Data Visualization and Cartography

Advanced Cartography Lab

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Data Used:

1. Major Cities in CSV file format
2. Malawi Country Boundary (shape file)
3. Malawi District Boundary (shape file)
4. Malawi and Neighboring Countries Boundary (shape file)
5. Malawi Water Bodies (shape file)
6. Africa Countries (shape file)

Data Sources:

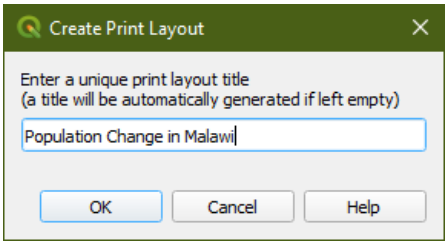
Data used in this exercise (provided on Moodle) were obtained from the following sources. You don't need to download any data from these sources but in the future, if you need to do any work in your own location, you can look for basic layers from these sources.

- Administrative Boundaries Data: https://www.diva-gis.org/datadown
- Data layers from Open Source Maps: https://download.geofabrik.de

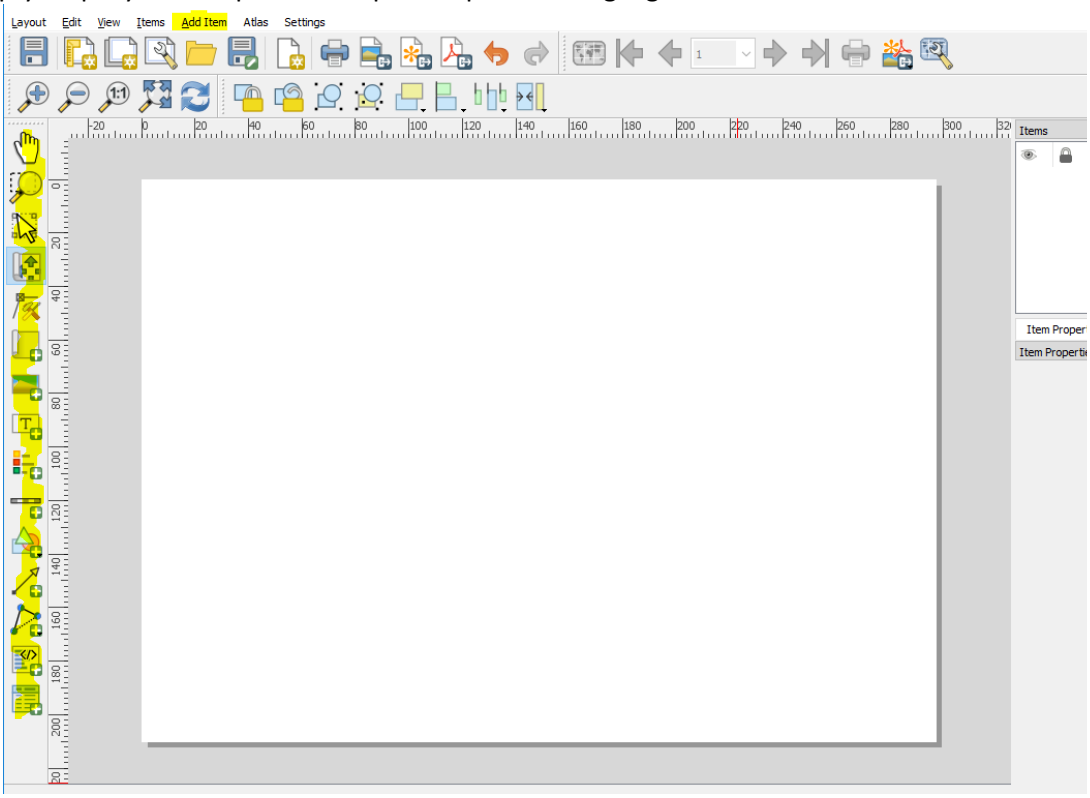
Part 2: Cartographic Representation and Map Layout:

As a final product for this exercise, you will be making a professional quality map of Malawi with ***major cities***, ***districts with names***, and ***water bodies***. Your map also should contain title, legend, scale, north arrow, a brief description of what the map is showing and what your observation is regarding the change in percentage population over 20 year period assessed, and finally your name and date.

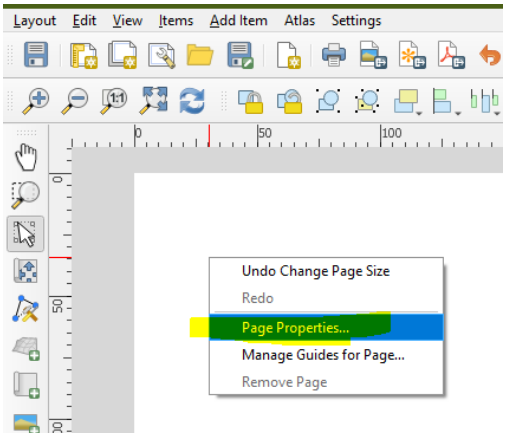
1. Go to Project → New Print Layout. You will be prompted to enter a title for the layout. Enter **Population Change in Malawi** as the title.



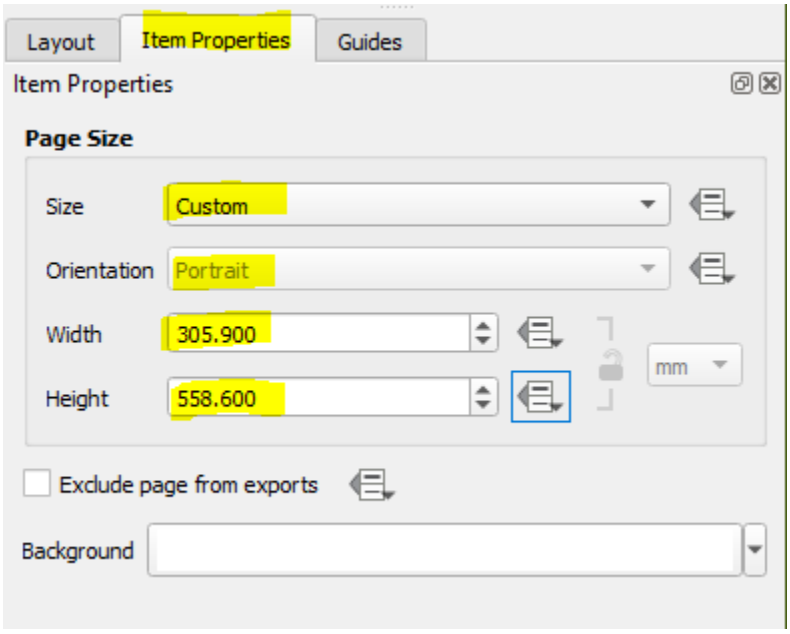
2. An empty map layout composer will open. Explore the highlighted menu and buttons to learn what they do.



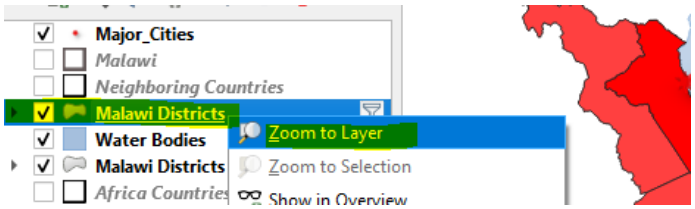
3. In the map layout window, click on Zoom full  to display the full extent of the Layout. We can import the map view from the Q-GIS project data canvas.
4. We need to change the layout to fit or needs here – to showcase Malawi, which is a country that is tall and narrow. So, a portrait layout will be more appropriate. We will also change the layout size to be much larger than the regular A4 paper size.
5. Anywhere within the canvas (white map area), right click using your mouse to get a submenu. Click on **Page Properties**.



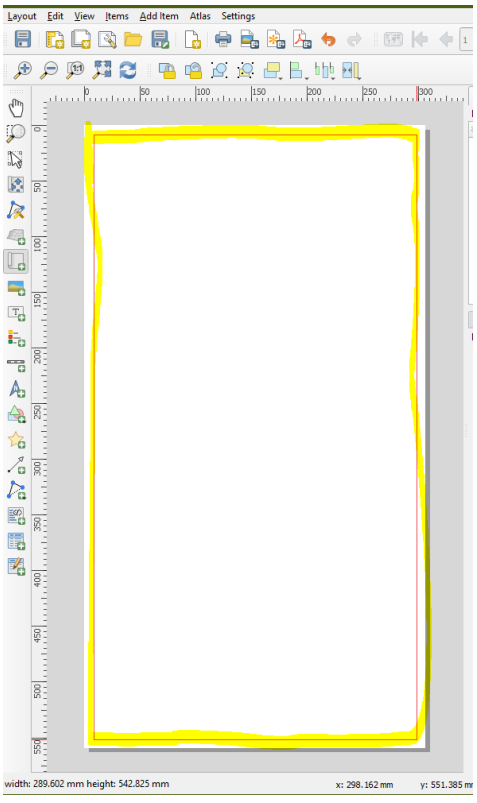
6. On the right side, **Item Properties Panel** will open and show you options for **Page Size**. Enter the following size for the page in mm.



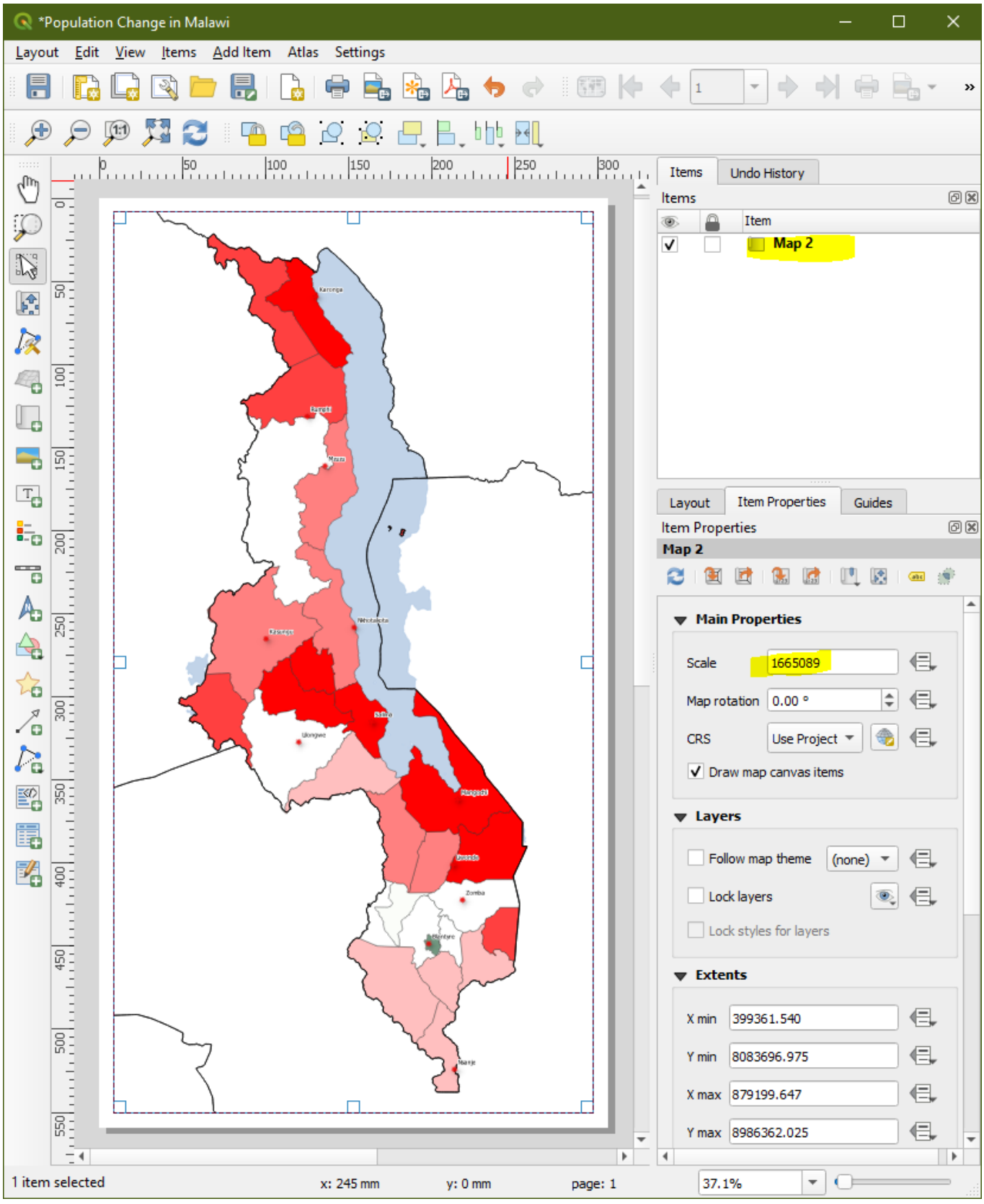
7. Now, go back to your QGIS project window. Right click on Malawi Districts layer, and select **Zoom to Layer option**



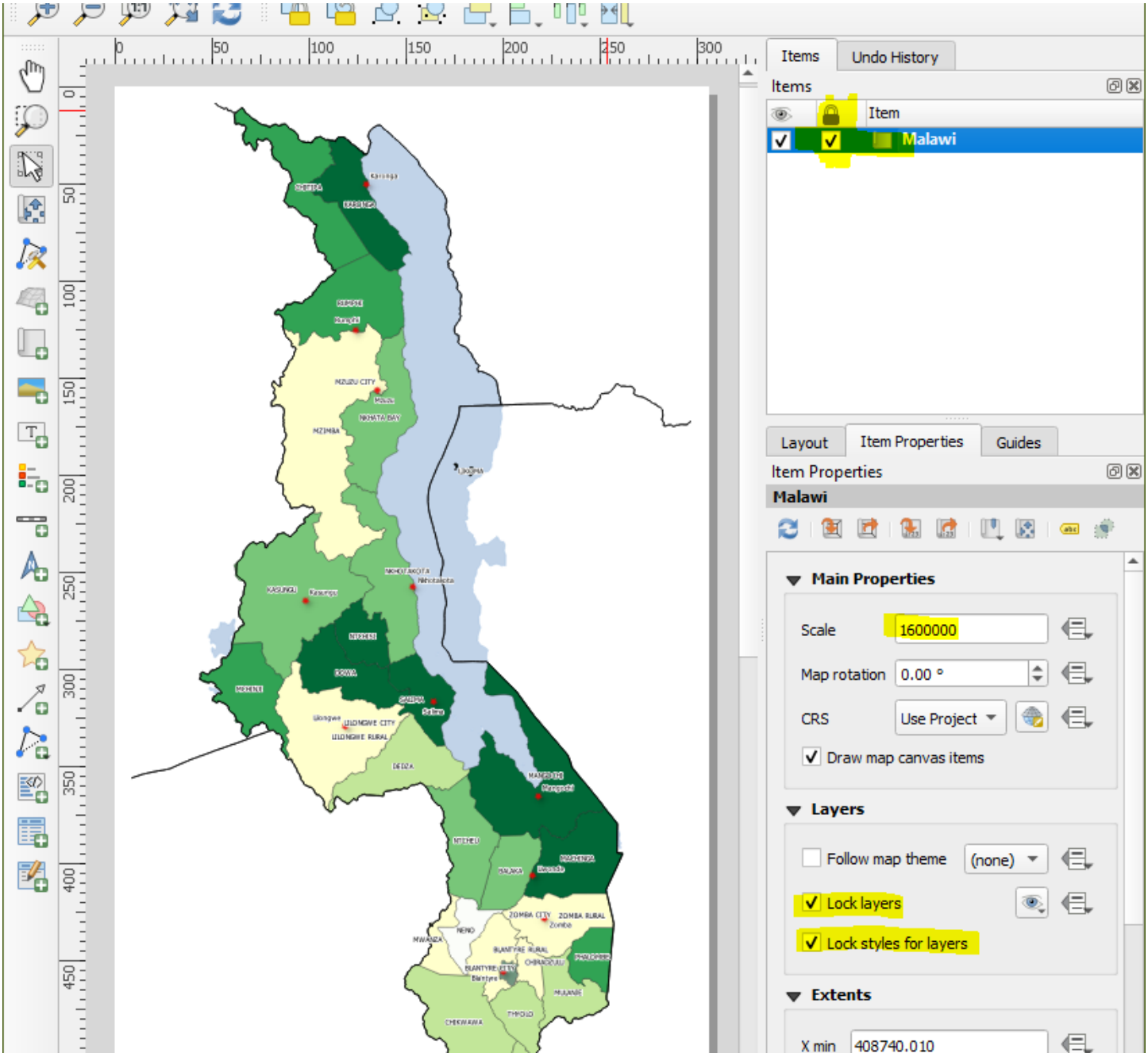
8. Now, get back to your On your layout canvas and click **Add Item → Add Map**. Once the Add Map button is active, hold the left mouse button and drag a rectangle where you want to insert the map.



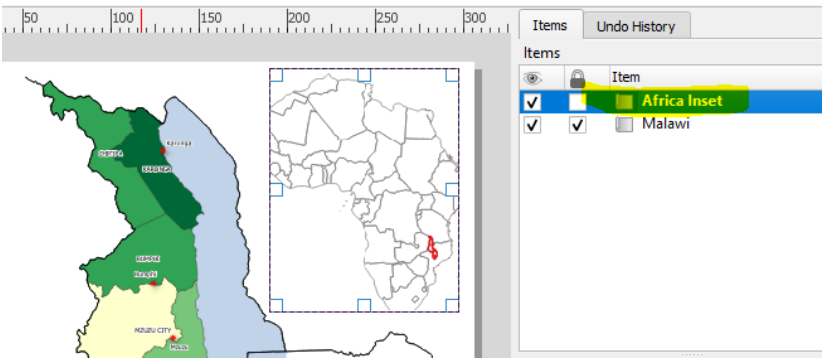
9. If done right, you should have your map view from QGIS project showing up on your Map Canvas. Double Click on the word "**Map 2"** under Items tab. Then change it to **Malawi**. This will be important for what we are going to do next.



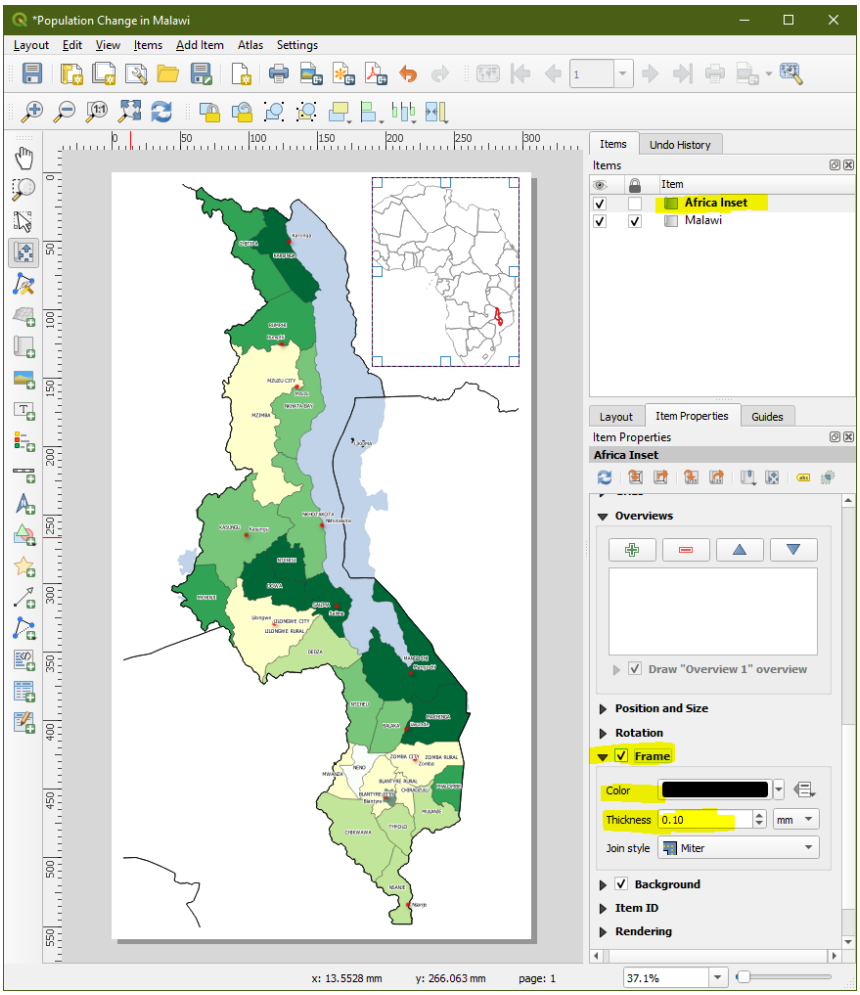
10. You will see that the rectangle that was drawn is filled with the map from QGIS canvas (it may take few seconds for it to refresh and create the data view, so have patience). If the map does not cover the area of interest completely, you can resize the rectangle as well as move the extent of map using  button.
11. Let us adjust the zoom level for the given map. Click on the **Item Properties** tab and enter 1,600,000 for Scale value.
12. It is customary to show broad location map in any detailed map that helps put the small study area in the context of the nation or the continent. This is usually called a reference map or an inset location map.
13. Now we will add **a map inset** that shows entire Africa with Malawi on it. Before we make any changes to the layers in the main QGIS window, check the **Lock layers** for map item and Lock layer styles for map item boxes. This will ensure that if we turn off some layers or change their styles, it will not change the main Malawi map that we have already made.



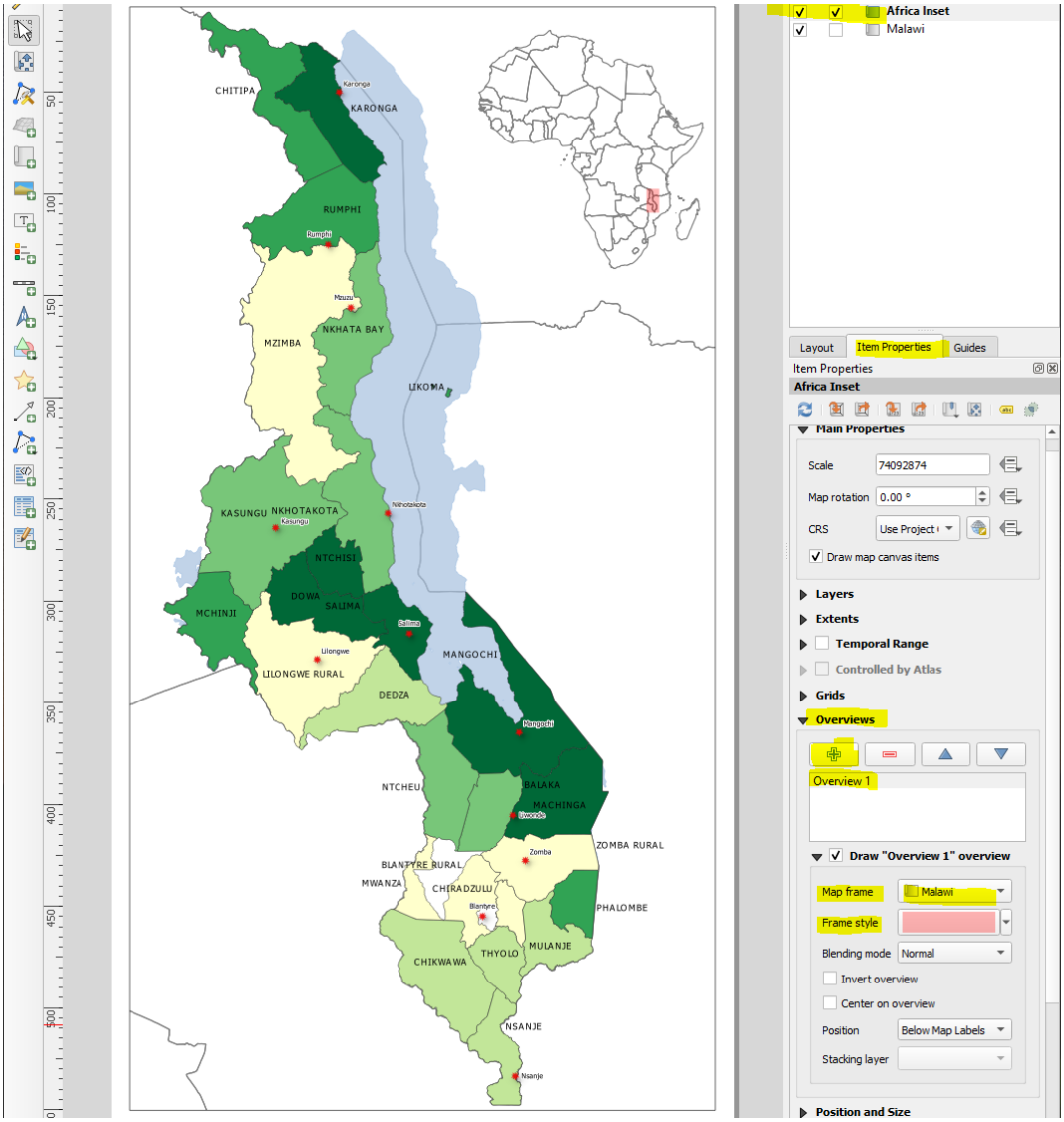
14. Now, switch to the main QGIS window.
15. Right click on the **Africa Countries** layer and click **Zoom to layer** option.
16. Now, turn of all layers except **Africa Countries** boundary and Malawi country boundary layers.
17. Now we are ready to add an inset reference map to our map layout. Go to the layout window. Click **Add Item → Add Map**.
18. Drag a rectangle at the place where you want to add the map inset (in one of the corners is ideal). You will now notice that we have 2 map objects in the layout. We will rename the second Map to **Africa Inset** so when making changes, make sure you have the correct map selected under **Items** panel.



19. Select the **Africa Inset** object that we just added. Select the **Item properties** tab. Scroll down to the **Frame** panel and check the box next to it. You can change the color and thickness of the frame border around Africa inset map so it is easy to distinguish against the map background.



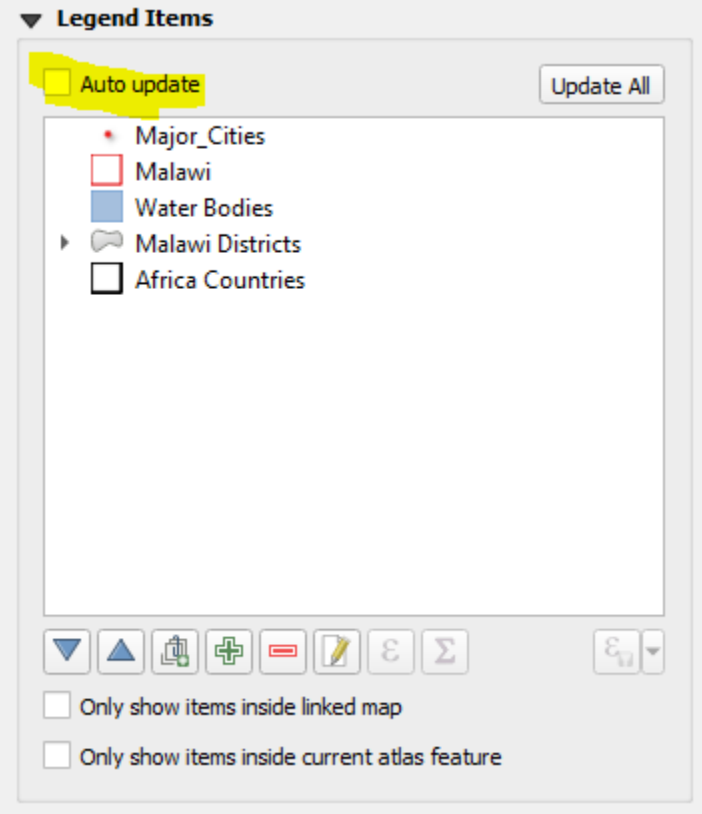
20. One neat feature of the Layout Composer is that it can automatically highlight the area from the main map, which is represented in our overview map inset. Select **Africa Inset** map from the list of **Items panel**. In the Item properties tab, scroll down to the Overviews section. Click the Add a new overview button.
21. Below the Overviews window, select **Malawi** as the Map Frame. What this is telling the Print Composer is that it must highlight our current main map area with the extent of the map shown in the Africa object.



22. Now that we have the map inset ready, we will add a grid and border to the main map. Select the **Malawi** map object from the Items panel. In the Item properties tab, scroll down to the Grids section. Click the Add a new grid button.
23. By default, the grid lines use the same units and projections as the currently selected map projections. However, it is more common and useful to display grid lines in degrees. We can select a different CRS for the grid. Click on the **Modify Grid** button next to CRS.
24. In the Coordinate Reference System Selector dialog, enter 4326 in the Filter box. From the results, select the WGS84 EPSG:4326 as the CRS. Click OK.
25. Select the Interval values as 1.5 degrees in both X and Y direction. You can adjust the Offset to change where the grid lines appear.
26. Scroll down to the Grid frame section and select a frame style that suits your taste. Also check the Draw coordinates box.

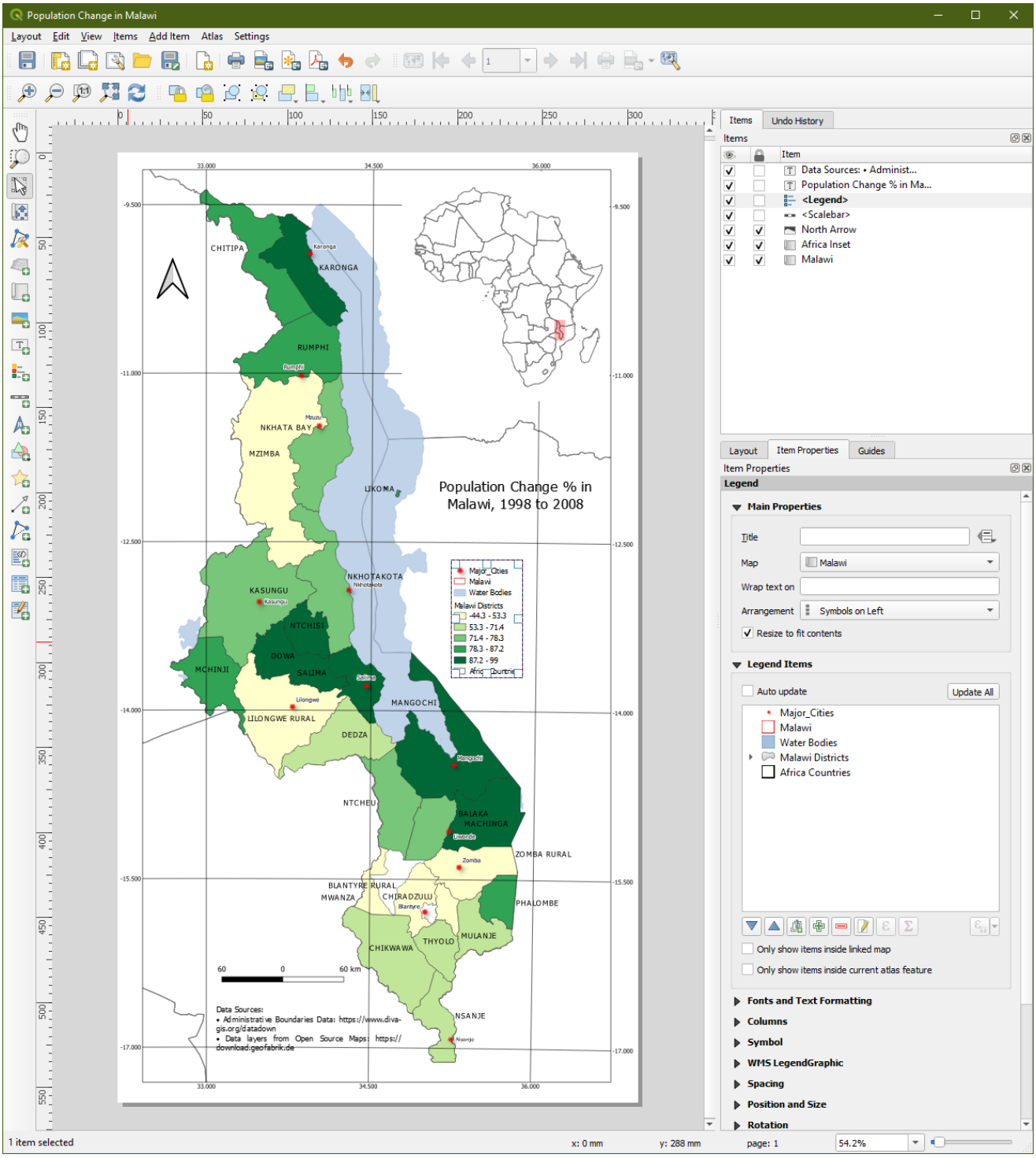
27. Adjust the **Offset** to map frame till the coordinates are legible. Change the Coordinate precision to 1 so the coordinates are displayed only upto the first decimal.
28. Now we will add a North Arrow to the map. The Print Composer comes with a nice collection of map-related images - including many types of North Arrows. Click **Add Item → Add North Arrow**.
29. Holding your left mouse button, draw a rectangle in the empty area on the right side of the map canvas.
30. Now we will add a scale bar. Click on **Add Item → Add Scale Bar**
31. Click on the layout where you want the scale bar to appear. In the Item Properties tab, make sure you have chosen the correct map element (**Malawi**) for which to display the scale bar. Choose the Style that fit your requirement. In the Segments panel, you can adjust the number of segments and their size
32. Now, we will add a legend to the map. First, we want to make sure that the legend displays the elements for the correct map, which in this case is the map with campsites. In your **Map Layout,** on the **Items** panel on the right, click on **Malawi** to indicate that is the main map.
33. Next, click on **Add Item → Add Legend**
34. Draw a rectangle in the empty part of your map.

35. Under **Item Properties, s**croll down to **Legend Items**
36. Disable **Auto Update** by unchecking the box
37. We can delete any of the layers that we don't want showing up on the legend.



38. It is time to label our map. Click on **Add Item → Add Label**.
39. Click on the map and draw a box where the label should be. In the Item Properties tab, expand the Label section and enter the text as shown here – "Population Change % in Malawi, 1998 to 2008"

40. Add three more labels and place them in appropriate place: 1) data sources and software credits, 2) your name and date, and 3) a brief paragraph that describes the population change trend that you have observed in your data. Look for data sources at the beginning of the exercise.



41. Once you are satisfied with the map, you can export it to one of many formats including Image (many common formats possible) PDF and SVG. For this lab, let's export it as a PDF file. Click **Layout → Export as** PDF file.
42. Save the project.
43. When you are done, post your map to the class forum and get peer-feedback.

That completes your map-making expedition! Congratulations!