

Introduction to QGIS: Week 2

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Road Map

- Last week
 - Worked with vector data
 - Created our first map
- Today
 - Vector and raster data
 - A little geospatial analysis

Raster Data: Geography

- Divide study area into squares of the same size
- To determine the location of a square, we only need:
 - The coordinates of the upper left square
 - The size of the squares
 - The position of the square in the raster

Raster Data: Values

- Baseline version: Every square can hold one value
 - E.g.: Temperature, rainfall, elevation
- Multiband version: Every square can hold multiple values
 - E.g.: Satellite image (red, green, blue)

Exercise for Today

- We know how many people live in each Swiss city
- However, administrative boundaries are determined by history and politics
- For one municipality, its boundaries might contain just the core of the urban area, while for another one, they might include thinly populated areas that are almost on the countryside
- Ask a simplified question: How many people live in the 5km around each of the biggest Swiss cities?

Shapefile of Swiss Communes

- Downloaded from <https://www.swisstopo.admin.ch/fr/geodata/landscape/boundaries3d.html> (17.10.2022)
- Contains boundaries of municipalities with some descriptive variables
- This and other data from the Swiss government can be found at <https://opendata.swiss/fr> (last accessed: 17.10.2022)
- On moodle: folder *Swiss Municipalities*

In the original shapefile, Lausanne and Luzern are split into two parts. To do the analysis correctly we would need to merge them, e.g. using Dissolve (by name)

Recap of Last Week

Please try for yourself:

1. Download the city shapefile from moodle
2. Import it into QGIS
3. What are the 12 Swiss communes with the largest number of inhabitants (variable: *EINWOHNERZ*)?
4. Use `Select Features by Value` to select these cities
5. Save them in a separate shapefile called *twelve_cities.shp*

Identifying a 5km “Doughnut” Around the Cities

1. Vector – > Geoprocessing Tools – > Buffer, choose *twelve_cities* as input layer and a 5km distance, hit Run
2. Vector – > Geoprocessing Tools – > Difference, output from above as input layer, *twelve_cities* as Overlay layer
3. Save as *doghnuts.shp*

If, at some point, you encounter an error message about invalid geometries: try running `Fix geometries`

Population Data

- Raster file, 100m × 100m tiles
- From the *Global Human Settlement Layer* project of the European Commission
- Downloaded at <https://ghsl.jrc.ec.europa.eu/download.php?ds=pop> (17.10.2022)
- On moodle: *raster_population.tif*

Symbology

- To be able to see something, need to change the symbology
- Right-click on the layer – > Properties – > Symbology
– > Min / Max Value Settings – > tick Mean +/-
standard deviation
- This is not a photo, the raster will look different depending on the symbology

Reduce Size

- Our study area is much smaller than the raster
- Keeping the large raster will result in a long computation time
- Use `Clip Raster by Extent`. As *Clipping extent* choose `Calculate from Layer` and the layer that defines our study area (*doughnuts* in this case)

Which Raster Cells Are in Each of Our Suburb-Doughnuts?

1. Convert raster data to point (vector data) by running Raster pixels to points
2. Run a spatial join

Spatial Joins

- Very useful GIS operation
- Relates different layers to each other by their location
- You can use different rules for the relation: intersects, contains, touches, etc.
- In QGIS: `Join Attributes by Location`

Spatial Join: Our Example

- Use Join Attributes by Location (Summary)
- Base layer: the polygons (our doughnuts)
- Join layer: the points
- Intersects
- Summaries to calculate: count (number of points), sum (total population), mean (population density)

There Must Be an Easier Way to Achieve This

There is: Zonal statistics

Plugins

- Many useful plugins can be installed
- Plugins – > Manage and Install Plugins
- Try: *QuickMapServices*