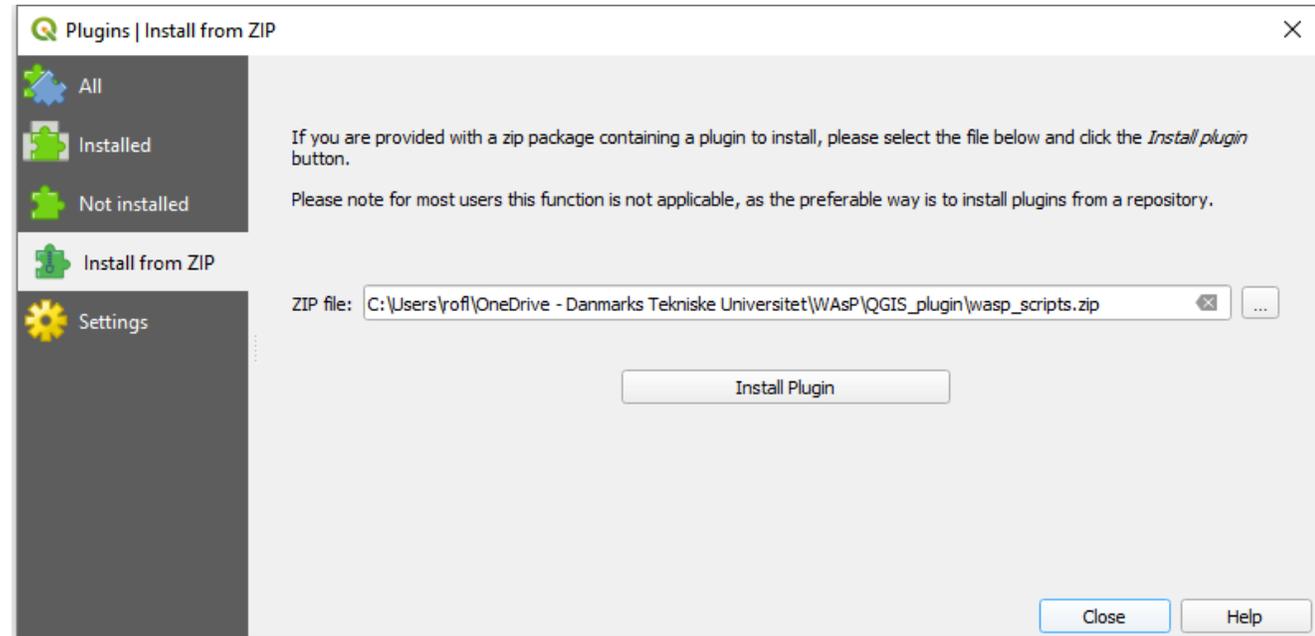


Installing the WAsP helper scripts in QGIS

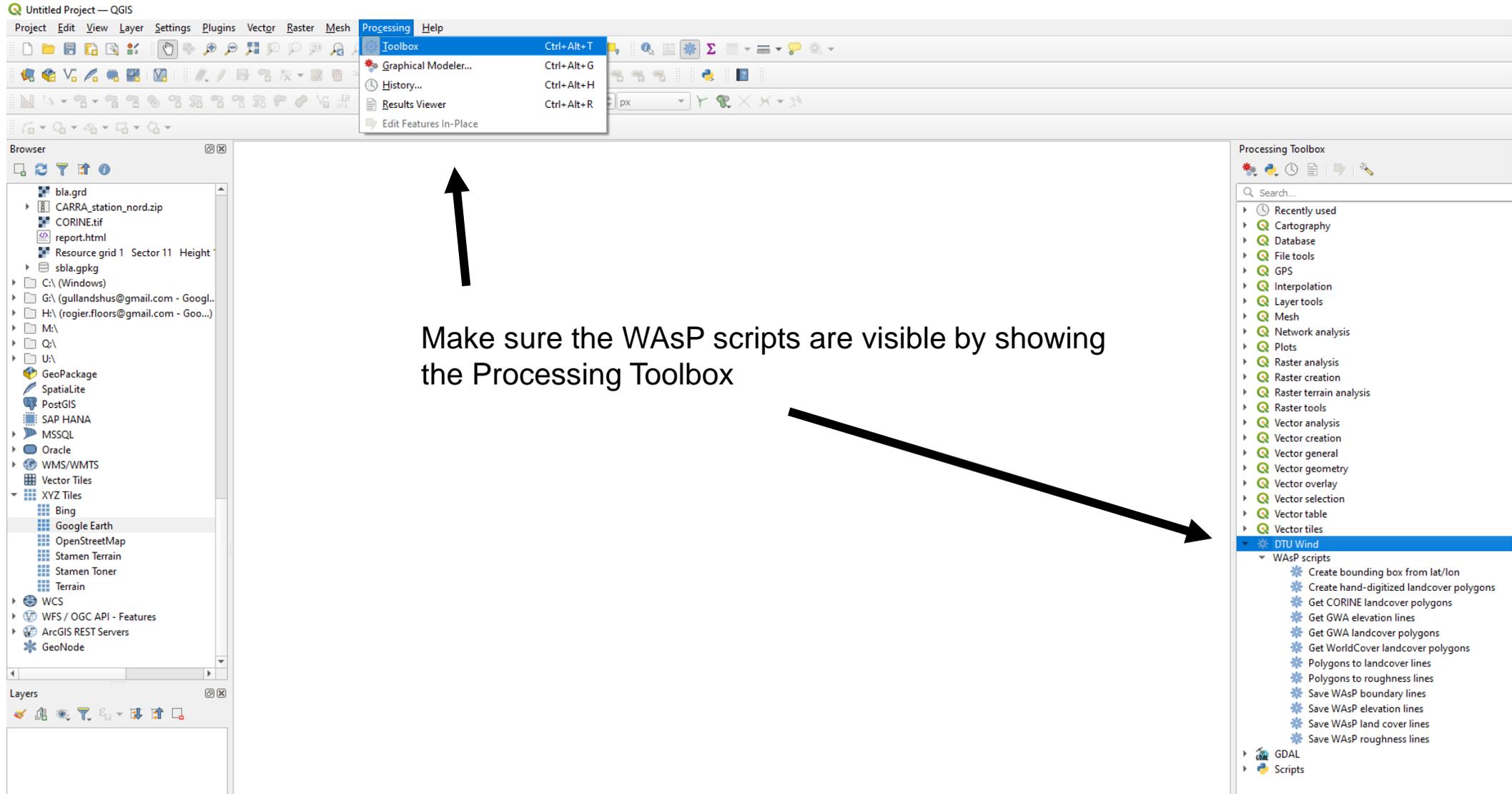
You will need to install QGIS for this exercise. Following the instructions on <https://download.qgis.org/> The following has been tested using versions 3.10.5 up to the newest version 3.32

In addition, you must download the plugin “wasp_scripts.zip” available here: https://data.dtu.dk/articles/software/Using_QGIS_to_create_WAsP_maps/20495178

Go to *Plugins > Manage and Install plugins > Install from ZIP*, provide to zip file above and click *Install Plugin*



Installing the WAsP helper scripts in QGIS



Make sure the WAsP scripts are visible by showing the Processing Toolbox

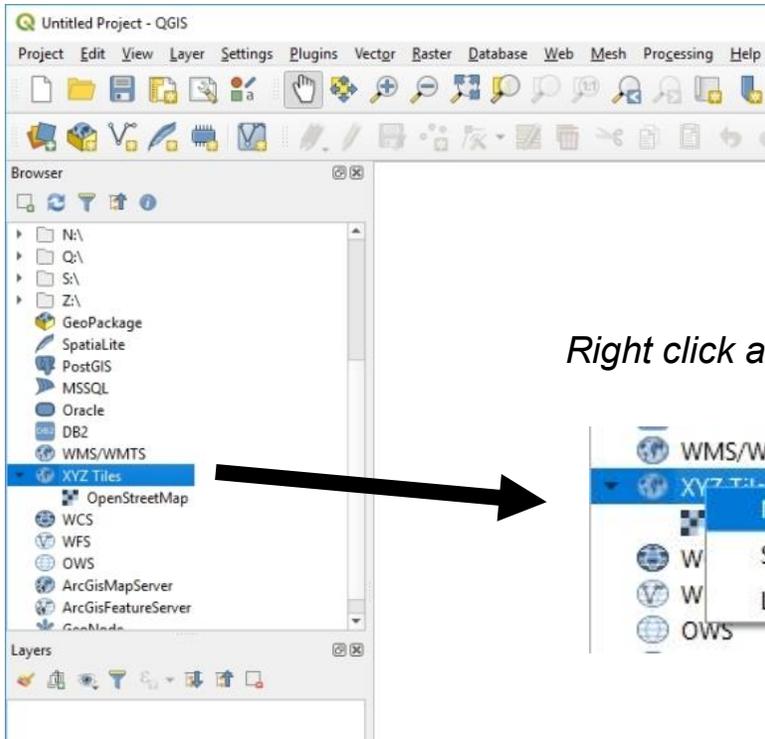
Adding Google Earth as a background

1. Use this URL as indicated below

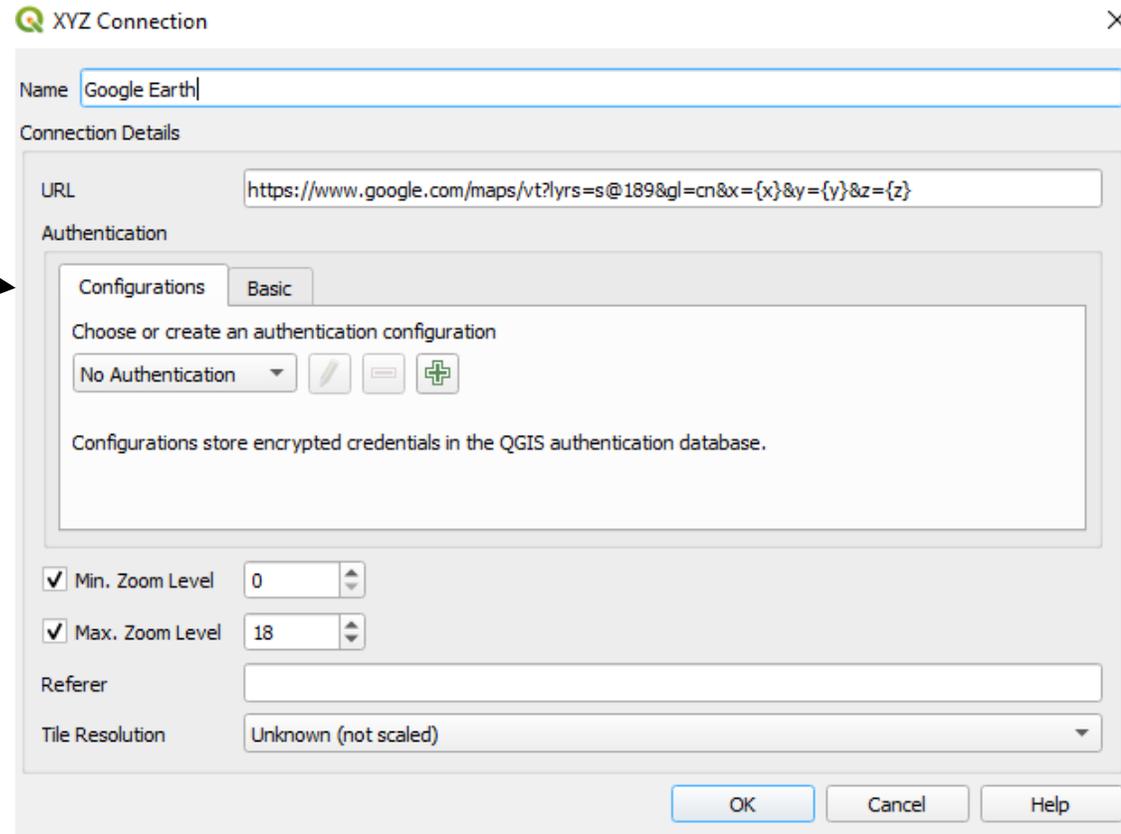
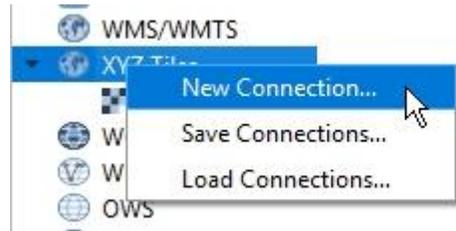
- <https://www.google.com/maps/vt?lyrs=s@189&gl=cn&x={x}&y={y}&z={z}>

If the URL above does not display, try to restart QGIS or you can try this alternative:

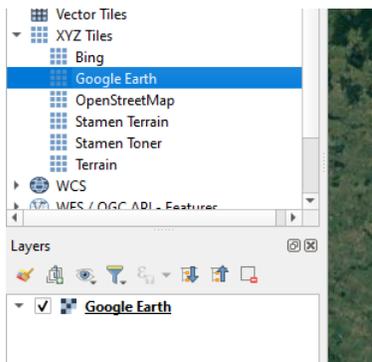
- [http://ecn.t3.tiles.virtualearth.net/tiles/a\(q\).jpeg?q=1](http://ecn.t3.tiles.virtualearth.net/tiles/a(q).jpeg?q=1)



Right click and select 'New connection'

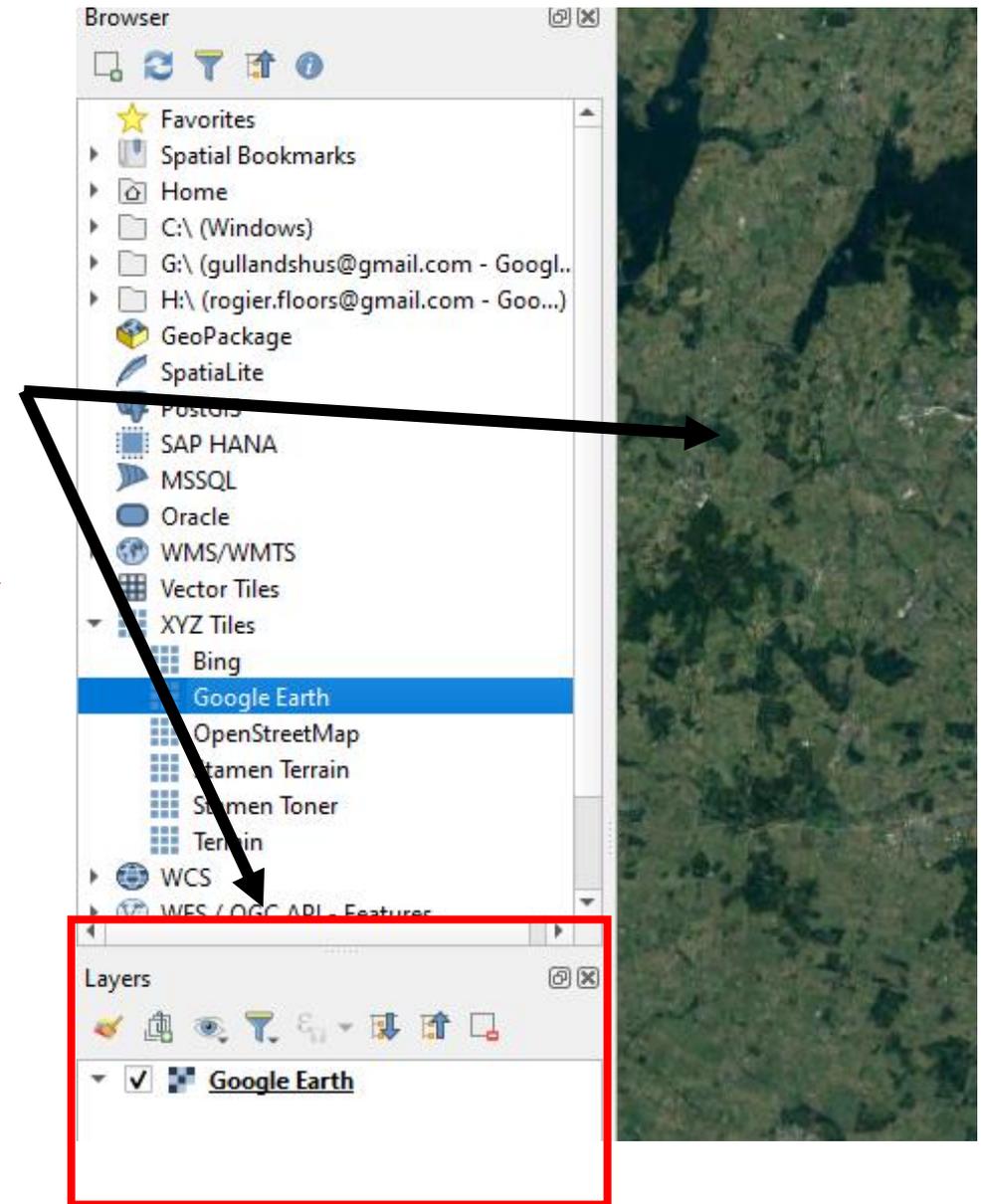


Double click on item 'Google Earth' that is now added. The satellite background should appear



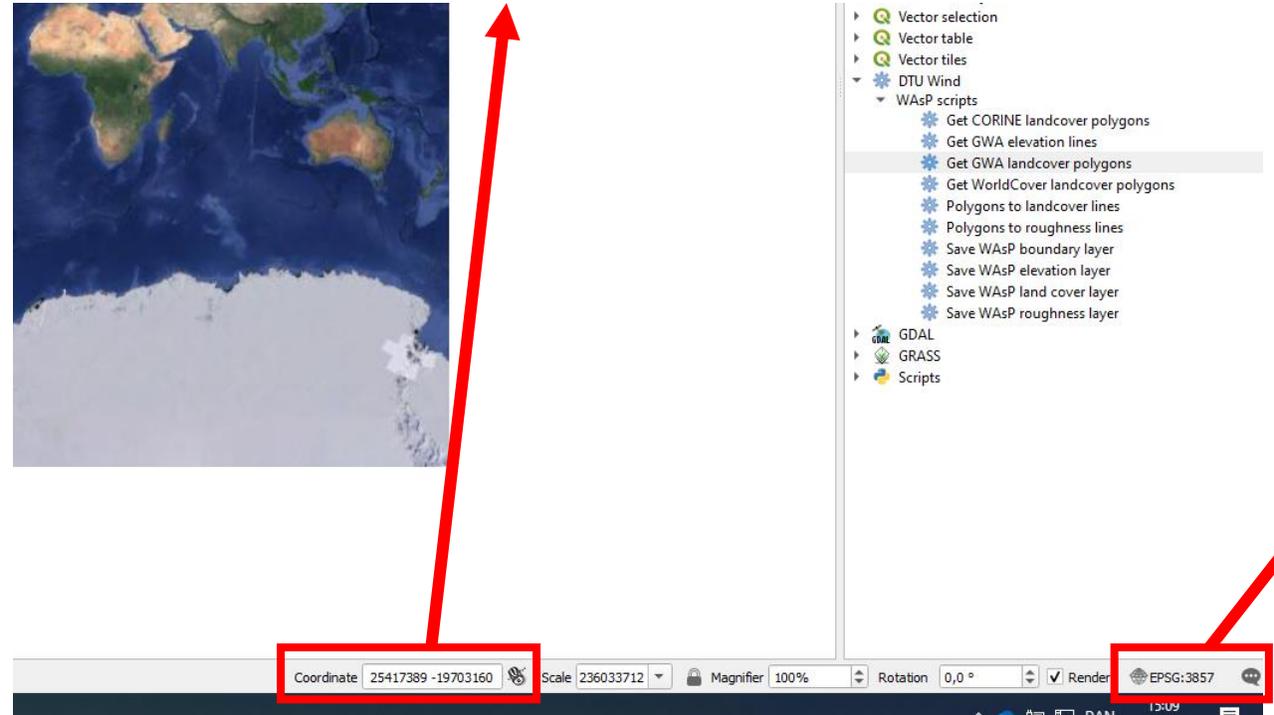
Working with layers

- In the layers panel you can see different layers that you will load into the **canvas** (area with the satellite map).
- Most processes in QGIS by default create temporary layers, **you will have to save them to disk if you want to keep them!** We recommend saving vector files as '.gpkg'. You can learn more in this [video](#).

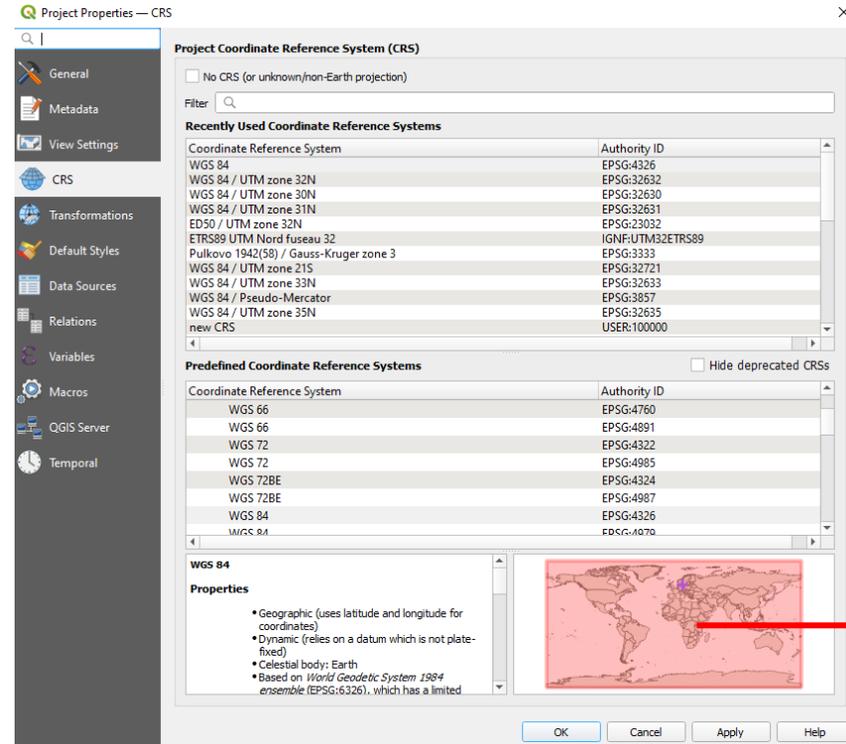


Projections & coordinates

Checking coordinates of your cursor position



Changing the projection



Make sure your site is in the red area, where the chosen projection is valid

The google earth tiles have projection EPSG:3857. Once you loaded this layer, this projection was automatically adopted for your canvas. It is easy to change for other projections by clicking on this button and search by the 'Authority ID', which is a standardized code for frequently used projections.

Some commonly used codes are:

- **Geographic:** EPSG:4326 (for geographic lat/lon projection)
- **Projected:** EPSG:32HNN, where H is 6 on northern hemisphere and 7 on the southern hemisphere and NN is the zone number. An overview of the UTM zones can be found [here](#)



For WAsP we can only use **projected** coordinate systems with unit meters, such as UTM. The scripts will **not** work for geographic projections.

What you will learn

- This exercise covers five procedures:
 - A. Importing an elevation map from GWA warehouse
 - B. Creating a hand-digitized roughness map using Google Earth satellite data
 - C. Importing a roughness map from the CORINE database (can be used for your projects if they are in Europe)
 - D. Importing a roughness map from the GWA database
 - E. Importing a roughness map from the WorldCover database

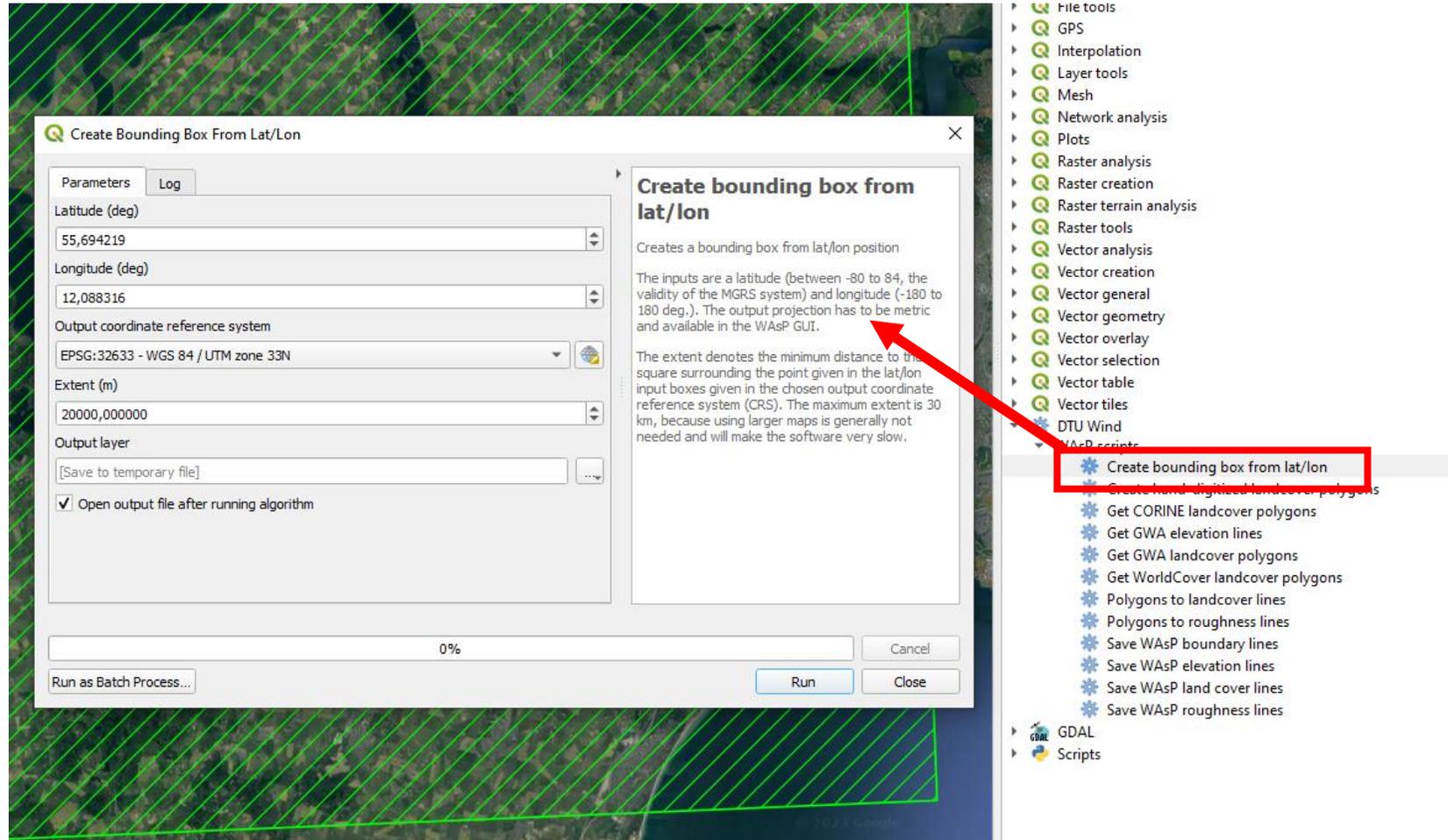
Exercise A – Importing an elevation map from GWA

- **Task:** make an **elevation map** for the region around the Risø campus:
 - Close to the meteorological mast at 55.694219°N, 12.088316°E

1) Creating a bounding box

- Run the script using the lat/lon given above
 - ✓ This will create a square polygon around the given lat/lon with the given extent called *Bounding box*

If you run a QGIS script the default is that it will operate on the current layer and generate a new temporary layer that will show up in your list in the 'Layers' panel.



Exercise A – Importing an elevation map from GWA

2) Run the script 'Get GWA elevation lines'

Select contouring interval for your map, in this case a line will be drawn every 10 m

Get GWA Elevation Lines

Parameters Log

Clipping layer
Bounding box [EPSG:32633]

Selected features only

Contouring interval (m)
10

Contouring offset (m)
0

Output layer
[Save to temporary file]

Open output file after running algorithm

0%

Run as Batch Process... Run Close

Get GWA elevation lines

Extracts elevation lines from viewfinder/SRTM

The input is a 'Bounding box' layer with a single Polygon where we want to retrieve the data. Based on this layer, the tiles that cover this area are downloaded and the data is clipped out of these tiles. Note that the projection of the clipping layer determines the projection of the output.

The lines are then converted using an interval and offset. The interval denotes the interval between which the contour lines are drawn and the offset denotes the starting point from where the contouring is started from.

The returned vector layer contains an attribute "ELEV" which can be used later on when saving it as a WAsP .map file.

The elevation data are obtained from [viewfinderpanoramas](#) and we acknowledge all contributors mentioned there. Most of the data is based on the 3" SRTM data, but other sources are used as well as described [here](#).

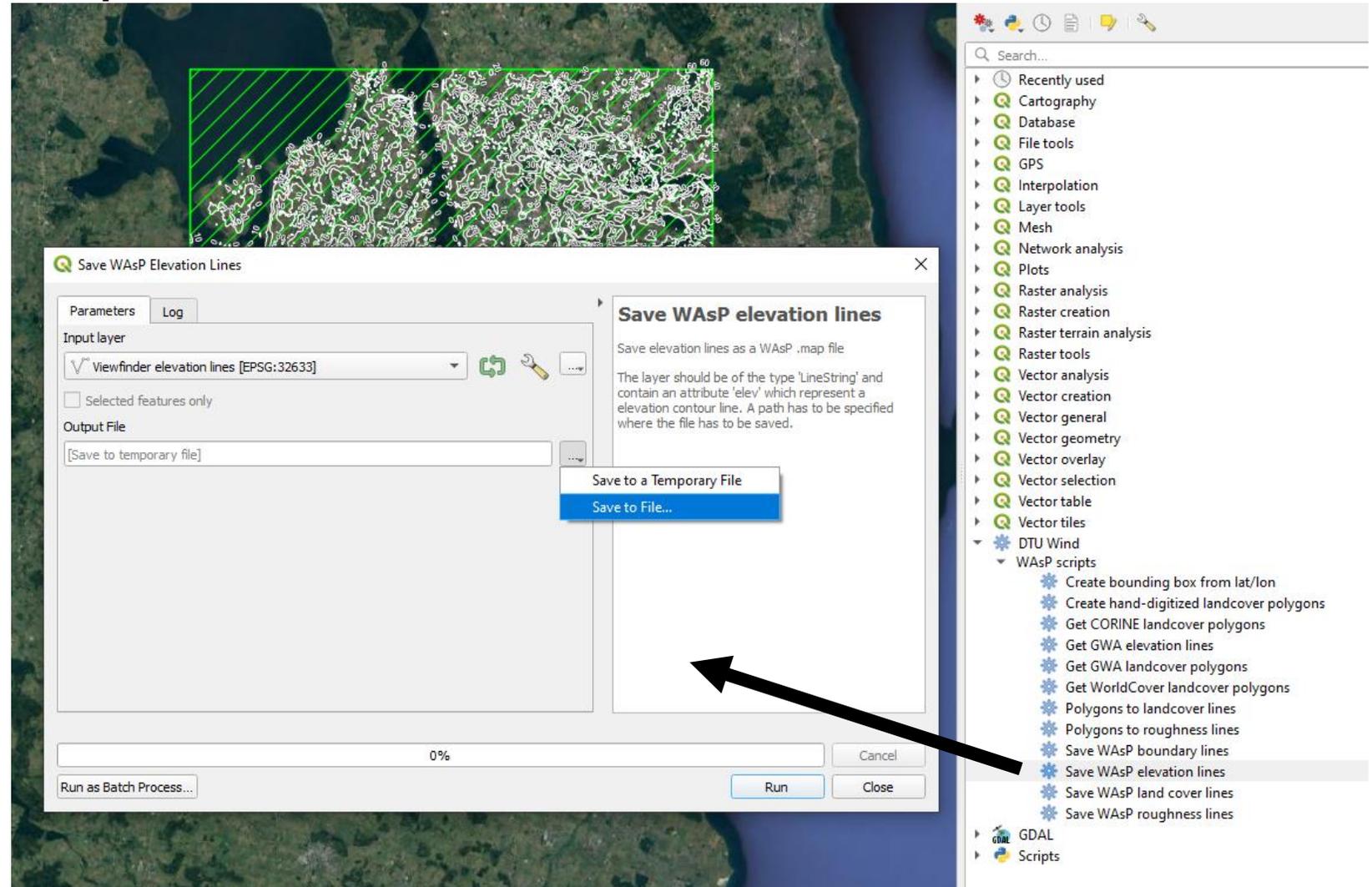
Processing Toolbox

- Recently used
- Cartography
- Database
- File tools
- GPS
- Interpolation
- Layer tools
- Mesh
- Network analysis
- Plots
- Raster analysis
- Raster creation
- Raster terrain analysis
- Raster tools
- Vector analysis
- Vector creation
- Vector general
- Vector geometry
- Vector overlay
- Vector selection
- Vector table
- Vector tiles
- DTU Wind
 - WAsP scripts
 - Create bounding box from lat/lon
 - Create hand-digitized landcover polygons
 - Get CORINE landcover polygons
 - Get GWA elevation lines
 - Get GWA landcover polygons
 - Get WorldCover landcover polygons
 - Polygons to landcover lines
 - Polygons to roughness lines
 - Save WAsP boundary lines
 - Save WAsP elevation lines
 - Save WAsP land cover lines
 - Save WAsP roughness lines
- GDAL
- Scripts

Exercise A – Importing an elevation map from GWA

3) Save the created map to disk

- In the Processing toolbox double click on “Save WAsP elevation layer”
- In the following window for the input layer select the *Output* layer and click *Save to file*

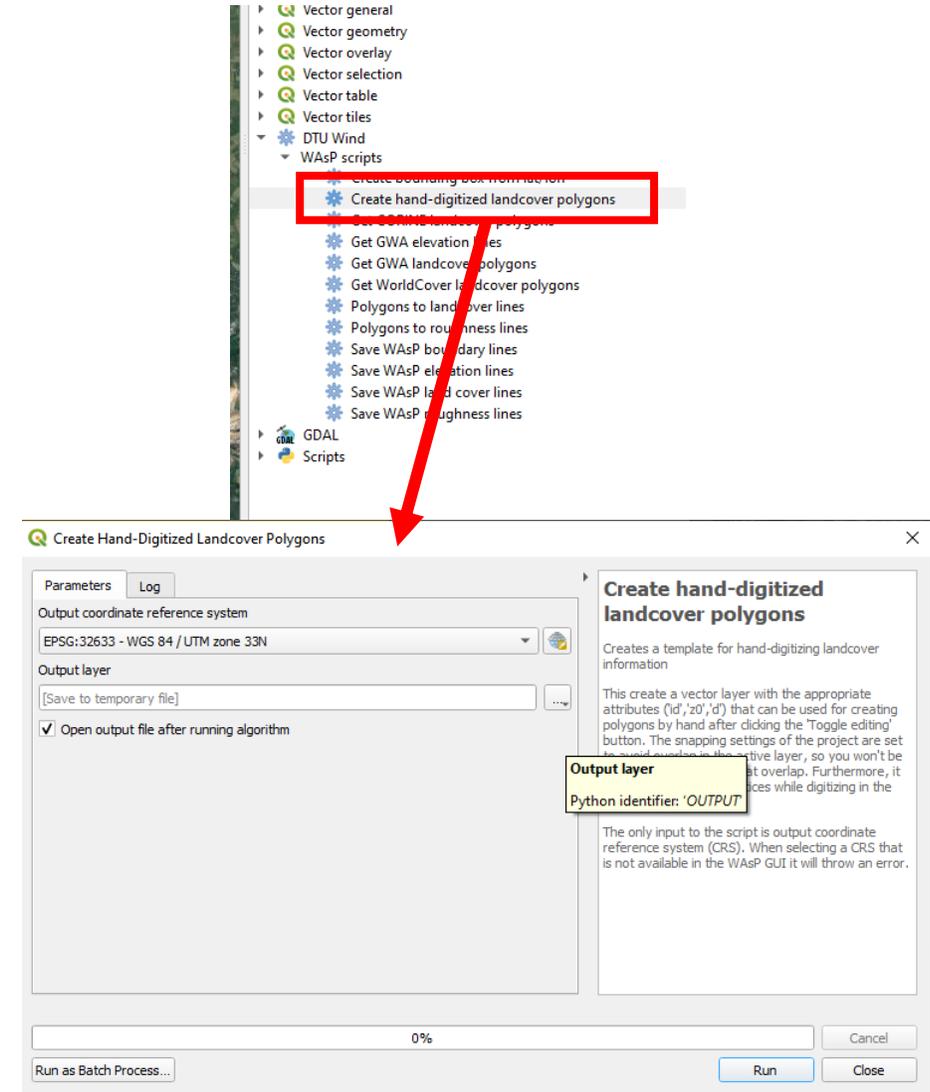


Exercise B – Digitizing a roughness map in QGIS

1) Create a hand-digitized polygon layer

In this exercise we will create a roughness map by digitizing google earth information.

- Add the google earth background layer from exercise 1A (if not present yet)
- Double click on the script 'Create hand digitized landcover polygons'
- Select the appropriate 'Output coordinate reference system' that you want to make your map in (see exercise A).
- Press 'run'



Some settings in your project are modified in this script to make sure no errors occur when digitizing. You will notice they look like below. You can read more about these in the QGIS help about [snapping](#). You can also watch [this video](#) to learn more details. Particularly watch this video if you save your polygons on disk and resume work later, because project settings are **not** saved after you quite QGIS.

Project Snapping Settings



Exercise B – Digitizing a roughness map in QGIS

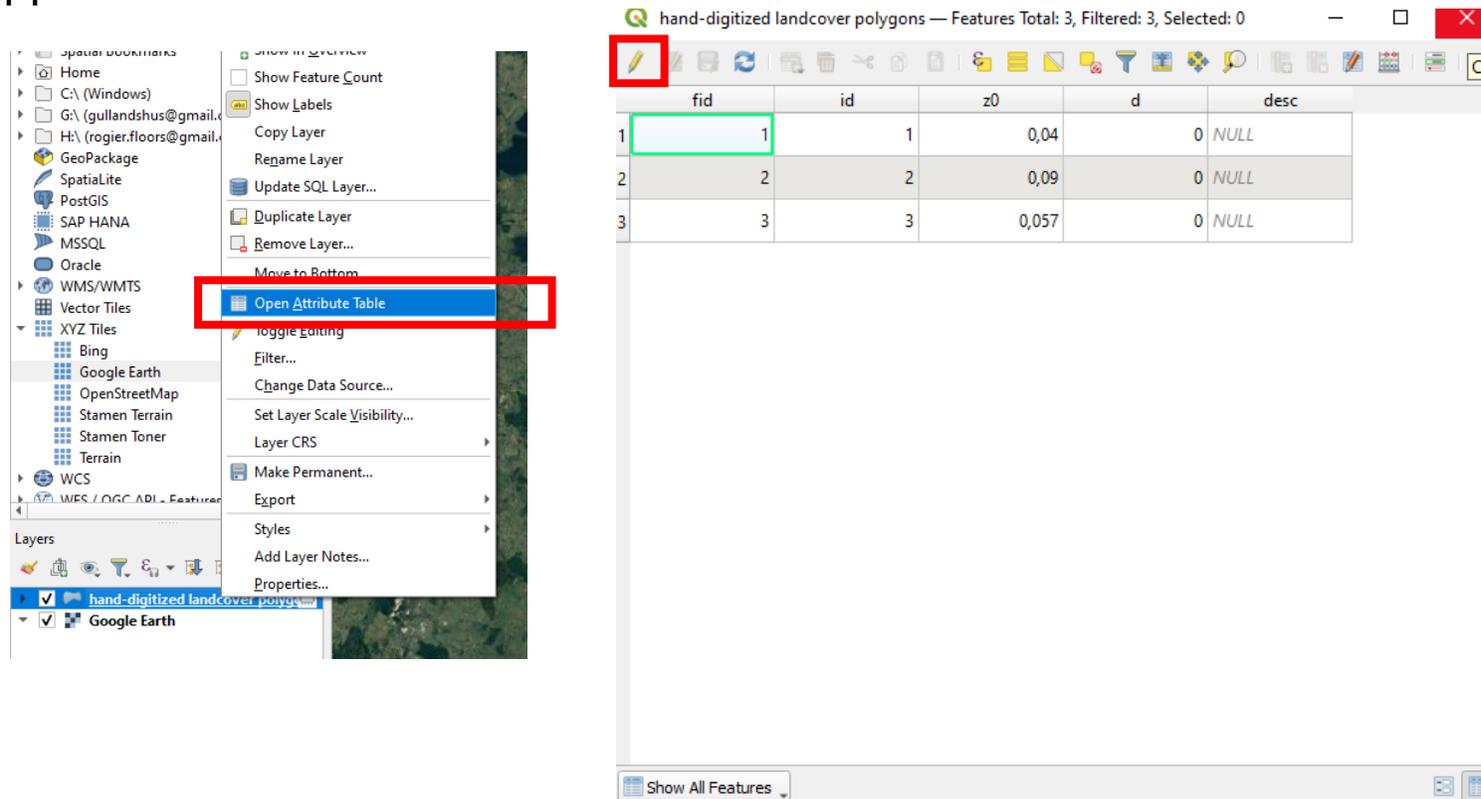
2) Digitize features in the map and assign a roughness

- Press *Toggle editing* 
- Press *Add Polygon feature* 
- Digitize a feature by *left-clicking* on the map at the desired points. Cross-points are shown by a green cross and should be avoided.
- Finish digitizing by *right-click* and fill in a *z0* (roughness length value). The other columns you can leave at their defaults (optionally you can add a description 'desc' like 'forest, grass').
- Save your edits 

Exercise B – Digitizing a roughness map in QGIS

2) Modifying existing polygons in your layer

- You can explore the features in a layer (in this case the hand-digitized) by *right-click* and 'Open Attribute Table'. You can start editing them by pressing the pencil symbol in the upper left corner.



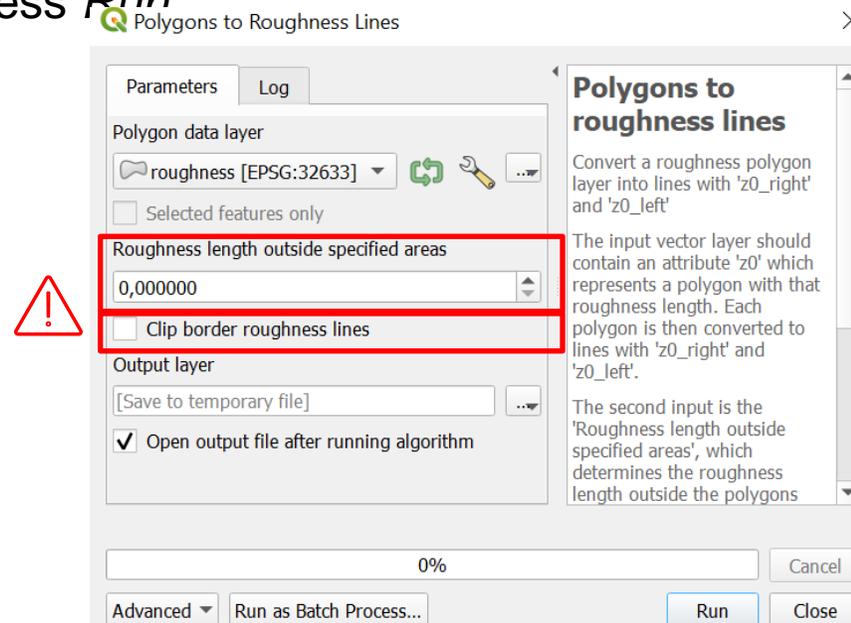
The screenshot shows the QGIS interface. On the left, the 'Layers' panel displays 'hand-digitized landcover polygons' and 'Google Earth'. A right-click context menu is open over the 'hand-digitized landcover polygons' layer, with 'Open Attribute Table' highlighted. The attribute table window is open, showing a table with 5 columns: fid, id, z0, d, and desc. The first row is highlighted in green.

fid	id	z0	d	desc
1	1	0,04	0	NULL
2	2	0,09	0	NULL
3	3	0,057	0	NULL

Exercise B – Digitizing a roughness map in QGIS

3) Convert polygons to roughness lines and save to disk

- Double click *WAsP scripts* > *Polygons to roughness lines*. Remember to **uncheck** the box 'Clip border roughness lines' and specify an appropriate 'Roughness length outside specified areas' press **Run**

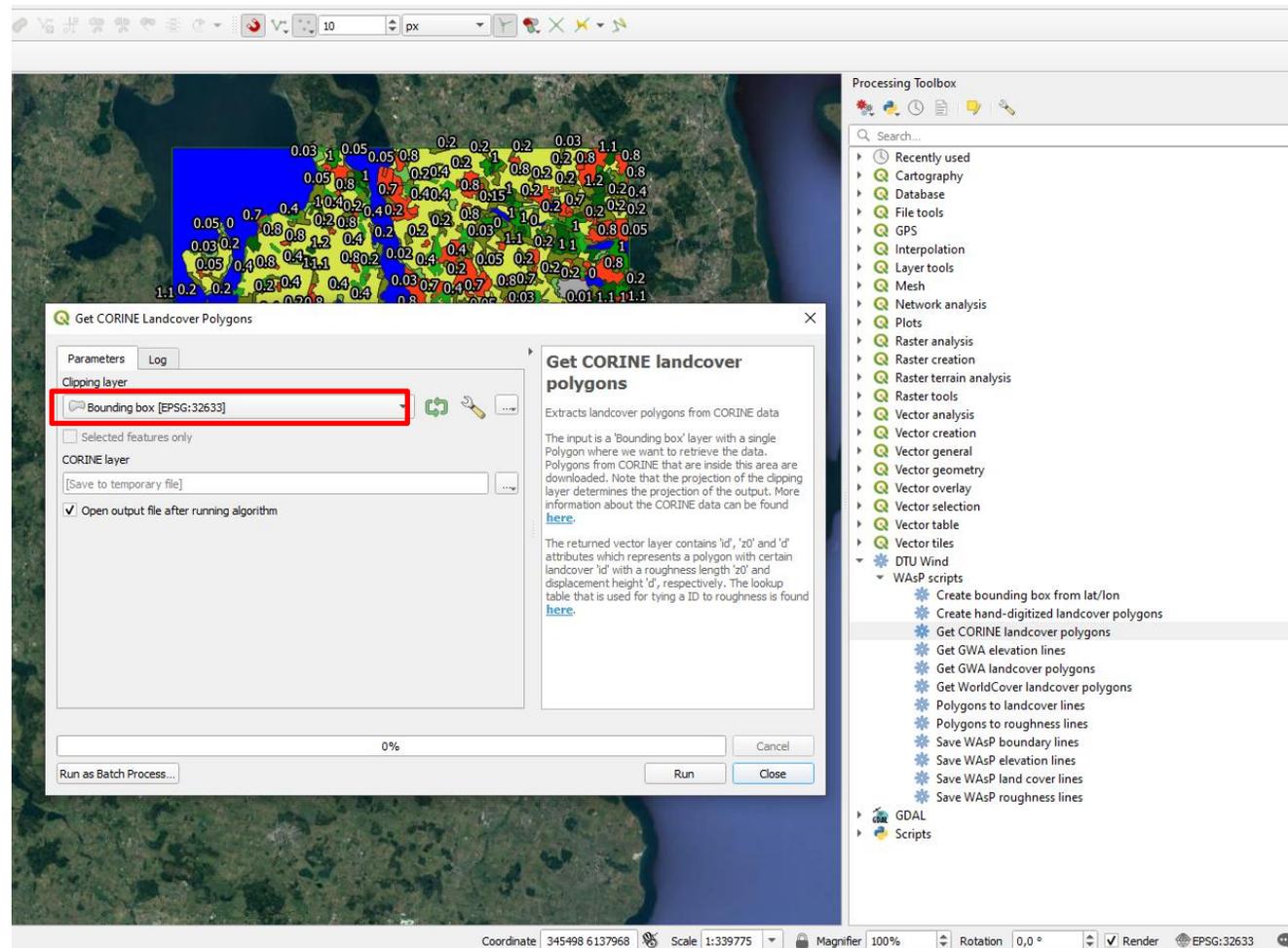


- Select the output layer that results from the above and double click *WAsP scripts* > *Save WAsP roughness layer* choose *Save to file* with the filename 'roughness.map' and click **Run**
- **You can open the 'WAsP map editor' and make sure your map has no errors**

Exercise C – Importing a CORINE roughness map

1) Double click the script “Get CORINE landcover polygons”

- Select the **Bounding box** layer that was already used for the elevation map



Exercise C – Importing a CORINE roughness map

2) Double click the script “Polygons to roughness lines”

Browser

Processing Toolbox

Parameters Log

Polygons to Roughness Lines

Polygon data layer

CORINE landcover polygons [EPSG:32633]

Selected features only

Roughness length outside specified areas

0.000000

Clip border roughness lines

Output layer

[Save to temporary file]

Open output file after running algorithm

0%

Run as Batch Process...

Run Close

Search...

Recently used

- Cartography
- Database
- File tools
- GPS
- Interpolation
- Layer tools
- Mesh
- Network analysis
- Plots
- Raster analysis
- Raster creation
- Raster terrain analysis
- Raster tools
- Vector analysis
- Vector creation
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 - Get GWA elevation lines
 - Get GWA landcover polygons
 - Get WorldCover landcover polygons
 - Polygons to landcover lines
 - Polygons to roughness lines
 - Save WAsP boundary lines
 - Save WAsP elevation lines
 - Save WAsP land cover lines
 - Save WAsP roughness lines
- GDAL
- Scripts



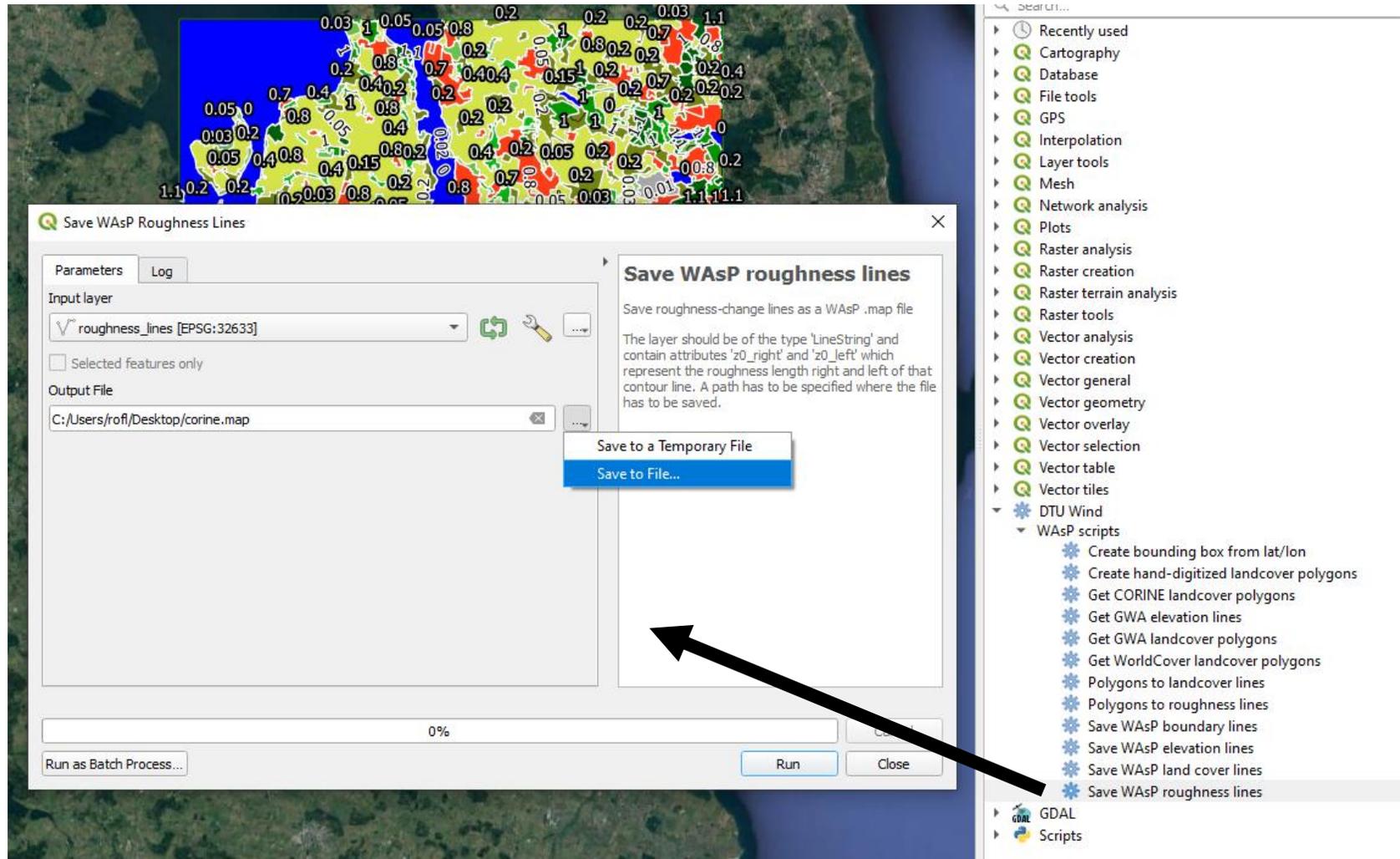
Make sure to check the option 'Clip border roughness lines' is checked, so that the map has 'open ends'

Exercise C – Importing a CORINE roughness map

3) Save the created layer to disk

In the Processing toolbox select "*Save WAsP roughness layer*"

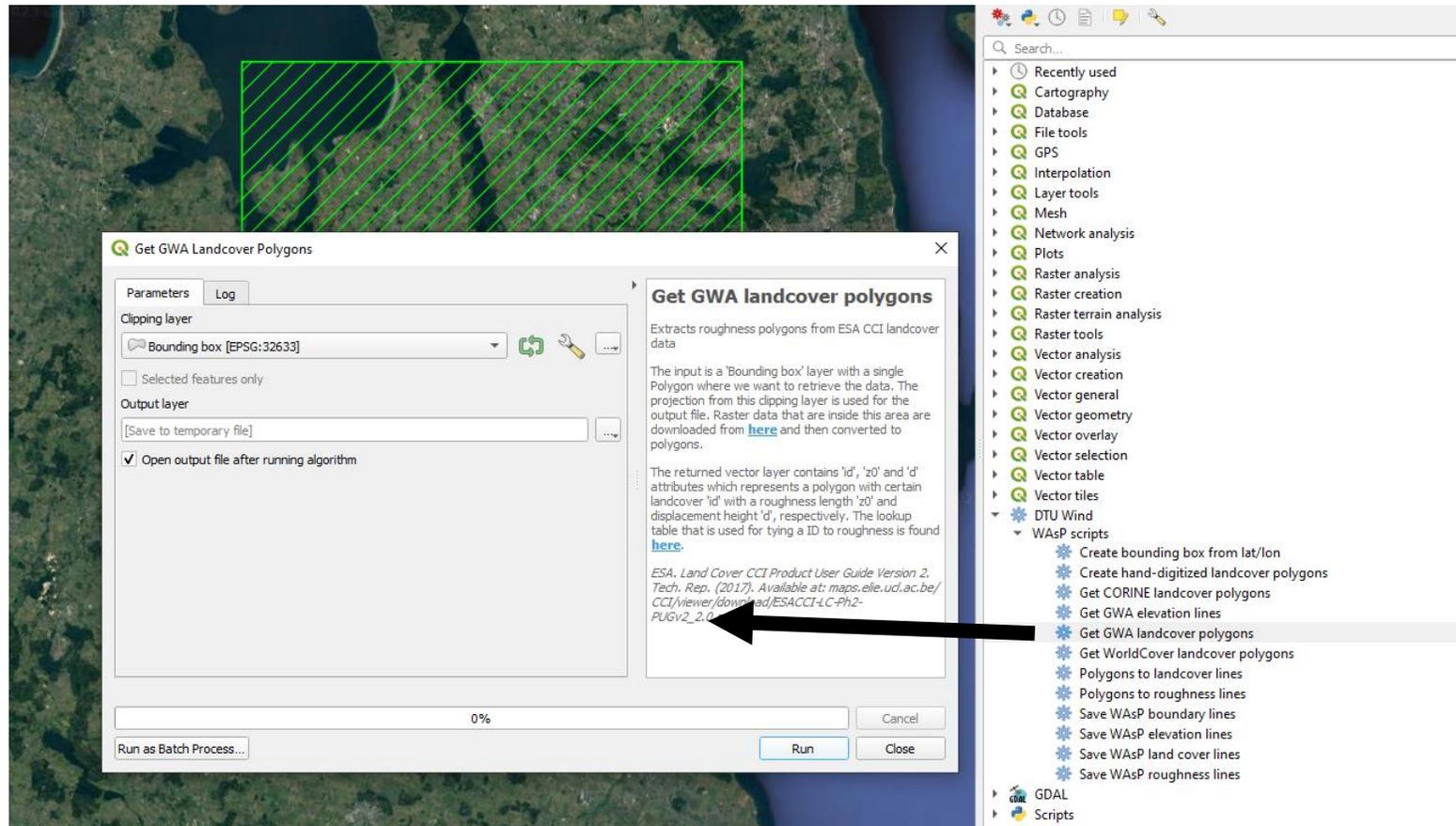
For the input layer select the *roughness lines* and click *Save to file* to a place on your disk



Exercise D – Importing a GWA roughness map

1) Double click on the script “Get GWA landcover polygons”

- Select the **Bounding box** layer that was already used for the elevation map



Exercise D – Importing a GWA roughness map

2) Run the script “Polygons to roughness lines”



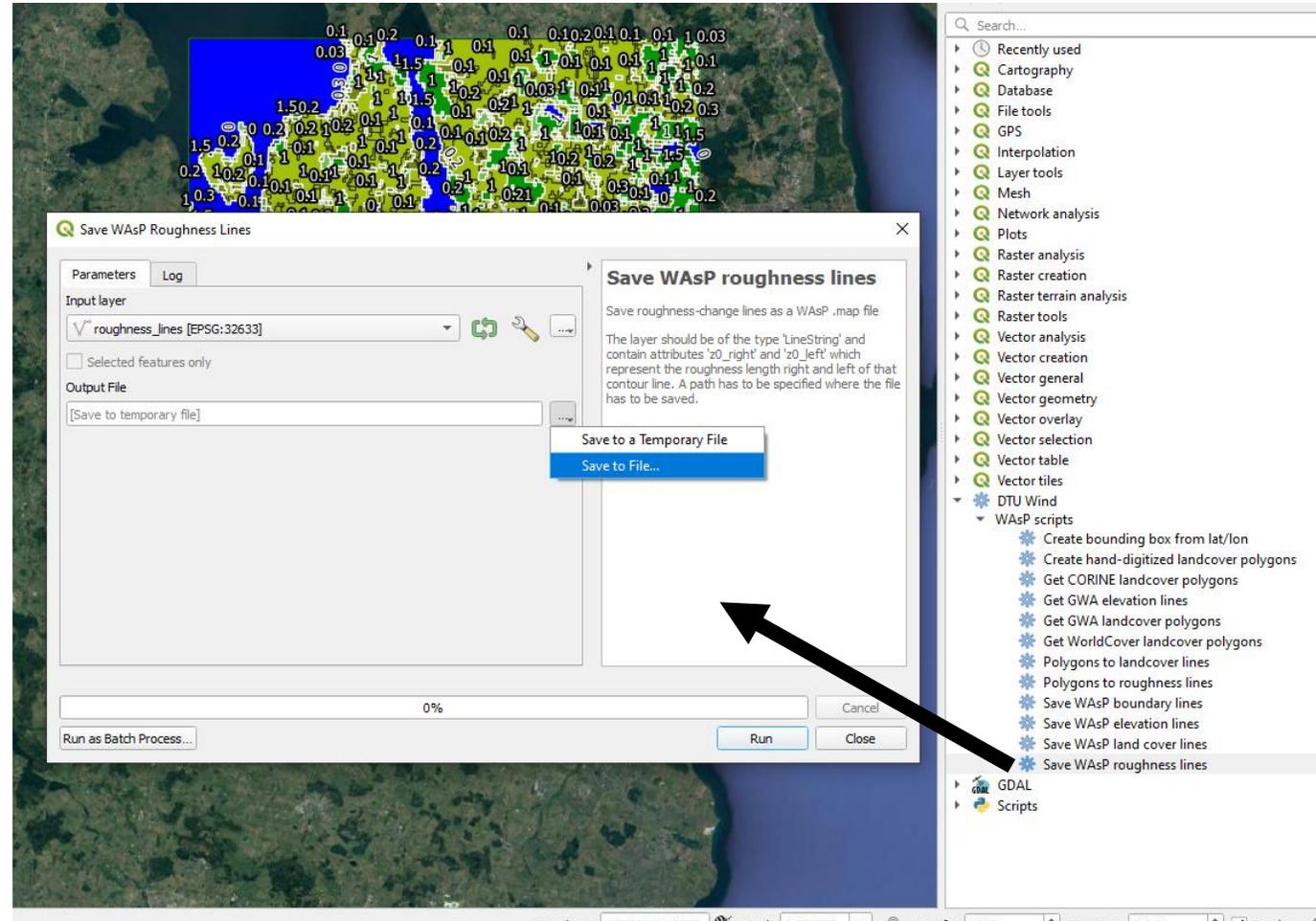
Make sure to check the option 'Clip border roughness lines' is checked

Exercise D – Importing a GWA roughness map

3) Save the created layer to disk

In the Processing toolbox double click on "Save WAsP roughness layer"

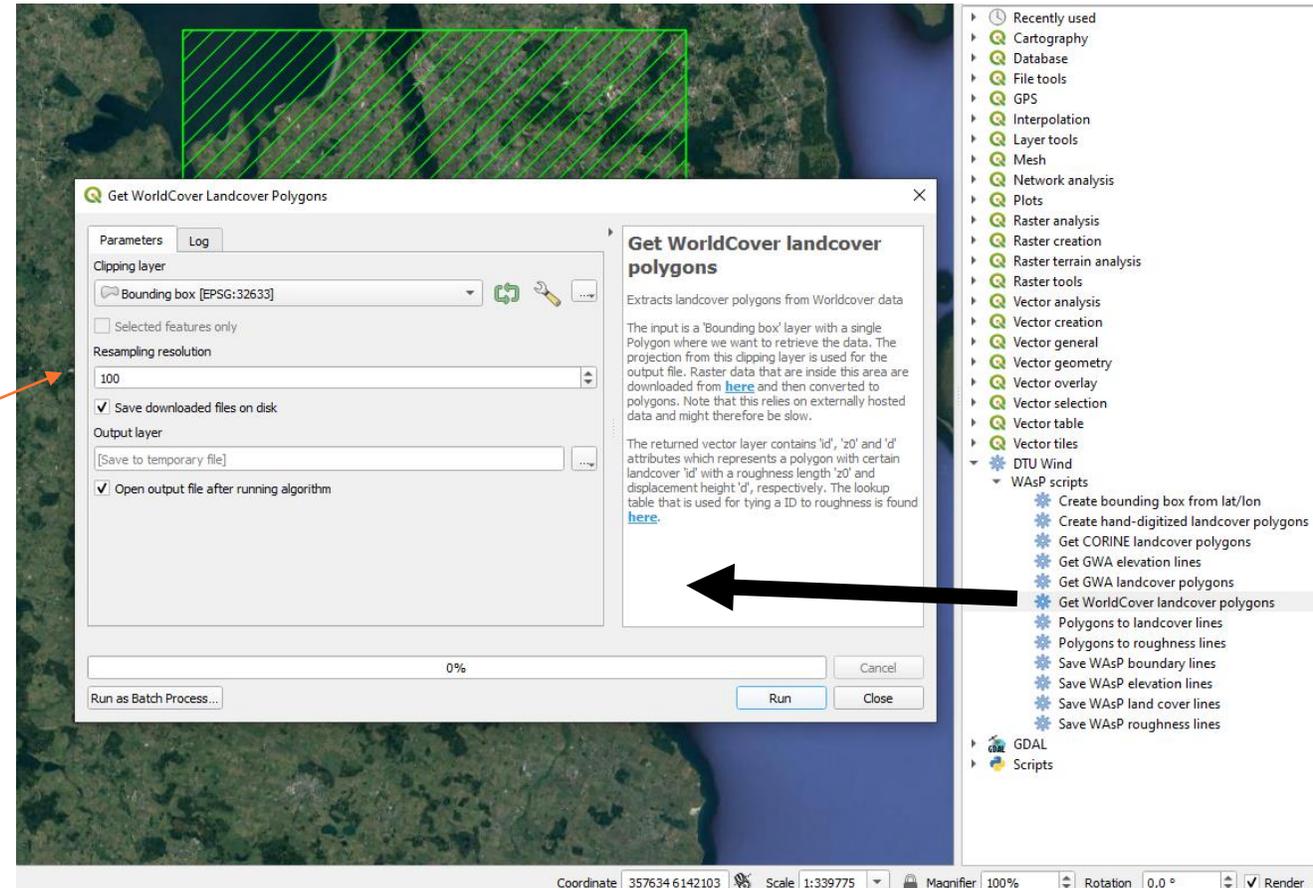
In the following window for the input layer select the *roughness lines* layer and click *Save to file*



Exercise E – Importing a WorldCover roughness map

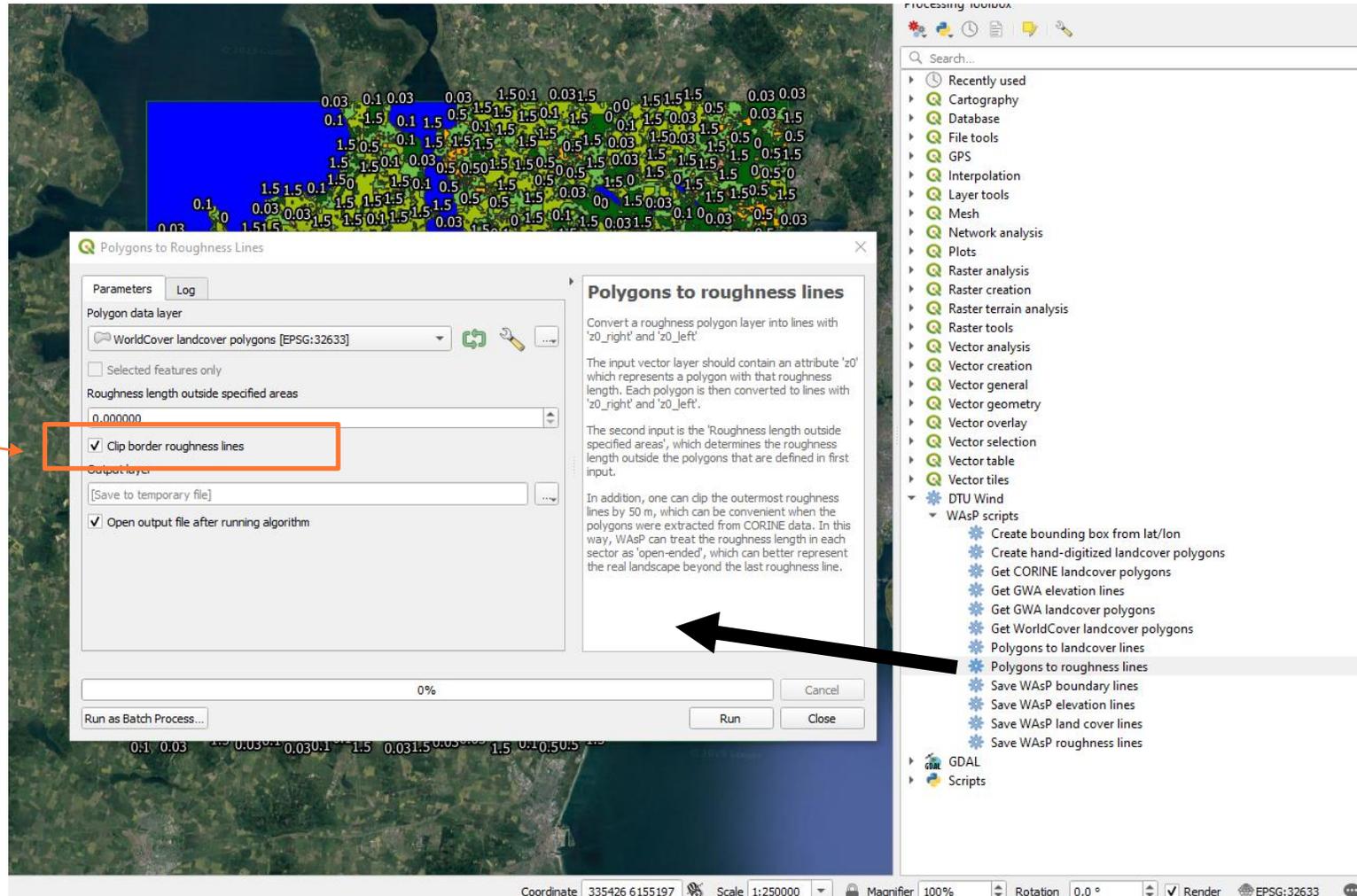
1) Run the script “Get WorldCover landcover polygons”

- Select the **Bounding box** layer that was already used for the elevation map
- The highest possible resolution is 50 m, the default recommended resampling to 100 m makes the maps easier to process



Exercise E – Importing a WorldCover roughness map

2) Run the script “Polygons to roughness lines”



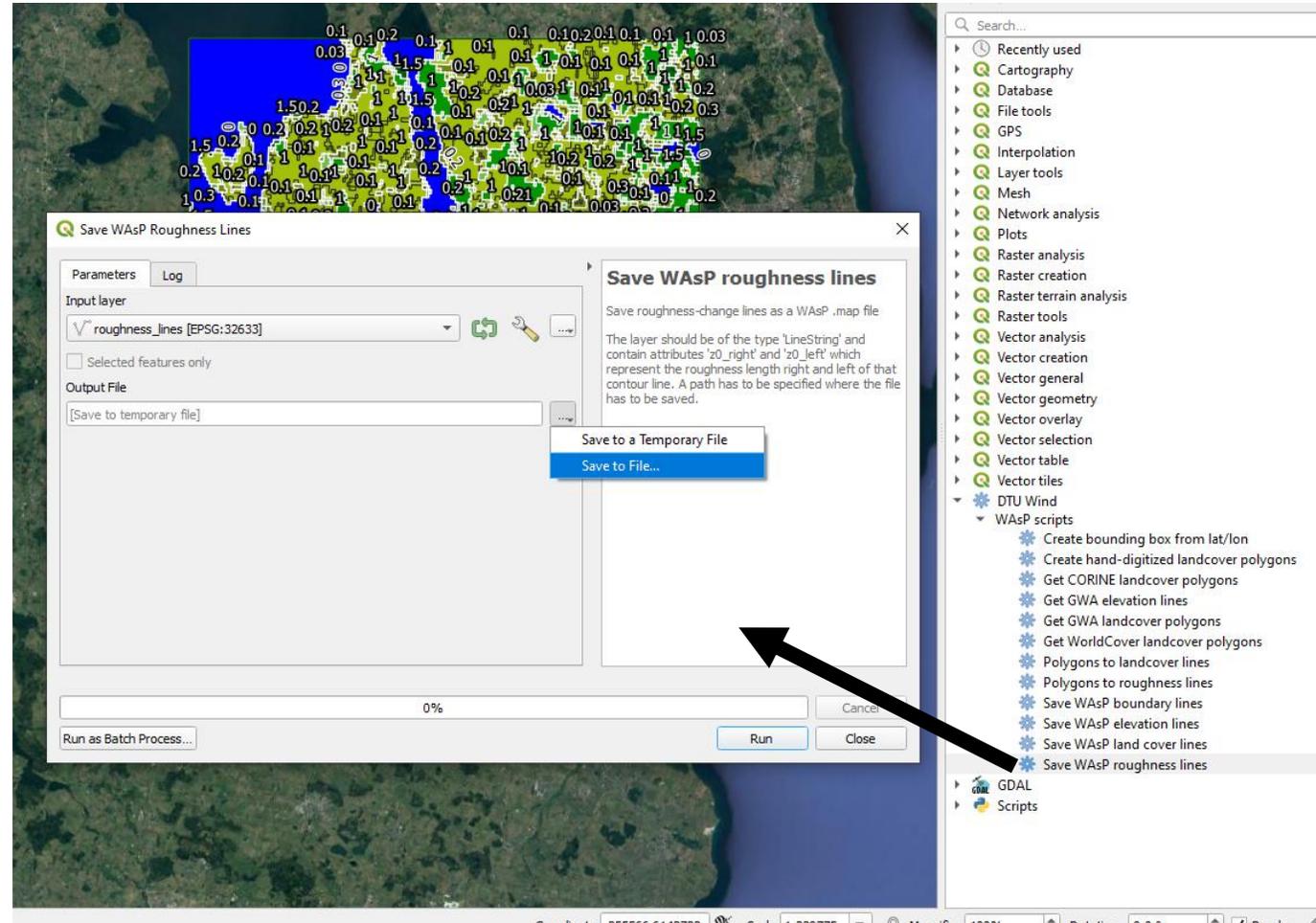
Make sure to check the option 'Clip border roughness lines' is checked

Exercise E – Importing a WorldCover roughness map

3) Save the created layer to disk

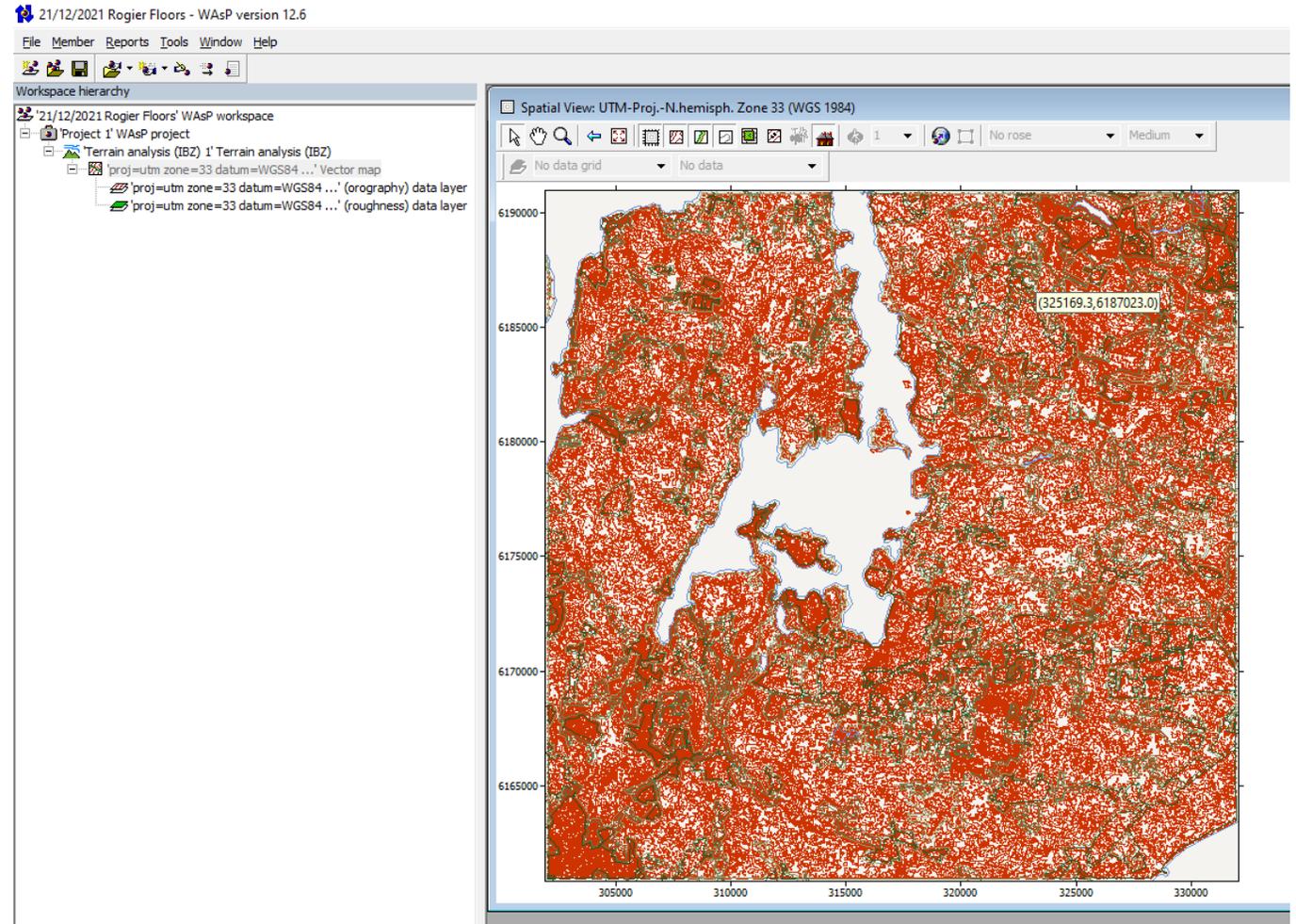
In the Processing toolbox double click on "Save WAsP roughness layer"

In the following window for the input layer select the *roughness lines* layer and click *Save to file*



Final WAsP workspace

- You can open the .map files that we have created directly in WAsP by right clicking on the project and click '*Insert from file > Vector map*'
- If you have already imported a roughness layer and want to add a elevation layer (or vice versa), right click on the map  and select '*Insert from file > Vector map data layer*'



Frequently asked questions:

- I have another questions that is not below?
 - Check the WAsP forum <https://www.wasptechnical.dk/forum/index.php> or send an email to WAsP support (waspsupport@dtu.dk)
- My google maps image does not show up:
 - Restart QGIS and try again
 - Use the alternative source by adding Bing maps in
 - <http://ecn.t3.tiles.virtualearth.net/tiles/a{q}.jpeg?q=1>
- Can I edit a polygon and change a property?
 - Yes you can, see for example [this video](#)
- I want to add a new polygon in my layer because it does not correspond to reality.
 - Watch [this video](#)
- How can I make sure there is no gaps between polygons when I digitize?
 - See exercise B, step 2. When you avoid overlap you can draw over the area that is covered by another polygon. The new polygon will then 'snap' to the edge of the old one. Make sure the option 'Topological editing' is selected, otherwise inconsistencies between the different polygons can show up. To check the validity of your polygon layer, you can install the plugin 'Check geometries'.
- How do I change the language in QGIS?
 - Go to *Settings > Options > General > "Override system local"*
- How do I reproject my vector layer?
 - Go to *Vector > Data management tools > Reproject Layer*
- How do I reproject my raster layer?
 - Go to *Raster > Projections > Warp (reproject)*
- I get an error:

Warning 1: Model file not specified. Process returned error code 1

Try the fix in this suggestion: <https://github.com/qgis/QGIS/issues/54375>