EXERCISE E01: Introduction to QGIS

Introduction

This is the first in a series of practical exercises designed to teach the basics of Geographic Information Systems (GIS). 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

This exercise will help you to become familiar with the Quantum GIS (QGIS) environment for visualizing and processing geospatial data. You will learn how to open various types of data layer, adjust the way they look, explore their attributes and select features for further analysis.

Instructions

Starting up

1) Read carefully through the *GIS_guide_to_practical_exercises* to prepare, then launch **QGIS** in the remote desktop (or on your own computer if you have installed it and copied the datasets)**.**
2) Create a new Project (*Project->New*). For future reference, find the short-cut icon for a *New Project*.
3) Add the vector layer *british_isles_polygons* to your project (Layer->*Add Layer->Add Vector Layer*). For the Source, browse ( ) to the **shapefile** (filename extension ***.shp*) within the relevant folder (see Practical Guide). For future reference, also find the short-cuts for adding a new vector layer such as dragging and dropping from a browser. This dataset is part of the *OpenStreetMap* project and consists of closed polygons representing the many islands making up the British Isles. Notice that the layer will be listed within the *Layers* panel of the Project Window.

Navigating and adjusting style properties

4) Explore this dataset by panning and zooming. Make yourself familiar with navigating around the dataset using the mouse-wheel and each of the icons (shown above):
5) Save your Project (*Project->Save*). Find the short-cut. Remember to save regularly from now on.
6) Change the appearance of this layer by adjusting its *Style* (*Layer->Properties->Style*). A useful short-cut to this dialog is to double-click in the *Layers* panel: Double-click here ➤ british_isles_polygons

   Click on **Simple Fill** and experiment with the *stroke colour*, *stroke width*, *fill colour*, and *symbol layer type*. It should rapidly become clear that you have complete control over how data layers appear. Whenever you design a map, consider carefully how to choose an appropriate style for each layer.

Measuring geospatial objects

7) A fundamental objective of GIS analysis is being able to measure geographic features. QGIS provides a tool (right) for measuring length, area and angle. Experiment with this tool to find: (a) the length of Great Britain (miles); (b) the approximate area of Ireland (square km).

Exploring the attribute table

8) An *attribute table* is a fundamental part of all GIS datasets. Each row of the table corresponds to a single feature (e.g. polygon) within the data layer, and each column, or attribute (of which there can be as many as is needed), records a property of the feature (e.g. name, area, etc.). Open the Attribute Table for *british_isles_polygons* (Layer->Open Attribute Table). Find a shortcut and note that you can also access this via the *Layers Panel* (right click on layer). This particular data layer has only two attributes: FID (field identifier) and Area.
9) Arrange your QGIS window on screen so that you can see both the Main Project Window and the Attribute Table. Explore the attribute table and its correspondance with the map, noting that you can sort the table according to area (click on Area column title), select polygons by clicking on the left-hand column of the table, and zoom to the map feature selected (see below).

Zoom to selection here

	FID	Area
.20	464385	218572612433

Select row here

Sort data here
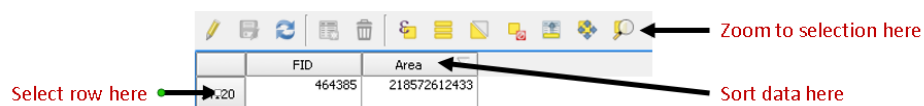
10) Find the 10 largest islands of the British Isles. Can you name them? How big is the Isle of Man? (NB: map coordinates are in meters, so area will be square meters). How good was your Ireland estimate?

11) You can also select features in a map using the *Main Project window*. Experiment with this using the various options under the icon 📇. This will be very useful later on.

Arranging further layers and labelling

12) Add vector layer shapefile *wales_principal_areas* to your project. This dataset is part of an Open Data mapping project (https://mapzen.com/) and consists of closed polygons representing the Principal Areas (historically referred to as counties) of Wales. Note this layer also appears in the *Layer Panel*.

13) Adjust the style of this layer and explore its *Attribute Table*.

14) Experiment with switching layer visibility on or off using the tick boxes in the *Layer Panel* (☑). This becomes essential when there are many layers. You can also remove layers (🗑).

15) Change the order of the layers by dragging upwards or downwards the entries in the *Layer Panel*. Note that the seaward political boundary of Wales goes beyond the coastline. This is because the physical land boundary is generally classified according to the mean high-water-mark, while administrative boundaries are normally classified according to the mean low-water-mark. That's Geography!

16) Displaying text to identify features is a common characteristic of maps. Make sure that the *wales_principal_areas* layer is selected (highlighted) in the Layers Panel, then open the Labelling Dialog (*Layer->Labelling*). Find shortcuts to this dialog (e.g. from the layers menu). Explore this dialog. Label the Wales polygons according to their English or Welsh names. Explore all the labelling options.

17) With the Principal Areas labelled, zoom out. Notice how QGIS chooses to place and resize the labels so that they remain visible, but switches some of them off to avoid overlap. This is a fundamental part of map design and QGIS tries to optimize readability. You can control this behavior through the *Labelling Dialog* and you are encouraged to experiment. Have you saved your project lately?

Adding point and line data layers and filtering

18) Add the vector layer shapefile *wales_WindFarm_Operational2011* located in *wales_windfarm_points*. These data are from the British Wind Energy Association (BWEA) and represent the location of windfarms that were operational in 2011. Examine the attribute table. Adjust the style, noting that point data is represented in a different way to polygon data. Label the windfarms.

19) Add the vector layer shapefiles located under *wales_roads_rivers*. These data also form part of the Open Street Map project (http://download.geofabrik.de/europe/great-britain/wales.html) and represent all roads and waterways in Wales. These are large datasets and may take time to load and display. Once again, examine the attribute tables and experiment with different styles for line data.

20) There are many ways to make subsets of data layers to select only the data you need or that you want to display. Here is just one: Choose to *Filter* the roads layer (highlight *gis_osm_roads_free_1*, then select Layer->Filter). Making sure of precise punctuation and spacing, type **"fclass" = 'primary'** into the lower box labelled *Provider specific filter expression* and click OK. Your map should now only display roads classed as primary. Experiment further with this dialog to see how each of the elements works.

Adding data from an online source to your Project

21) Using a browser, download http://lle.gov.wales/catalogue/item/FloodAlertAreas.zip to your *OneDrive*. Unzip this file (right-click->extract all), then open the shapefile and explore it. Try searching for and downloading other GIS data files from lle.gov.wales, geofabric.de, or another source.

22) Make sure that you have learned all of the lessons above. You will need this knowledge in future exercises and for the assessments.

Learning outcomes

By the end of this exercise you should:

1) Be able to create a new QGIS project, add data layers, change their style and navigate around them.
2) Understand how to re-order layers, switch layer visibility on and off, and remove layers.
3) Appreciate the relationship between GIS layers and attribute tables, and be able to label features.
4) Know how to download data for use in QGIS