EXERCISE 7 ATTribute DATA MANAGEMENT

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7.1 INTRODUCTION
You have learnt to digitise and create point, line/segment and polygon maps. Spatial data is incomplete without the non-spatial or attribute data because spatial analysis is generally performed based on the attributes. The attribute data is stored in the form of tables with rows and columns. Each row in an attribute table represents a spatial feature and each column describes a characteristic.

In this exercise we will learn to work with the attribute data. You can perform several function such as create, edit, join, import/export and also perform computations on the attribute data in QGIS software.

Objectives
After working through this exercise, you should be able to:
- open and create attribute data and tables;
- link an external attribute data;
- create new attribute through data computation;
- import and export attribute data; and
- create a new vector layer from a part of the attribute data.

7.2 REQUIREMENTS
To perform this exercise successfully, following are the requirements:
- personal computers with QGIS installed in it, and
- sample vector data.

7.3 STEPS IN QGIS
There are several functionalities using the attribute data in QGIS. Some of the commonly used functions are shown here.

7.3.1 Opening Attribute Table
Attribute table displays features of a layer. You can open attribute table for a vector layer by clicking on it in the map legend area. When you click on it the layer becomes active. Then choose Open Attribute Table from the
main menu *Layer*. You can also open the layer by right clicking on the layer and choosing *Open Attribute Table* from the dropdown menu. A new window will open, which displays the feature attributes in the layer as shown in Fig. 7.1. The attribute table title shows the number of features and the number of selected features. You will notice that there are several rows and columns. Each row in the attribute table represents one map feature and each column contains a particular piece of information about the feature. There are several buttons at the bottom of the table. You can search, select, move or even edit features in the attribute table.

![Attribute table for the Alaska layer](image)

**Fig. 7.1: Attribute table for the Alaska layer**

### 7.3.2 Selecting Features in an Attribute Table

You can select a feature in the attribute table by clicking on row number on left side of the table. Each selected row in the attribute table displays the attributes of a selected feature in the layer. If you change the set of features selected in the main window, the selection is also updated in the attribute table. Similarly, if you change the set of rows selected in the attribute table, the set of features selected in the main window will be updated. You can select multiple rows by holding the *Ctrl* key. You can make continuous selection by holding the *Shift* key and clicking on several row headers. It will select all rows between the current cursor position and the clicked row.

You can sort the table by any column by clicking on the column header. A small arrow indicates the sort order. Downward pointing arrow means descending values from the top row down and vice versa.

You can perform search by attributes. If you want to perform a simple search on only one column, you can use the *Look for field*. Select the field (column) from which you want to perform the search from the dropdown menu and click on the [Search] button. It will select the matching rows and show the total number of matching rows in the title bar of the attribute table, and in the status bar of the main window.

If you want to perform complex search then you can use the *Advanced search* button, which will launch the *Search Query Builder*. Query has been described in Exercise 17 of Part III of this manual.

If you want to show only the selected records, you can use the *Show selected only* checkbox. If you want to search selected records only, you can use the *Search selected only* checkbox. The *Case sensitive* checkbox allows you to select case sensitive.
There are several buttons at the bottom left of the attribute table window, which provide following functionality, respectively:

- Unselect all (Ctrl+U)
- Move selected to top (Ctrl+T)
- Invert selection (Ctrl+S)
- Copy selected rows to clipboard (Ctrl+C)
- Zoom map to the selected rows (Ctrl+J)
- Pan map to the selected rows (Ctrl+P)
- Toggle editing mode (Ctrl+E)

When you click on the toggle editing mode you will be able to edit single values. It will also enable the following functionalities:

- Save edits (Ctrl+S)
- Delete selected features (Ctrl+D)
- New Column (Ctrl+W)
- Delete Column (Ctrl+L)
- Open field calculator (Ctrl+I)

If you want to use attribute data in external programs (such as Excel) use the Copy selected rows to clipboard button. You can copy the information without vector geometries if you deactivate Settings → Options → General tab → Copy geometry in WKT representation from attribute table.

### 7.3.3 Saving Selected Features as a New Layer

You can save the selected features as any OGR supported vector format and also transform into another Coordinate Reference System (CRS). Open the right mouse menu of the layer and click on Save selection as to give name of the output file, its format and CRS. You can also specify OGR creation options within the save vector layer dialog box.

### 7.3.4 Working with Non-spatial Attribute Tables

You can load non-spatial tables in QGIS such as the tables supported by OGR, delimited text and the PostgreSQL provider. You can use the tables for field lookups or just browse and edit using the table view. When you load the table, you can see it in the legend field. You can open it with the Open Attribute Table tool and then edit like any other layer attribute table.

You can use columns of the non-spatial table to define attribute values or a range of values that are allowed to be added to a specific vector layer during digitising. To know more about it you can explore the edit widget in the Fields Tab.

### 7.3.5 Performing Calculations on Attribute Table

You can perform calculations on attribute table using the Field Calculator button on the basis of existing attribute values or defined functions, e.g. to calculate length or area of geometry features. You can write the results to a new attribute column or it can also be used to update values in an already existing column.

To perform the field calculation, first bring the vector layer in editing mode. It will open a dialog box as shown in Fig. 7.2 in which you have to first select whether you want to only update selected features, create a new
attribute field where the results of the calculation will be added or update an existing field.

![Field Calculator dialogue box](image)

Fig. 7.2: Field Calculator dialogue box

If you choose to add a new field, you need to enter some boxes such as field name, field type (integer, real or string), the total field width, and the field precision. For example, if you choose a field width of 10 and a field precision of 3 it means you have 6 signs before the dot, then the dot and another 3 signs for the precision.

The Function List contains functions as well as fields and values. You can view the help function in the Selected Function Help. In Expression you see the calculation expressions you create with the Function List.

You can use various fields, values and functions to construct the expression for calculation or you can just type it into the box. To display the values of a field, you just right click on the appropriate field. You can choose between Load top 10 unique values and Load all unique values. On the right side opens the Field Values list with the unique values. You can add a value to the Field calculator Expression box by double clicking its name in the Field Values list.

The **Operators, Math, Conversions, String, Geometry** and **Record** menus provide several functions. In Operators you find mathematical operators and in Math mathematical functions. The Conversions group contains functions that convert one data type to another and the String group provides functions for data strings. In the Geometry group you will find functions for geometry objects and using Record group functions you can add a numeration to your data set. To add a function to the Field calculator Expression box, click on a box from the Function List and then double click the function you wish to apply.

Here is an example, which illustrates calculation of length of the railroads layer from the QGIS_example_dataset. Follow the steps below to calculate length of the railroads:

1. Load the shapefile `railroads.shp` and open its attribute table.
2. Click on Toggle editing mode and open the Field Calculator dialog.
3. Select the Create a new field checkbox to save the calculations into a new field.
4. Add ‘length’ as Output field name, ‘real’ as Output field type and define Output field width ‘10’ and a Precision of ‘3’.
5. Now click on function length in the Geometry group to add it as $\text{length}$ into the field calculator expression box and click $\text{Ok}$.

6. You can now find a new column length in the attribute table.

### 7.3.6 Importing Attributes from Other Software

At times, you may have your data as a table or an Excel spreadsheet. You can easily use this data in your GIS project, if you have a list of X and Y coordinates and some attributes. Follow the steps given below to import and use such tabular data into QGIS:

1. Open your tabular data and examine it. It should have at least two columns containing the X and Y coordinates. Save the file as a text file.

2. If you have an Excel spreadsheet, you can save the file as a 'Tab Delimited File' or a 'Comma Separated Values (CSV)' file. Once you have exported the data in this way, you can open it in a text editor such as Notepad to view the contents. You will see that each field is separated by a Tab.

3. We will be using a plugin called ‘Add Delimited Text Layer’ for this. So, now go to $\text{Plugins}$ menu and select $\text{Manage Plugins}$. It will open the QGIS Plugin Manager as shown in the Fig. 7.3. If the plugin is not shown here you can select $\text{Fetch Plugins}$ from $\text{Plugins}$ menu.

![Fig. 7.3: QGIS Plugin Manager dialogue box](image)

4. Once the plugins is enabled, you will see a menu item under the $\text{Layers} \rightarrow \text{Add Delimited Text Layer}$. Select it to open the plugin. A dialogue box now opens.

5. In the dialog box, click on Browse and specify the path to the text file. Now, check the 'Tab' delimiter in the delimiters section. Check the 'comma' as the delimiter, if your data is in CSV format. The plugin will try to guess the correct X and Y coordinate fields. It may be stored as LONGITUDE and LATITUDE or LAT and LONG. If the plugin selects wrong fields, you may change it and then click $\text{OK}$ button.

6. You will now be asked to select the Coordinate Reference System. Select the appropriate coordinates as per your vector data and then click $\text{OK}$.

7. The data will now be imported and displayed in the $\text{QGIS viewer}$ window. The layer is now imported and ready for analysis. To save the layer as shapefile, right click on the layer and select ‘$\text{Save As}$’.
8. Once you have saved the layer as shapefile, you can use it next time without importing.

7.3.7 Linking Spatial Data with Attributes in an Excel Table

You can link a spatial data with attributes stored in an Excel table. Follow the steps to carry out the same:

1. First, add your shapefile as vector layer in QGIS.
2. Now, add your Excel table (which can be in .csv or .xls formats) to QGIS in the way mentioned earlier.
3. The table and the vector layer will now be visible in the layer table of contents. Now, select Join in the Layer properties.
4. To make a simple Join, choose a connecting common attribute, which is present in both the datasets (such as the state name or a previously created ID-Number).
5. You can now easily export the shapes attribute table in .csv or other formats.

After completing the exercise, submit the following to your instructor for evaluation:

1. Snapshot of the attribute table with the new fields added.
2. Snapshot of the imported attribute table.
3. Snapshot of the layer saved from selected attributes.
4. Snapshot of the attribute table after performing calculations.

7.4 HOME WORK: DO IT YOURSELF

1. List out the points you should keep in mind while carrying out data editing.
2. Explore what are the other functions available in QGIS to work on attributes.
3. Explore how you can handle attribute data in ILWIS software.

7.5 REFERENCES


7.6 FURTHER/SUGGESTED READING