

## **HOMEWORK 1**

### **PREPARED BY**

**NAME SURNAME:** MELIH SAFA ÇELIK

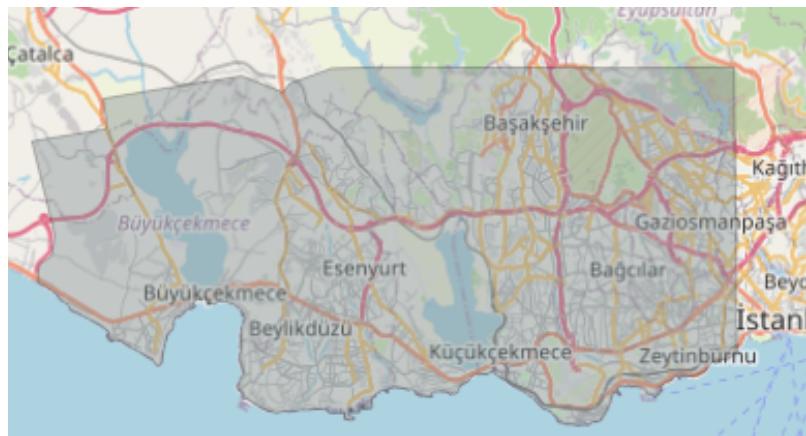
**NUMBER** : 010180519

**DUE DATE** : 16/05/2022

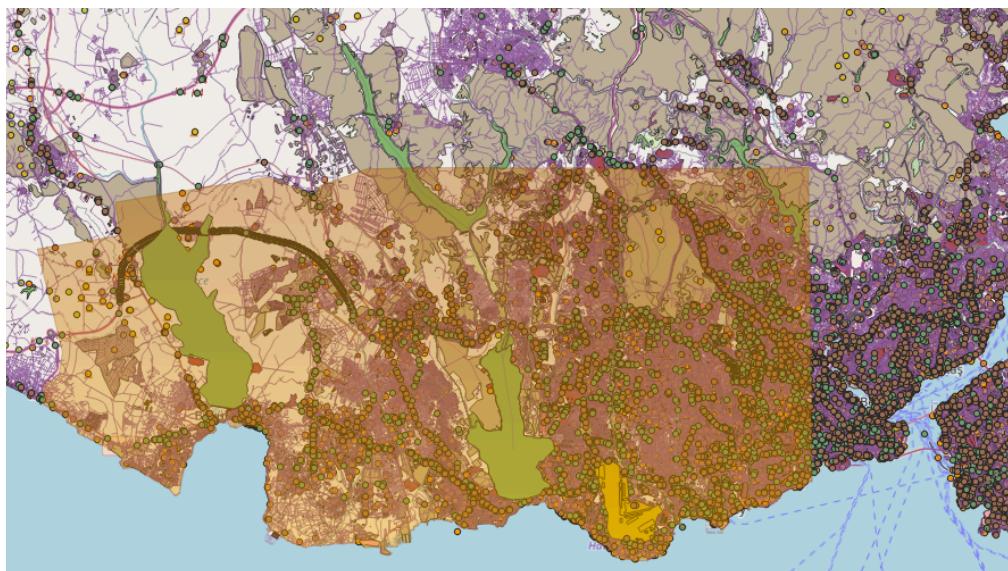
**COURSE NAME** : SPATIAL ANALYSIS AND ALGORITHMS IN GIS

**COURSE INSTRUCTOR** : PROF. DR. HANDE DEMIREL

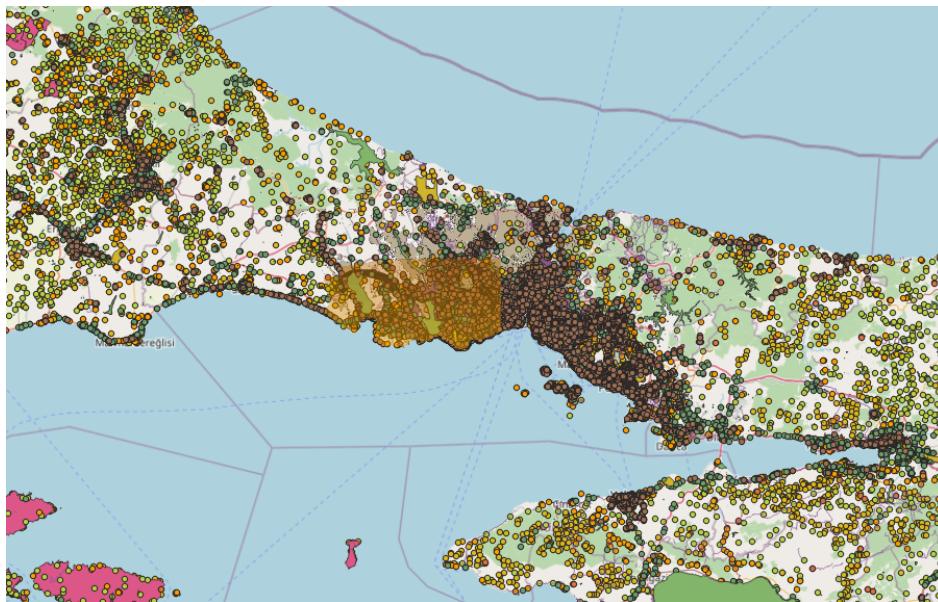
Firstly, given region boundary data is imported and opened OpenStreetMap with the region data on the QGIS software.



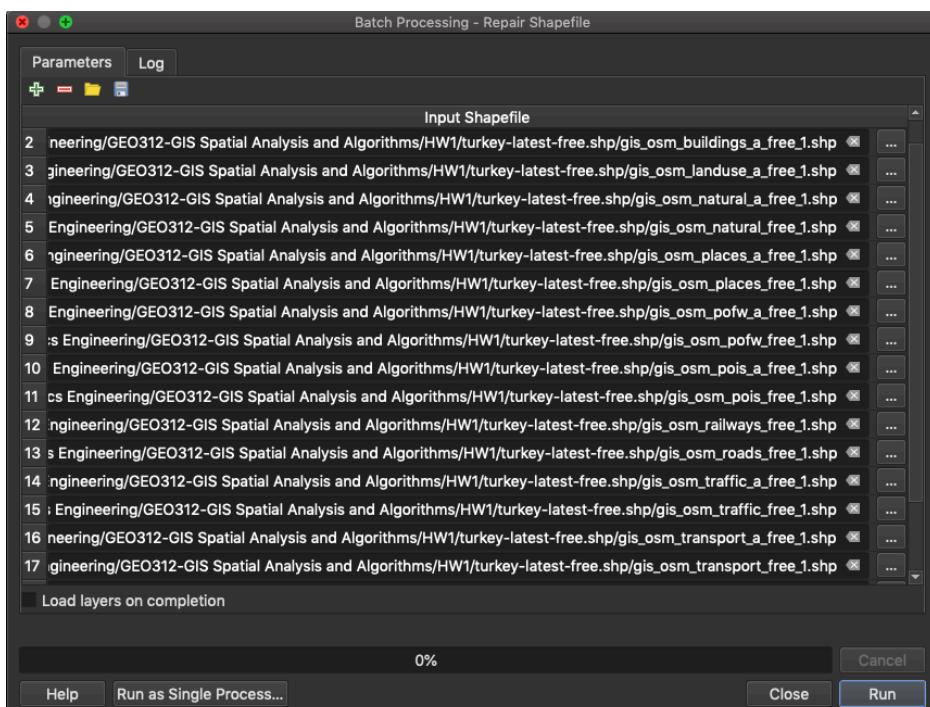
Later, loads of data is downloaded from the Geofabric website and also imported to the QGIS. On the oncoming steps, some methods of processing will be applied on these data.



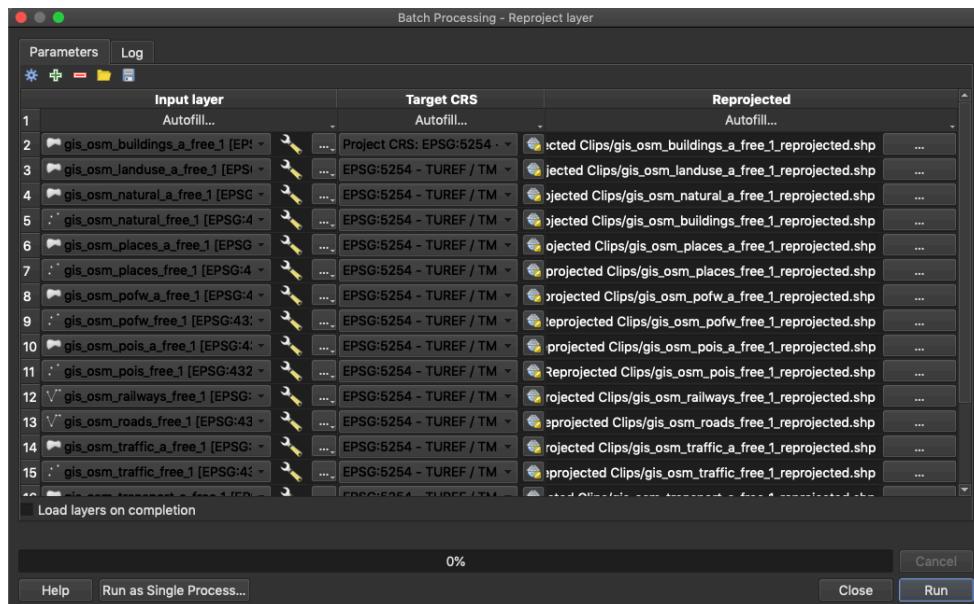
As can be seen, there is lots of data that are dense and out of the boundary. Before clipping the data that are at the out of boundary, some processing steps shall be done as batch processing.



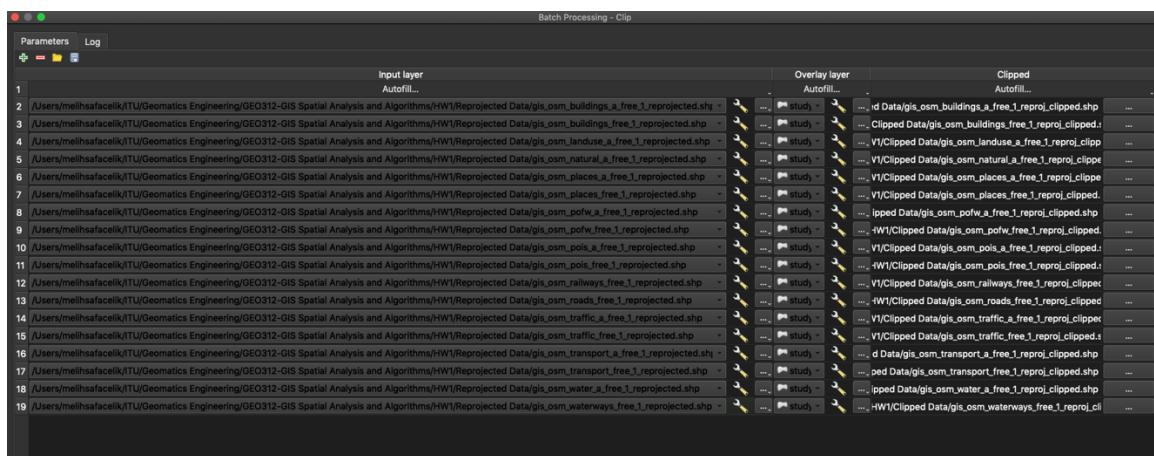
First in the batch processing steps, shapefiles are repaired.



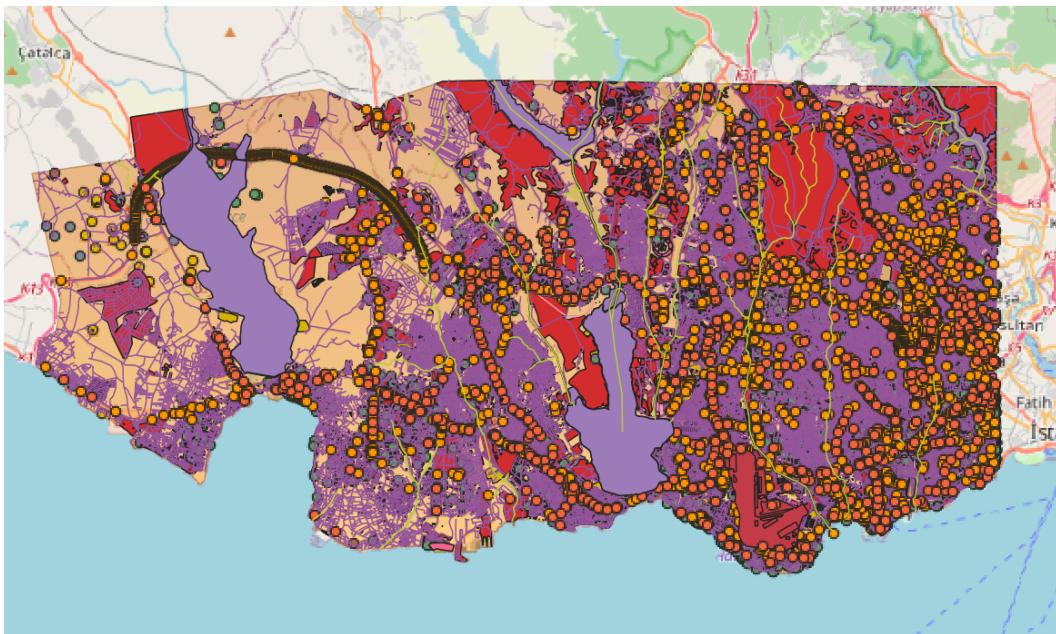
Later, projection of the data and also project, is set with the “Batch Processing – Reproject Layer” tool of QGIS.



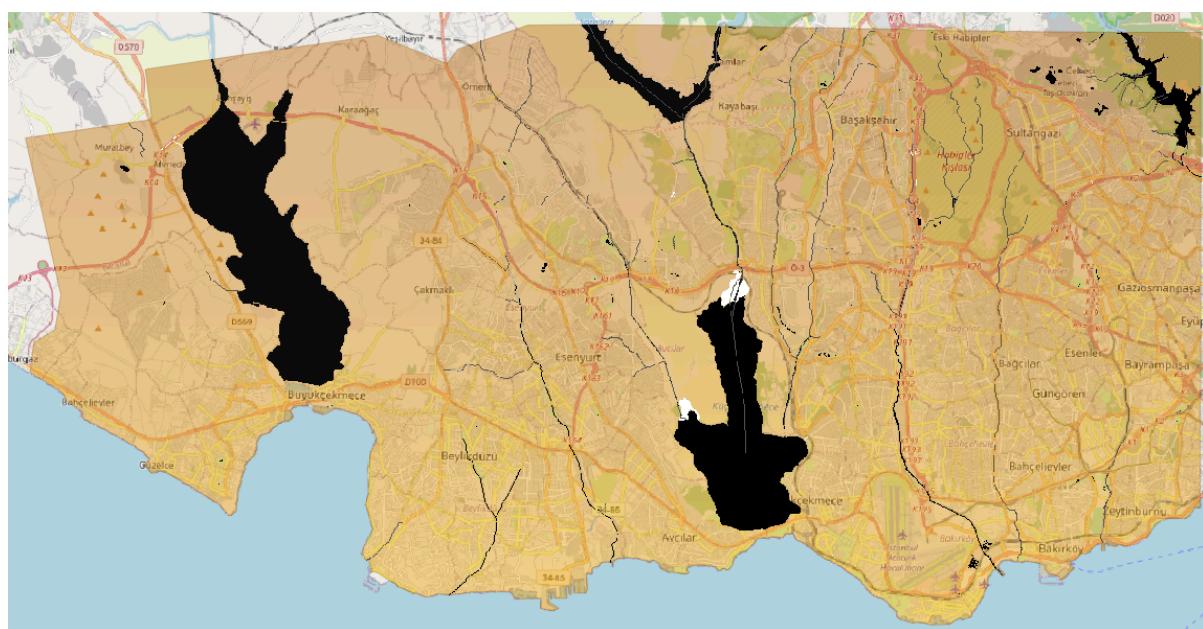
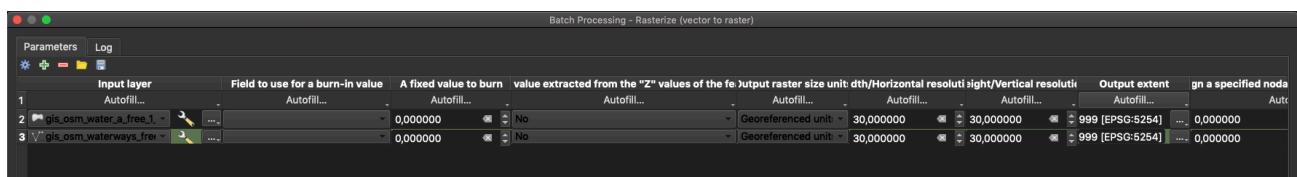
As those steps are done, finally, clip step has become. All out of boundary data will be clipped from the boundary.



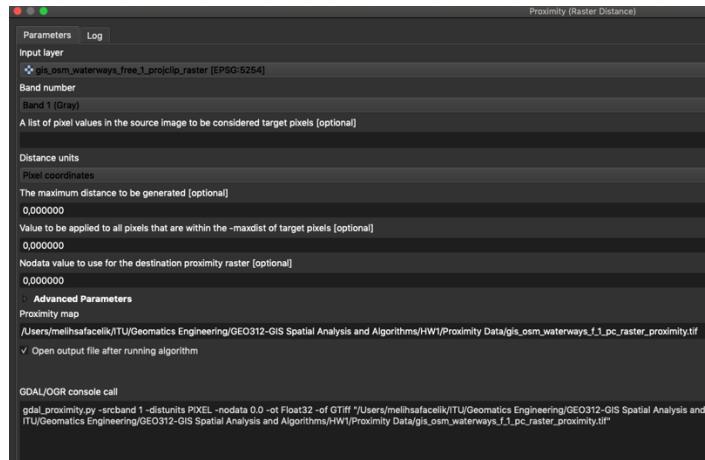
After executing the tool, all out of boundary data is deleted from both on the map and the attribute tables.



Rasterize process is applied to the waterways and the water bodies class. It can be defined as a vector to raster step.

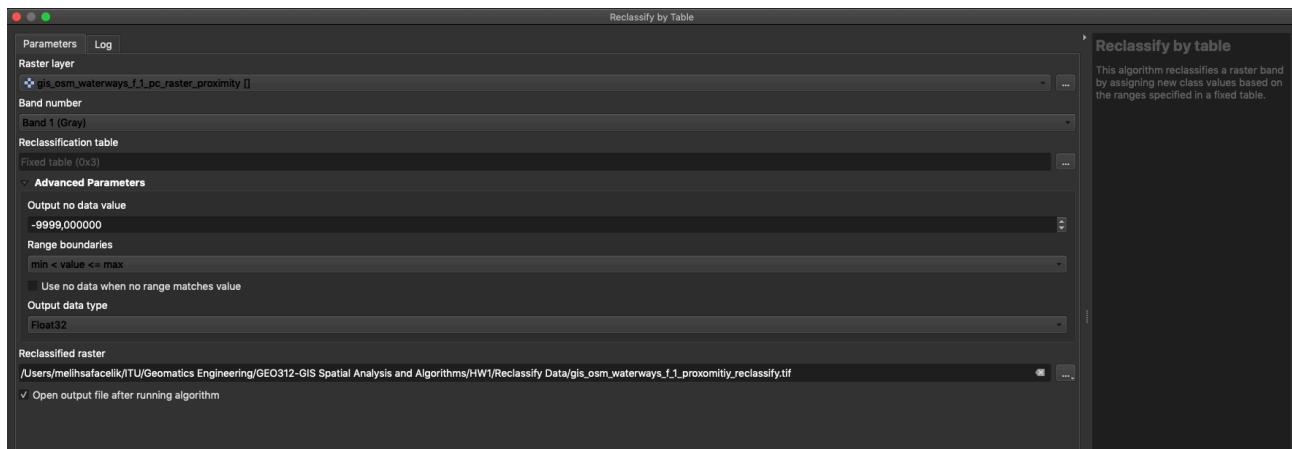


After, proximity step which is called as raster distance too, is applied to the waterways and water bodies products seperately.



Proximity step result of the water bodies can be seen above. Also, proximity raster of waterways can be found in the project folders. Furthermore, reclassification is done to the water ways and the water bodies data.

Reclassification table		
	Minimum	Maximum
1	0	250
2	250	500
3	500	1000
4	1000	2500
5	2500	

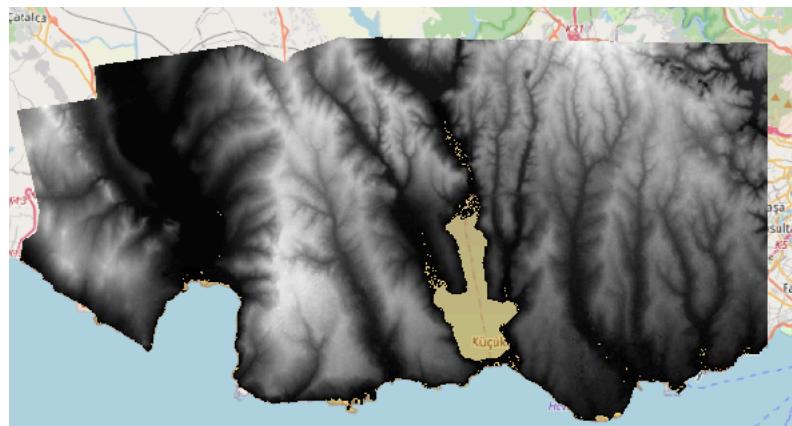


At above, waterways reclassification can be found. At below, reclassification will be applied to the water bodies.



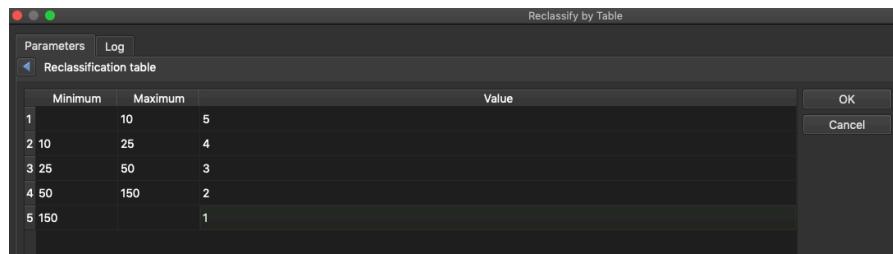


Finally at the above, water bodies reclassification can be found. Moreover on the project, as the next steps, Digital Elevation Model (DEM) data is downloaded from the USGS. Like the previous OSM data, also the out of boundary DEM data is clipped according to the project boundary. Additionally, it is reprojected by warping the DEM data with the QGIS “Warp” tool.

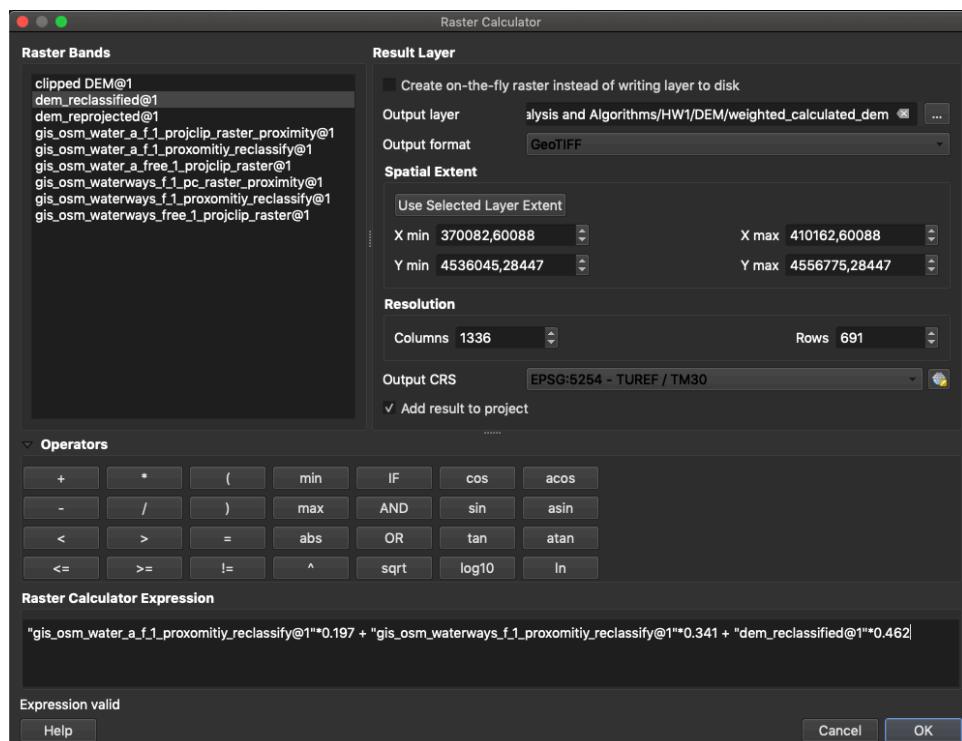


After, DEM data is reclassified according to the given specs which can be found below.



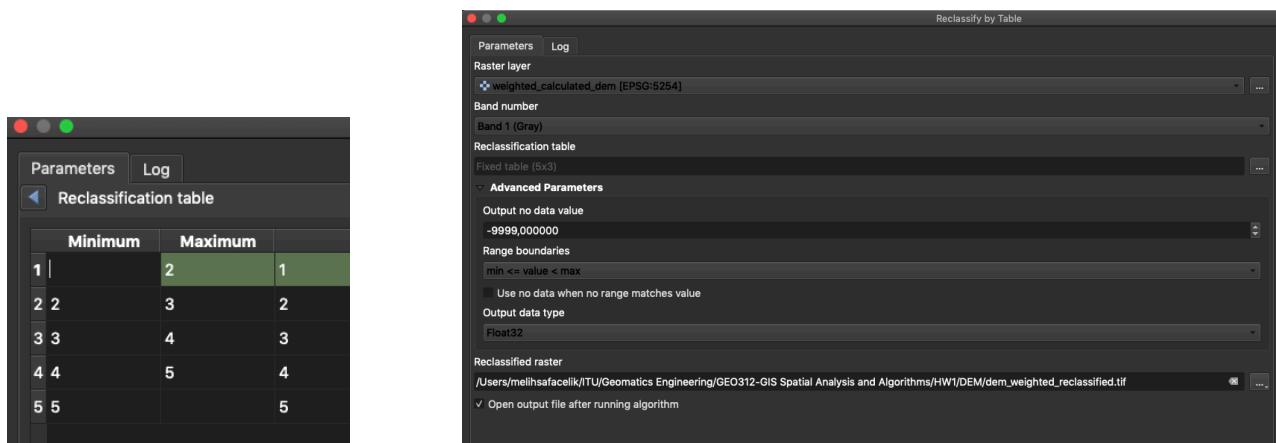


After, 3 data such as water bodies proximity reclassified, waterways proximity reclassified and the DEM reclassified, are considered to do a merge process. In the manner of merging those 3 data, “Raster Calculator” tool is used.





After that, weighted data is reclassified again with the previously given parameters.

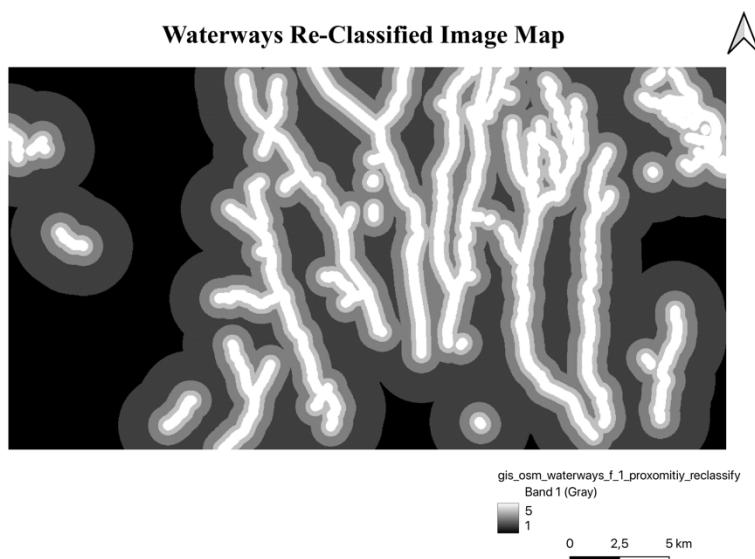
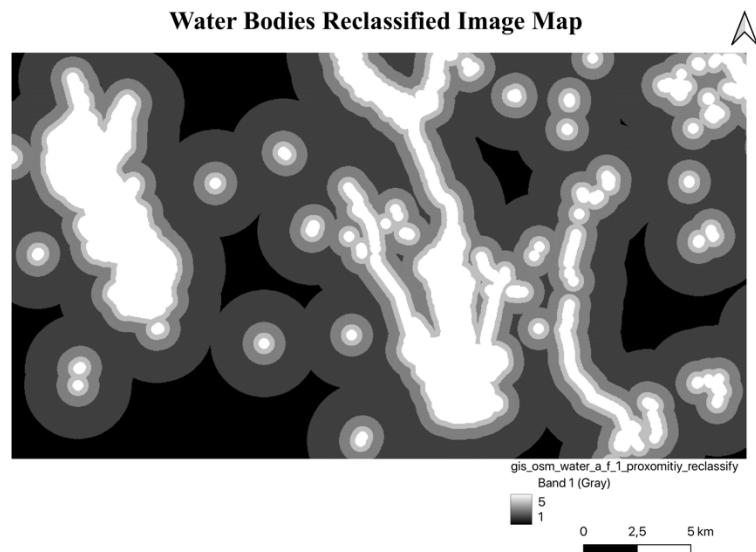


Weighted reclassified DEM image is created.

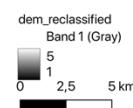


## RESULTS

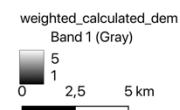
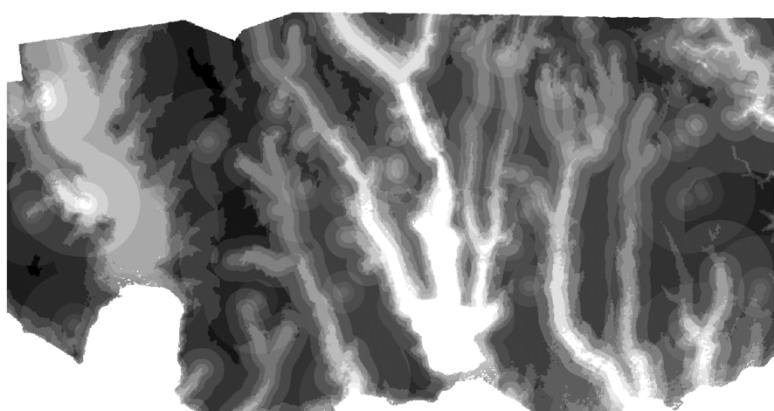
As the results, output products are created again as maps. These maps can be found as PDF files in the project folder and also will be discussed below.



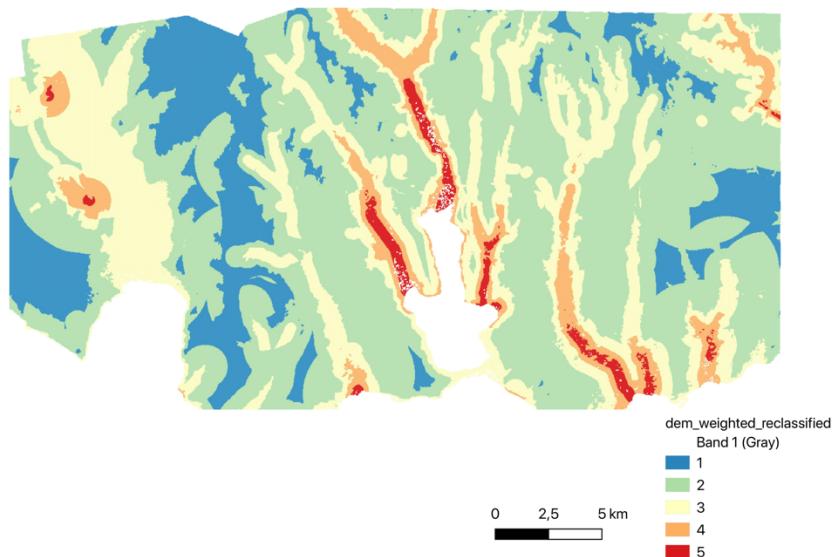
DEM Re-Classified Image Map



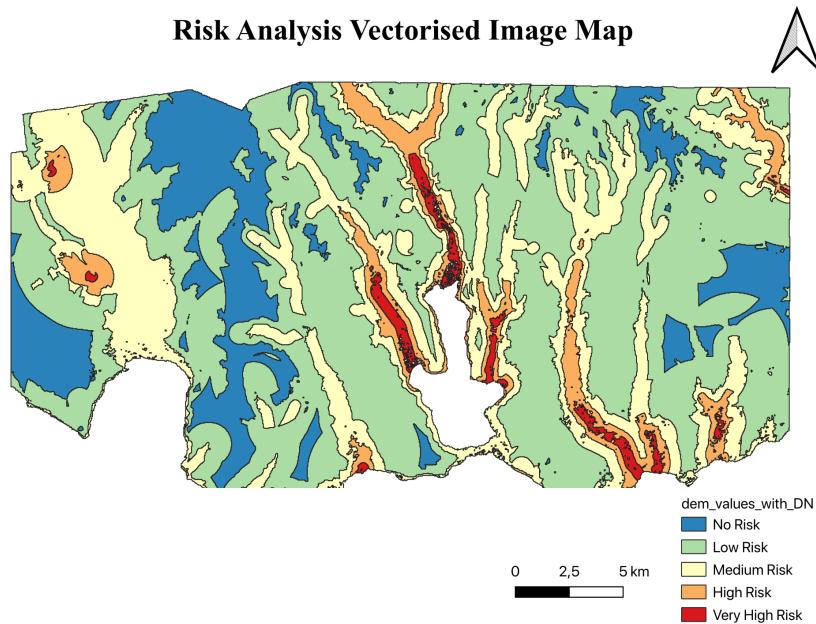
Weighted DEM Image Map



Weighted DEM Re-Classified Image Map



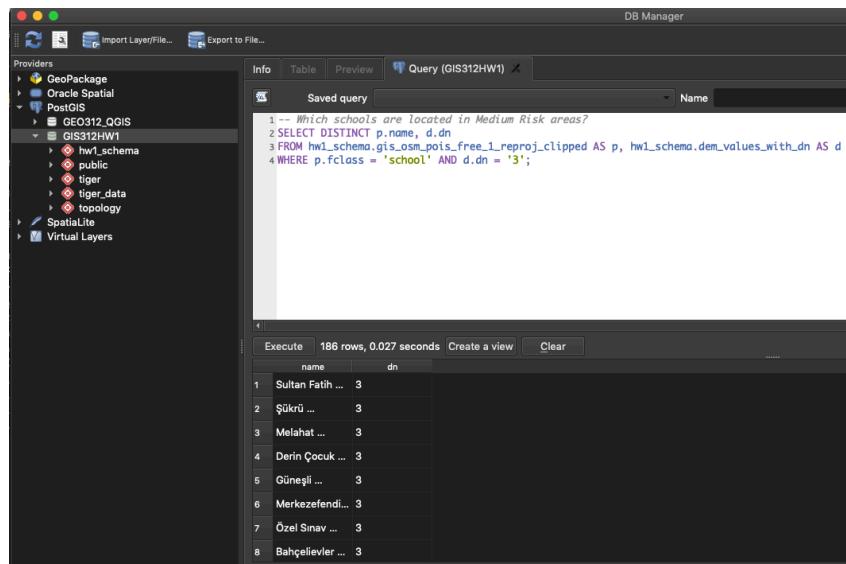
Risk Analysis Vectorised Image Map



There are 2 query which should be provided and developed by us. Furthermore, these SQL queries are developed in the PostGIS environment and can be seen below. Both of the geopackages of the queries can be found in the project folder.

1. Which schools are located in Medium Risk areas?

```
SELECT DISTINCT p.name, d.dn
FROM hw1_schema.gis_osm_pois_free_1_reproj_clipped AS p,
hw1_schema.dem_values_with_dn AS d
WHERE p.fclass = 'school' AND d.dn = '3';
```

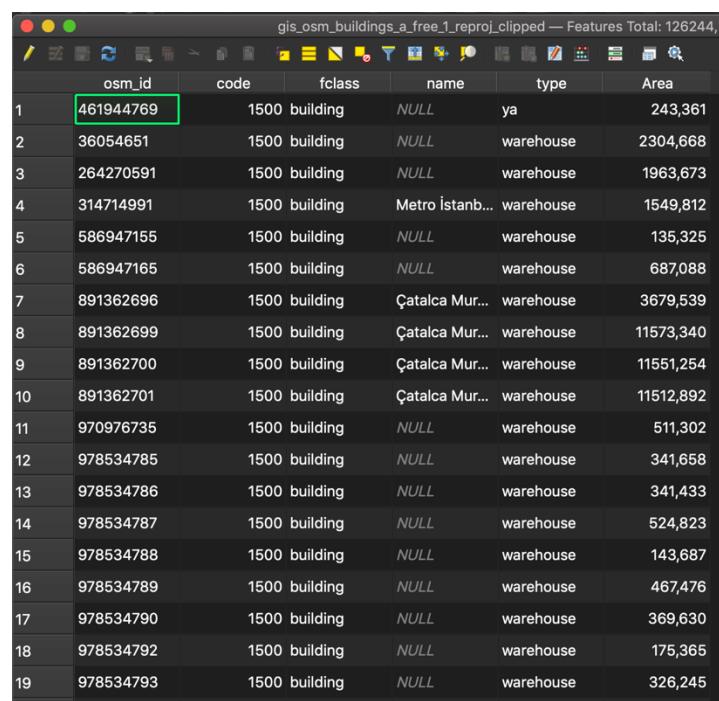


The screenshot shows the DB Manager interface with the following details:

- Providers:** GeoPackage, Oracle Spatial, PostGIS, GEO312\_QGIS, GIS312HW1, hw1\_schema, public, tiger, tiger\_data, topology, Spatialite, Virtual Layers.
- Query (GIS312HW1):**

```
1 -- Which schools are located in Medium Risk areas?
2 SELECT DISTINCT p.name, d.dn
3 FROM hw1_schema.gis_osm_pois_free_1_reproj_clipped AS p, hw1_schema.dem_values_with_dn AS d
4 WHERE p.fclass = 'school' AND d.dn = '3';
```
- Results:** 186 rows, 0.027 seconds. The results table shows the following data:

	name	dn
1	Sultan Fatih ...	3
2	Şükrü ...	3
3	Melahat ...	3
4	Derin Çocuk ...	3
5	Güneşli ...	3
6	Merkezefendi...	3
7	Özel Sınav ...	3
8	Bahçelievler ...	3

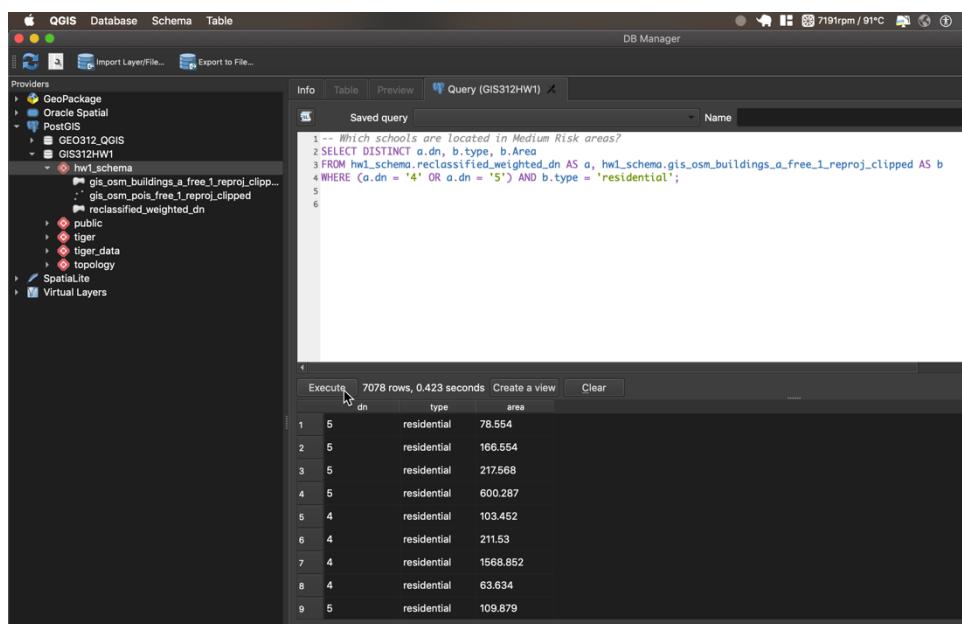
The screenshot shows a QGIS table view with the following details:

- Layer:** gis\_osm\_buildings\_a\_free\_1\_reproj\_clipped — Features Total: 126244, F
- Table Headers:** osm\_id, code, fclass, name, type, Area
- Data:** A list of 19 building features with fclass 1500, including their IDs, codes, names, types, and areas. The first row (osm\_id 461944769) is highlighted.

	osm_id	code	fclass	name	type	Area	
1	461944769		1500	building	NULL	ya	243,361
2	36054651		1500	building	NULL	warehouse	2304,668
3	264270591		1500	building	NULL	warehouse	1963,673
4	314714991		1500	building	Metro İstanbul...	warehouse	1549,812
5	586947155		1500	building	NULL	warehouse	135,325
6	586947165		1500	building	NULL	warehouse	687,088
7	891362696		1500	building	Çatalca Mur...	warehouse	3679,539
8	891362699		1500	building	Çatalca Mur...	warehouse	11573,340
9	891362700		1500	building	Çatalca Mur...	warehouse	11551,254
10	891362701		1500	building	Çatalca Mur...	warehouse	11512,892
11	970976735		1500	building	NULL	warehouse	511,302
12	978534785		1500	building	NULL	warehouse	341,658
13	978534786		1500	building	NULL	warehouse	341,433
14	978534787		1500	building	NULL	warehouse	524,823
15	978534788		1500	building	NULL	warehouse	143,687
16	978534789		1500	building	NULL	warehouse	467,476
17	978534790		1500	building	NULL	warehouse	369,630
18	978534792		1500	building	NULL	warehouse	175,365
19	978534793		1500	building	NULL	warehouse	326,245

2. What is the total area of residential areas intersected with High-Risk or Very High-Risk areas?

```
SELECT DISTINCT a.dn, b.type, b.Area
FROM hw1_schema.reclassified_weighted_dn AS a,
hw1_schema.gis_osm_buildings_a_free_1_reproj_clipped AS b
WHERE (a.dn = '4' OR a.dn = '5') AND b.type = 'residential';
```



The screenshot shows the QGIS DB Manager interface. On the left, the 'Providers' panel lists 'PostGIS' and 'hw1 schema'. The 'hw1 schema' provider contains tables like 'gis\_osm\_buildings\_a\_free\_1\_reproj\_clipped', 'gis\_osm\_pois\_free\_1\_reproj\_clipped', and 'reclassified\_weighted\_dn'. The central area shows a 'Query (GIS312HW1)' tab with the following SQL code:

```
1 -- Which schools are located in Medium Risk areas?
2 SELECT DISTINCT a.dn, b.type, b.Area
3 FROM hw1_schema.reclassified_weighted_dn AS a, hw1_schema.gis_osm_buildings_a_free_1_reproj_clipped AS b
4 WHERE (a.dn = '4' OR a.dn = '5') AND b.type = 'residential';
5
6
```

Below the code, the results are displayed in a table:

	dn	type	area
1	5	residential	78.554
2	5	residential	166.554
3	5	residential	217.568
4	5	residential	600.287
5	4	residential	103.452
6	4	residential	211.53
7	4	residential	1568.852
8	4	residential	63.634
9	5	residential	109.879