A brief introduction to QGIS

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Chapter 1

Introduction

QGIS is an Open Source Geographic Information System (GIS) licensed under the GNU General Public License.

The aim of this document is to present some recipes about importing and exporting vectors, and treatment and exploration of spatial data. I expect to add more recipes on vector styling and map composition.

This is a brief introduction to QGIS, as such it does not intend to replace the QGIS User Guide. I also recommend you visiting the StackExchange chanel, where you can get support on questions related to QGIS.

The data used to illustrate the recipes presented in this document come from the Portail données ouvertes Montréal; particularly, the selected data from this site is under the license Creative Commons Attribution 4.0 International.

To follow the recipes presented in this document, please download the accompanying files from my GitHub page.

Chapter 2

QGIS installation and Graphical User Interface

2.1 QGIS installation

It is possible to install QGIS on Windows, Mac OS X, Linux, BSD, and Android operating systems. The installers can be downloaded from this website, and this link provides detailed installation instructions.

By the time of writing this document, the last version of QGIS is `3.8.2 Zanzibar`, which was released on October 16, 2019.

2.2 QGIS Graphical User Interface

The QGIS graphical user interface (GUI) is composed of:

- **Menu bar**: gives access to the main functionalities of QGIS.
- **Toolbars**: give a quick access to QGIS functionalities.
- **Panels**: they provide several functionalities, for instance managing layers, and browsing spatial data.
- **Map display**: shows the spatial data of the current project.

It is possible to customize the appearance of QGIS by navigating to **View** from the **Menu bar**. From here, you can select the panels and toolbars you want to display. I would recommend toggling the **Processing Toolbox** from the panel because it allows to quickly access to the main operations available in QGIS.

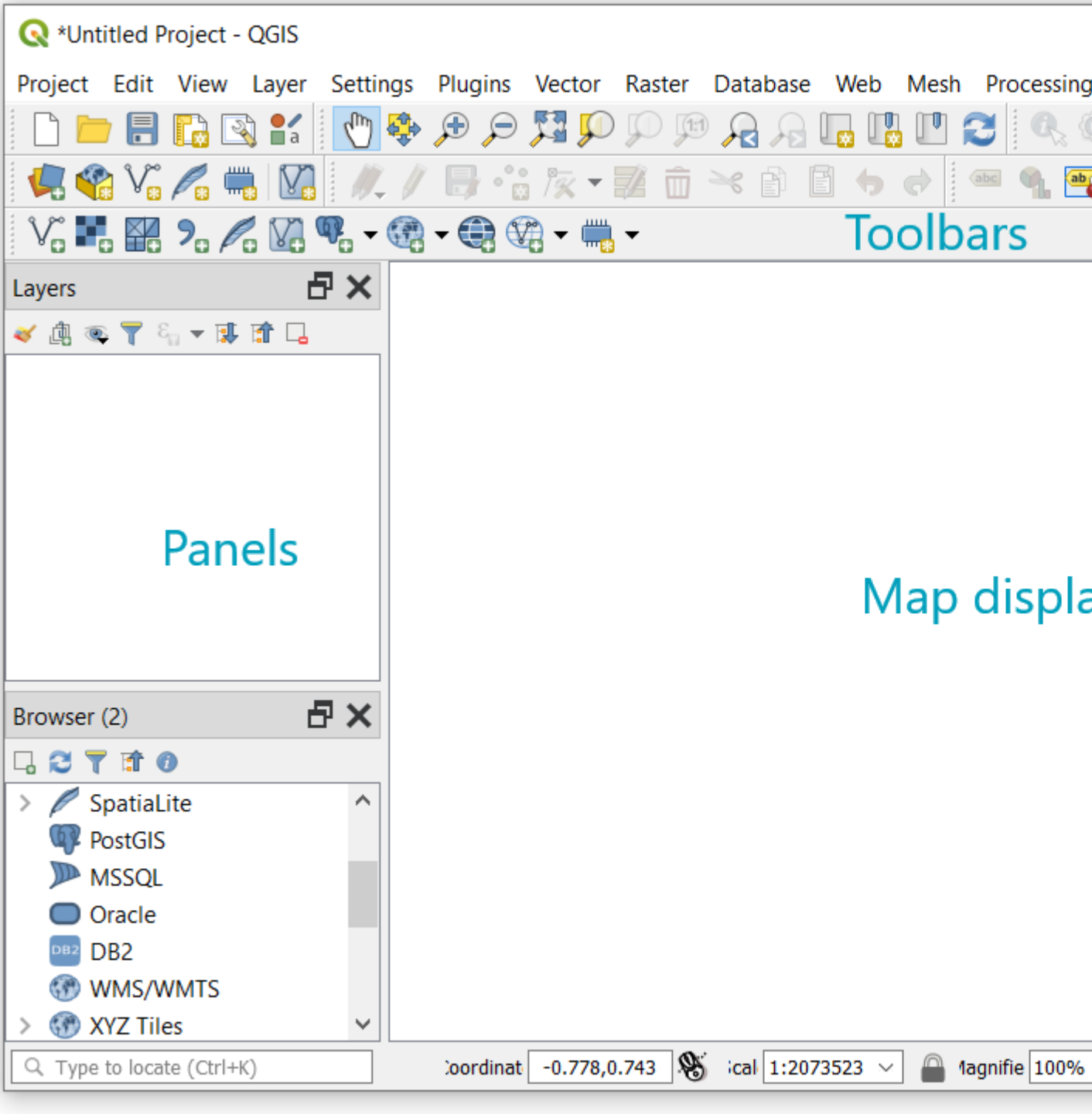

Figure 2.1: QGIS GUI

Chapter 3

Loading and Exporting data

The quickest way to load data into QGIS is the technique drag-and-drop. It only requires locating the data you want to import into QGIS, select the file, and drop it on the **Map display** or on the **layer panel**.

Another option for importing data is to use the browser panel. Navigate through the browser, locate the layer or data to be imported, right-click on it, and finally select Add Layer to Project. However, using the **Manage Layers Toolbar** or **Add Layer** from the **Layer** menu give more control on the importation.

3.1 Importing data from text files

This recipe is illustrated with the `coordonnees-stations-rsqa.csv` file, which reports the locations of the stations of the Air Quality Monitoring Network (RSQA) set up in Montreal. The aim of the RSQA is to monitor the atmospheric concentration of criteria pollutants.

1. Navigate to the **Layer** menu and select **Add delimited text layer**. The following dialog will pop up:
2. In the **File Name** field, indicate the path to the `coordonnees-stations-rsqa.csv` file.
3. In the **Geometry Definition** section, indicate that point coordinates are being imported. Then indicate the corresponding fields for longitude and latitude. According to the sources of the layer being imported, the coordinate system is WGS 84, so we don't need to change it. When you want to import an attribute table, you can select the option **No geometry**.
4. Click on **Add**. You will see the following set of points, probably not in the same colour. Optionally, you can add a base map or another layer to give some spatial context, but for now we have successfully imported the layer corresponding to the stations of the RSQA network.

   In section **??** we describe how to add a basemap to add spatial context.
5. **Optional step**: save the imported layer as a new shapefile (Section **??**).

3.2 Importing data from KML files

QGIS supports importing Keyhole Markup Language (KML) files. KML is the format used by Google Earth to show spatial data.

The importation of a KML is illustrated with the `grandparcs.kml` file which contains polygons corresponding to the parks of Montreal.

1. Navigate to the **Layer** menu and select **Add vector layer**. The following dialog will pop up:

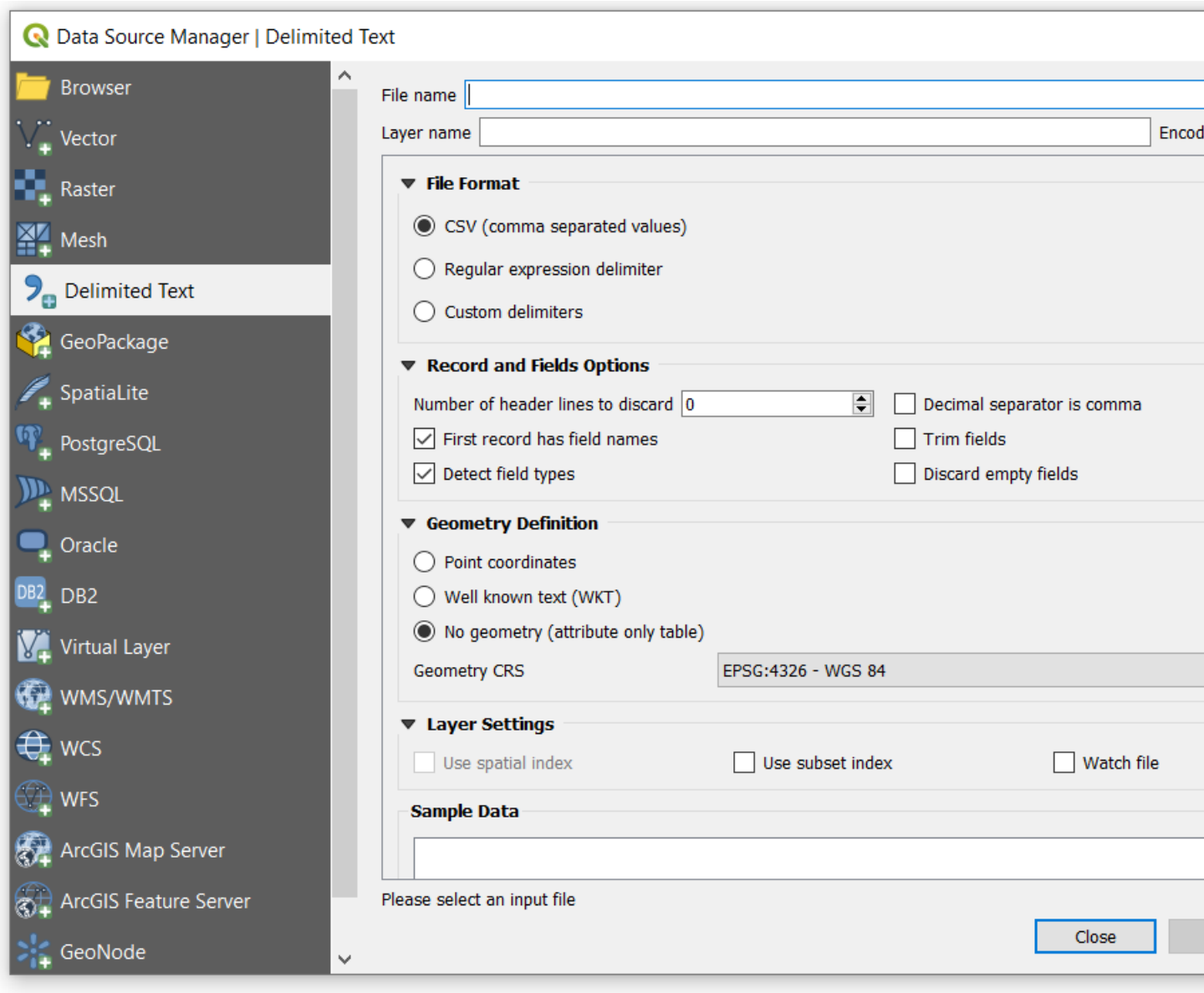

Figure 3.1: Add delimited text layer window

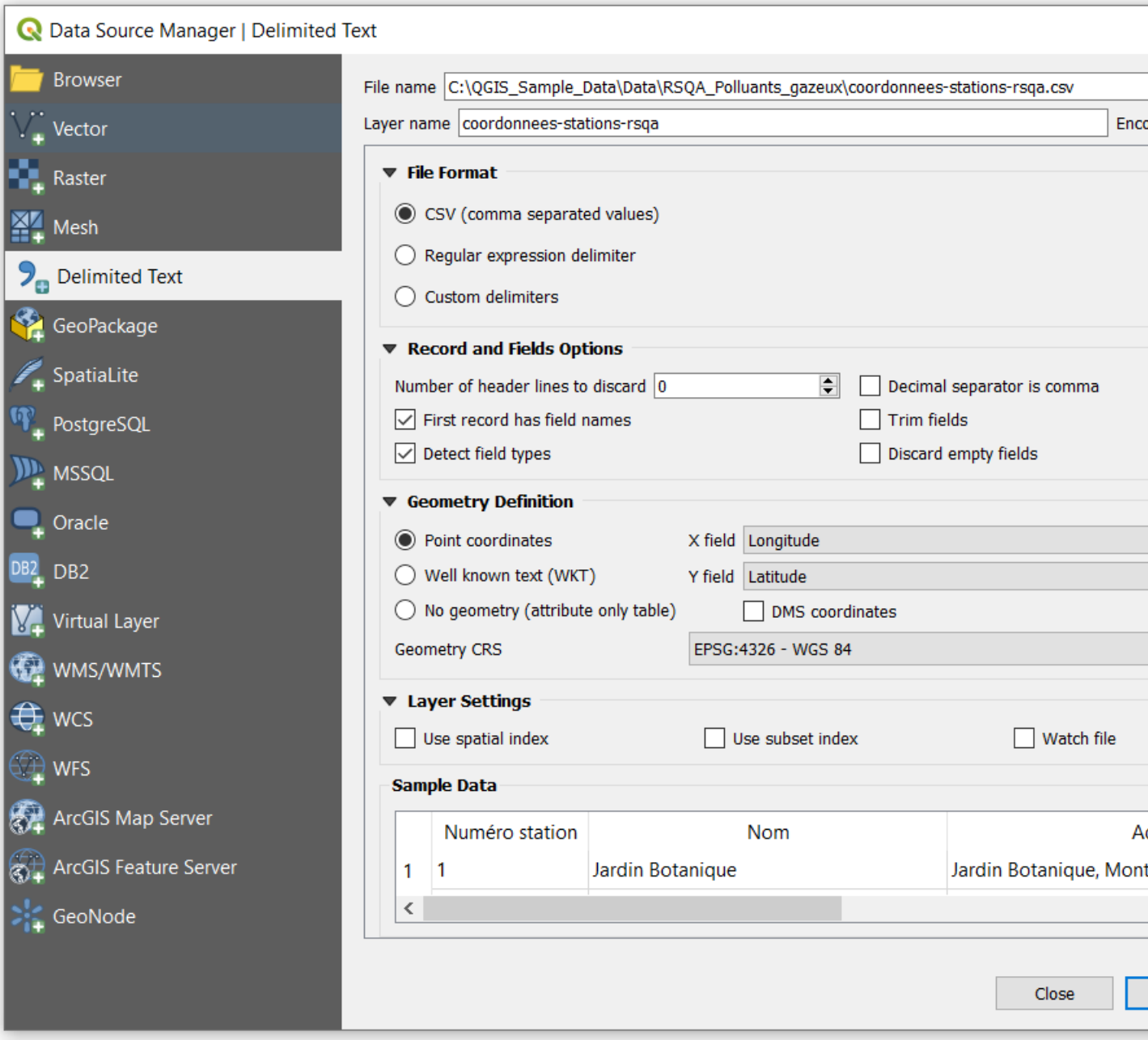

Figure 3.2: Indicating the path to the text file

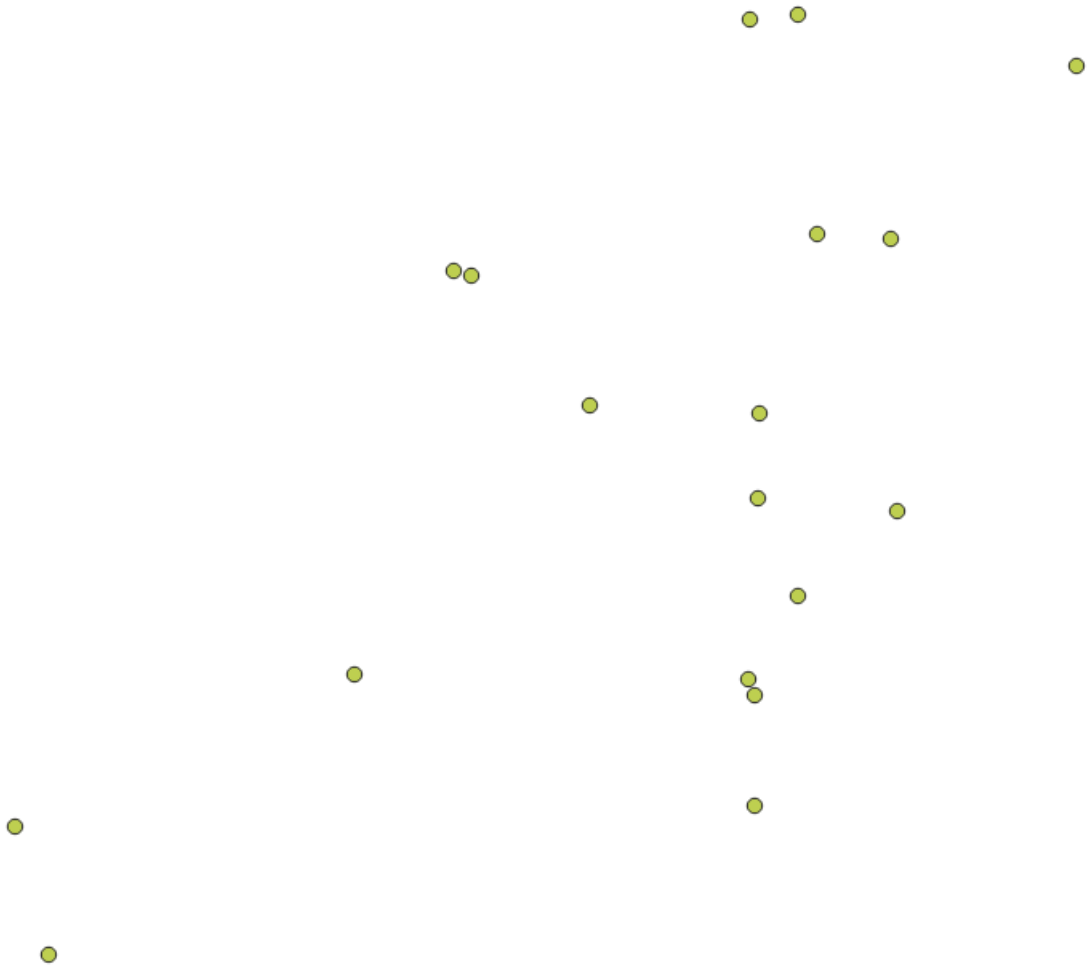

Figure 3.3: Montreal's Air Quality Monitoring Network

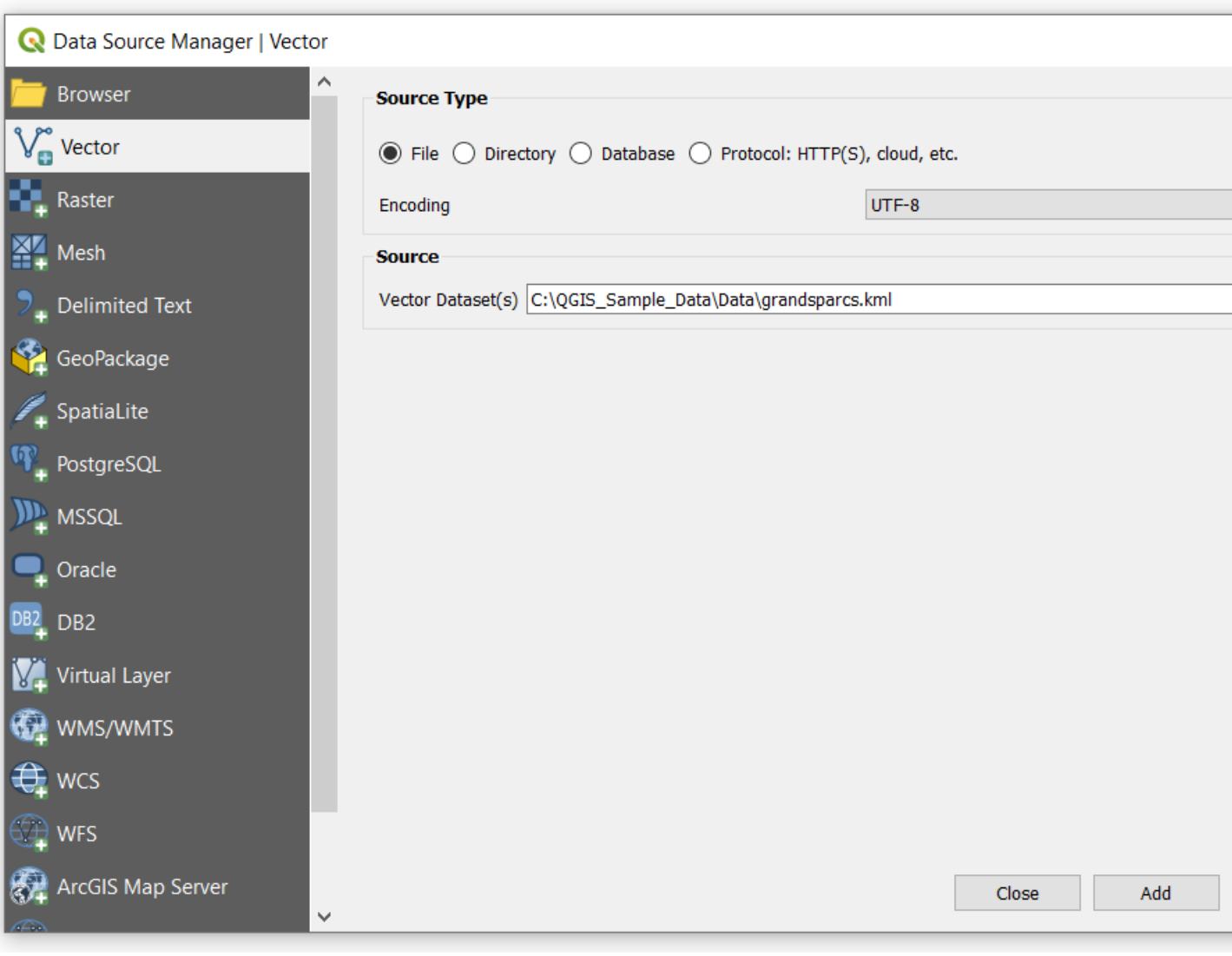

Figure 3.4: Add vector layer window

Figure 3.5: Montreal's parks

2. In the **File Name** field, indicate the path to the `grandparcs.kml` file. The following layer will be displayed in QGIS:

3.3 Importing GeoJSON files

GeoJSON is another frequently used format for storing and representing geographical attributes. This format is based on the JavaScript Object Notation (JSON).

The importation of a GeoJSON layer is illustrated with the `ilotschaleur.json` file. This file contains the urban heat islands (UHI) of Montreal. UHI correspond to urban areas characterized by higher summer temperatures than the immediate environment with differences between 5 and 10°C.

1. Navigate to the **Layer** menu and select **Add vector layer**. The following dialog will pop up:
2. In the **File Name** field, indicate the path to the `ilotschaleur.json` file. The following layer will be displayed in QGIS:

3.4 Saving a layer

We use the previously imported `coordonnees-stations-rsqa.csv` file to illustrate how to export a layer in a different format.

1. Right-click on the name of the layer, select **Export**, then **Save features As...** The following dialog window will pop up.
2. Select the format in which you want to export the layer. In this case, we have selected the widely used ESRI shapefile, we will use this layer in future recipes. Another commonly used format is GeoJson

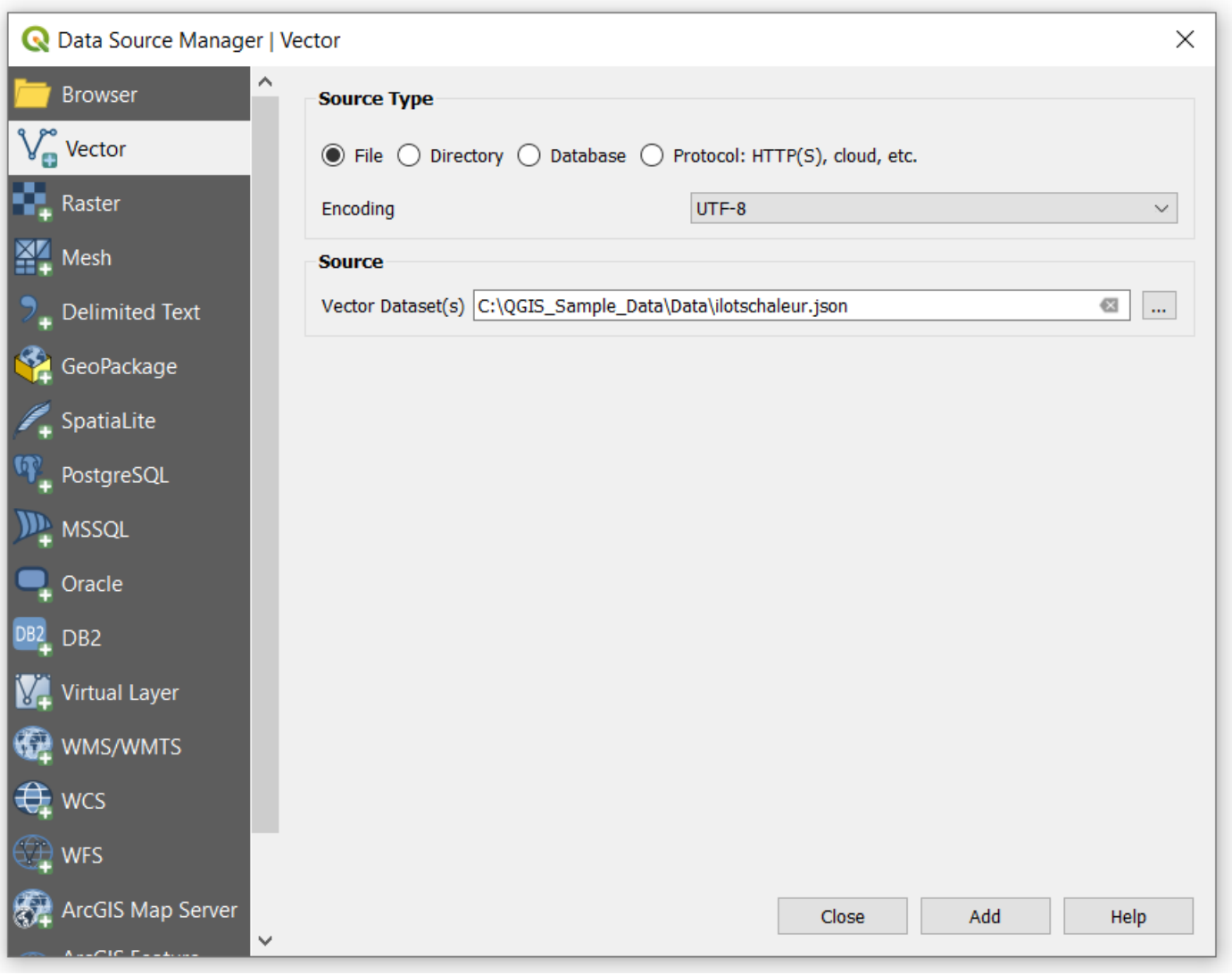

Figure 3.6: Add vector layer window

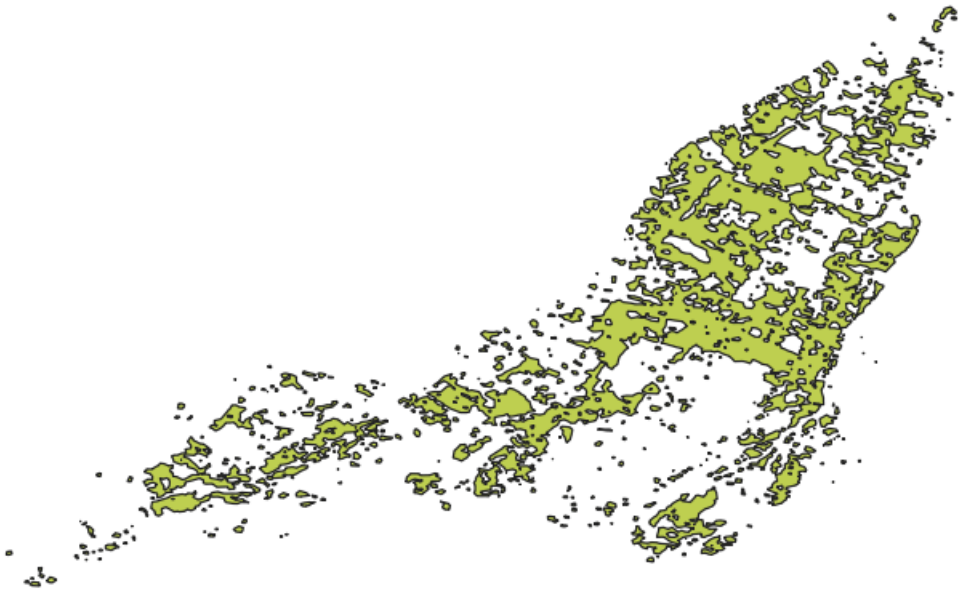

Figure 3.7: urban heat islands (UHI) of Montreal

since it is compatible with web base applications.

3. Indicate the path where the layer will be stored and give it a name. Indicate whether you want to add the saved file to the current project, and finally click on OK.

3.5 Reprojecting a layer

Most of the time, the layers are not in a CRS that is more convenient for the operation in hand. QGIS offers on-the-fly reprojections for rendering the layers. However, when executing operations like spatial analysis, it is required that all layers be in the same CRS. This recipe is illustrated with the `LIMADMIN.shp` file that corresponds to the administrative limits of Montreal's boroughs.

Before executing a spatial analysis, it is recommended to reproject the layers to the most convenient CRS.

1. Right-click on the name of the layer, select **Export**, then **Save features As...**. The following dialog window will pop up.
2. Indicate the path where the layer will be stored and give it a name. If you tick the box **Add saved file to map**, the recently exported layer will be saved and added to the current project.
3. Click on the little globe to select the CRS in which the new layer will be projected. The following window will pop up:
4. You can filter the CRS. In this case we will export the new layer in **EPSG:6622**, since it is the most accurate for Quebec. Click **OK** to confirm the selection of the CRS and click again **OK** to save the layer.

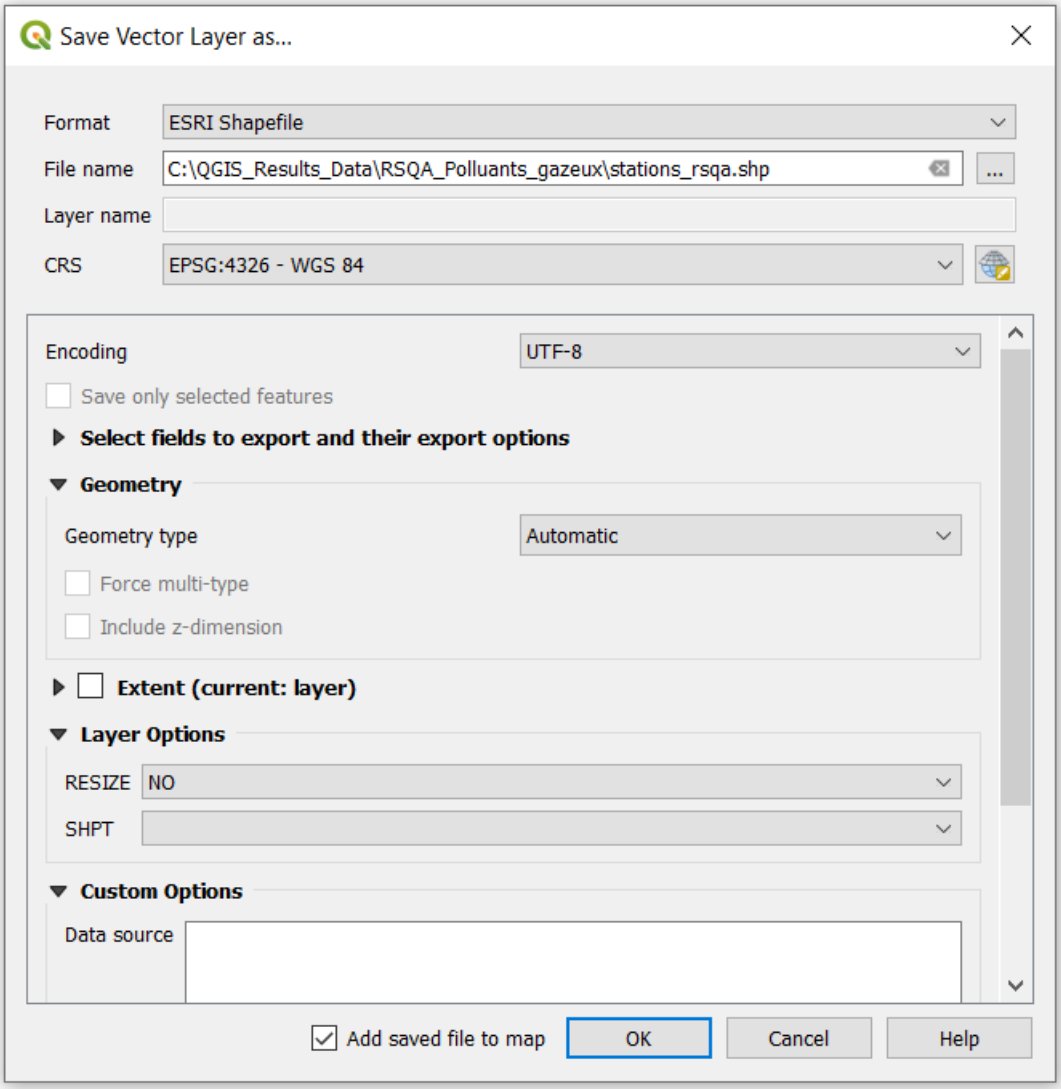

Figure 3.8: Save features as... window

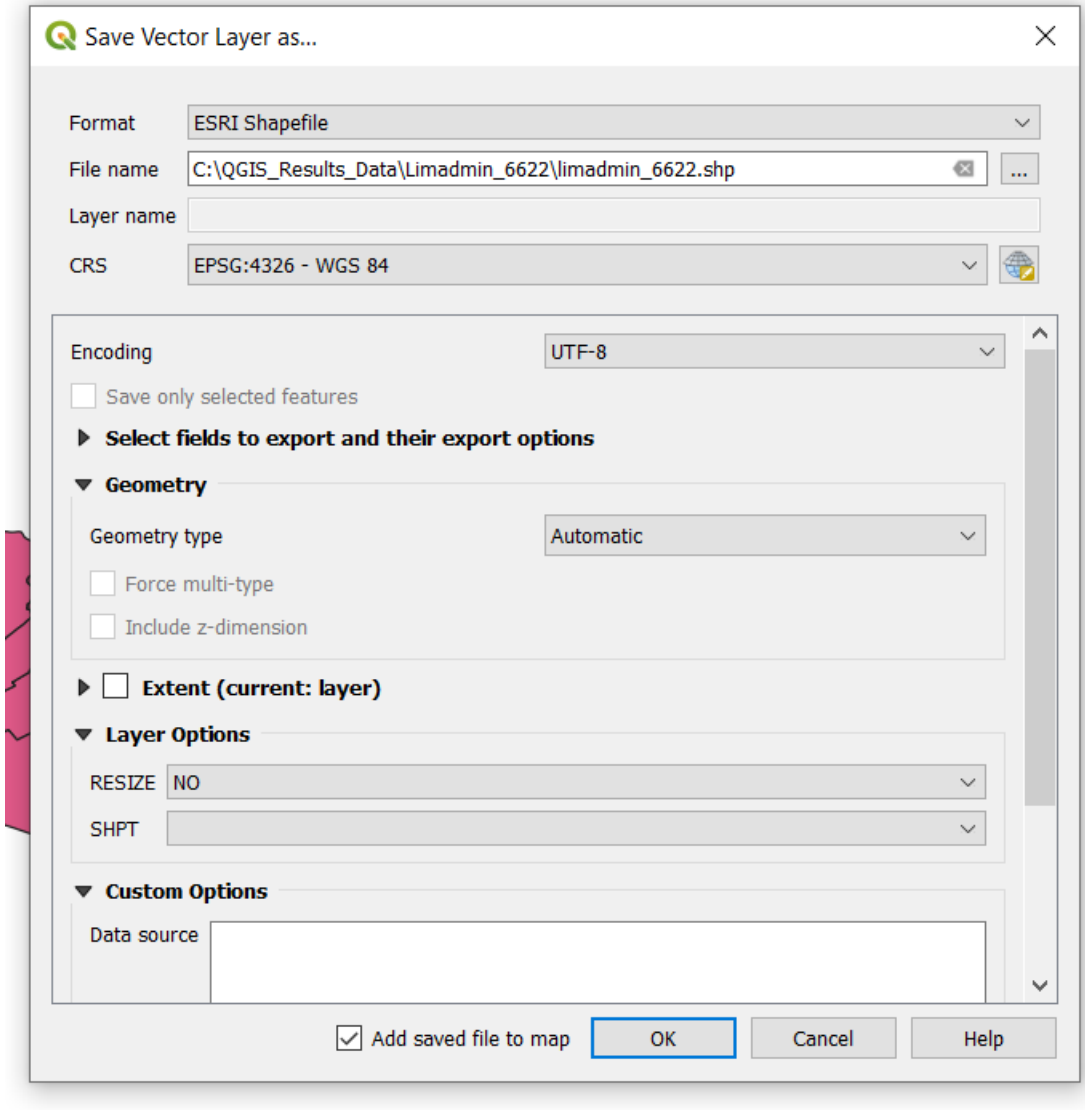

Figure 3.9: Reprojecting a layer

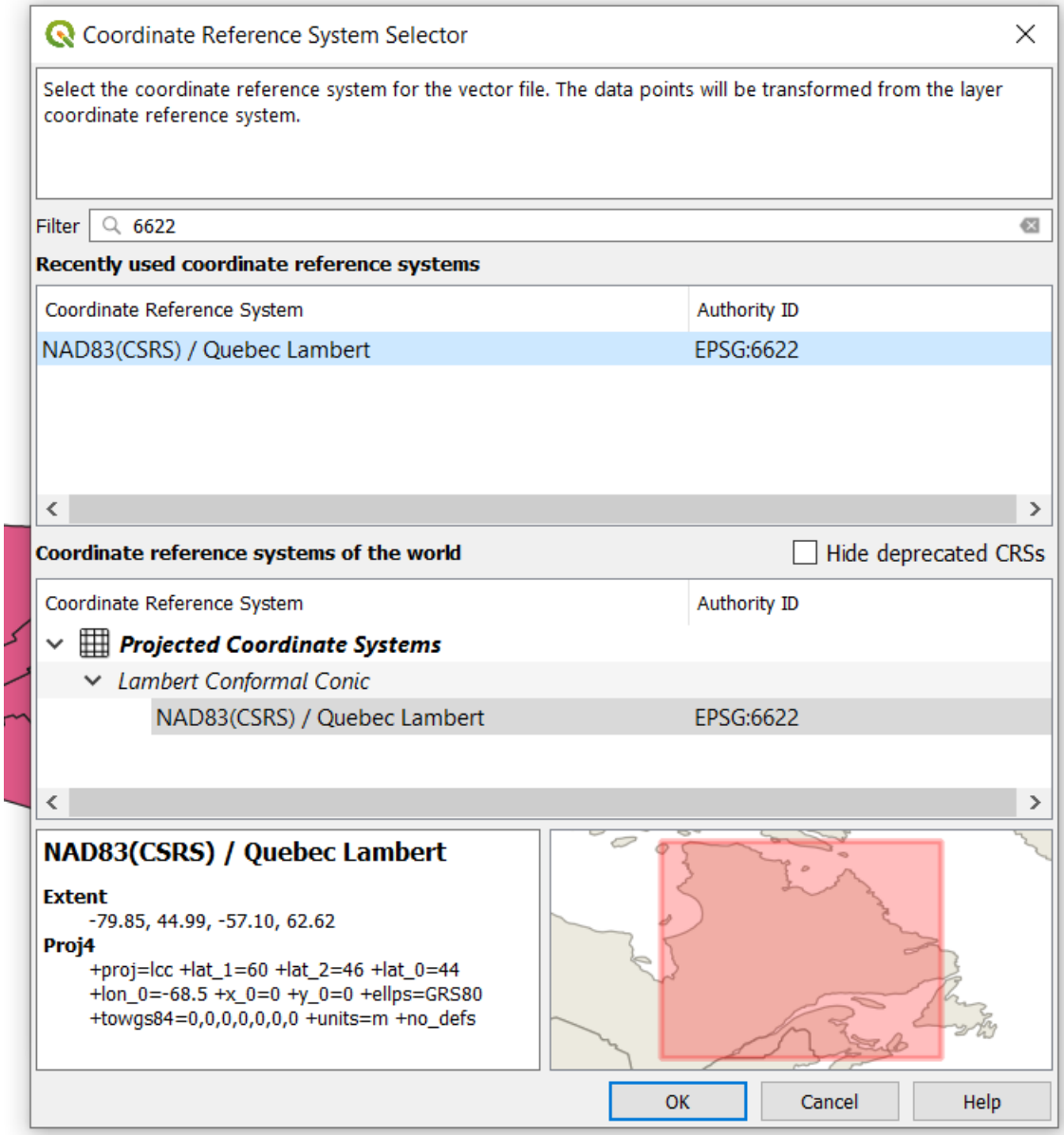

Figure 3.10: Selecting another CRS