# Introduction to QGIS

Practical Exercise 2

This exercise builds on Exercise 1B. The data you've prepared and styled in the previous practical, will now be used to compose and publish a final map.

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1   Creating Maps in QGIS

Your data rendered in QGIS may easily be illustrated in the form of a map by using the **Print Composer** tools located under the **[Project]** menu. The following sub-sections demonstrate how to use the **Print Composer** to generate a map similar to that illustrated below. Launch your saved project from **Exercise 1B** and let's begin.
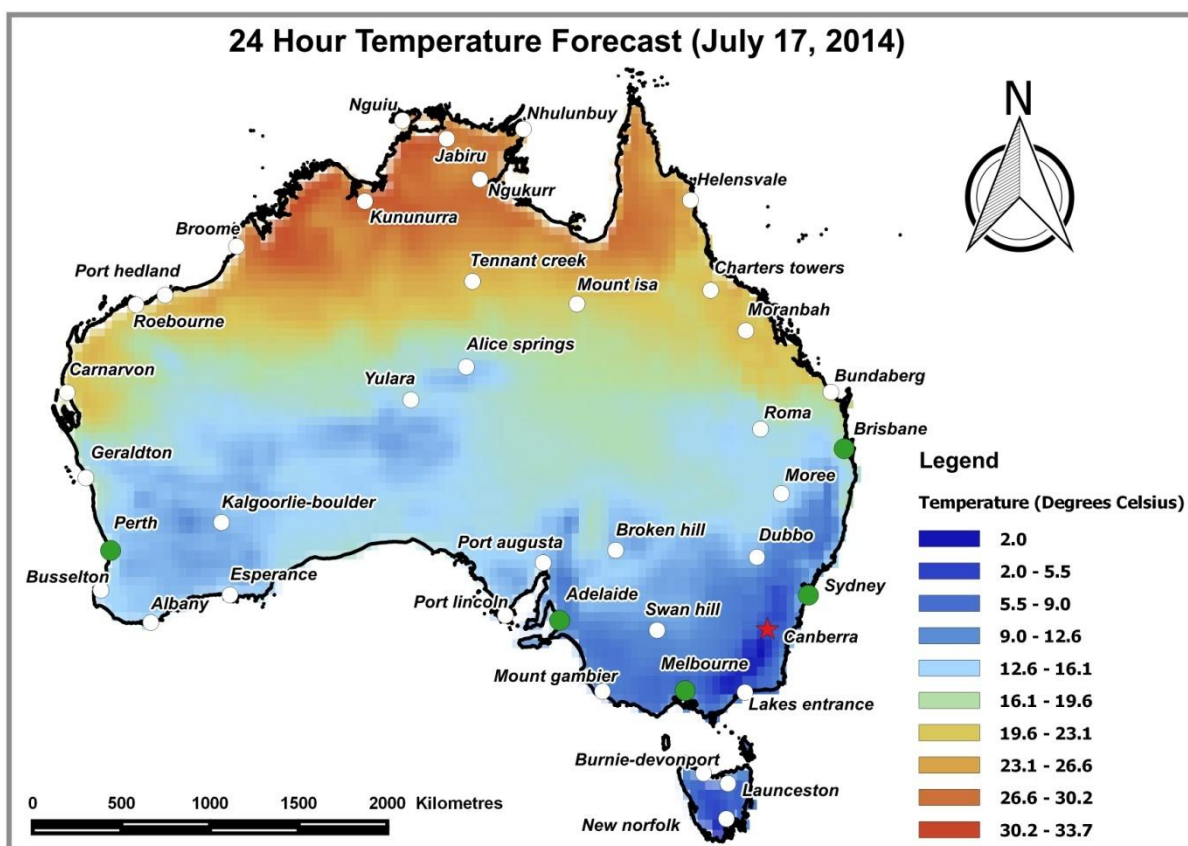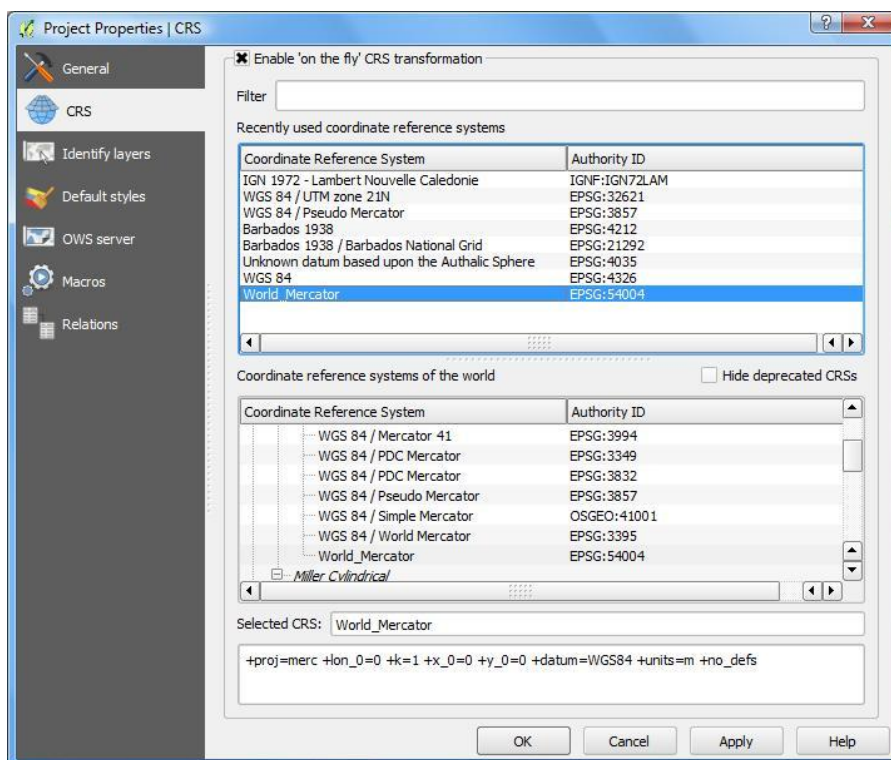

1.1   Changing the Coordinate Reference System of a Project

Your final map will have a scale bar which, by default, reflects the scale/size/distances of rendered map objects in the units used by the map. Currently, the project uses a Geographic Coordinate System known as the **1984 World Geodetic System (WGS 84)**. Objects rendered in **WGS 84** are measured in decimal degrees. If you were to create a map using the project's current coordinate reference system, the units of the scale bar would be in decimal degrees. Ideally, your scale bar should be in units such as miles,

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metres or kilometres so that the scale information is more useful to viewers. Therefore, before you start composing your final map, you must change the project's coordinate reference system from a Geographic Coordinate System to a Projected Coordinate System that uses metres.

1. Select **{Project Properties...}** from the **[Project]** menu.

2. Select the **CRS** tab from the left panel; activate **"Enable 'on the fly CRS' transformation"** and select **"World Mercator"** from the list of "**Recently used coordinate reference systems**" (*see image above*).

    Note: If for any reason, the "World Mercator" coordinate reference system is not listed, then simply locate it using the Filter field. Type "World Mercator" into the field and the coordinate system will be appear at the bottom of the menu as shown in the following image.

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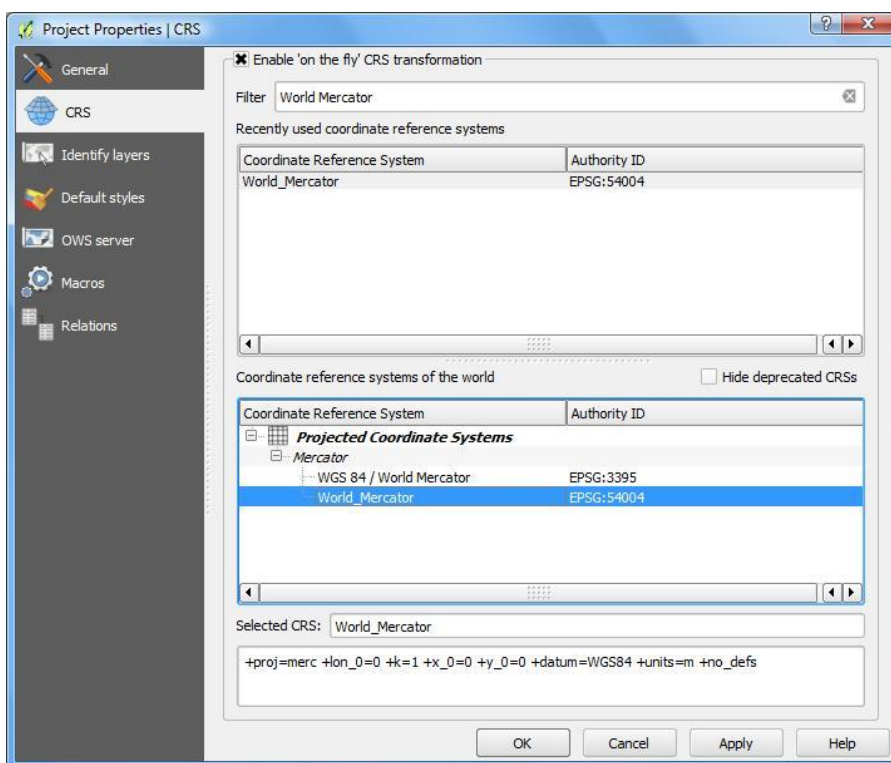
3. Hit **{OK}** after the World Mercator coordinate system has been selected.

Note: The coordinate reference system of your project has now been changed from WGS84 (a geographic coordinate system) to World Mercator (a projected coordinate system); so now when you apply a scale bar to your final map, it will represent map objects in units of metres or kilometres.

1.2   Setting Up the Map Page

1. Select the **[Project]** menu and choose **{New Print Composer}** from the list.

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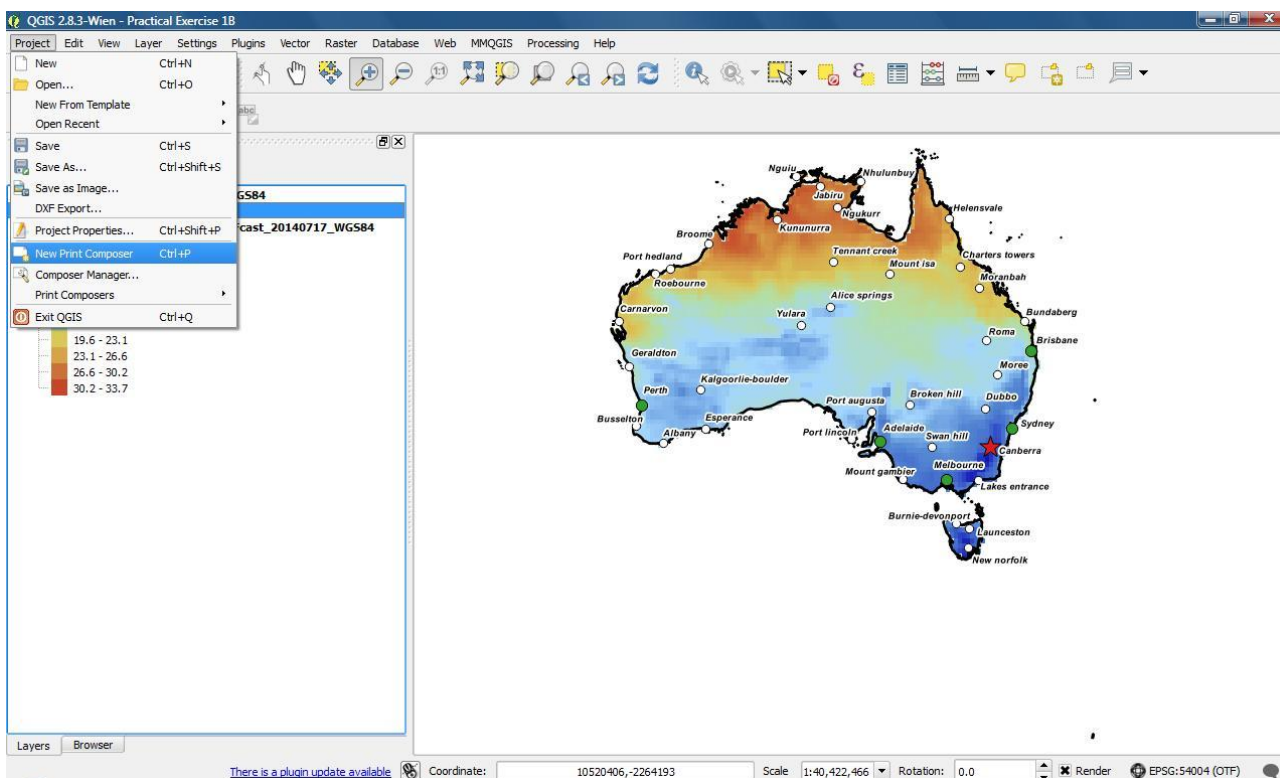
Note: This launches a "Composer title" menu, where you are invited to give your map composition a title.

2. Enter the name, **"Australia - 24 Hour Temperature Forecast (20140717)"**, into the field and hit **{OK}**.


Note: A second interface, as illustrated by the following image, will open up and display the Map Composer (see next image). This interface is used to construct and publish/export the final map.

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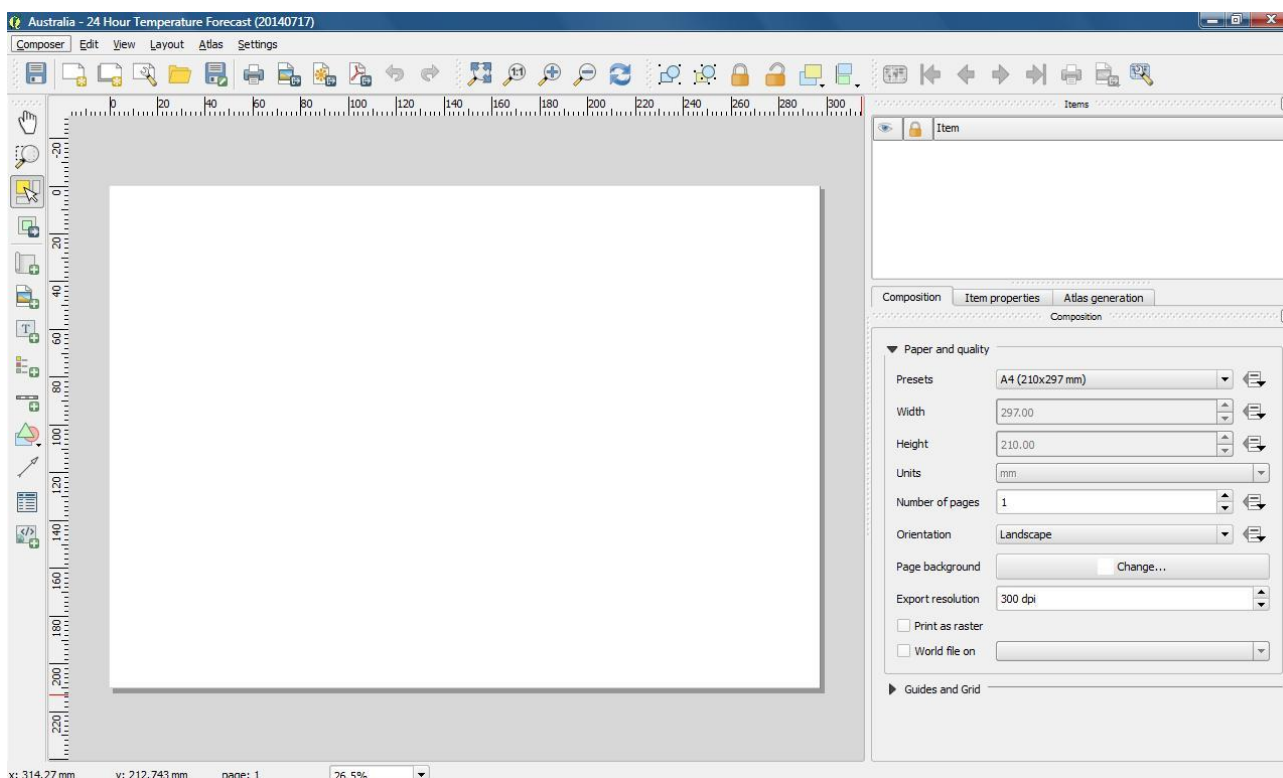
3. Your first step will be to set the map/composition layout. Start by activating the **Composition** tab *(see next image)* on the right portion of the **Print Composer** screen.

4. Under **"Paper and quality"**, select **A4 (210x297mm)** from the **"Presets"** drop-list; browse down to **"Orientation"** and select **"Landscape"** from the drop-list if it is not already selected by default *(see next image)*.

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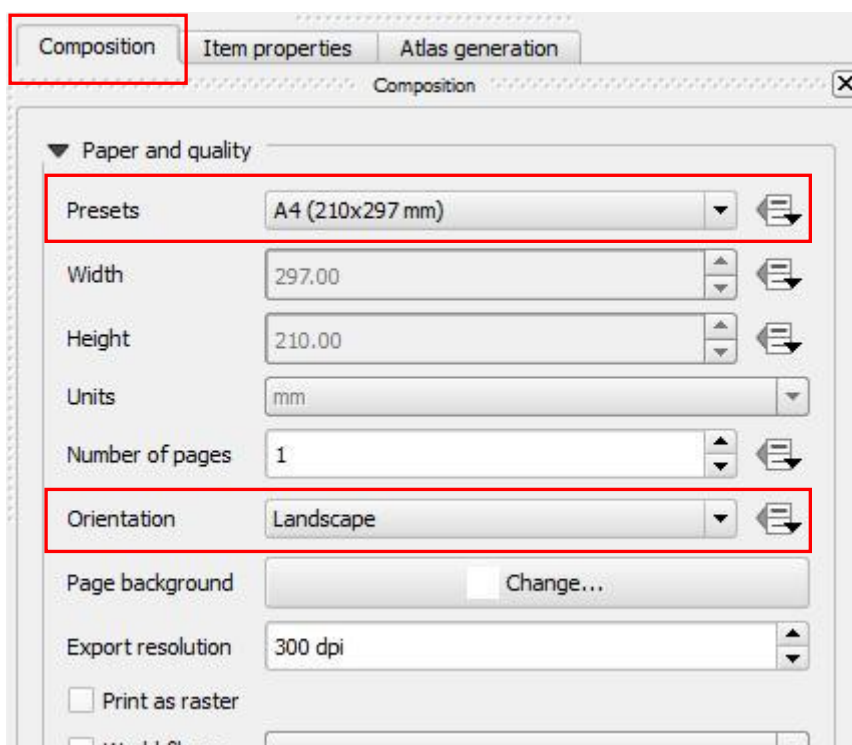
Note: These settings determine the dimensions and orientation for your final map. Now you'll import the contents of the Map Canvas for your final graphic. Before doing so, enable the grid option (see previous image) to help you to assess how your map objects are aligned. To do so, select the [View] menu option and enable {Show Grid}.

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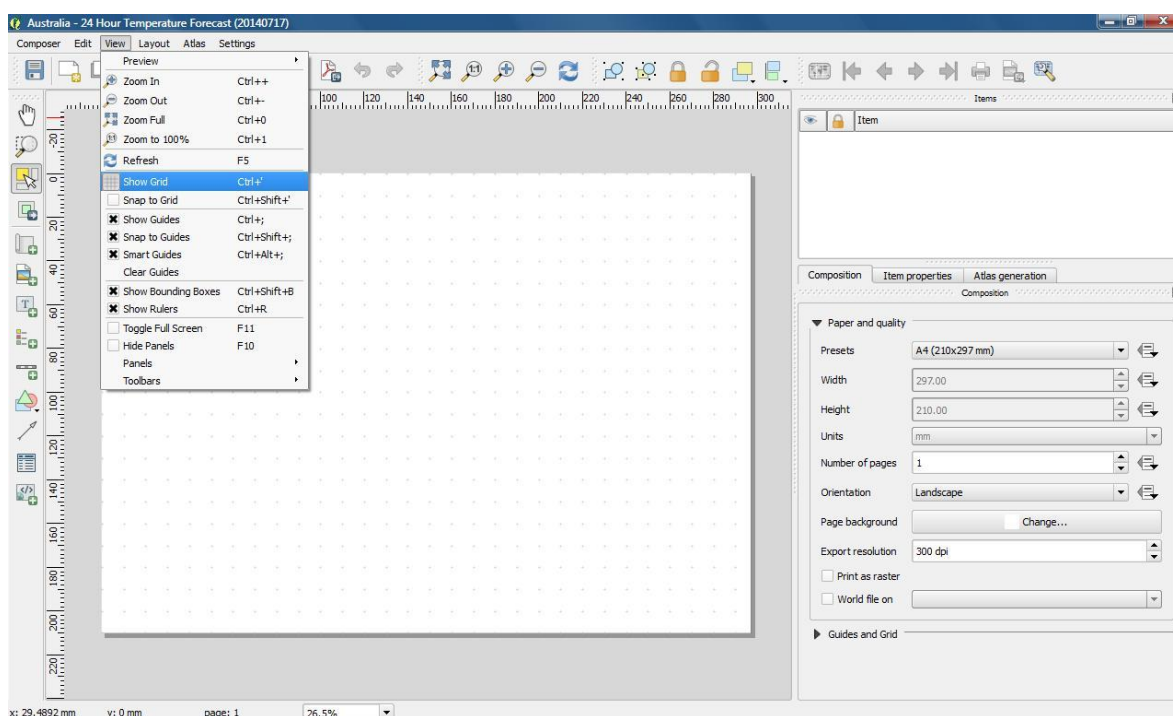
1.3   Adding Map Content

1. Select the **[Layout]** menu option and choose the **{Add Map}** tool from the list.
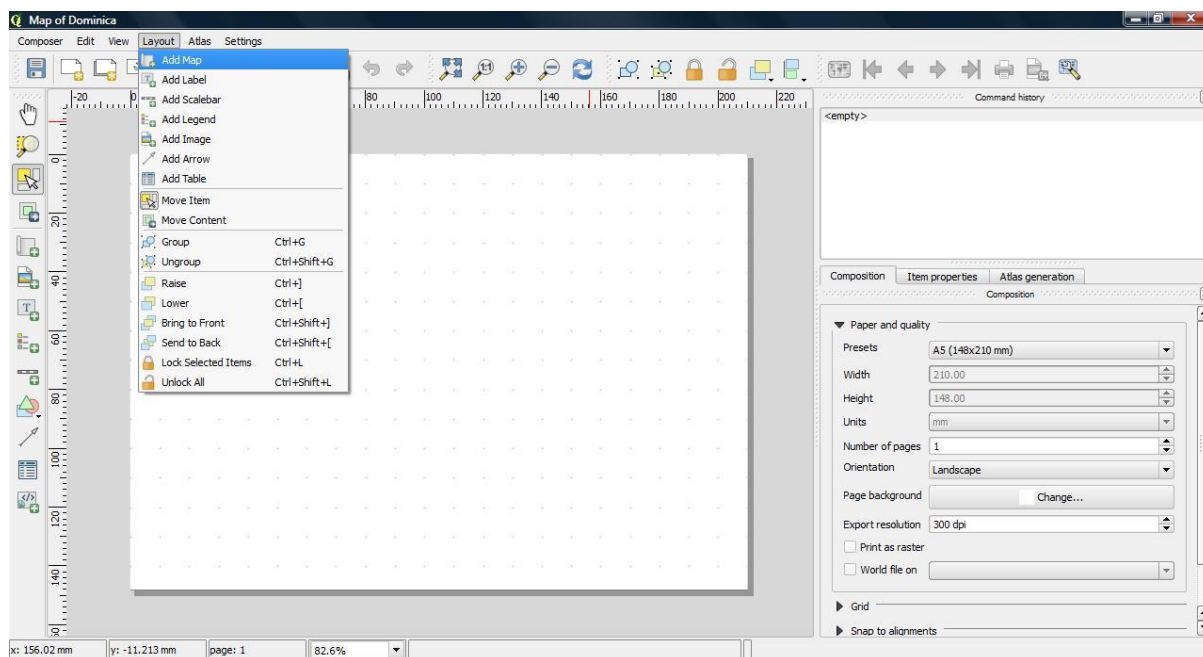

Note: Alternatively, you may use the {Add new map} tool from the toolbar on the left of the interface – see image on the left

2.   Place your mouse over a random area in the top left-corner of the map composition page; left-click and drag your mouse towards the top right-corner and then down towards the bottom-right. When you release the mouse, the map content will appear.

Note: Do not be concerned at the moment if your map appears to be too big or too small for the page. These issues will be adjusted in further steps.

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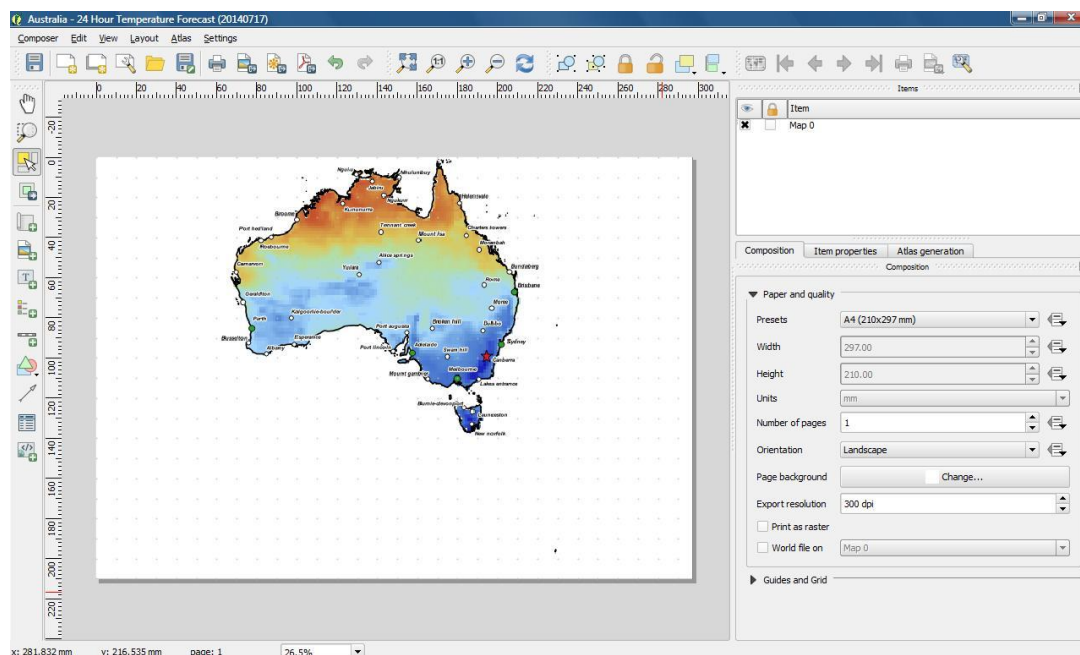
3. Activate the **Item Properties** tab on the right of the screen *(see next illustration)* and scroll down to the fields under **"Position and size"**.

Note: This is where you are allowed to set the size of the map frame. Currently the composition page is 297 mm X 210 mm. The aim is to make the map frame just slightly smaller than the composition page.
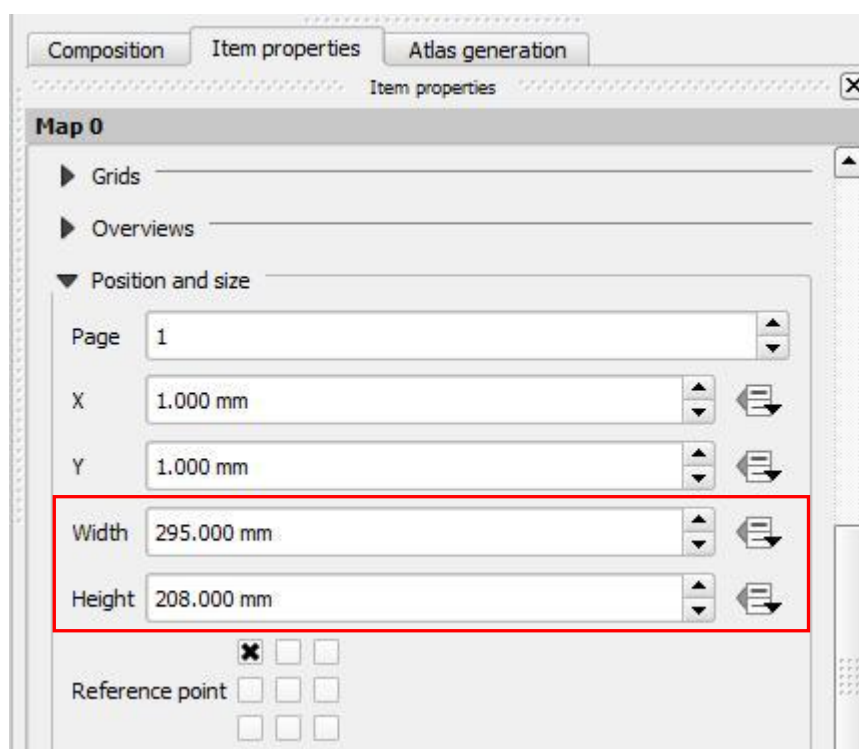

4. Set the **Width** and **Height** fields under **"Position and size"** *(see next illustration)* to 295 mm and 208 mm respectively.

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Note: You can use your mouse to drag the map frame to the centre of the composition page.
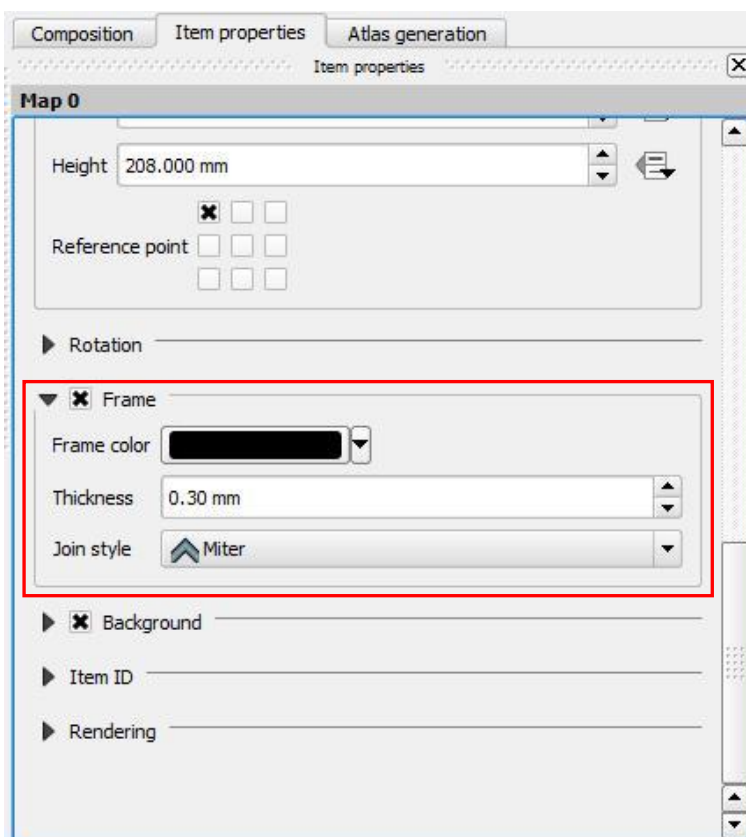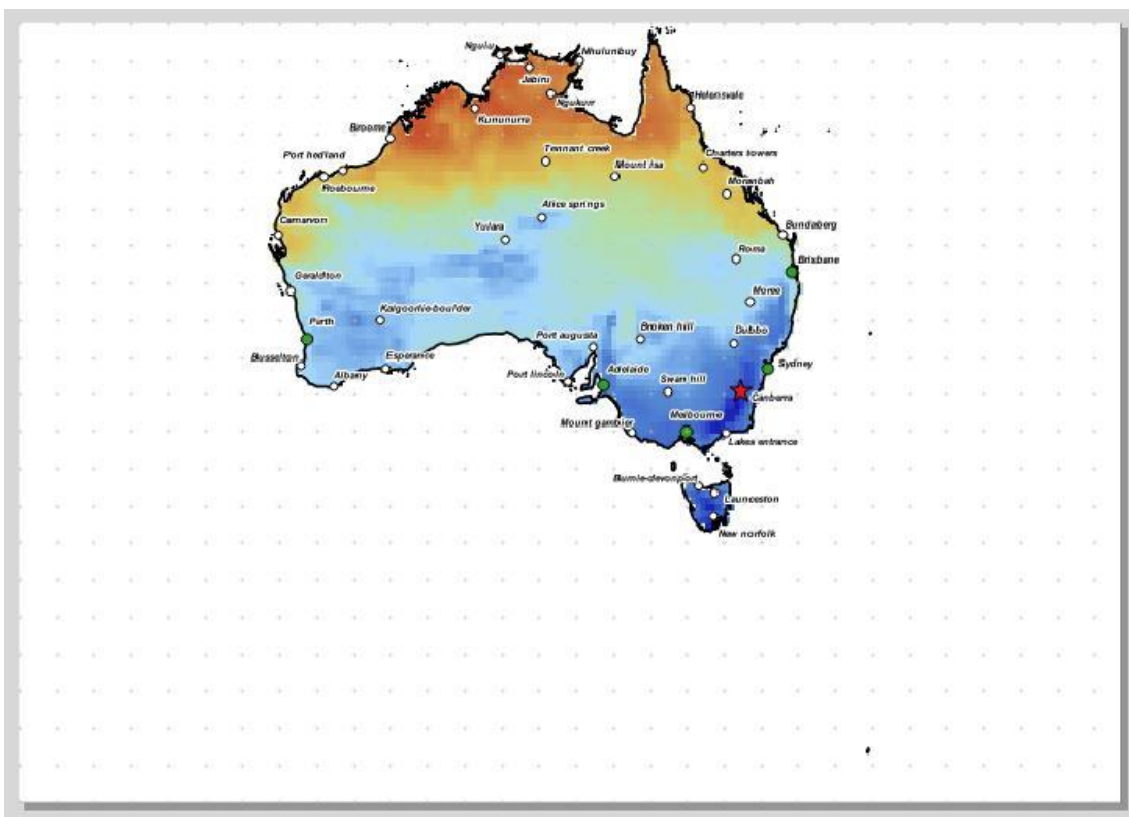
5. Scroll to the section below **"Rotation"** and enable the "**Frame**" option to make the map frame visible.

Note: For now, allow the frame properties to remain at their default settings. However, frame colour, frame thickness and "join style" settings can be changed via this part of the menu.
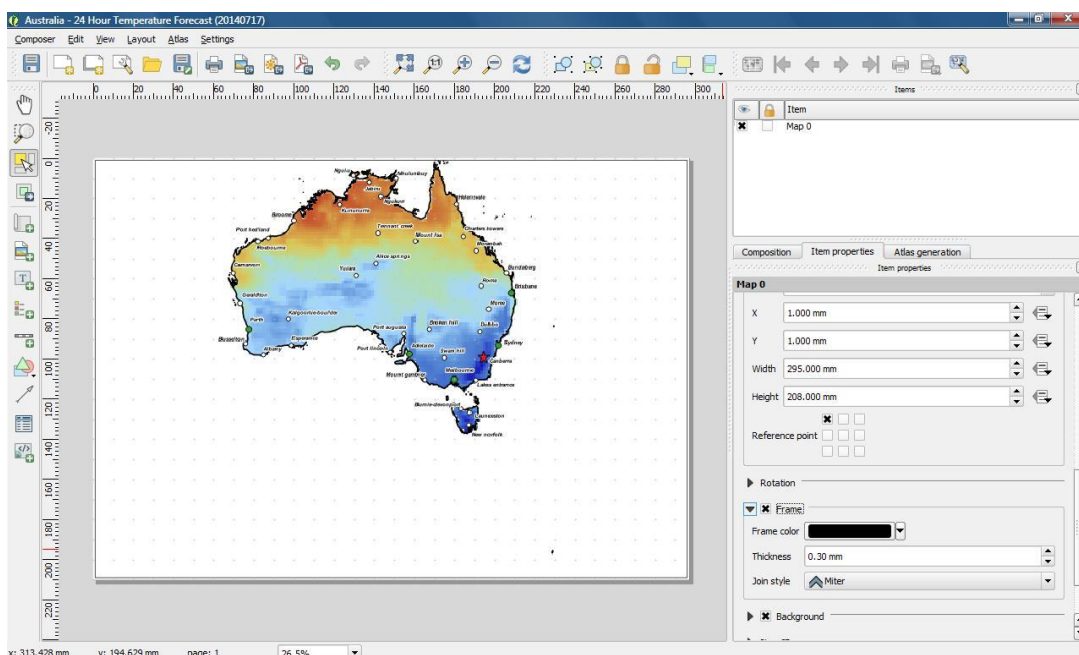
Your map content is now in place. However, its size on the page may need to be adjusted to make a better composition. You can adjust it by doing the following:

1) *Return to the main QGIS window and set the map to the full extent with the Zoom Full tool.*

2) *Return to the Map Composer window and see if this the size in the Map composer has improved. Follow step a, if your map is still too small for the page. However, if your map is too large on the page, then skip step 'a' below and follow step 'b'.*

   a. *Do the following:*

      i. *Return to the QGIS main window and activate the Zoom in tool.*

      ii. *Click on a section that is northwest of Australia; drag your mouse to the right and stop at an area that is northeast of Australia; then drag to the south and release. This creates a box around the country which defines the area that QGIS will zoom to. The level of zoom will be determined by the size of the box you make.*

   b. *Do the following:*

      i. *Return to the QGIS main window and activate the Zoom out tool.*

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ii. Use the Zoom out tool to decrease the size of the map. The Pan tool may also be used to re-centre the map. If you've zoomed out too far. Then simply use the Zoom in tool to adjust the size.

3) Return to the **Map Composer** window; activate the **Item Properties** tab; scroll to the **"Extents"** section (*see image below*) and select, **"Set to map canvas extent"**.
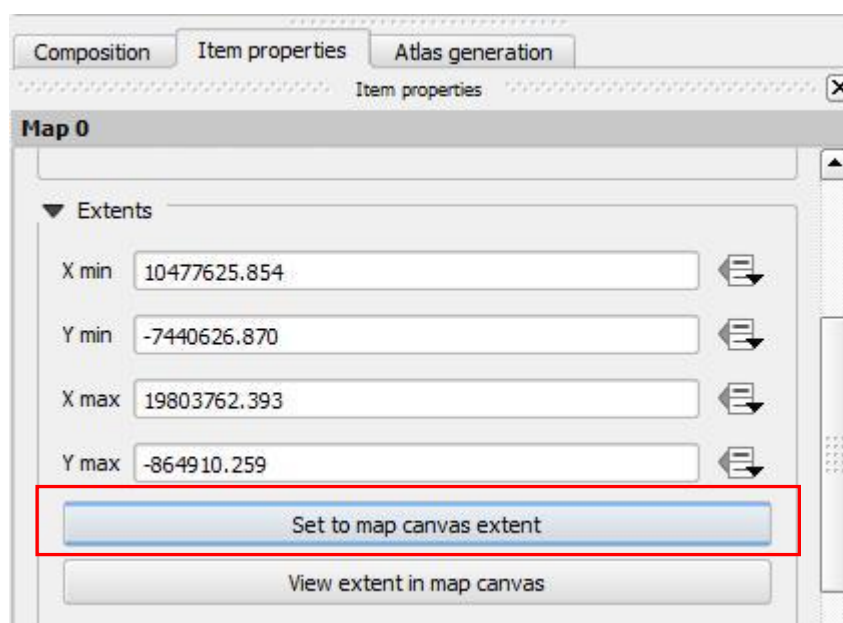
The aim is to change the map content so that its size on the page is similar to that shown in the next image:

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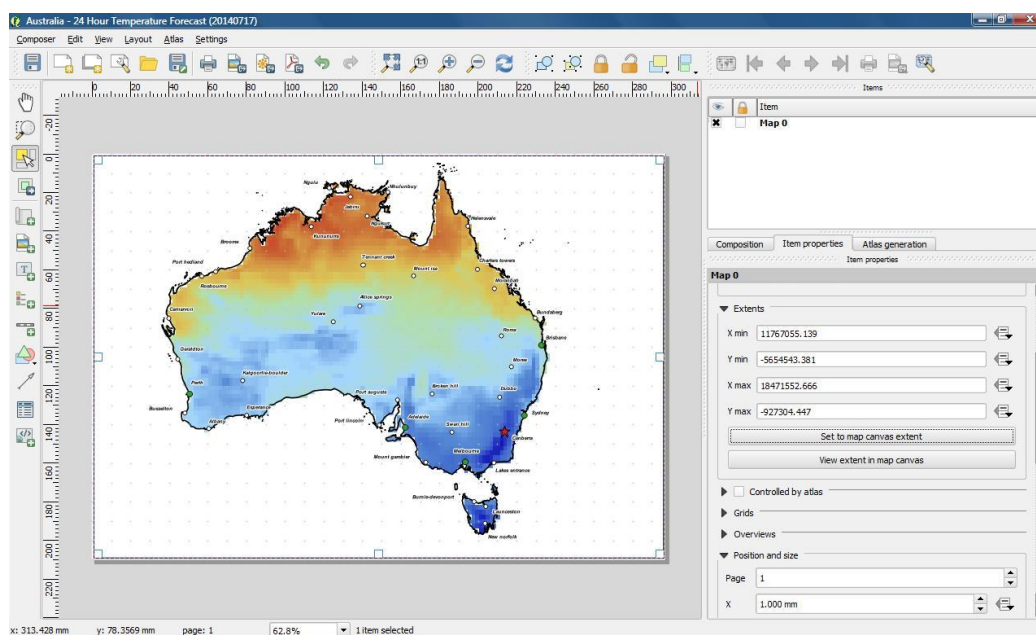
4) If you are not satisfied with the changes you've made to the map so far, you can repeat steps 2 and 3 above until you get an outcome that is similar to the image seen above.

The scale bar, legend, north arrow and map title may now be added to complete your map. Before doing so, try the following:

1) *Select the [Layout] menu option and then choose {Move Content}.*

Tip: The Move Content tool *may also be activated from the toolbar.*

2) *Place your mouse over any random region of the map content; left-click, hold and drag the image around the composition page.*

Note: This tool allows you to shift the map content around the composition page without moving the frame. This may become necessary as you add more objects (i.e. scale bar, legend, north-arrow and map title) to your composition page. Once you've finished experimenting with this tool, return the graphic to a central location on the page.

1.4   Adding a Scale Bar

1. To add your scale bar, select the **[Layout menu]** and then select **{Add Scalebar}.**

Tip: The Add scalebar tool *may also be activated from the toolbar.*

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2. Position your mouse on any area of the composition page (with white space) and then double-click to add the scalebar.
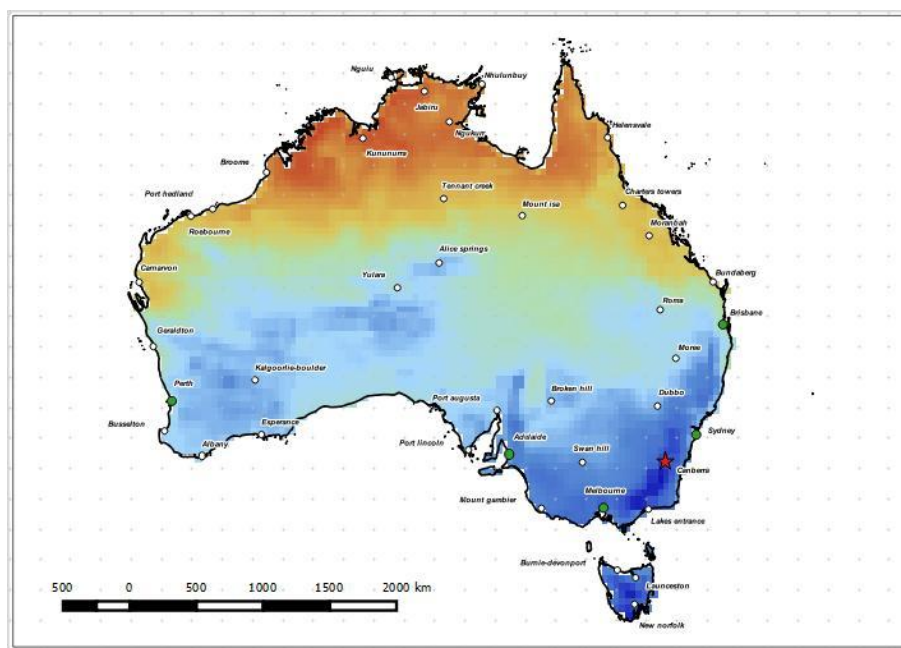

Note: A scalebar should now be visible on the composition page, showing distances in kilometres. Had the steps in section 1.1 not been taken, the scalebar you just added would have defaulted to units of decimal degrees. By changing the coordinate reference system associated with the project to a projected coordinate system that uses units of metres instead of decimal degrees, your scale bar is now more appropriate. QGIS can easily convert the native units of the scalebar (metres) to other types of units such as nautical miles or feet if so desired. This option is demonstrated in the next steps.

3. Activate the **Select/Move item** tool from the toolbar.

4. Single-click your scalebar to ensure it is selected; then activate the **Item properties** tab *(see next illustration)* on the right.

5. Locate the **"Main properties"** section under the current tab and select the **Style** drop-list *(see next illustration)*.

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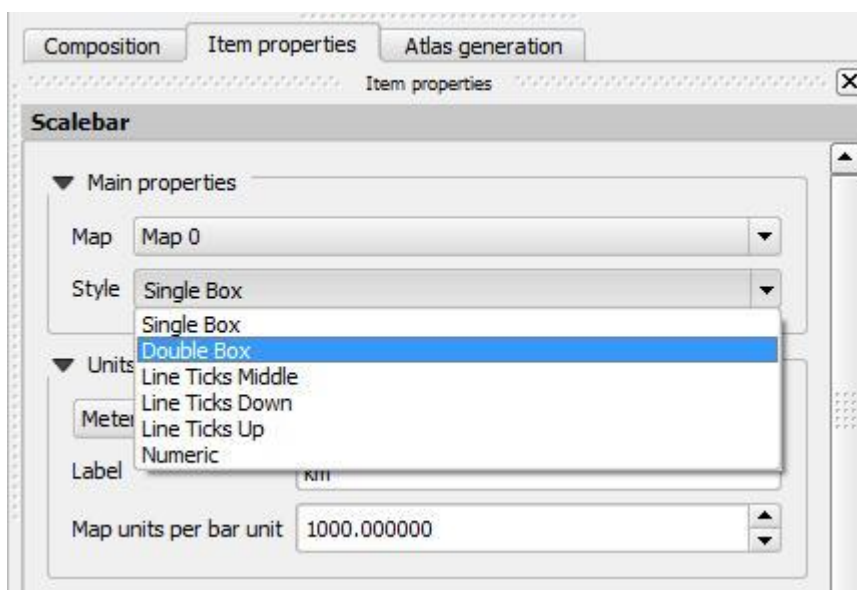
Note: You should now see a list of styles that may be applied to your scalebar. Try selecting different scalebar styles and observe the changes. Set your final choice to the "Double Box" style and then proceed.

6. Scroll down to the section of the interface captioned, **"Units"** *(see next illustration).*

Note: Under "Units", there is a drop-list and two fields captioned, "Label" and "Map units per bar unit". The former field is used to change the label that is assigned to the scalebar. Try
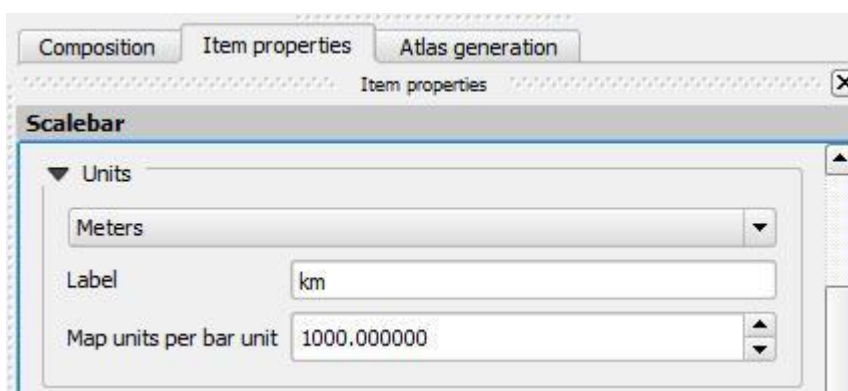

changing the entry from "km" to "kilometres" and see what happens. The other field simply controls the ratio of map units to scale bar units. The default setting is ideal given that the ratio of metres (the native map units) to kilometres is 1000:1. If you wanted to, you could also change the native map units from metres to nautical miles or feet by selecting from the drop-list in this section of the menu.

7. Scroll down to **"Segments"** *(see next illustration)*; experiment with the available fields and see what happens.

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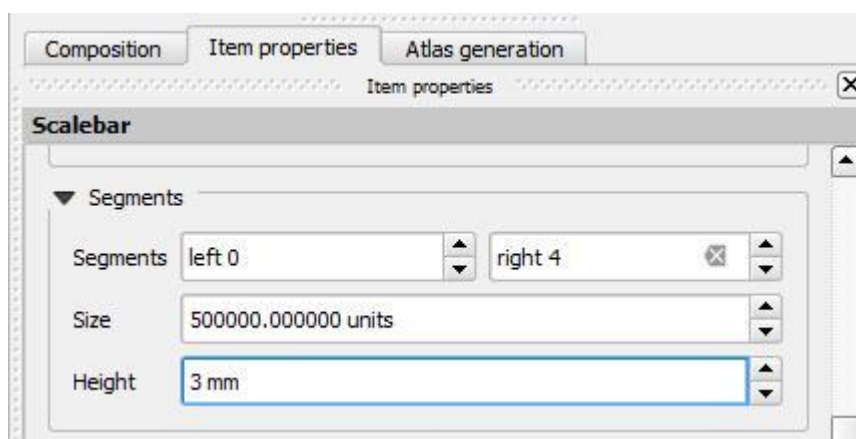
Note: Before moving on, set the left segment to 0 and the right segment to 4. The size and height fields can be left at their default values.

8. Scroll down to **"Fonts and colors"** *(see next illustration)* and experiment with the font and colour options for your scale bar.
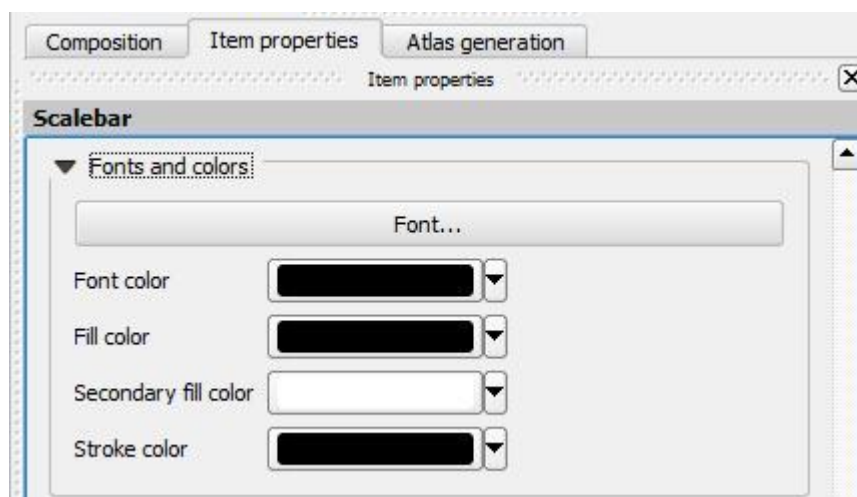
Note: Make sure to finalise your scalebar using a black Arial font in Bold and size 12. When completed, use the {Move Content} and {Select/Move Items} tools to reposition the objects on the composition page so that they resemble the following graphic.

Tip: The map content can only be shifted with the {Move Content} tool. However, you must first select it with the {Select/Move items} tool.

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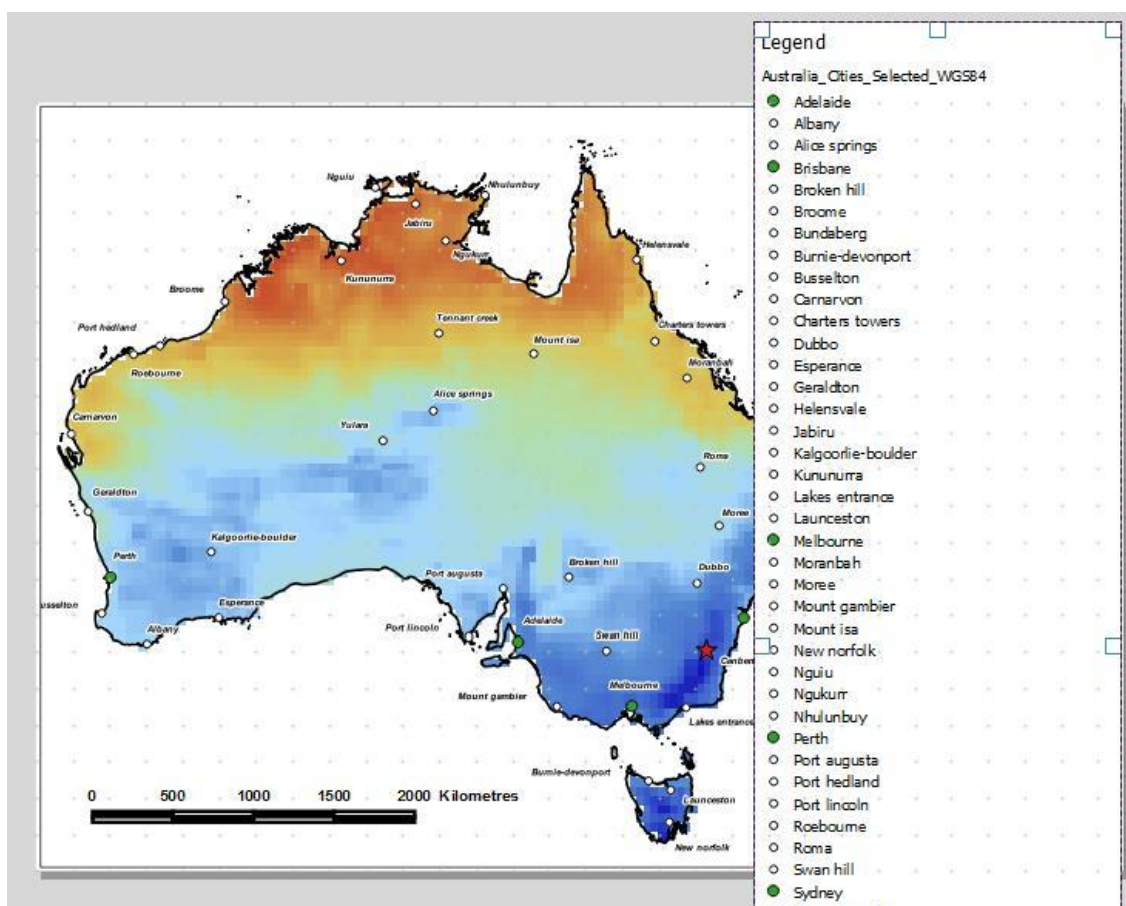1ˢᵗ MedCOF Training Workshop. Madrid, 26-30 October 2015
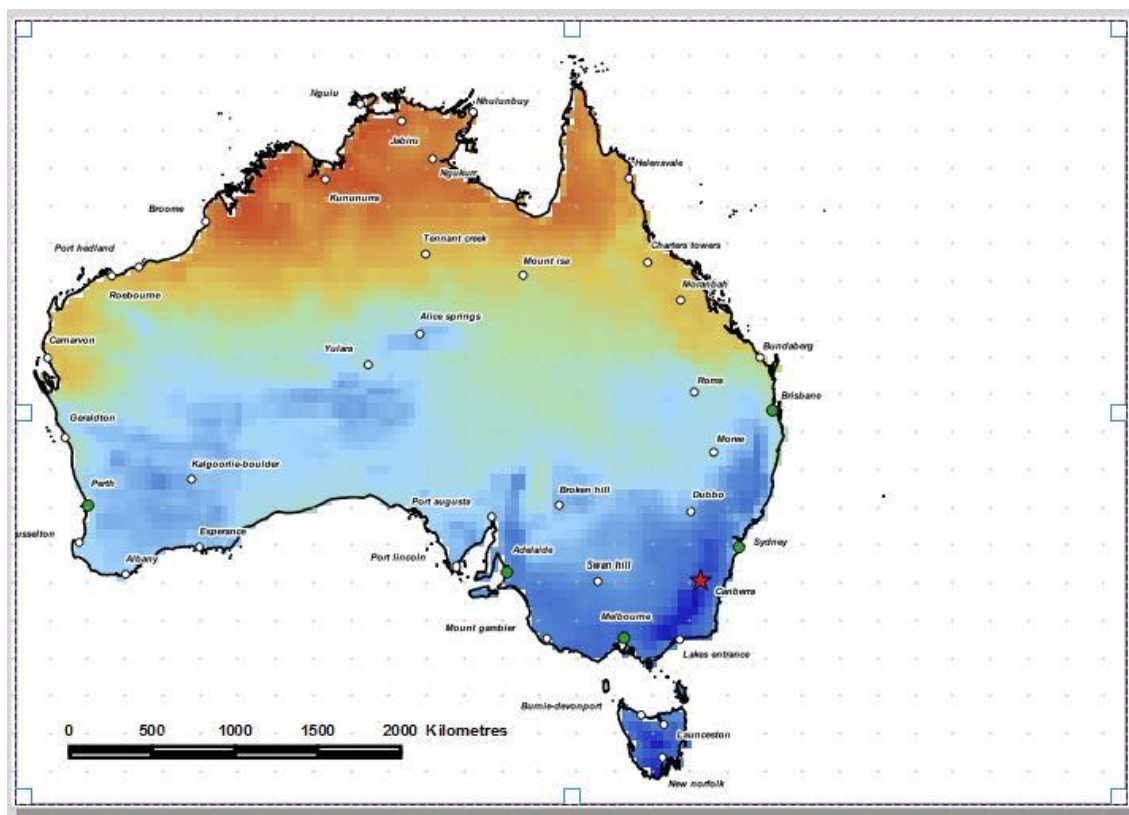
The next step illustrates how to add a map legend.

1.5   Adding a Legend

1. Choose **{Add Legend}** from the **[Layout]** menu; double-click any random location on the composition page to make your legend appear.

Tip: You may also use the {Add legend} tool   *from the toolbar.*

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Note: When your legend is added, it will appear quite large on the page. This is because of the way the cities layer is classified and the large number of cities in your map. However, since the cities are labelled then you will not need to show them in the Legend. They will be removed in due process.

2. Use the **{Select/Move item}** tool to select the Legend.

3. Once the legend object is selected, activate the **Item properties** tab on the right.

4. Locate the **"Main properties"** section and view the entry in the **"Title"** field *(see next illustration).*

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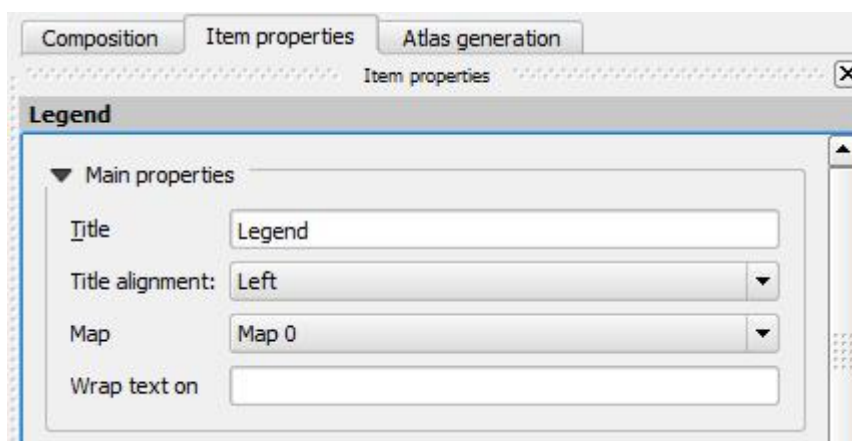
Note that changes to this field will result in changes to the title of the legend in your map. However, you should retain the default title for now.

5. Scroll down to **"Legend items"** *(see next illustration)*.
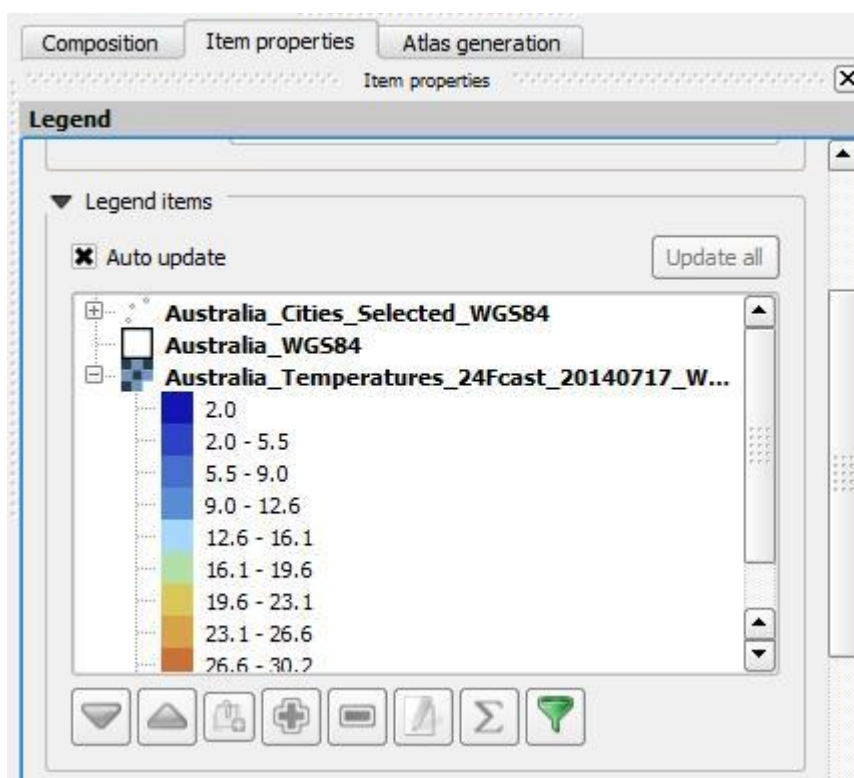
Note: This section lists all the data layers currently present in your map. From this panel you can control which layers are shown in the legend and also how legend entries are labelled and styled. You will take this opportunity to remove the cities layer from the Legend.

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6. Disable the **"Auto update"** option, highlight the cities layer (**"Australia_Cities_Selected_WGS84"**) and then select the **{Delete}** tool (*see next illustration*).
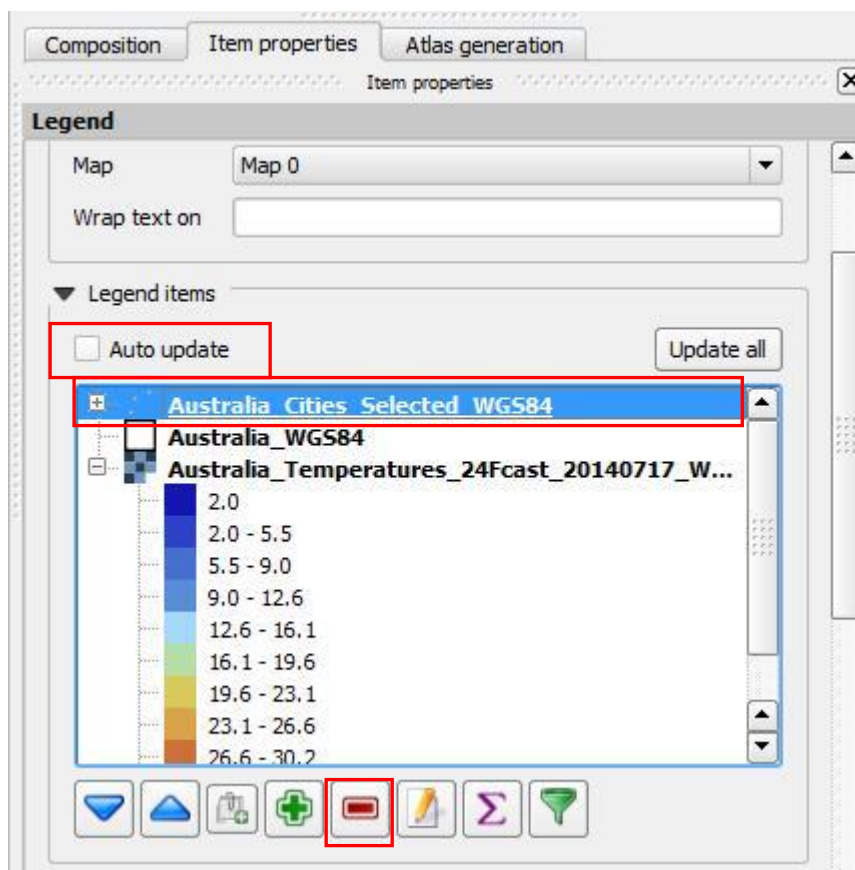

Note: Using the delete entry tool on a selected Legend item will remove it from the Legend. After this step, your map should now resemble the following image. Notice the Legend has been updated to show the removal of cities.

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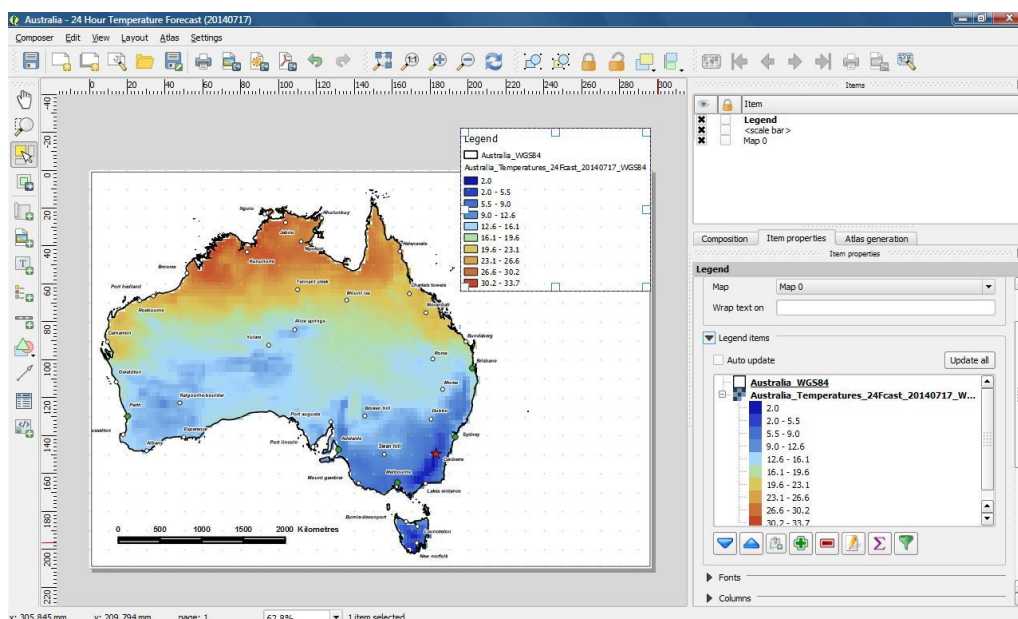
7. Use the same method from the previous step to remove the country layer (i.e. **"Australia_WGS84"**) from the Legend.

   Note: Next, you'll experiment with the characteristics of the legend entry for temperatures.

8. Select/Highlight the temperatures layer in the Legend items menu and then select the edit tool *(represented by the pen and pad graphic shown in the next image)*
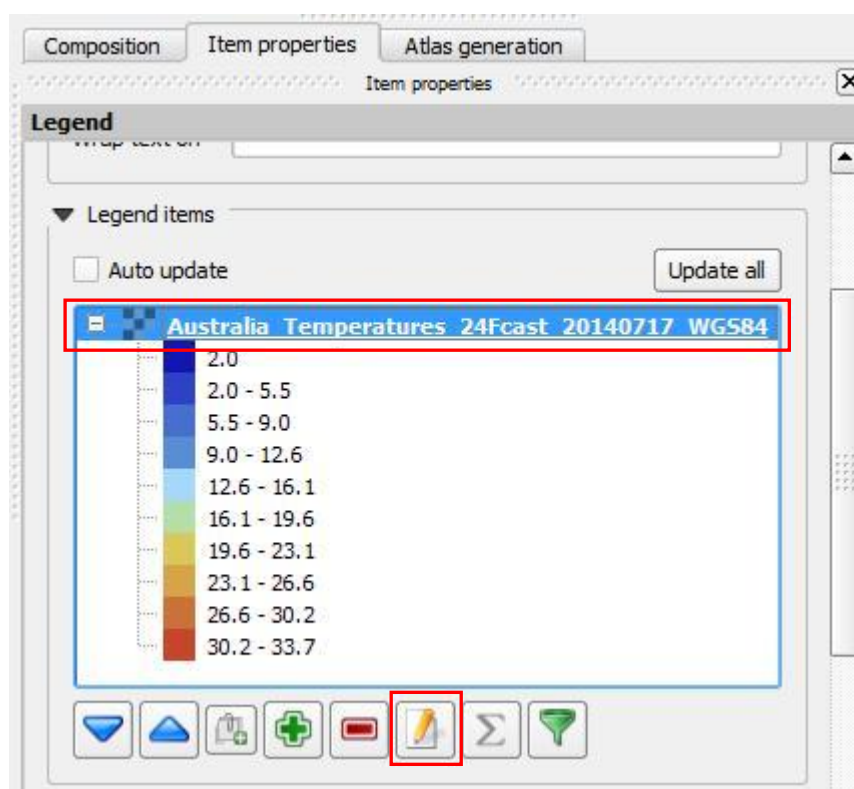

   Note: This launches a "Legend item properties" menu, where you can change the label/name assigned to a legend entry.

9. Change the entry in the **Legend item properties** menu from its default to **"Temperature (Degrees Celsius)"** and hit **{OK}**.

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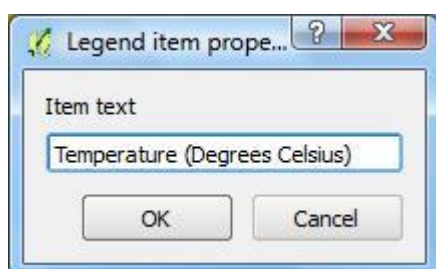
Note: The entry in your legend should have been renamed. The new name is now easier for viewers to interpret.

10. Use the **{Select/Move items}** tool to shift the Legend into a new position on the map, similar to that which is illustrated below*.*
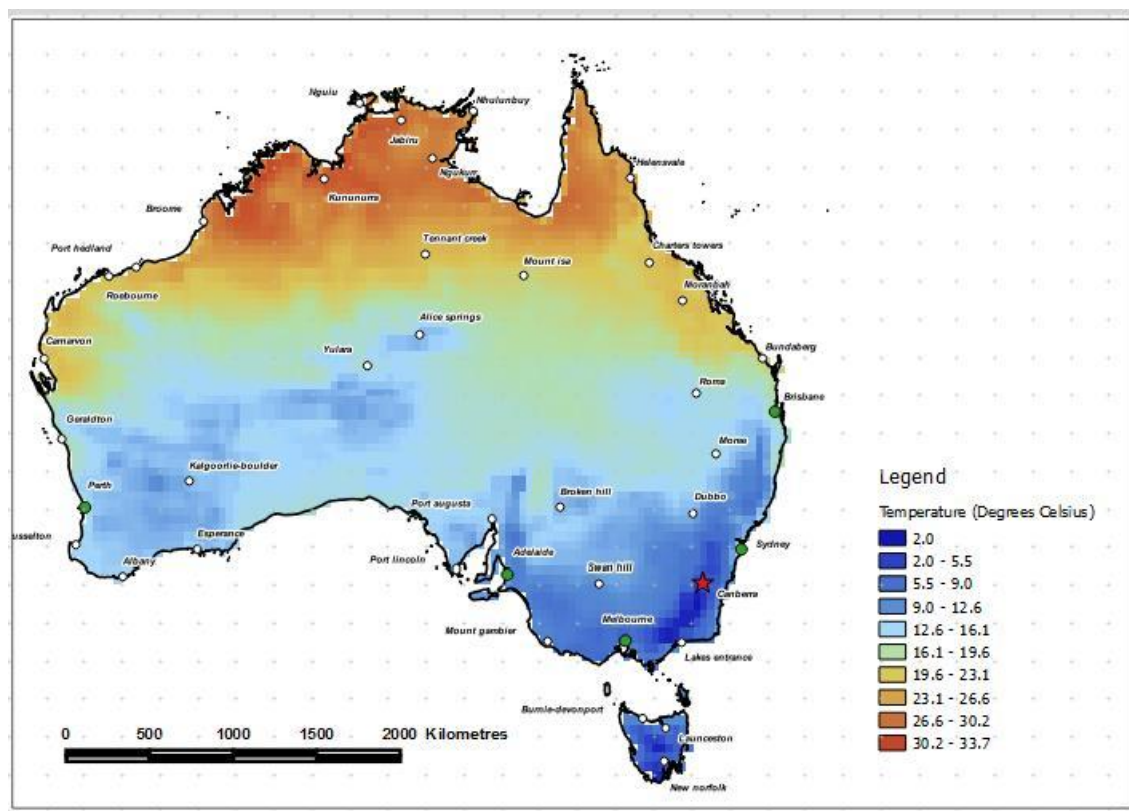
Note: Your decision to include or exclude layers from your map legend should be dependent on the message your map is intended to communicate and also the perceived role the features play in getting the message across. In this case, the map has a simple purpose of communicating the spatial distribution of temperatures according to a 24-hour modelled forecast. Since the cities are labelled there would be no need to include them in the Legend. The country layer is also not needed to help tell the story.

The next steps deal with changing the font styles and spacing associated with your legend entries.

11. Scroll down to **"Fonts"** and try changing the **Title font, Subgroup font** and the **Item font.**

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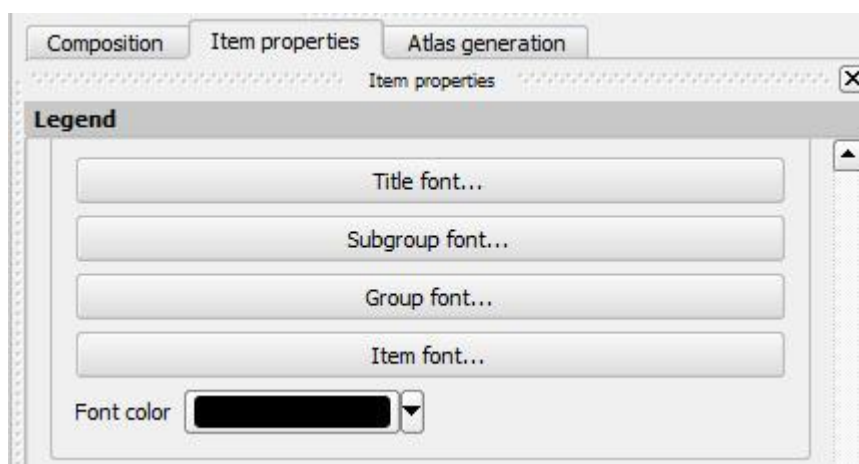
Note: Finalize your Legend with a size 16 Arial font in Bold for the Title, a size 12 Arial font in Bold for the Subgroup font and a size 12 Arial font in Bold for the Item font..

12. Scroll down to **"Symbol"** *(see next image)* and change the **symbol width** to 15 mm.
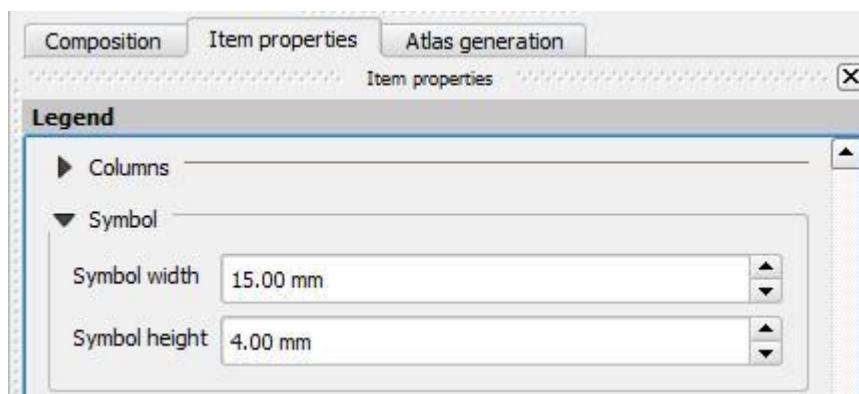
13. Scroll down to **"Spacing"** *(see next image)* and experiment with changing all the options to see the effects caused.

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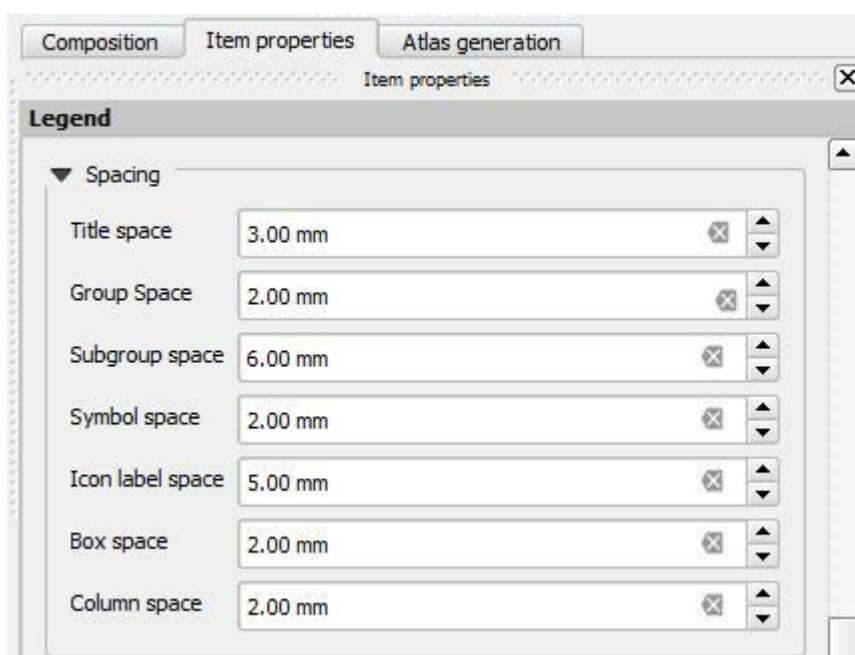
Note: Your final changes should be as follows:

- ➢ *Title space – 3.00 mm*

- ➢ *Group space – 2.00 mm*

- ➢ *Subgroup space – 6.00 mm*

- ➢ *Symbol space – 2.00 mm*

- ➢ *Icon label space – 5.00 mm*

- ➢ *Box space – 2.0 mm*

- ➢ *Column space – 2.0 mm*

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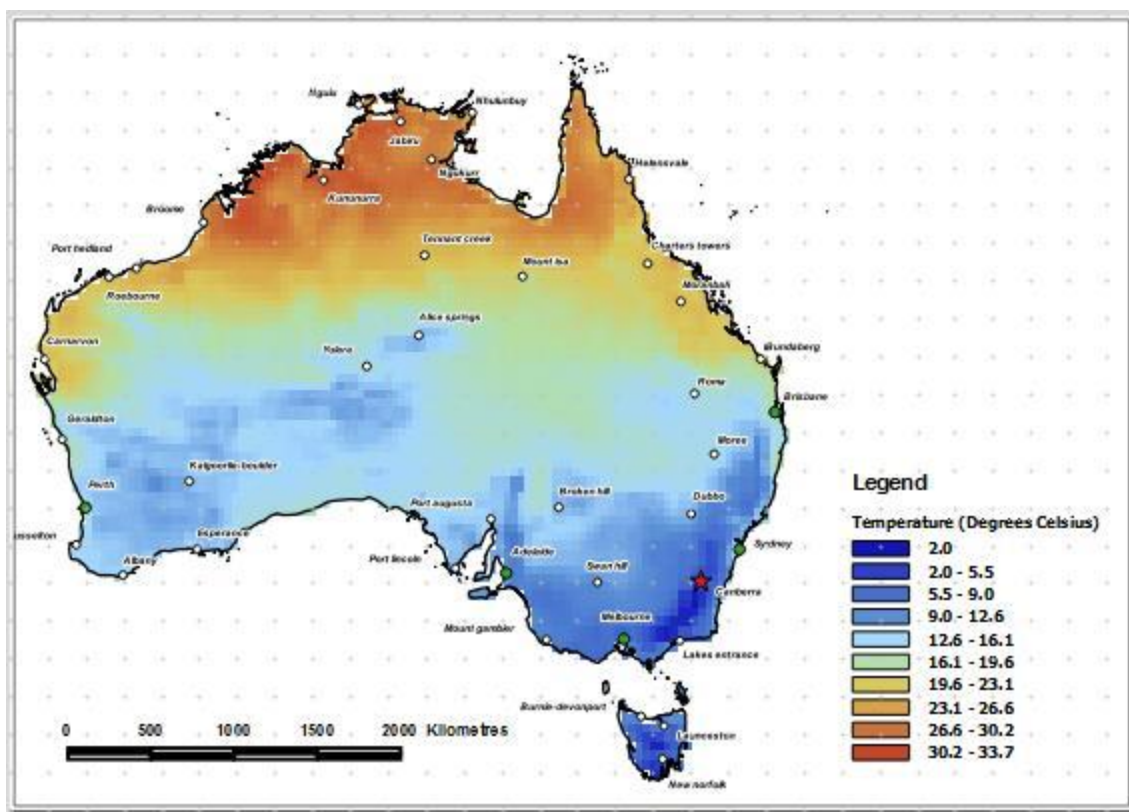
## 1.6   Adding the North Arrow

1. Select **{Add Image}** from the **[Layout]** menu and click in an open space on the composition page.

    Tip: The {Add image} tool   *may also be activated from the toolbar.*

2. Activate the **Item properties** tab on the right and scroll to **"Search directories"**.

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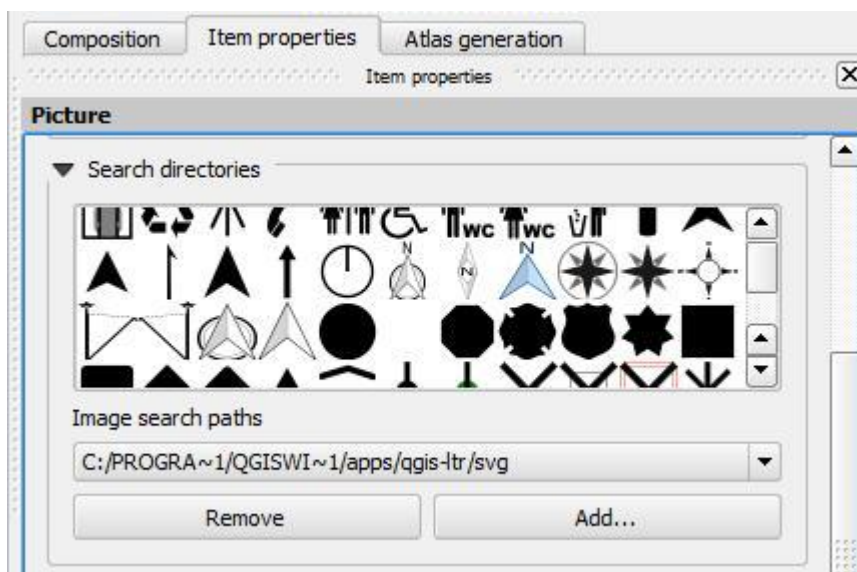
Note: A set of preview images will load from a directory on your system. You will need to choose an appropriate image from this list to be used as your north arrow. Unlike other GIS platforms, QGIS is quite limited in the types/styles of north arrow graphics it provides. However a few suitable options can still be found.
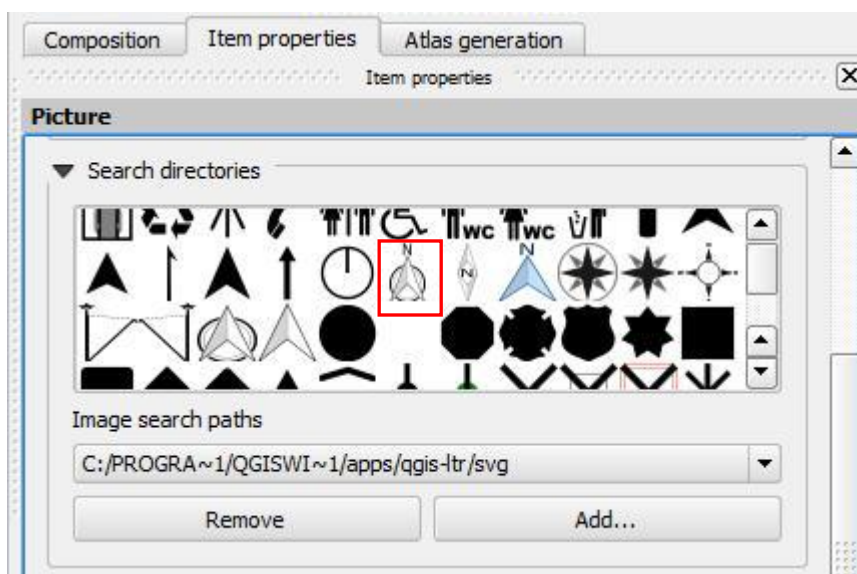
3. Select the north arrow (shown above) from the list and then scroll to **"Position and size"** *(see next illustration)*.

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4. Change the **Width** and **Height** field entries from their default sizes to 45 and 43 to slightly increase the dimensions of the north-arrow.
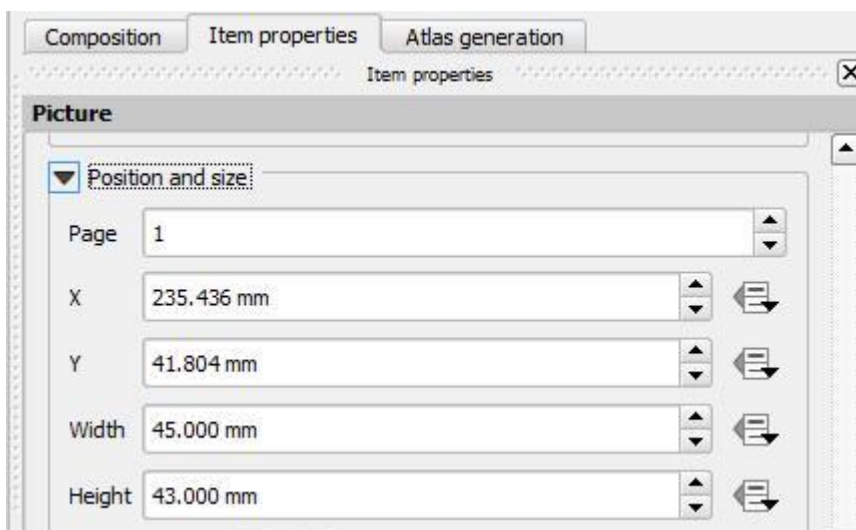
Note: The map is almost complete. All it needs now is a title and some final minor adjustments..
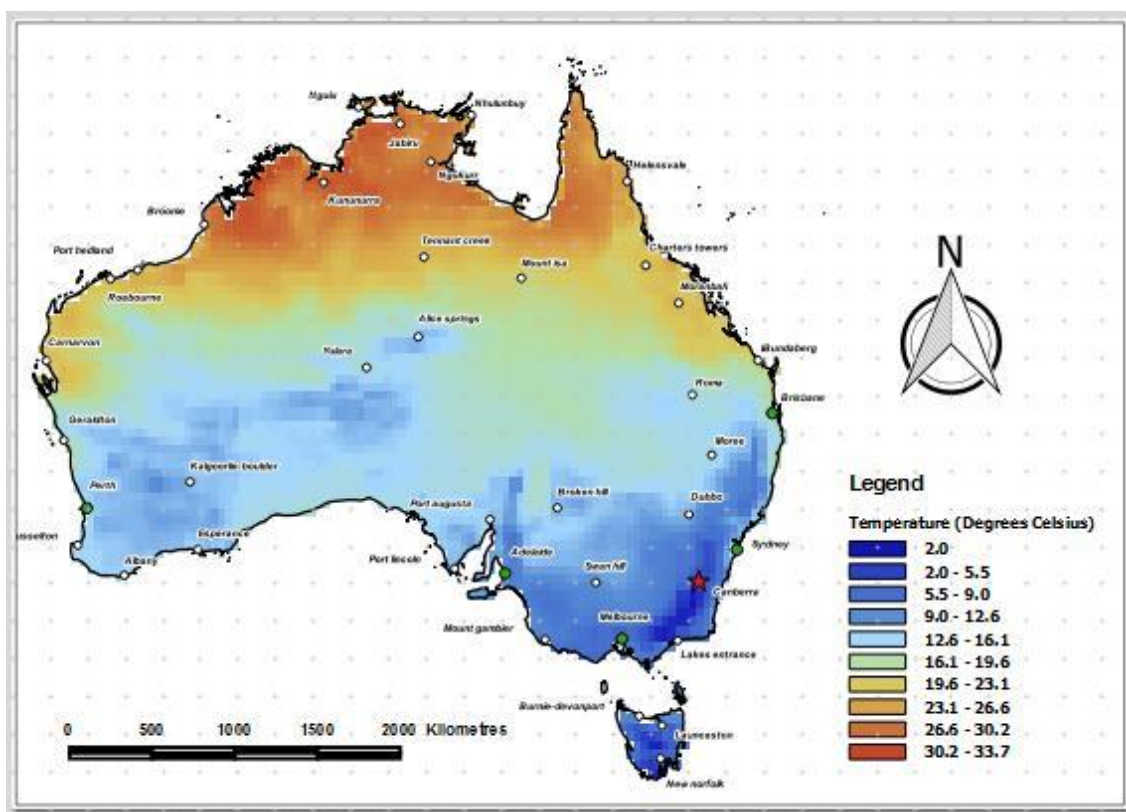
1.7   Adding a Map Title

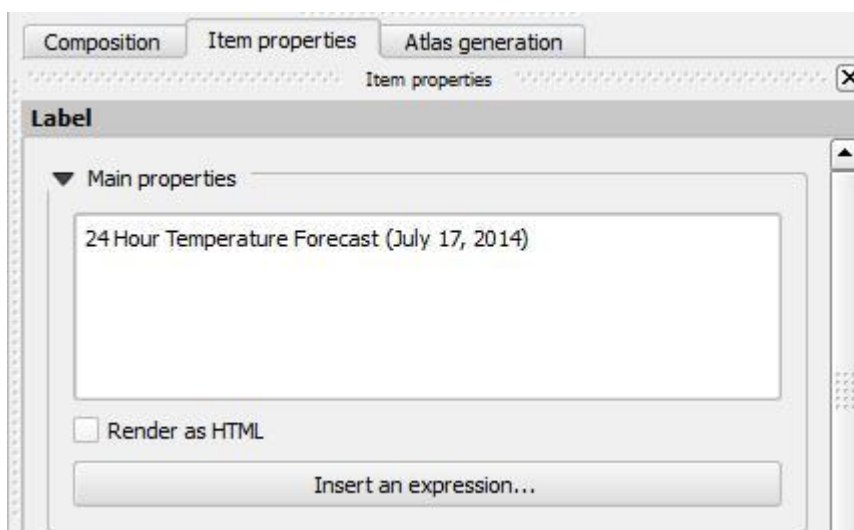1. Select the **{Add Label}** tool from the **[Layout]** menu and single-click the upper section of the composition page.

    Tip: The {Add Label} tool *may also be selected from the toolbar.*

2. Activate the **Item properties** tab and enter the title **"24-Hour Temperature Forecast (July 17 2014)"** under the **Main properties** text field *(see next image)*.

3. Scroll down to "**Appearance**" *(see image on the right)* and apply a Bold Arial font in size 24. Also set the horizontal alignment to **"Center"** and the vertical alignment to **"Middle"**.

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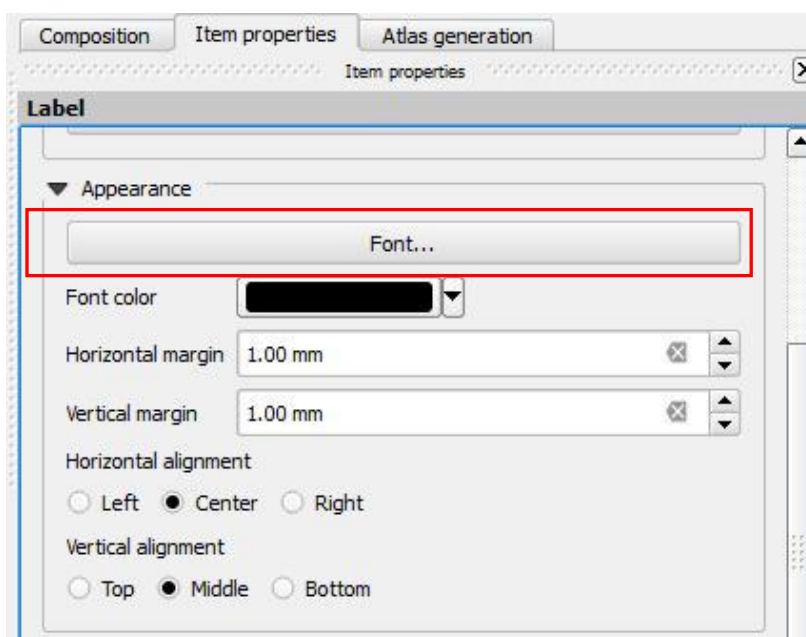
Note: Use the Select/Move items tool to shift the map title to a position that is similar to that shown in the image below.
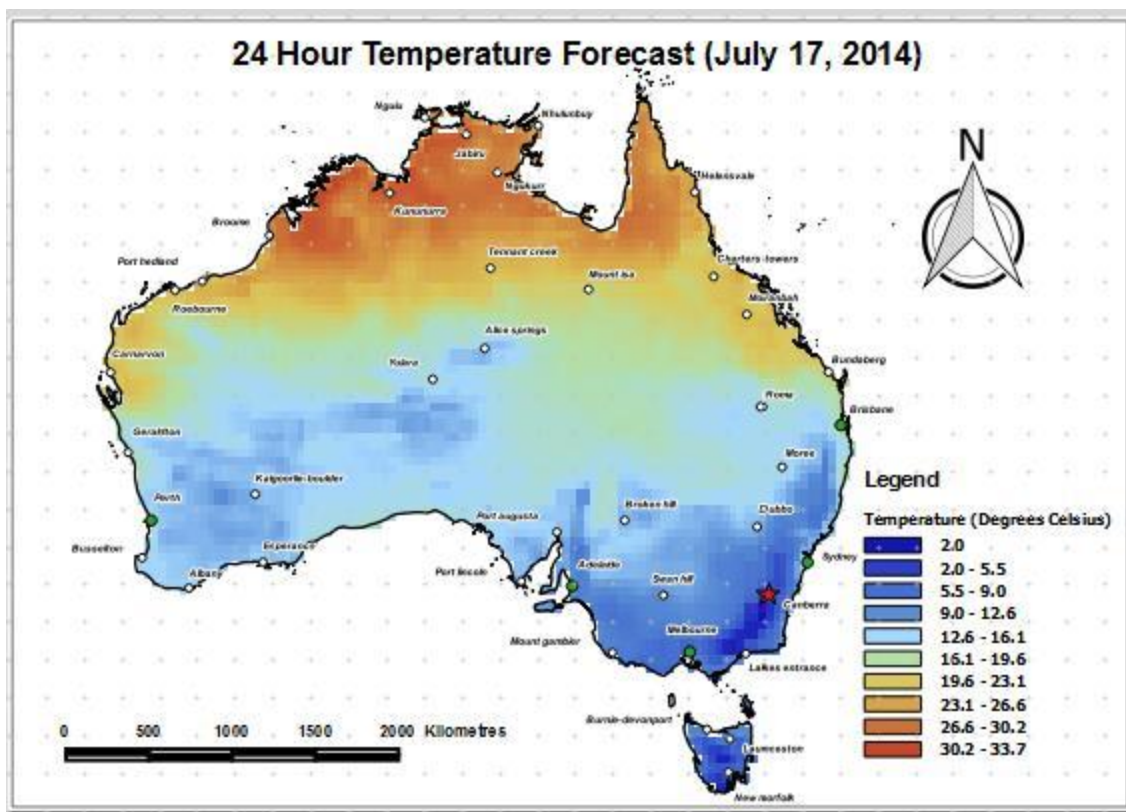

1.7 Making the Final Adjustments

Note: All of the necessary map elements have been created. However, there are perhaps some final adjustments you can make to improve your map. For example, you may need to consider shifting items around the page with the {Select/Move item} and {Move Content} tools to make the page look more balanced or to avoid clashes with other map objects. Please note that it is also possible to shift an object around the composition page using the arrow keys on your keyboard, once it has been selected with the {Select/Move Item} tool. You should also remember that the map content (map of Australia) can only be shifted around by using the {Move Content} tool.

Another thing you may have to consider is whether the size of your city points and their label sizes are suitable. Changes you make in your main QGIS Window may not be automatically reflected in the Map Composer. However you can update the Map Composer window by doing the following after you've changed layer properties (i.e. sizes, colours, etc.):

1) *Return to the Map Composer*

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**2) Use the Select/Move Item tool to select the map frame**

3) Open the Item Properties tab and locate the "Main properties" section
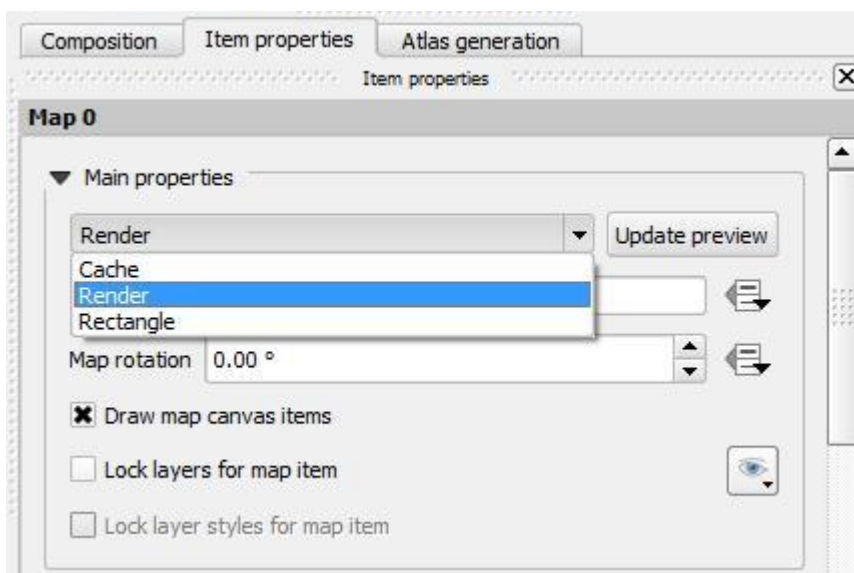

4) Select "Render" from the drop-list and then hit "Update preview".

These steps will update the Map Composer to reflect any changes you've made in the QGIS main window. So for example, if you've changed any of the sizes or colours for symbols or their labels, the changes would be visible in the Map Composer, after you hit the "Update Preview" button. If necessary, you should experiment with some changes in the main QGIS main window to increase the sizes for the symbols for the various cities. You should also consider changing the label sizes.

Lastly, you may also consider changing your font sizes for Legend items, the Title or the Scalebar if you think they are too small or too big. After you've experimented, your final map should resemble the image below. Once you are satisfied with the result, you can complete the final step and export it.

24 Hour Temperature Forecast (July 17, 2014)
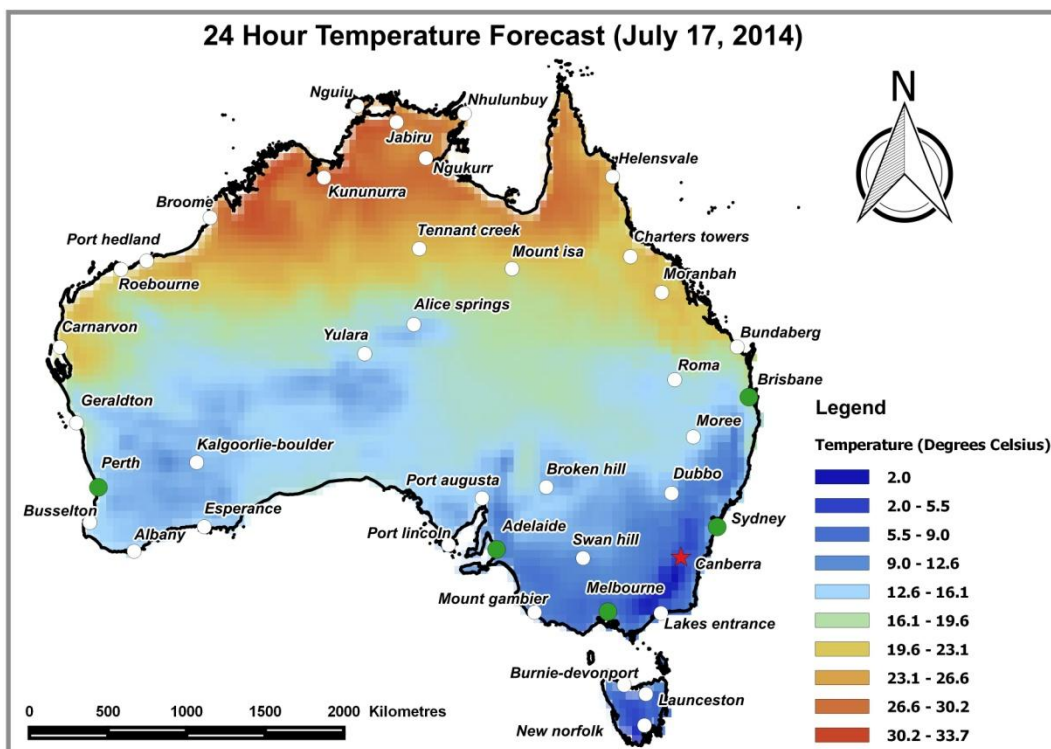
4. Export your final map to the workspace directory by selecting **{Export as image...}** from the **[Composer]** menu *(see next image)*. Name your map, **"Australia – Temperature Forecast 20140717"**.

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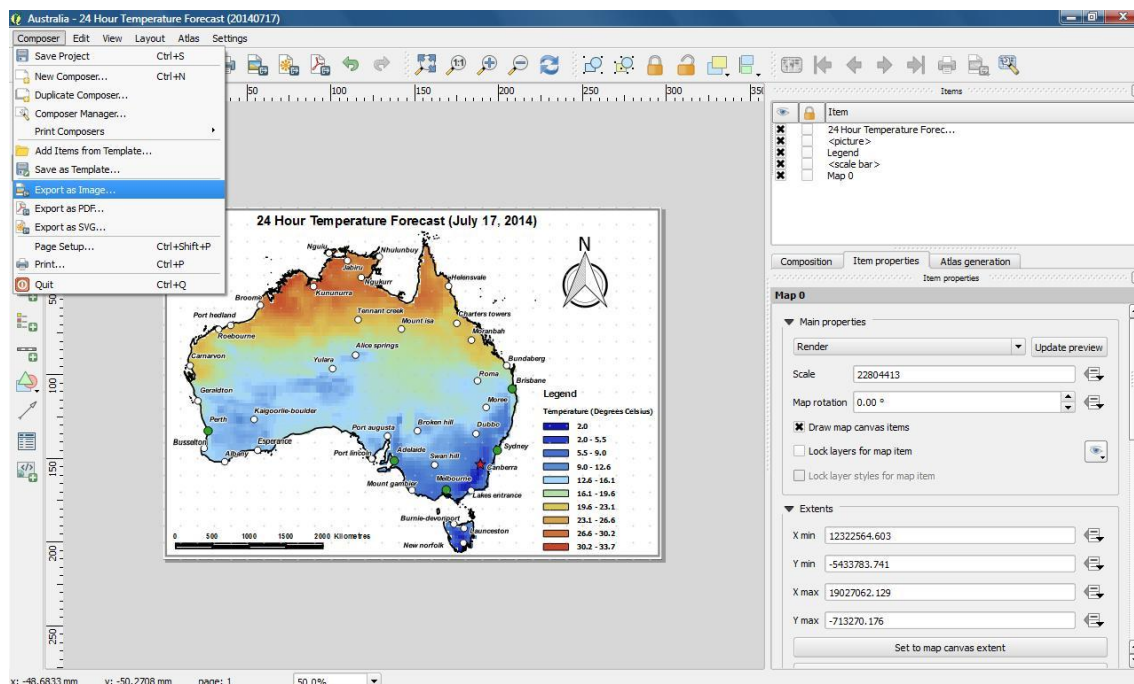
Note: This menu provides the option of exporting your map, as it is presented in the Composer, to an image format of your choice (e.g. jpeg, bmp, tiff, png, etc.). Maps may also be exported as PDF documents by using the {Export as PDF...} option. When completed, do the following:

1) *Save the Map Composer project.*

2) *Return to the main QGIS window and save the QGIS project via the [Project] menu.*

3) *Visit your workspace and open the saved map to view it.*

1.8 Summary

Completion of this exercise should provide you with very basic knowledge about map generation in QGIS. However, you should bear in mind that QGIS provides several alternative pathways for accomplishing many of the tasks illustrated. You should also be aware that QGIS possesses significantly more functionalities than demonstrated in this exercise as well as the previous exercises.

With some review of these exercises and more practice you will gain comfort with performing the following tasks in QGIS:

➢ Importing and removing data layers

➢ Manipulating data layers using basic map tools (i.e. the zoom and pan tools)

➢ Investigating the properties of vector and raster data

➢ Obtaining basic information from data features using the Identify tool and/or the attribute table

➢ Executing basic selection methods with the attribute table and the selection map tool

➢ Creating subset data for vectors and rasters

➢ Working with data in different coordinate systems and projection

➢ Imposing basic style/appearance changes on the different types of spatial data with respect to fonts, sizes, colours and alignment

➢ Designing and exporting a basic map from imported data

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Practise using the raster and vector data provided for the workshop to create a map of your choice that focuses on your home country.

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