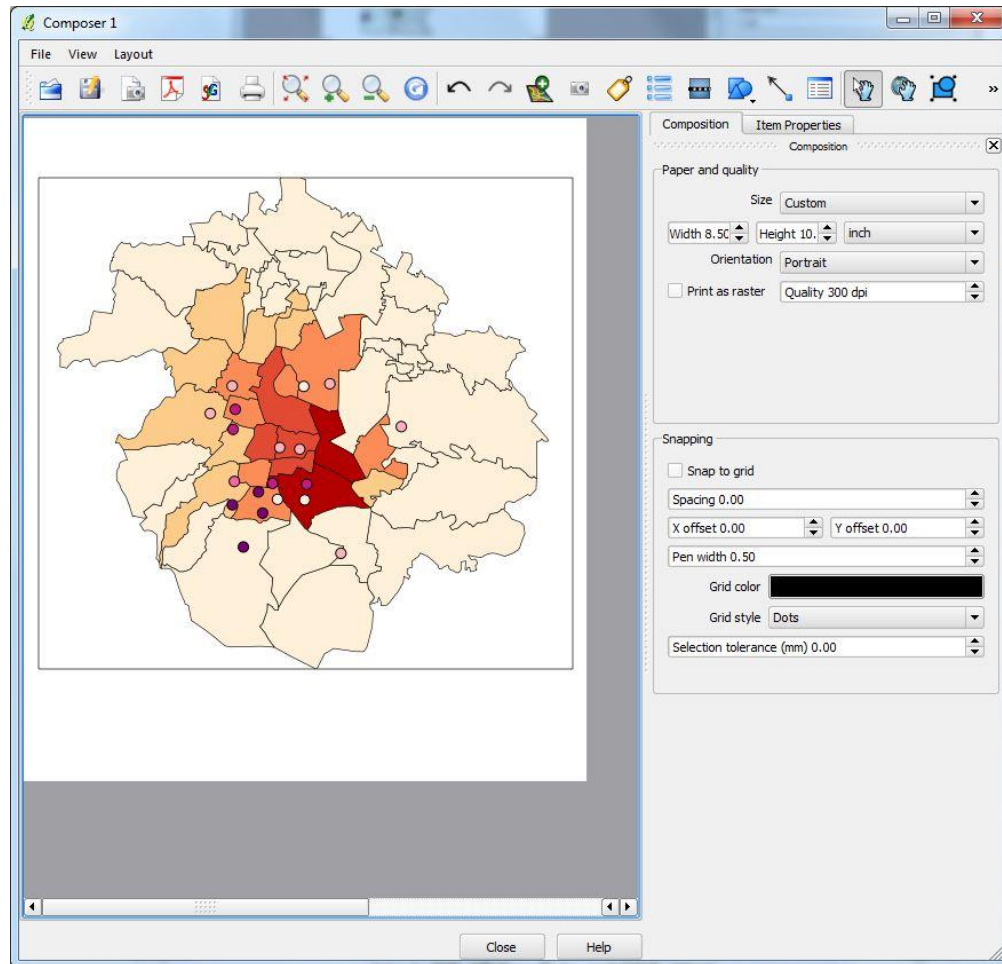
A new Print Composer window will open. The Print Composer tool contains three main parts. A menu and toolbar on top which gives you access to various map elements and controls. The main area has a blank canvas where you would be composing the map. On the right side, there is a panel with two tabs: Composition and Item Properties.



In the Composition tab you can set up your page size and orientation. In the Item Properties tab you can control the properties for each item you add to your map. You can add multiple elements to the composer. Each element has its own properties. If you want to remove an element use the delete or backspace key.

- In order to explore the print composer window, hold your mouse over each button to see what the button does.
- Click the **Composition** tab look to the **Paper and quality** section. Change the *units* from mm to **inches**.
- Change the *orientation* from Landscape to **Portrait**.
- Change the *Width* to **8.5** and the *Height* to **10.0**.

- Click the **Zoom Full**  button to zoom to the page.
- Click the **Add new map**  icon on the main toolbar.
- Click and drag a rectangle on the composer canvas with the left mouse button. This box can be changed later, however, leave some room at the top for a title and more room at the bottom for some map elements.





- Click the **Item Properties** tab.

To display the map you can choose between three different modes


Cache (default) – renders the map in the current screen resolution. If you zoom in or out the map is not rendered again but the image is scaled.

Rectangle – It only displays an empty box with a message.

Render – if you zoom in or out the composer window, the map will rerender.


- Keep the type to **Cache** for now.
- If you wish move your map canvas click on the **Select/Move**  button, then select the map and drag it to a new location.
- If you wish to resize your map click on the **Select/Move**  button and drag one of the blue handles in the corner of the map.
- You can change how the map fills the space in the map element by changing the Width, Height, Scale in the Item Properties.
- Change the *Scale* to **100000** and hit **Enter**.

Notice that now you are zoomed in. In order to rescale the map we will use the Move item content button.

- Click the **Move Item Content**  button.
- Use your mouse scroll wheel and zoom out. If you need to adjust the scale using the Scale text box do so. Your scale should be around 500000 in order to see all municipalities. You can also click and drag your map in order to recenter the map.

### STEP 3 Add map elements

Maps contain many elements in order to disseminate information and tell a story. We have added a map but now lets' add some elements to explain what you see on your map.

- Click the **Add new label**  button. Click on the white space above your map.

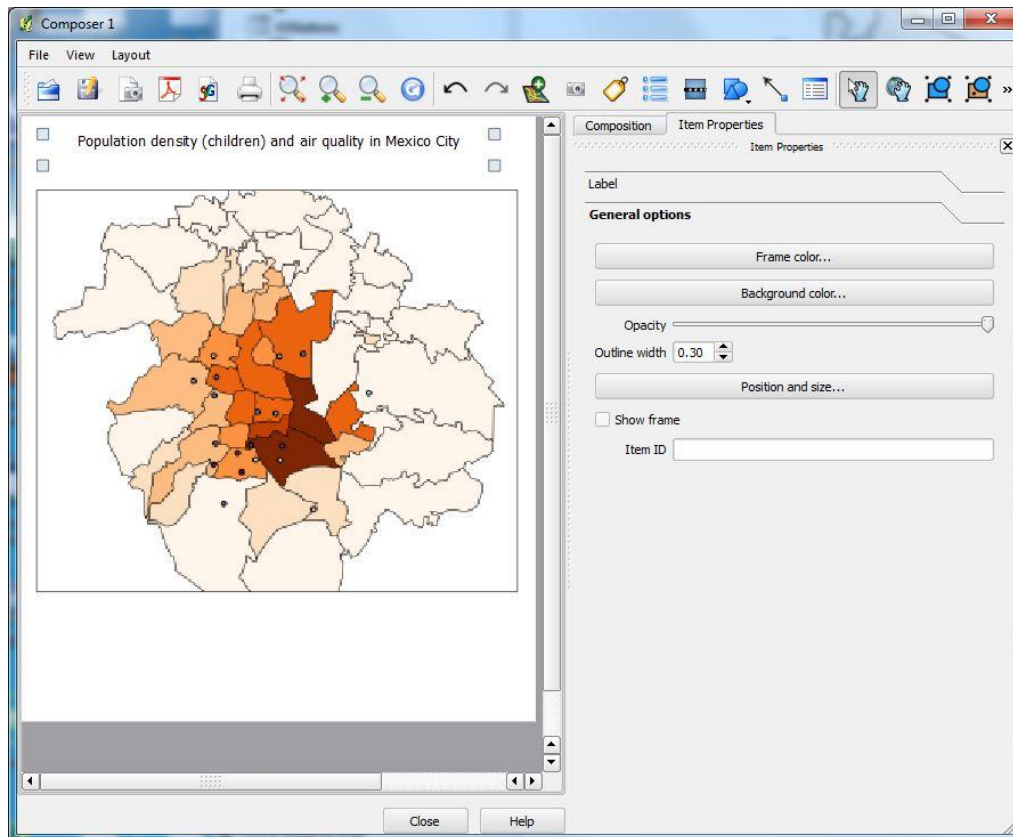
Notice that the right hand panel changes giving you a space to type in new text.


- For your title type ***Population density (children) and air quality in Mexico City.***

You may need to make the label box on your map canvas larger, in order to fit your title.


- Click **Font** and change your font to a size which makes it legible. Perhaps around 18.
- Expand the text box on your map so that you can see your title.
- Click **General options**.
- Uncheck **Show frame**.
- Reposition your title so that it is placed where you would like on your map canvas.





- Click **Layout > Add Scalebar**.
- Click the map canvas on the lower right-hand side.
- In the Item Properties, change the *Style* from **Single Box** to **Line Ticks Middle**.
- Click **General Options** and uncheck the **Show frame** option.
- Move the scalebar to an area that looks good to you.
- Click **Add New Legend**  button.
- Click anywhere in the white space under your map.
- Click **Legend Items** under Item Properties.

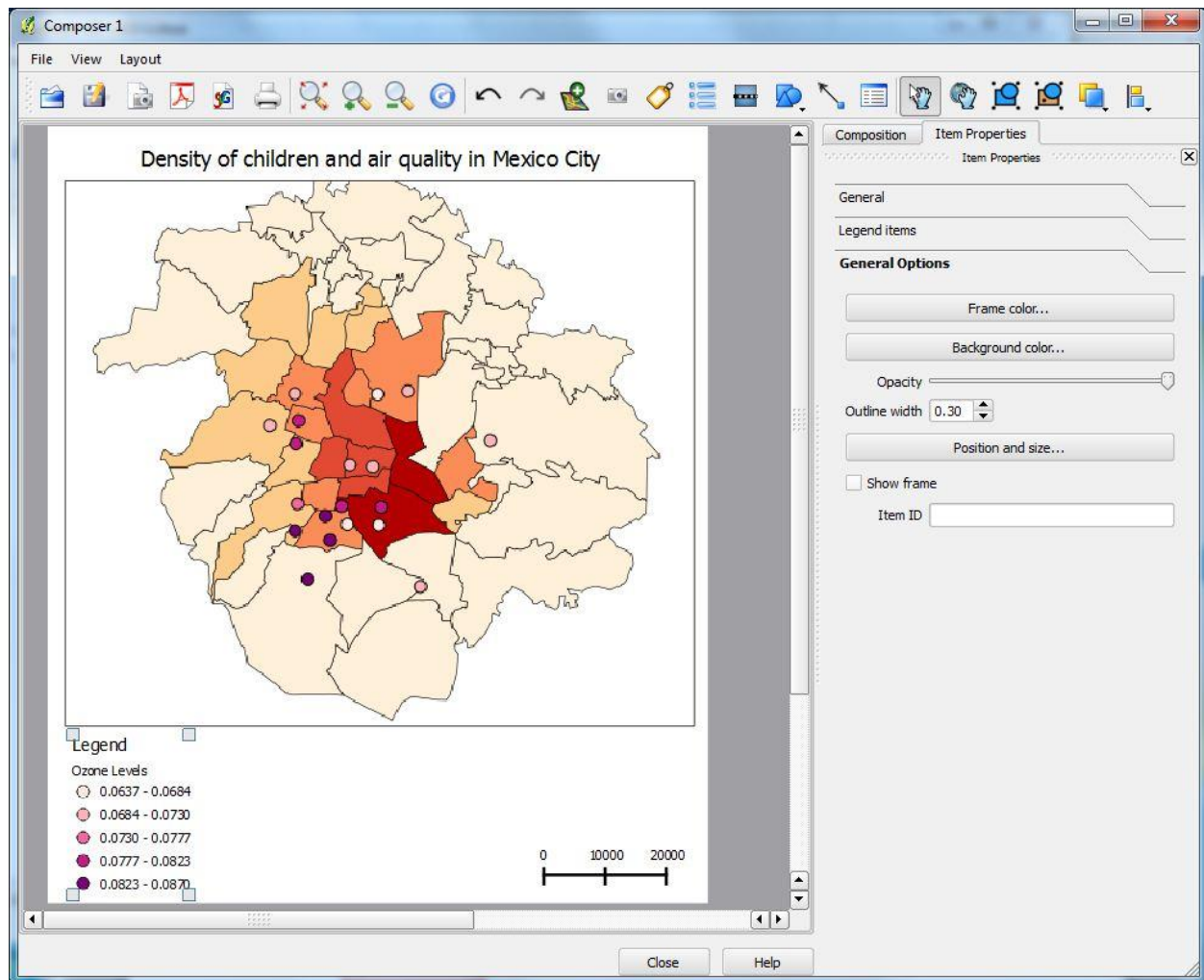
In QGIS there is no way to set the legend items into multiple columns. For our map if you have more than one layer turned on, there is not enough space to have a legend with all layers in a vertical row. We will add multiple legends and place them side by side. This is a workaround in QGIS.

- Click on the layer airquality in the Legend layer list.
- Click the **Legend item Properties**  button.
- In the text box which appears rename this title to “Ozone Levels”.


- Click **OK**.
- Click on Mexico\_City and click Delete .


Now you should only have one item in your legend.

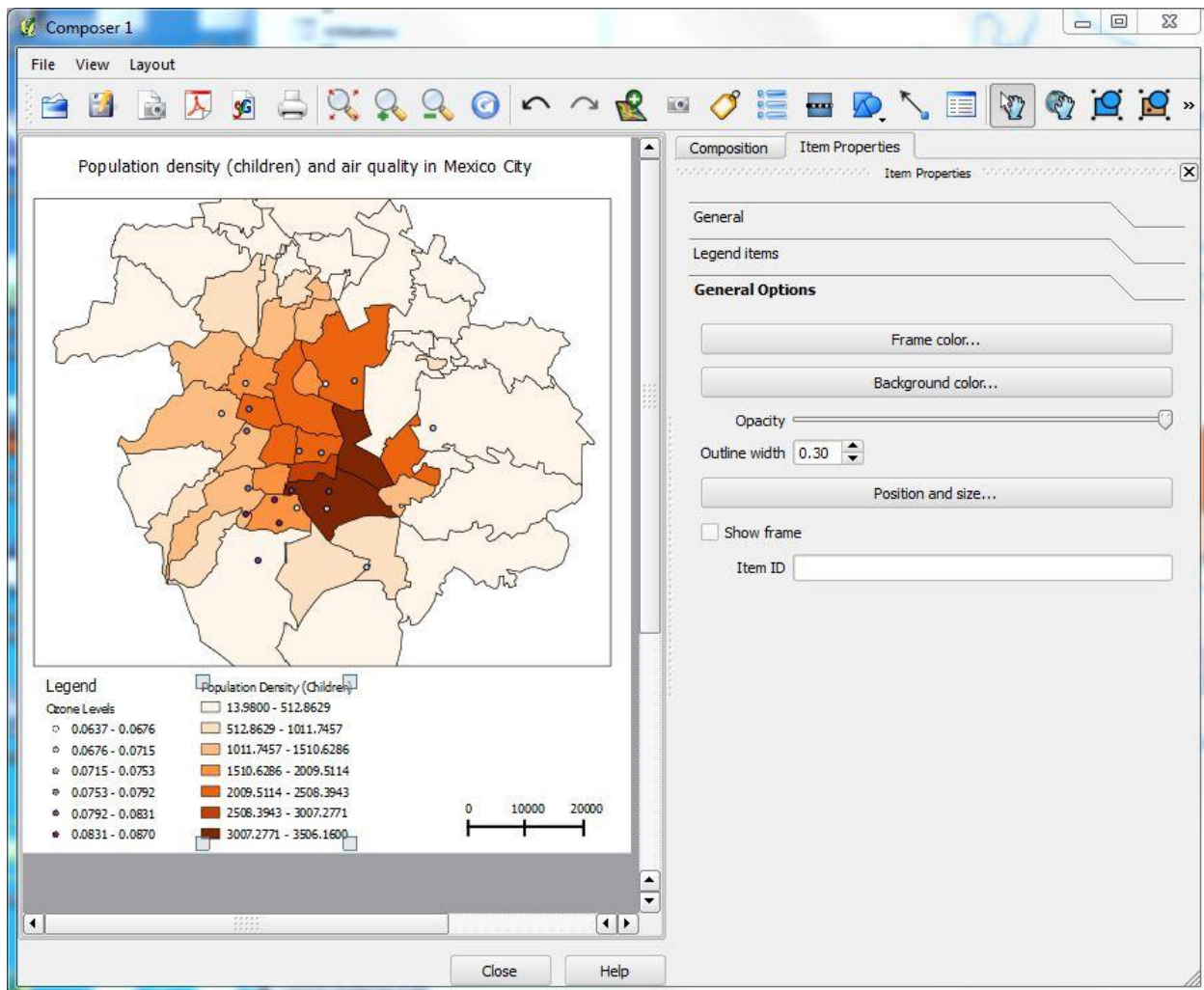
- Click the **General Options** and uncheck **Show frame**.
- Move your legend on your map canvas under your map towards the left hand side. Make sure there is room for the more legend elements which will have the other map items.




Now we are going to add the next legend item to the map canvas.

- Click **Add Legend** .
- Click on the map canvas beside your legend and under your map.
- In the **Item Properties** delete the **Title** (Legend).
- Click **Legend items** tab.

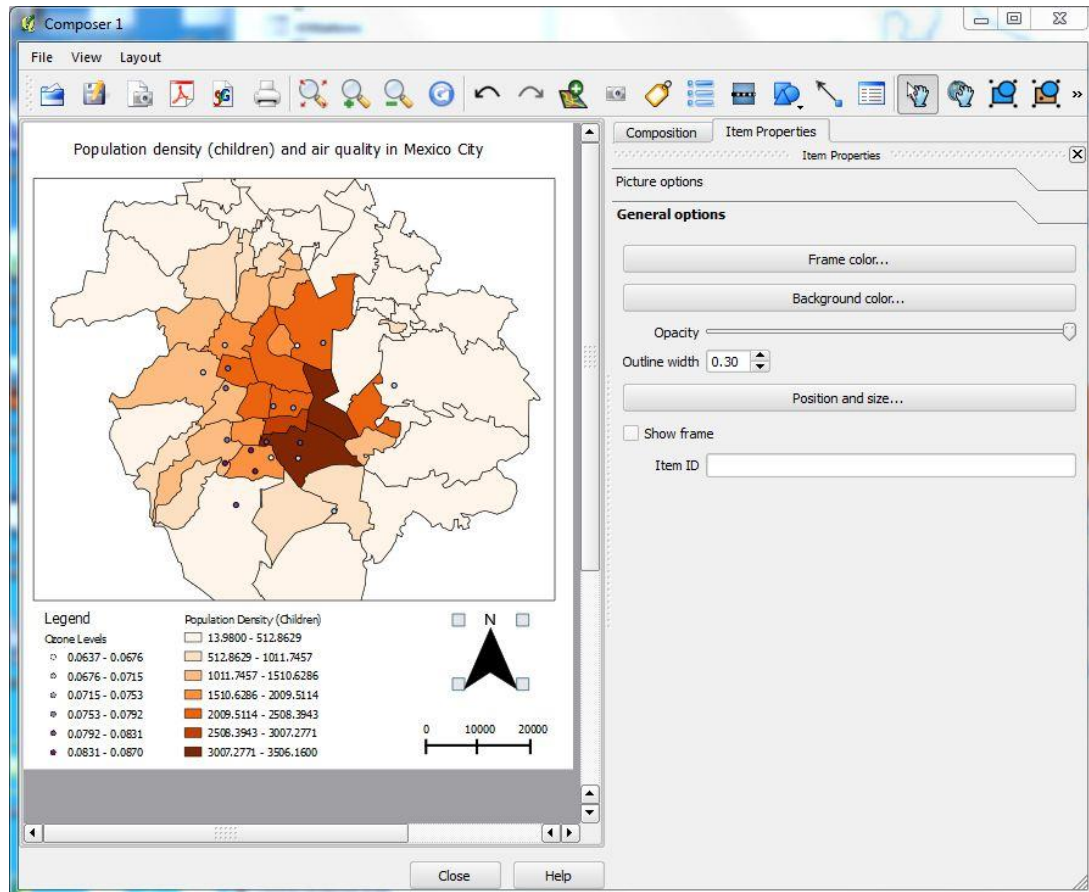
- Delete all layers from the Legend Items list except demo\_socio\_utm.
- Click on Mexico\_City and click the **Legend item Properties**  button.
- In the text box which appears rename the layer to “Population Density (Children)”.
- Click **OK**.
- Click the **General Options** and uncheck the **Show frame** box.
- Click and move the new legend so that it is beside the existing legend.



The final element we will add to our map is the North Arrow.

- Click **Add Image**  button.
- Click in the white space under the map and above the scale bar.

- In the Item Properties tab scroll through the images until you find a north arrow which you like. Click on this image, it will appear in the box of the new image you just added.
- Click **General Options** and uncheck **Show frame**.
- Make any other changes to your map you would like. Once your map is finished move on to the next step to export your map to an image.



#### STEP 4 Export the map to an image file

Add or change anything you would like. Make sure your map looks the way you would like it to look. Once you are finished making your map, we will export the map into an image. The JPEG(.jpg) image format is a good way to save a map because it is a common format and is readable by many free programs. Below are steps to save your image as a .jpg. If you prefer to save your map as a .pdf or a .svg then choose those options under the File menu.

- Click on the **File** menu and select **Export as Image...**
- Change the **Save as type:** to jpg format (\*.jpg, \*.JPG).
- Navigate to <your working directory>\data and name your map **mexicoCityMap.jpg**.

- Click **Save**.

**Congratulations you have just created a map that can be used to communicate the severity of ozone air pollution in Mexico City.**