EXERCISE 2: Composing maps in QGIS

Introduction

Communication of geographical data and concepts through maps is a fundamental skill for spatial scientists. Creating maps requires both the ability to make them complete, correct and functional, *and* the flair to make them interesting and attractive. This exercise will introduce you to the QGIS *Print layout Window*.

You will find data for this exercise on the *L: Drive* under *College of Science/Geography/GIS/data*. This instruction sheet should be read in conjunction with the document *GIS_guide_to_practical_exercises* which gives general information about QGIS and how to find further help.

Learning aim

In this exercise you will learn how to create functionally complete maps in QGIS for print or digital output. The aim is to create a 1:1,000,000 scale map of Wales illustrating mean wind speed and county boundaries.

Instructions

Creating a new map layout

1) Launch QGIS, create a new project and open the shapefiles *british_isles_polygons*, *wales_border* and *wales_principal_areas*. You have seen some of these layers before.
2) Label the Principal Areas of Wales in Welsh or English.
3) From the *Project Menu* choose to create a *New Print layout* (+ seek shortcuts). Note that you will need to give your layout a name, that you can open more than one *Print Layout Window* together, and that the *Layout Manager* gives you a tool for organizing layouts associated with a QGIS Project.
4) I recommend that you arrange the *Layout* and *Project* windows on the screen so that you can see both at once. Subsequent instructions refer to the *Layout Window* unless otherwise stated.
5) The properties of the *Layout* and *Items* within it are controlled within the Tabs on the bottom right hand panel of the *Print layout*. Selecting which layout item to adjust is controlled by the *Items* tab on the top right-hand panel (you start with no items). First adjust the page size and orientation (*Right-click->Page Properties* on the *Print Layout* window). Change the page orientation to **Portrait** (A4), but note that you can choose a custom page size here which may be useful for your assessments.

Adding and adjusting a map item

6) The process of composing a map consists of adding *Items* and adjusting their *Properties*. Some properties, particularly those related to layer order, style and labelling are controlled through the *Project Window*. Start by adding a map frame (*Add Item->Add Map*; or). You will need to draw (and adjust) a box onto your layout to show where to place this Map Item. Maximising the size of this box is a good option if there is room to put other Items on top of it. Check that a *Map* item appears in the list under the *Items tab* (top right panel).
7) Under *Item properties* for your Map Item, set the S*cale* value to 1:1,000,000 (just input 1000000). By careful and iterative use of the *Move item content* icon ( ), the *Select/Move item* icon ( ) and adjusting the scale, compose your map such that all of Wales is included. You will need the full page width. You can also use the mouse wheel to change the scale (+ctrl key for fine adjustment).
8) When you are satisfied with the scaling, framing, and position of your map you can 'lock' it in place using the tick box in the *Items* tab on the top right panel.
9) Go back to the QGIS Project Window and adjust the style of the layers. Choose colours, border widths and fonts to emphasize the focus of the map (Wales) and the functional difference between the outline of Wales (representing the physical coast) and the *Principal Areas* boundaries (representing a non-physical political construct). To force your *Print Layout* to reflect these changes, select *Update preview* under the *Item properties* tab or Refresh ( ).
10) Under *Item properties*, give your map item a *Frame* (border), and choose a background colour appropriate for representing the ocean.

Adding a scale-bar, north arrow and graticule

11) Select *Add Item->Add Scalebar* (+ find shortcut). Click on the map to place it (it can be moved later). A Scalebar should appear which correctly reflects the size of your map, and a new list item should appear under the *Items tab*. Highlighting this item should allow you to adjust its properties under the *Item properties* tab. Experiment with different styles, positions and units. It is tricky to get this to look exactly how you want, so take your time.
12) To add a north arrow, select *Add Item->Add North Arrow* and click where you want to place it on your layout. Under the *Item properties* tab, expand the *Search directories* menu, and you should be presented with a selection of thumbnail images. Choose something appropriate for a North arrow. Experiment with the properties of this image. Note that in a map projection other than OSGB where North is not in the upwards direction, you will need to manually adjust the rotation.
13) A graticule is a grid showing Latitude and Longitude which helps to communicate the Geographical location of your map. To add a graticule, expand the ***Grids*** part of the Map *Item properties*, add a grid () and adjust the grid properties. A one-degree Latitude/Longitude grid will need a Coordinate Reference System (CRS) of WGS84 (EPSG:4326 under Geographic Coordinate Systems) and an X and Y interval of 1.0. Add grid labels (***Draw Coordinates***). Adjust grid and labels to maximise readability. change the number of decimal places presented to avoid lots of unnecessary trailing zeroes.

Adding a title and legend

14) Any text, such as a title, can be added to your map using *Add Item->Add Label*. Place an appropriate title on your map layout, and experiment with its style using the *Item properties* panel.
15) Select *Add Item->Add Legend* and click on the map where you want to put it (you can move it later). As with other layout items, you have complete control over the appearance of the legend using the *Item properties* panel, and you are encouraged to experiment. At least learn how to rename items in the Legend (double-click), re-order and remove legend items (un-tick *Auto Update* and investigate the icons: ). Remember that a good map avoids clutter and looks neat and tidy.

Adding raster data to the map and to the legend

16) From the *Project window* Add the *raster* layer (TIF file) from *wales_windspeed folder* and choose and customize a nice *colour ramp* (use single-band pseudocolour). Adjust the various properties and order of layers so that you can see the Wales Principal Areas as well as the windspeed data, for example by making the Principle Areas transparent. Try to make your layout look attractive. Beware of creating semi-transparent layers – these can destroy the vital link between the colours on your map, and the colours in your legend, and thereby make your map much harder to read or interpret.
17) From the *Layout window*, for the *Map item* once again *Update preview*. If your chosen colour-scale does not appear in the Legend, add it. Rename the legend entry to something meaningful and experiment with the legend and layer properties to make it look clear and attractive.
18) Tick the check-box *Lock layers for map item* from the *Item properties* panel to prevent your map being altered by the next steps. Un-tick this if you want to make further changes.

Adding an inset map

19) Users of your map might not be aware of the geographical location of Wales but will probably be familiar with the shape of the British Isles. Providing an Inset map showing the area that the map covers is a neat and attractive means of providing geographical reference in addition to the graticule. Try adding a second *Map Item* to your layout, this time making it a small box containing the whole of the British Isles (e.g. at a scale of 1:20,000,000). You will need to choose which layers of your project to include in this new map. Only some of them will be useful at this scale, and clutter is to be avoided.
20) The *Overviews* section of the Item properties for this new map item allows you to automatically show a rectangle on the map to illustrate the location of your main map of Wales. You will need to add an *Overview* (), select your Wales map as the *Map frame*, and change the properties to make it look nice. Once again, this step is complex and will require you to experiment.

Exporting your map

21) To ensure that your map items retains the appearance that you have chosen, select *Lock layers for map item* from the *Item properties* panel for EACH map item. Your map may be printed directly to a printer, and this will ensure that your chosen map scale (1:1,000,000) truly reflects the relationship between map features and real-world distances.
22) Alternatively, you can save your map as a PDF document (*Layout->Export as PDF*), or a bitmap for inclusion in a document or presentation (*Layout->Export as Image*). You will need this last method for your coursework, so have a practice now. Note that if you have created a Print Layout of size and orientation A4-Portrait, then importing this into a Word document makes it difficult to arrange with a figure caption below it without wasting a lot of space. Custom page sizes can get you around this problem.

Learning outcomes

By the end of this exercise you should:

1) Be familiar with the QGIS Map Layout, and its relationship to the QGIS Project window.
2) Know how to add and arrange essential map features and adjust their properties to make a map attractive.
3) Know how to configure multiple map items, legends, grids, scales and labels in a map layout.
4) Be able to export a map layout for inclusion in a document or presentation.