



# OnSSET/Global Electrification Platform

## Hands-on 5: Data extraction to CSV<sup>1</sup>

In order to facilitate the extraction of GIS data to CSV format, the team at KTH-dES has developed a QGIS plug-in. This document is divided into two parts. The first explains how to install the plug-in and make it available for use in QGIS, and the second part explains how to extract the data using the plug-in.

**NOTE1: This Plug-in works with QGIS 3.10. If you use any other version there can be issues for the plug-in to work properly.**

- 1) Follow the [instruction](#) "QGIS 3.10 Installation Instructions" if you have not already installed QGIS on your computer.
- 2) Download the remaining datasets for Benin [here](#).

## Learning outcomes

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By the end of this exercise, you will be able to:

- 1) Use the plug-in to extract the data to a csv file.
- 2) List the datasets that are used in the plug-in.
- 3) Create the CSV file required for Hands-on 6.

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<sup>1</sup> This exercise is an exercise developed by Khavari, B., 2019. Exercise 5: Data extraction to CSV [WWW Document]. OnSSET Teaching Kit. URL [https://onsset.github.io/teaching\\_kit/courses/module\\_2/Excercise%205/](https://onsset.github.io/teaching_kit/courses/module_2/Excercise%205/) (accessed 2.18.21).

All images are screenshots from [QGIS](#) 3.10, which is licensed under Attribution-ShareAlike 3.0 Unported ([CC BY-SA 3.0](#)) unless stated otherwise.

# 1. Installing the plug-in

Note: In order run this version of the plug-in you have to make sure that your population data are available in polygon form.

1. Download the zipped folder onto your computer from here. Choose the option which is valid for the version that you have for QGIS. Right-click on gep\_onsset.zip and select Save link as... ()

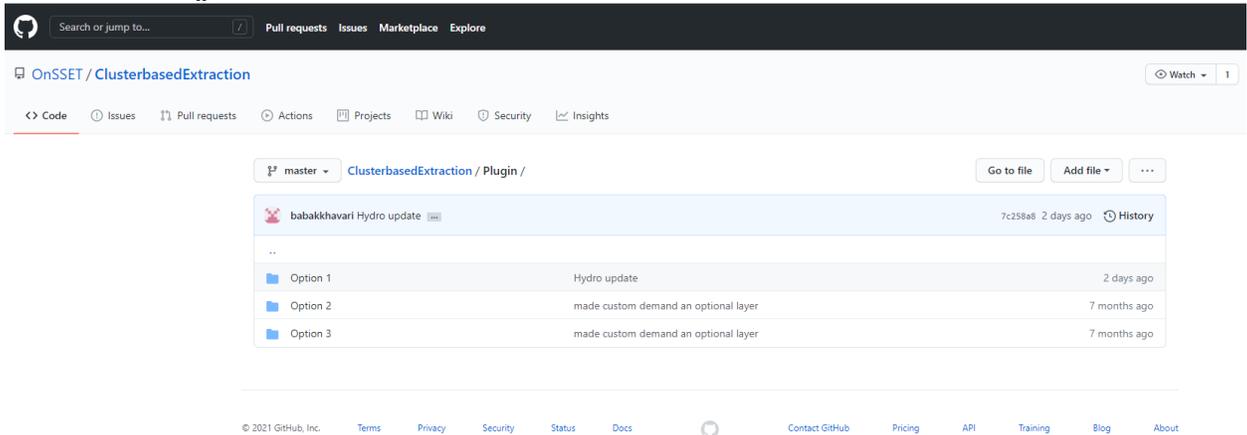


Figure 1. GitHub page (Picture source: Screenshot from <https://github.com/OnSSET/ClusterbasedExtraction/tree/master/Plugin>, licensed under [MIT license](#))

2. Open **QGIS Desktop** (make sure that you use version 3.10).
3. On top of the window you have a number of menus; click on the one that reads **Plugins**.

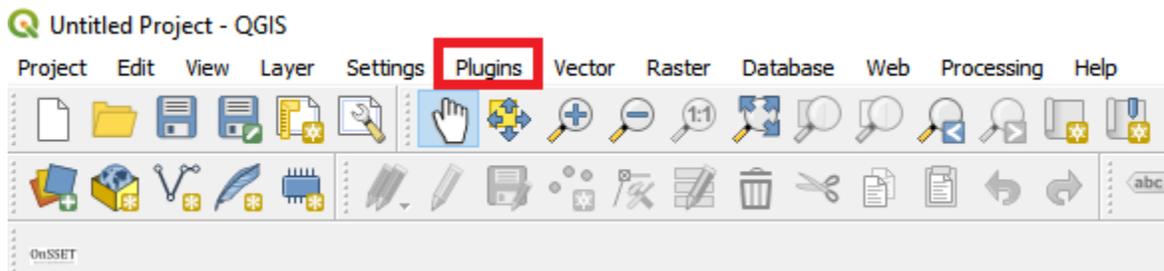


Figure 2. Plug-in menu

4. Next, go to **Manage and Install Plugins...**

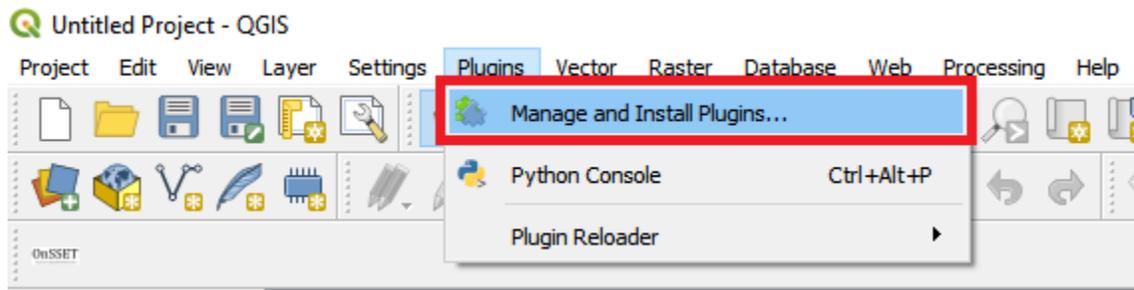


Figure 3. Management menu for plug-ins

5. This opens a new window with a number of different options on the left-hand side. Choose **Install from ZIP**

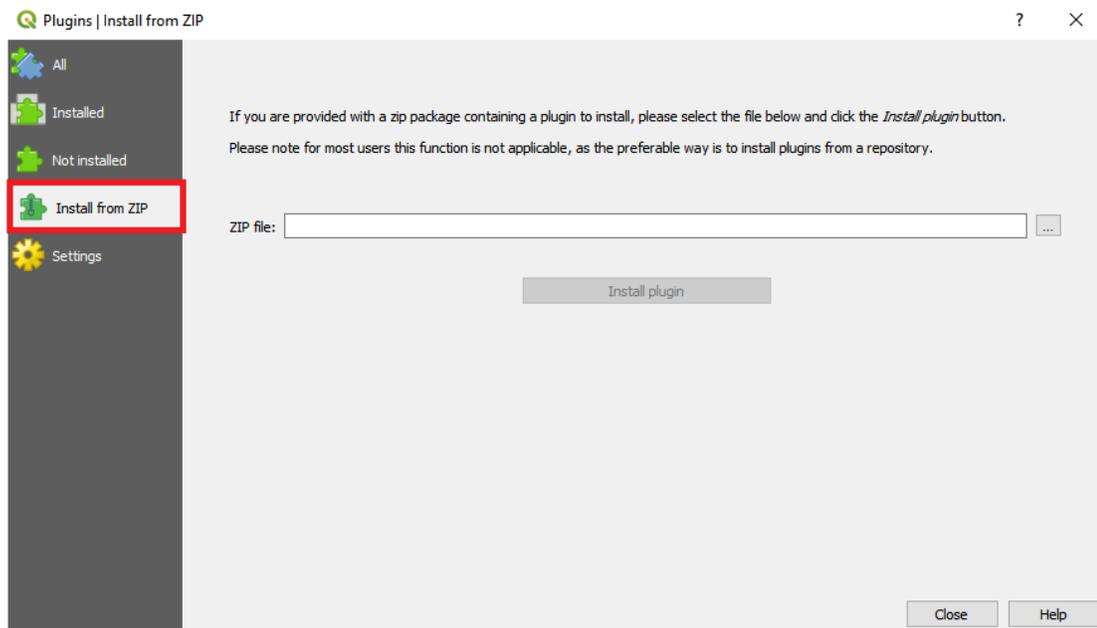


Figure 4. Installing plug-ins using ZIP-files

6. In the window that opens, click on the three dots next to the empty field; then navigate to wherever you saved the **gep\_onsset.zip** file and select it.

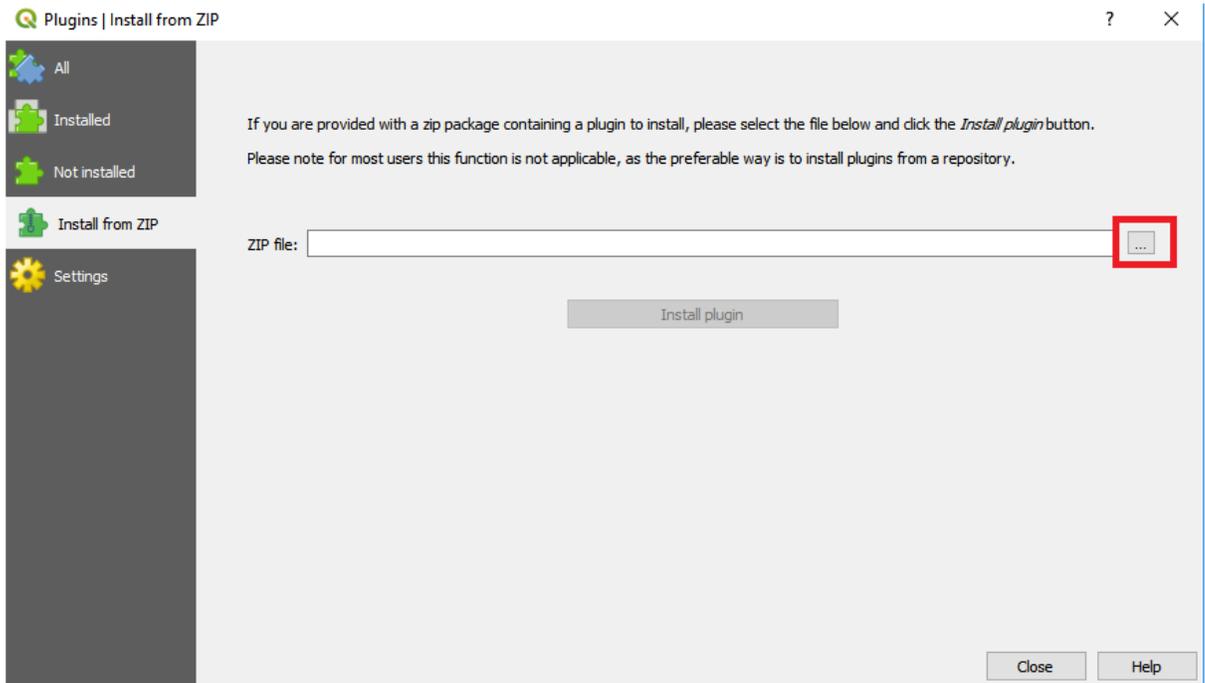


Figure 5. Click on this button to browse to the zipped file

7. When you have found it, click on **Install plugin**.

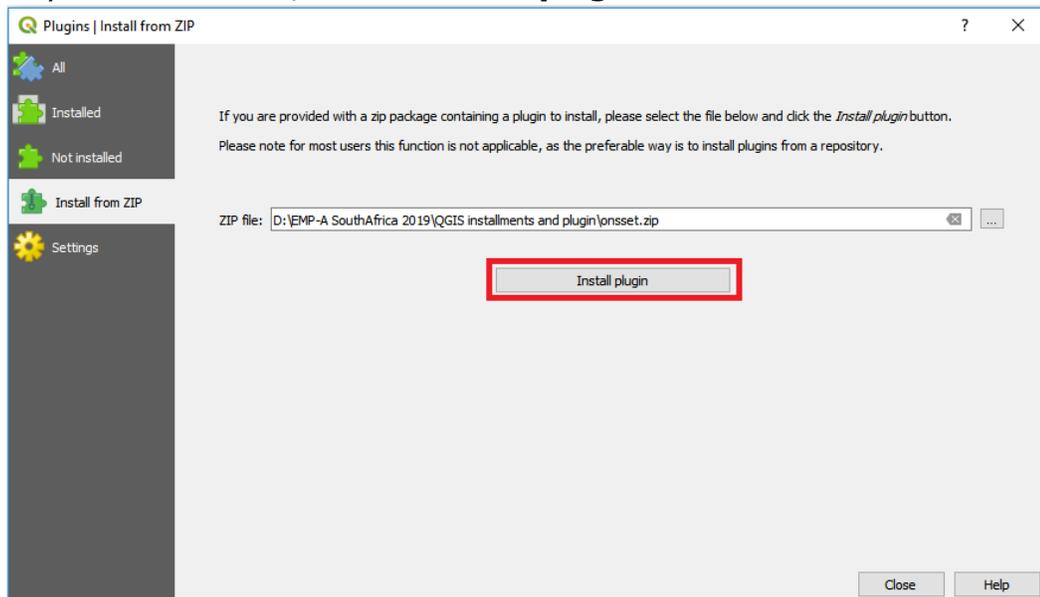


Figure 6. When you have found the zipped folder click on this button to install it

8. After the plug-in has been installed it will appear under the **Database** menu on top of the screen. You are now ready to run the plug-in.

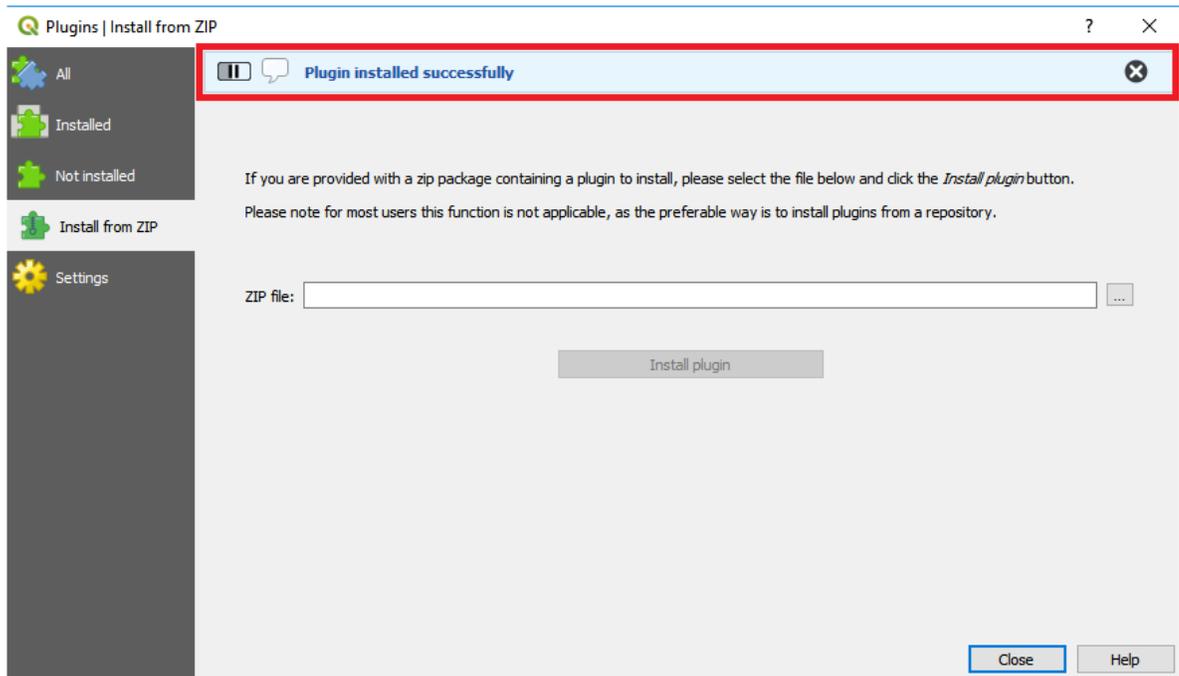


Figure 7. This field will appear when the install is completed

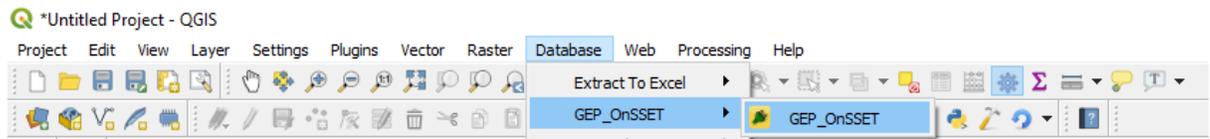


Figure 8. When the plug-in is installed, it will appear under the database menu with the name "GEP\_OnSSET"



## 2. Running the plug-in

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Before opening the plug-in, make sure that all the datasets that are required to run it are loaded into your QGIS window. Make sure that all the datasets have the correct type as specified in the table below.

**Note2: All datasets in this import have to be in the coordinate system WGS 84 - WGS84 - EPSG:4326.**

*Table 1. The datasets required for the analysis (source: [table](#) licensed under [CC-BY 4.0](#))*

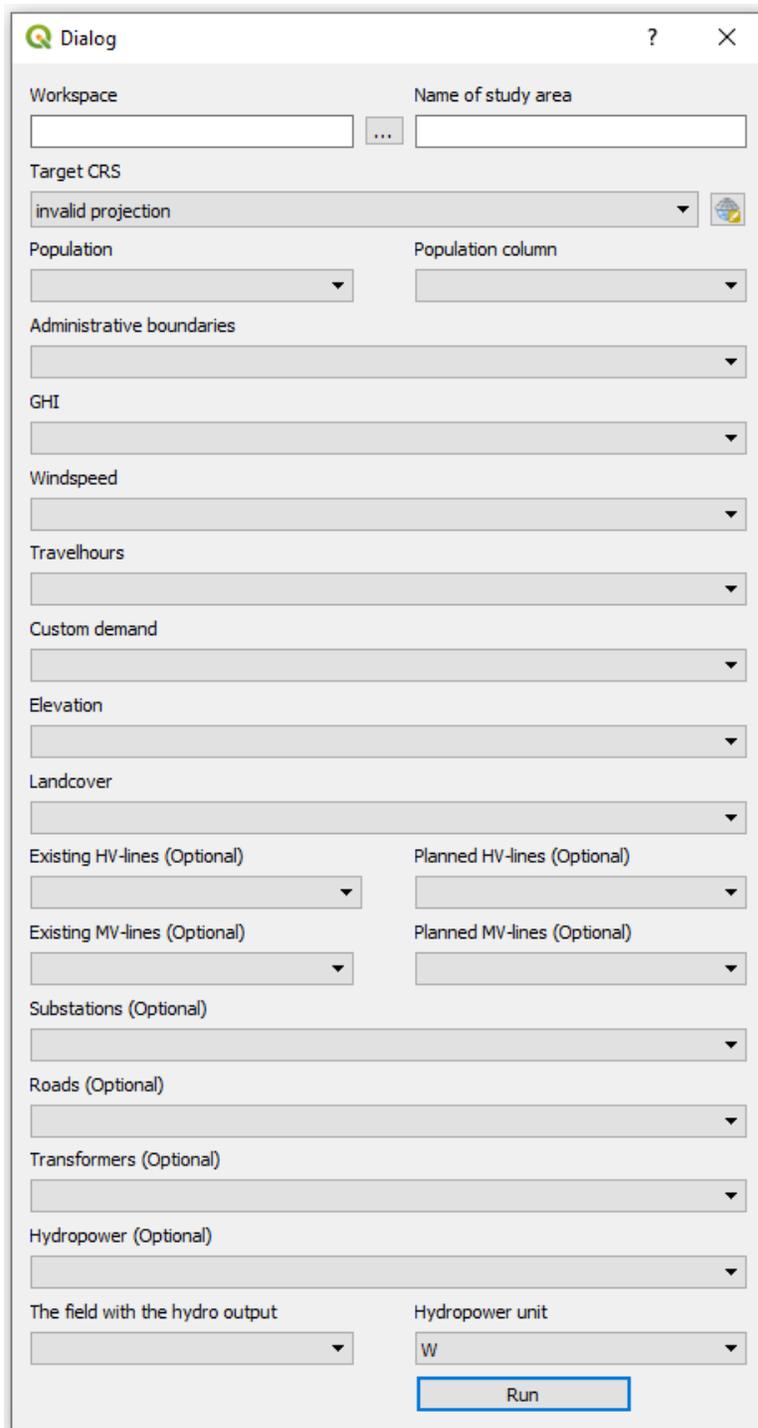
Dataset	Type
Administrative boundaries	Polygon
Population	Polygon
GHI	Raster
Wind speed	Raster
Travel hours	Raster
Custom demand layer (Customized layer with estimation of average per capita demand for each cluster in 2030)	Raster
Elevation	Raster
Land cover	Raster
Existing HV lines	Lines
Planned HV lines	Lines
Existing MV lines	Lines
Planned MV lines	Lines
Substations	Points
Transformers	Points
Roads	Lines
Hydropower	Points

**NOTE3: The name of the datasets do not have to match with the table, but they must be of the correct type.**

**NOTE4: When you have made sure that you have all the required datasets loaded into QGIS, create an empty folder and name it after your study area. This folder will serve as your workspace.**

**NOTE5: The HV and MV lines have the same file name for Benin. To identify the different types, rename the layers in QGIS after import.**

1. Open the plug-in from the **Database** menu. The name of the plug-in when installed will be **GEP OnSSET**.
2. The following window will open up:



The screenshot shows a dialog window titled "Dialog" with a close button (X) and a help button (?). The window contains several input fields and dropdown menus for configuring a study area. The fields are organized as follows:

- Workspace**: A text input field with a browse button (...).
- Name of study area**: A text input field.
- Target CRS**: A dropdown menu currently showing "invalid projection" and a globe icon.
- Population**: A dropdown menu.
- Population column**: A dropdown menu.
- Administrative boundaries**: A dropdown menu.
- GHI**: A dropdown menu.
- Windspeed**: A dropdown menu.
- Travelhours**: A dropdown menu.
- Custom demand**: A dropdown menu.
- Elevation**: A dropdown menu.
- Landcover**: A dropdown menu.
- Existing HV-lines (Optional)**: A dropdown menu.
- Planned HV-lines (Optional)**: A dropdown menu.
- Existing MV-lines (Optional)**: A dropdown menu.
- Planned MV-lines (Optional)**: A dropdown menu.
- Substations (Optional)**: A dropdown menu.
- Roads (Optional)**: A dropdown menu.
- Transformers (Optional)**: A dropdown menu.
- Hydropower (Optional)**: A dropdown menu.
- The field with the hydro output**: A dropdown menu.
- Hydropower unit**: A dropdown menu currently showing "W".

At the bottom right of the dialog, there is a blue "Run" button.

Figure 9. The plug-in in use (source: [image licensed under CC-BY 4.0](#))

Below information will be provided regarding the use of each box.

**Box 1.** This box lets you choose the workspace. Click on the three dots and navigate to the empty folder that you have created previously. When you have found it click ok and continue.

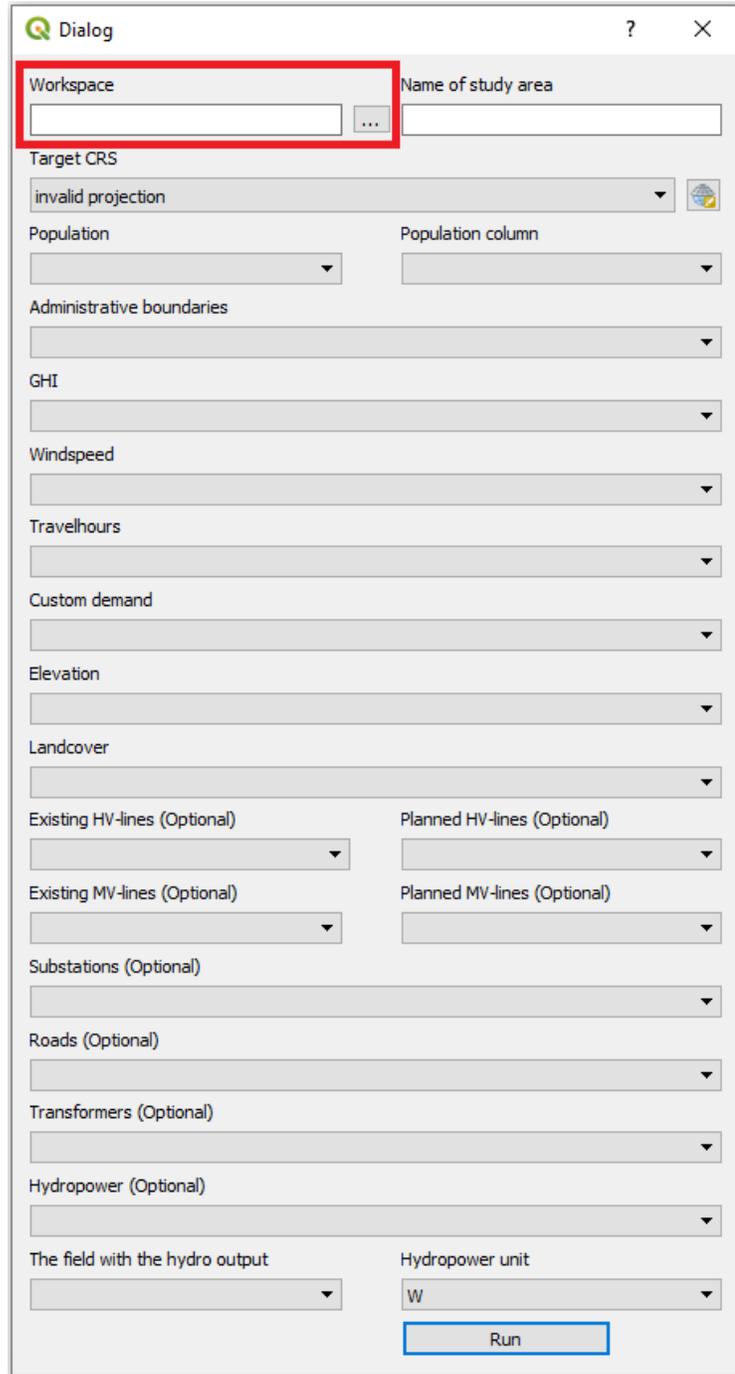
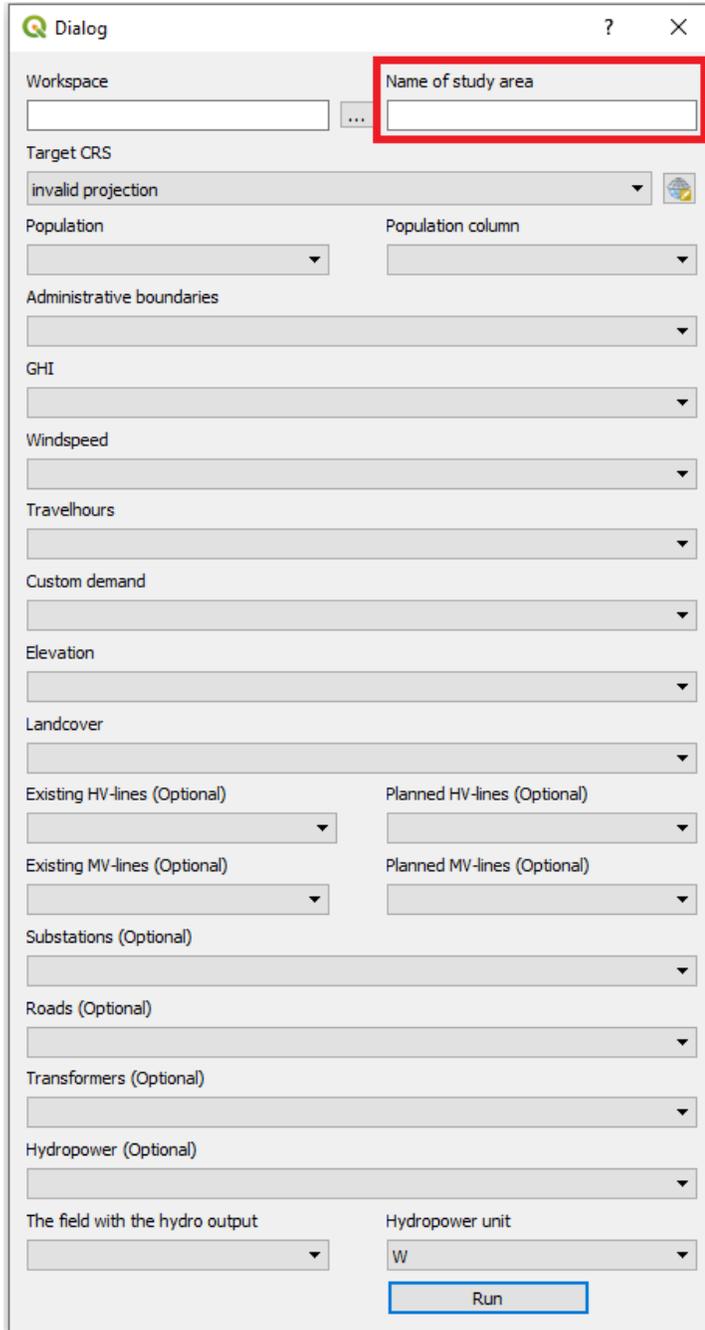


Figure 10. Box 1: enter the workspace by clicking on the button with three dots and navigate to the empty folder you are using as workspace (source: [image](#) licensed under [CC-BY 4.0](#))

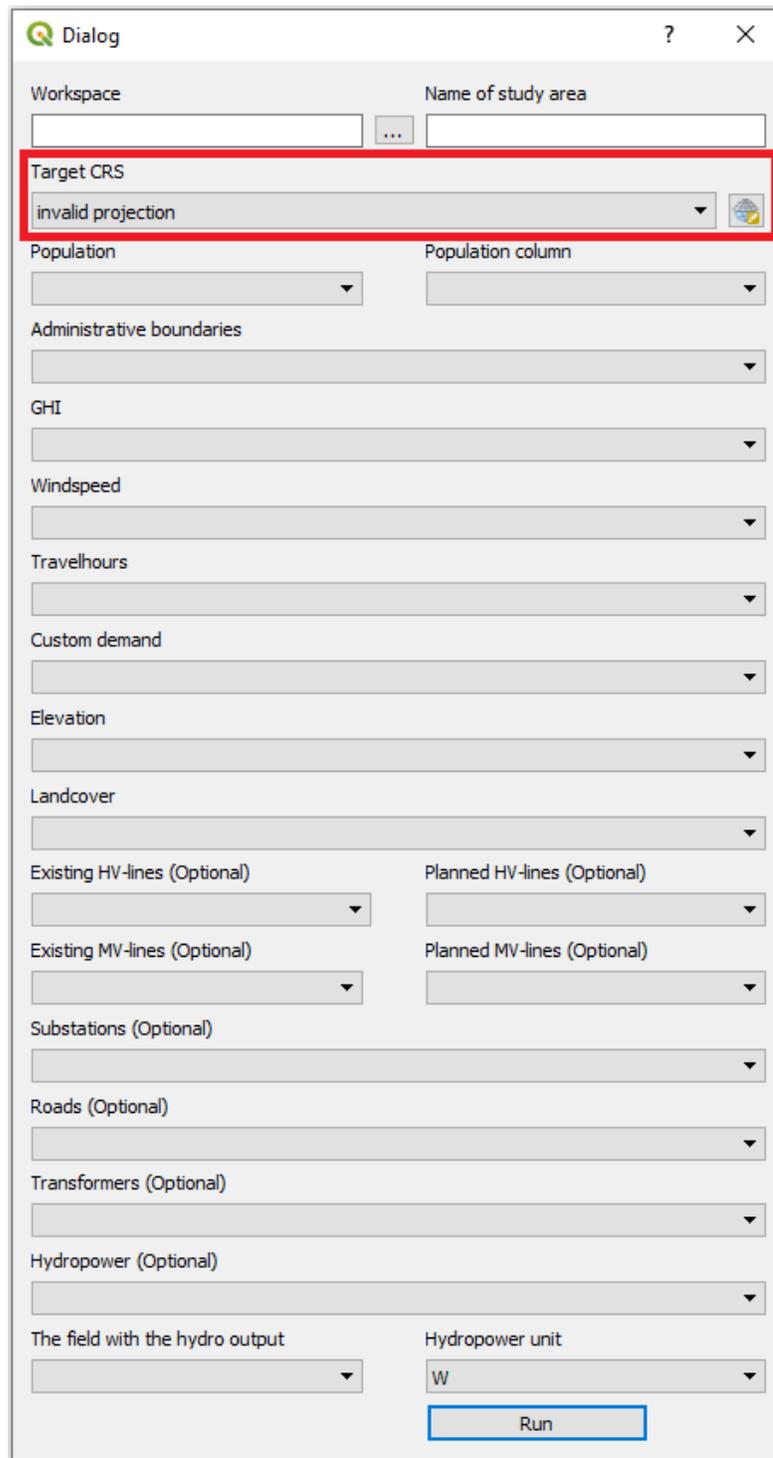
**Box 2.** Enter the name of your study area. This is the name will be given to your csv output file.



The image shows a software dialog box titled "Dialog" with a close button (X) and a help button (?). The dialog contains several input fields and dropdown menus. The "Name of study area" field is highlighted with a red rectangular box. Below it are fields for "Workspace", "Target CRS" (set to "invalid projection"), "Population", "Population column", "Administrative boundaries", "GHI", "Windspeed", "Travelhours", "Custom demand", "Elevation", "Landcover", "Existing HV-lines (Optional)", "Planned HV-lines (Optional)", "Existing MV-lines (Optional)", "Planned MV-lines (Optional)", "Substations (Optional)", "Roads (Optional)", "Transformers (Optional)", "Hydropower (Optional)", "The field with the hydro output", and "Hydropower unit" (set to "W"). A "Run" button is located at the bottom right of the dialog.

Figure 11. Box:2 Enter the name of the study area (source: [image](#) licensed under [CC-BY 4.0](#))

**Box 3.** This box lets you choose an appropriate coordinate system.



The image shows a QGIS dialog box titled "Dialog". It contains several input fields and dropdown menus for configuring a reprojecting process. The "Target CRS" dropdown menu is highlighted with a red rectangular box and currently displays "invalid projection". Other fields include "Workspace", "Name of study area", "Population", "Population column", "Administrative boundaries", "GHI", "Windspeed", "Travelhours", "Custom demand", "Elevation", "Landcover", "Existing HV-lines (Optional)", "Planned HV-lines (Optional)", "Existing MV-lines (Optional)", "Planned MV-lines (Optional)", "Substations (Optional)", "Roads (Optional)", "Transformers (Optional)", "Hydropower (Optional)", "The field with the hydro output", and "Hydropower unit" (set to "W"). A "Run" button is located at the bottom right of the dialog.

Figure 12. Box 3. Enter the coordinate system that you wish to reproject your data to (source: [image](#) licensed under [CC-BY 4.0](#))

To find the coordinate system that is appropriate for your country please visit <http://epsg.io/> and search for your country.

For Benin we use: WGS 84 / UTM zone 31N, EPSG:32631

Next, come back to QGIS. Click on the icon next to the field and check the EPSG code, for Benin 32631. Choose one where the unit is in metres and the red box covers the whole area you are working with.

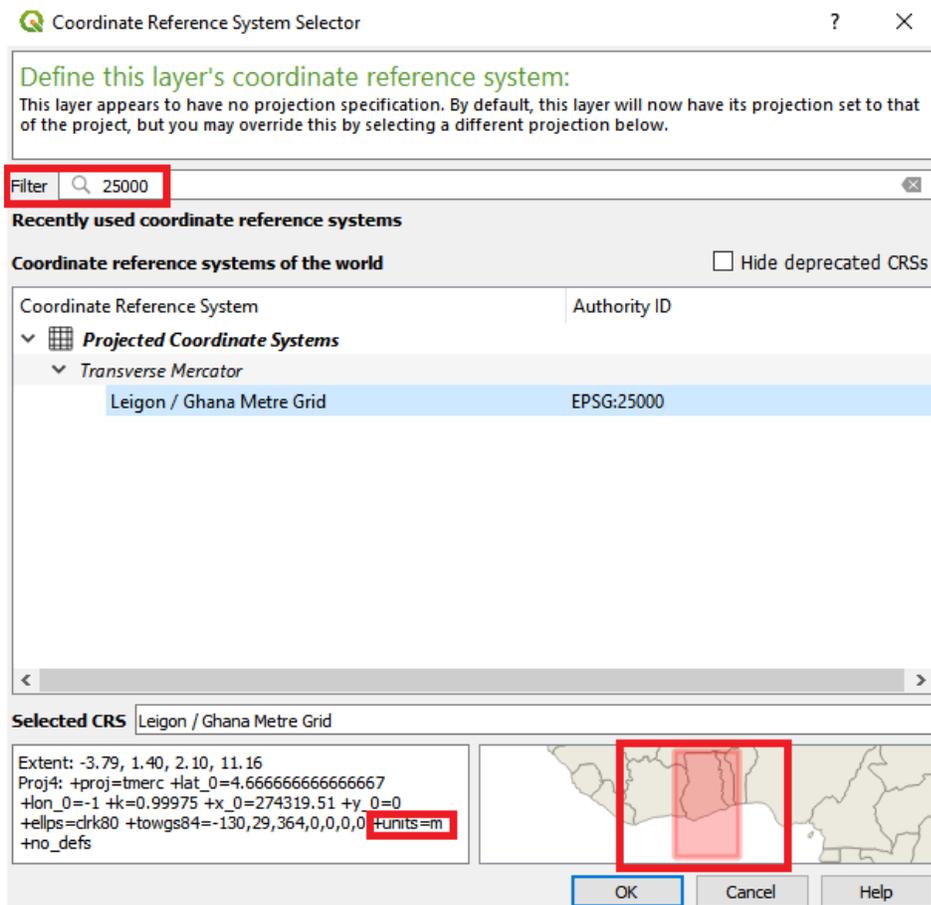
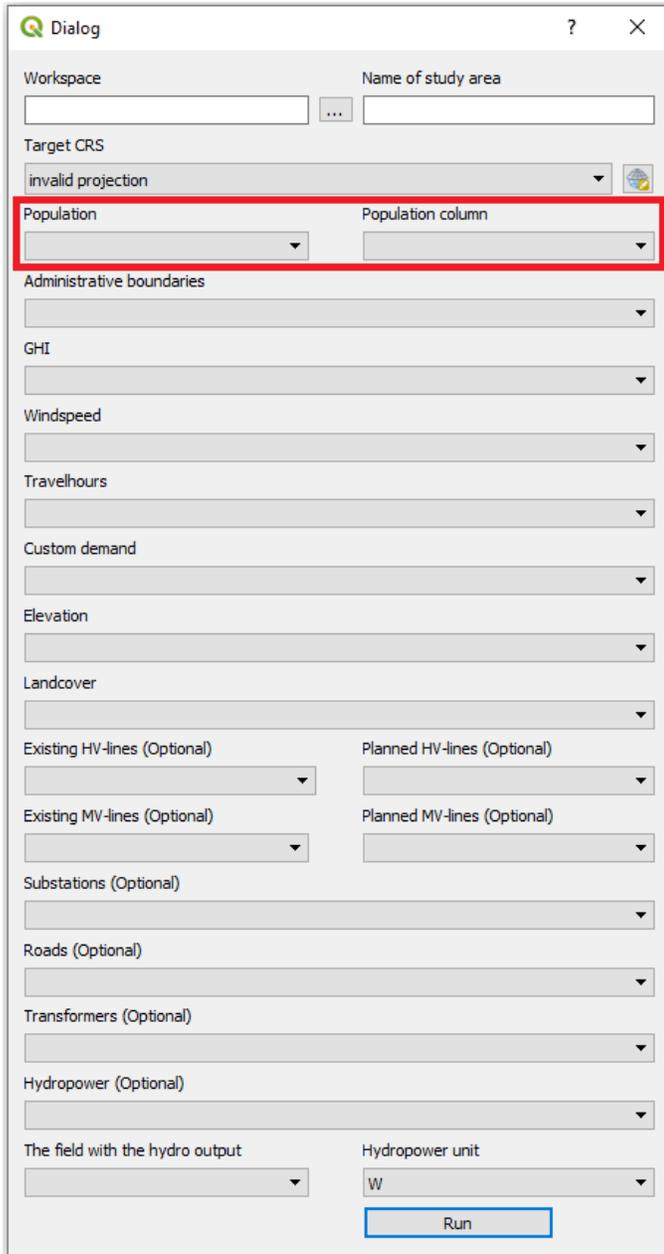


Figure 13. Enter the coordinate system you have chosen in the field. Make sure that the unit is metres (lower left box) and that the red area covers your study area (lower right box)

**Box 4 and 5.** In box 4 select the population dataset. You will have to choose the column that represents the population in the attribute table in box 5.

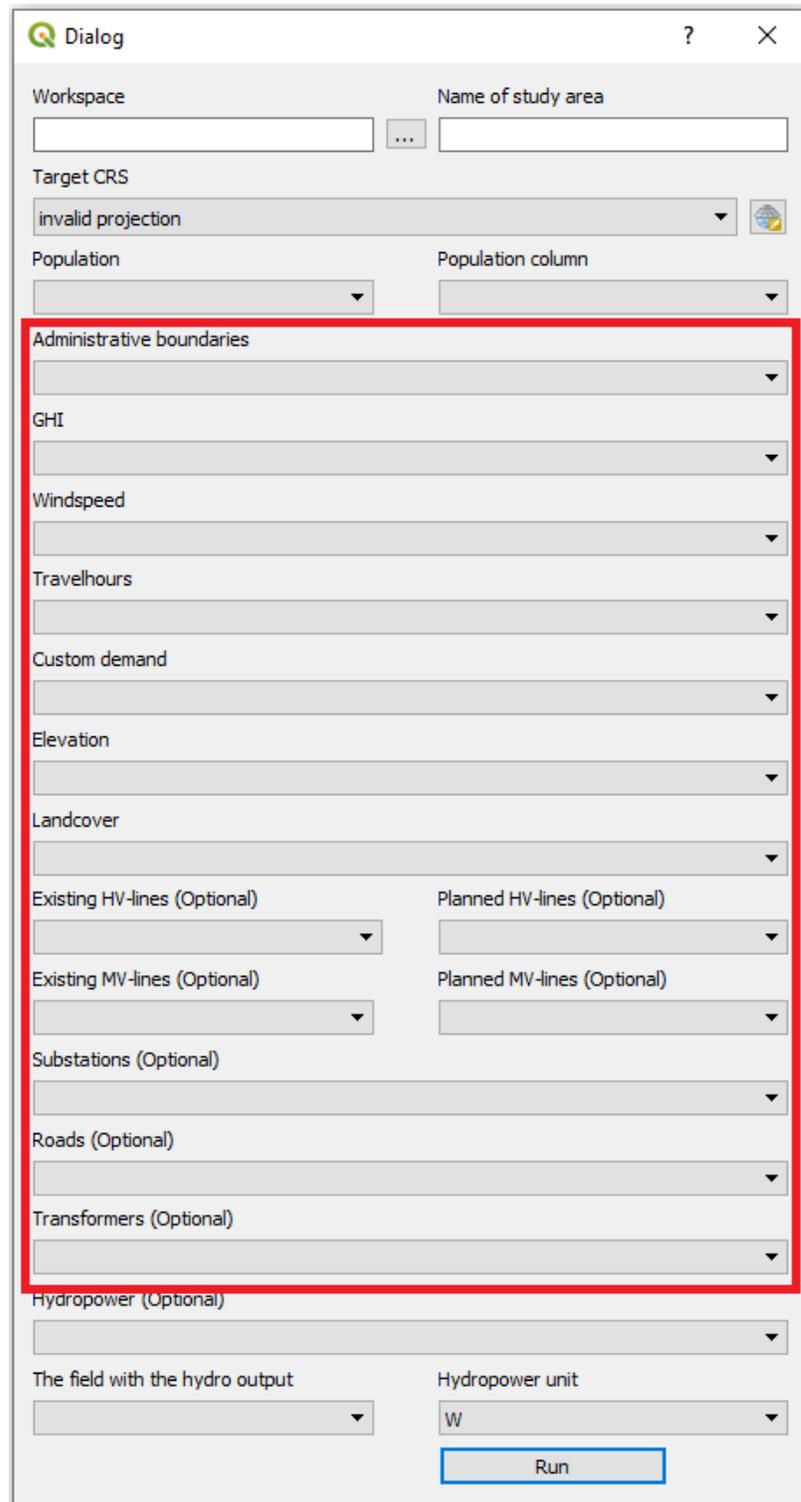


The screenshot shows a 'Dialog' window with the following fields:

- Workspace: [ ]
- Name of study area: [ ]
- Target CRS: invalid projection
- Population:** [ ]
- Population column:** [ ]
- Administrative boundaries: [ ]
- GHI: [ ]
- Windspeed: [ ]
- Travelhours: [ ]
- Custom demand: [ ]
- Elevation: [ ]
- Landcover: [ ]
- Existing HV-lines (Optional): [ ]
- Planned HV-lines (Optional): [ ]
- Existing MV-lines (Optional): [ ]
- Planned MV-lines (Optional): [ ]
- Substations (Optional): [ ]
- Roads (Optional): [ ]
- Transformers (Optional): [ ]
- Hydropower (Optional): [ ]
- The field with the hydro output: [ ]
- Hydropower unit: W
- Run button

Figure 14. Box 4: enter the population clusters and in Box 5 select the column representing the population (source: [image](#) licensed under [CC-BY 4.0](#))

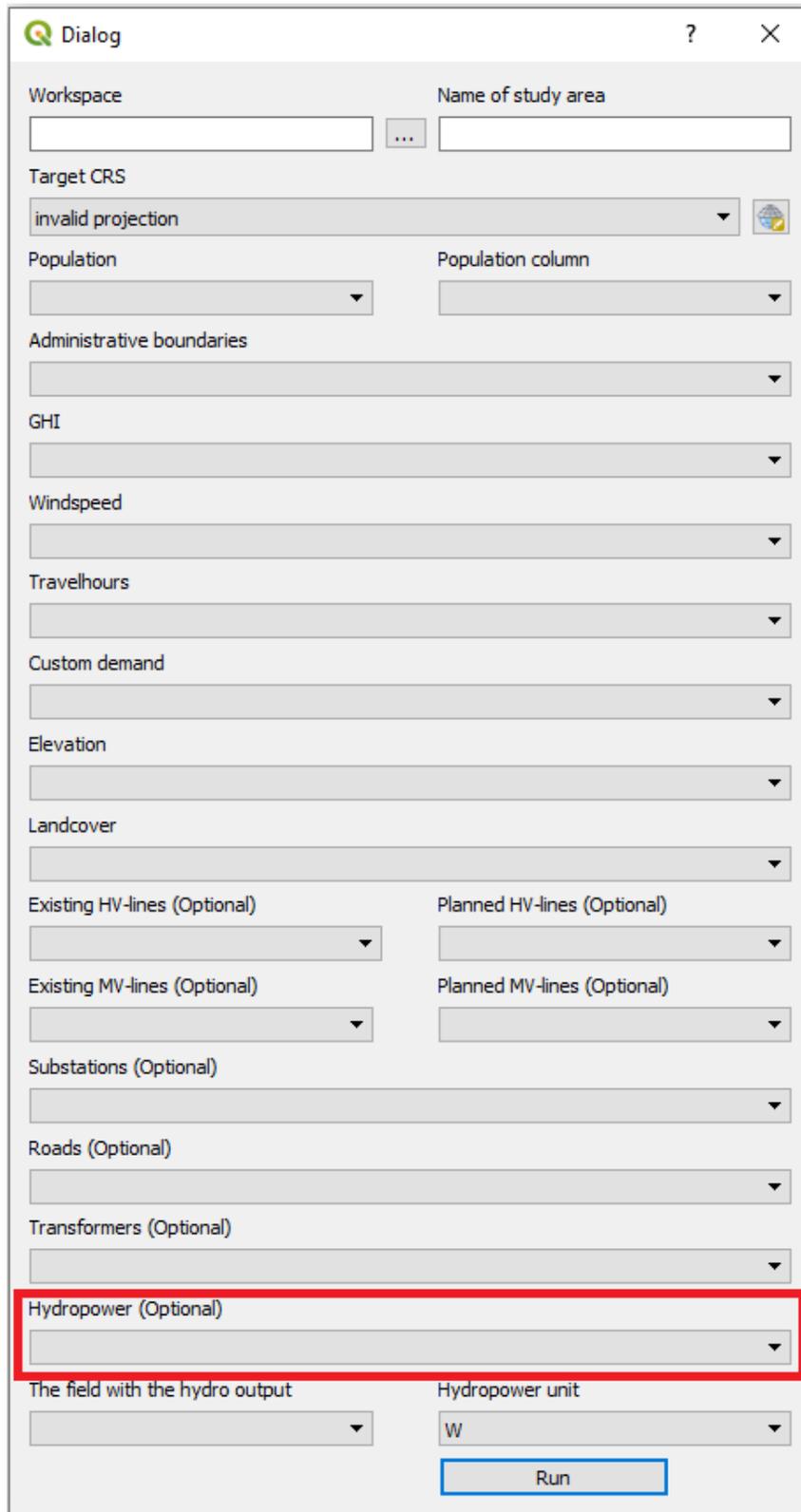
**Box 6 – Box 19.** Select the matching datasets for the boxes



The image shows a software dialog box titled "Dialog" with a search icon, a question mark, and a close button. It contains several input fields and dropdown menus. At the top, there are fields for "Workspace" and "Name of study area". Below that is a "Target CRS" dropdown menu currently set to "invalid projection". There are also "Population" and "Population column" dropdowns. A large red rectangular box highlights a section containing the following dropdown menus: "Administrative boundaries", "GHI", "Windspeed", "Travelhours", "Custom demand", "Elevation", "Landcover", "Existing HV-lines (Optional)", "Planned HV-lines (Optional)", "Existing MV-lines (Optional)", "Planned MV-lines (Optional)", "Substations (Optional)", "Roads (Optional)", and "Transformers (Optional)". Below this highlighted section are "Hydropower (Optional)", "The field with the hydro output", and "Hydropower unit" dropdowns. At the bottom right, there is a "Run" button.

Figure 15. Fill in the correct datasets for each one of these boxes. (source: [image](#) licensed under [CC-BY 4.0](#))

**Box 20.** Click on the box and select the hydropower layer; make sure that it is a point vector.

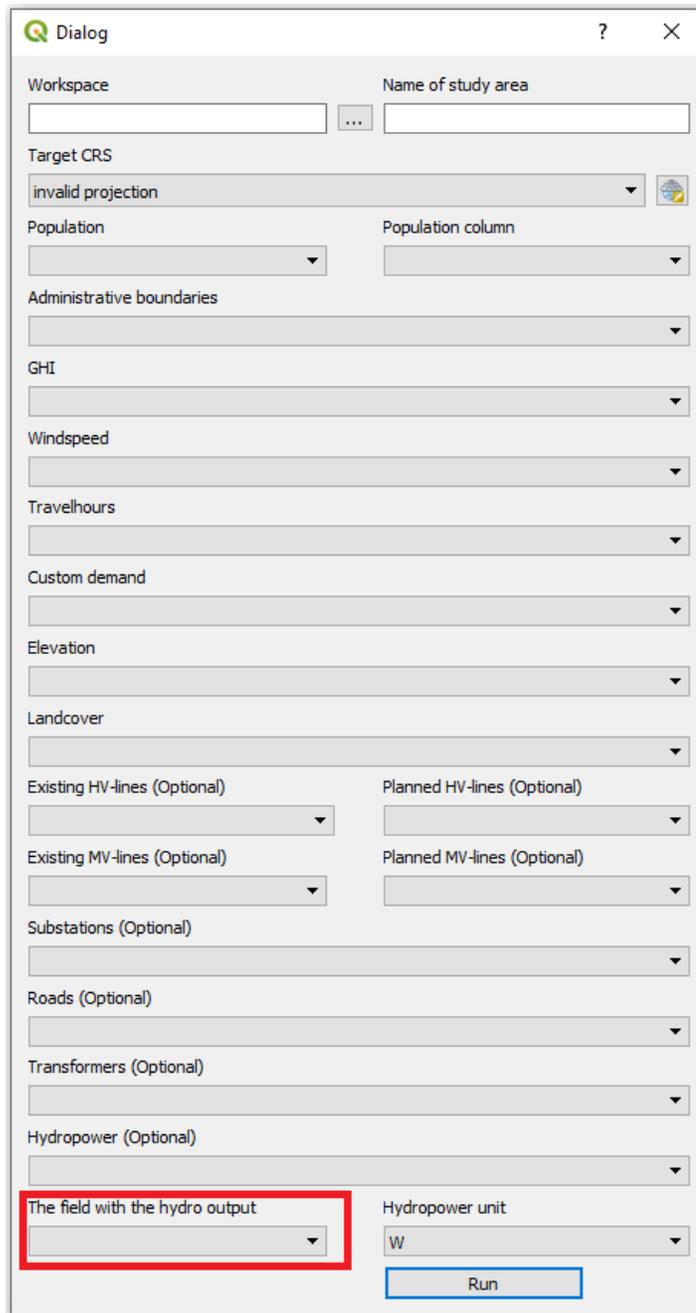


The dialog box contains the following fields and options:

- Workspace: [Text input]
- Name of study area: [Text input]
- Target CRS: [Dropdown menu, currently showing 'invalid projection']
- Population: [Dropdown menu]
- Population column: [Dropdown menu]
- Administrative boundaries: [Dropdown menu]
- GHI: [Dropdown menu]
- Windspeed: [Dropdown menu]
- Travelhours: [Dropdown menu]
- Custom demand: [Dropdown menu]
- Elevation: [Dropdown menu]
- Landcover: [Dropdown menu]
- Existing HV-lines (Optional): [Dropdown menu]
- Planned HV-lines (Optional): [Dropdown menu]
- Existing MV-lines (Optional): [Dropdown menu]
- Planned MV-lines (Optional): [Dropdown menu]
- Substations (Optional): [Dropdown menu]
- Roads (Optional): [Dropdown menu]
- Transformers (Optional): [Dropdown menu]
- Hydropower (Optional): [Dropdown menu]** (highlighted with a red box)
- The field with the hydro output: [Dropdown menu]
- Hydropower unit: [Dropdown menu, currently showing 'W']
- Run: [Button]

Figure 16. Hydropower points to be entered in this box (source: [image](#) licensed under [CC-BY 4.0](#))

**Box 21.** Select the box that includes the hydropower output (in this box you will select a column in the attribute table). The hydropower output is the potential electricity that can be outputted from each plant. In this case it is PowerMW.

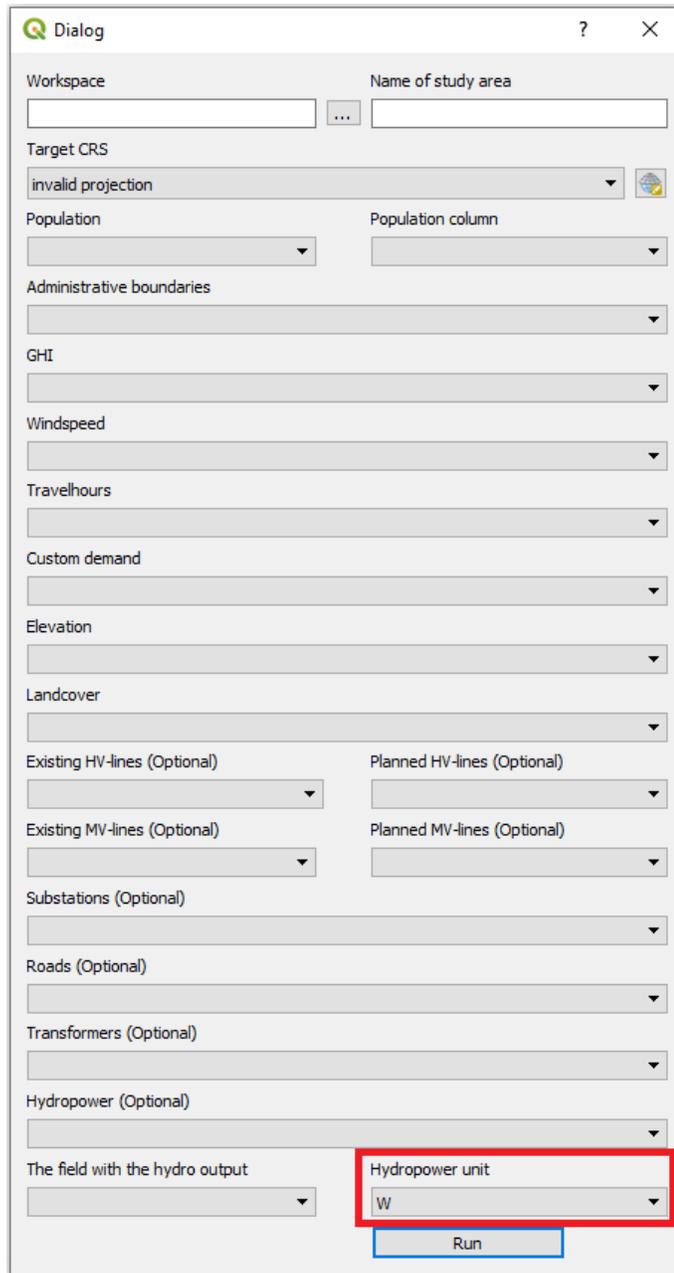


The dialog box contains the following fields and options:

- Workspace: [Text input]
- Name of study area: [Text input]
- Target CRS: [Dropdown menu: invalid projection]
- Population: [Dropdown menu]
- Population column: [Dropdown menu]
- Administrative boundaries: [Dropdown menu]
- GHI: [Dropdown menu]
- Windspeed: [Dropdown menu]
- Travelhours: [Dropdown menu]
- Custom demand: [Dropdown menu]
- Elevation: [Dropdown menu]
- Landcover: [Dropdown menu]
- Existing HV-lines (Optional): [Dropdown menu]
- Planned HV-lines (Optional): [Dropdown menu]
- Existing MV-lines (Optional): [Dropdown menu]
- Planned MV-lines (Optional): [Dropdown menu]
- Substations (Optional): [Dropdown menu]
- Roads (Optional): [Dropdown menu]
- Transformers (Optional): [Dropdown menu]
- Hydropower (Optional): [Dropdown menu]
- The field with the hydro output: [Dropdown menu - highlighted with a red box]
- Hydropower unit: [Dropdown menu: W]
- Run: [Button]

Figure 17. The field in the attribute table that includes the hydropower potential (source: [image](#) licensed under [CC-BY 4.0](#))

**Box 22.** Select the unit of that the hydropower output is given in. You can choose between W, kW, and MW. If you chose PowerMW in the previous step the unit should be MW.



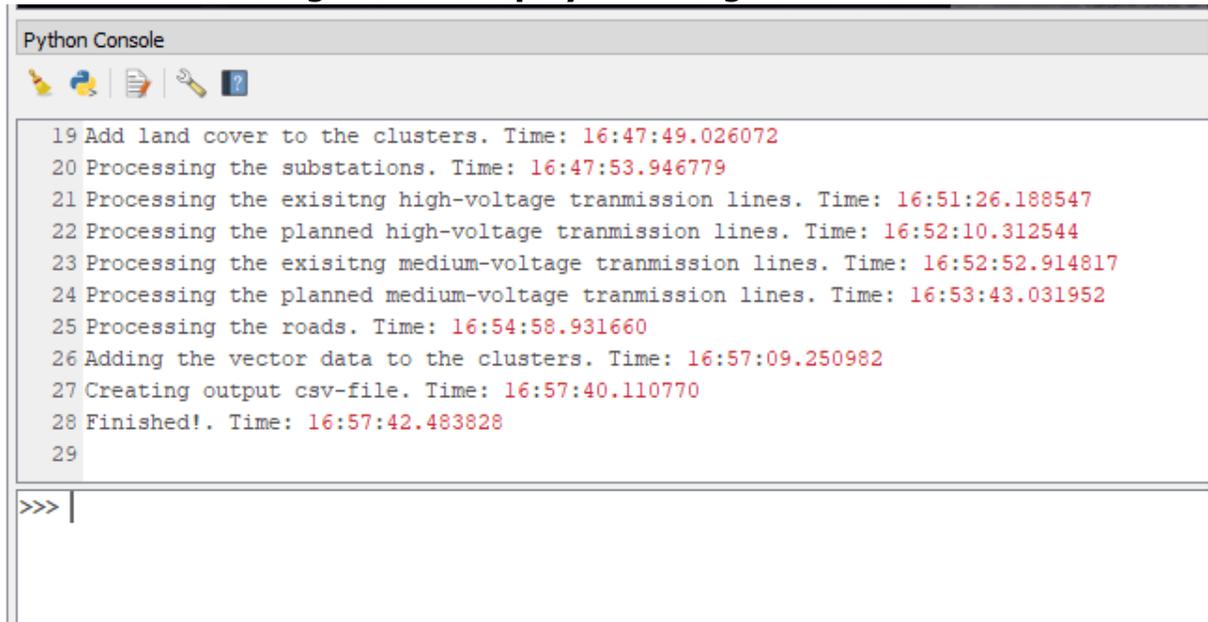
The image shows a 'Dialog' window with the following fields and options:

- Workspace: [Empty text box]
- Name of study area: [Empty text box]
- Target CRS: invalid projection
- Population: [Empty dropdown]
- Population column: [Empty dropdown]
- Administrative boundaries: [Empty dropdown]
- GHI: [Empty dropdown]
- Windspeed: [Empty dropdown]
- Travelhours: [Empty dropdown]
- Custom demand: [Empty dropdown]
- Elevation: [Empty dropdown]
- Landcover: [Empty dropdown]
- Existing HV-lines (Optional): [Empty dropdown]
- Planned HV-lines (Optional): [Empty dropdown]
- Existing MV-lines (Optional): [Empty dropdown]
- Planned MV-lines (Optional): [Empty dropdown]
- Substations (Optional): [Empty dropdown]
- Roads (Optional): [Empty dropdown]
- Transformers (Optional): [Empty dropdown]
- Hydropower (Optional): [Empty dropdown]
- The field with the hydro output: [Empty dropdown]
- Hydropower unit: W (highlighted with a red box)
- Run: [Blue button]

Figure 18. The unit of the values in Box 18 (source: [image](#) licensed under [CC-BY 4.0](#))

- When all boxes have the correct data, click "Run". This will run the plug-in. Depending on the size of the country this can take between 15 minutes and a few of hours.

**NOTE6: While the plug-in is running you will not be able to use QGIS. If you try to use QGIS you will get a loading icon. As the plug-in is working different messages will be printed in the QGIS python console that opens automatically when you start the plug-in. When the plug-in is finished a message will be displayed stating so.**



```
Python Console
19 Add land cover to the clusters. Time: 16:47:49.026072
20 Processing the substations. Time: 16:47:53.946779
21 Processing the existitng high-voltage tranmission lines. Time: 16:51:26.188547
22 Processing the planned high-voltage tranmission lines. Time: 16:52:10.312544
23 Processing the existitng medium-voltage tranmission lines. Time: 16:52:52.914817
24 Processing the planned medium-voltage tranmission lines. Time: 16:53:43.031952
25 Processing the roads. Time: 16:54:58.931660
26 Adding the vector data to the clusters. Time: 16:57:09.250982
27 Creating output csv-file. Time: 16:57:40.110770
28 Finished!. Time: 16:57:42.483828
29
>>> |
```

*Figure 19. Printed text during the run with timestamps*

4. When the plug-in has finished a CSV file with the same name as you specified in box 2 will appear in a folder named "Assist" within your workspace folder.

**Finally, create a copy of the CSV file, and we will use it in the next hands-on exercise.**