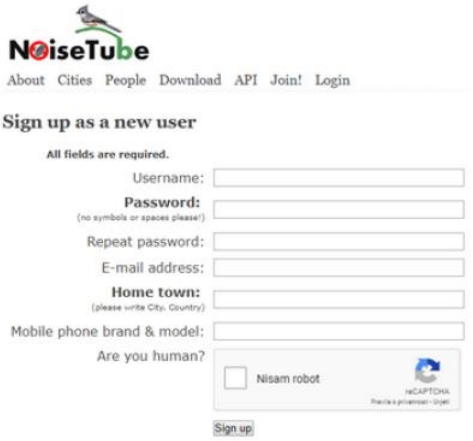
VISUALIZATION OF NOISE LEVEL MEASUREMENT DATA

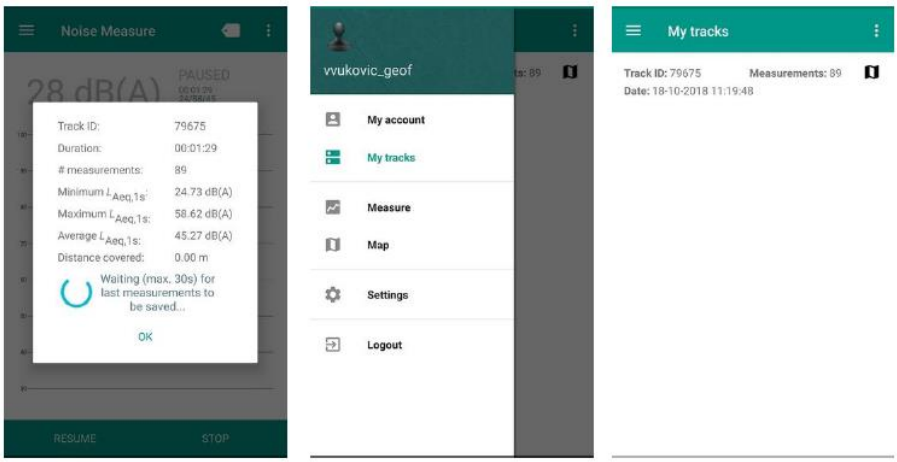
Instructions for collecting and retrieving measurement data

1. Register on www.noisetube.net



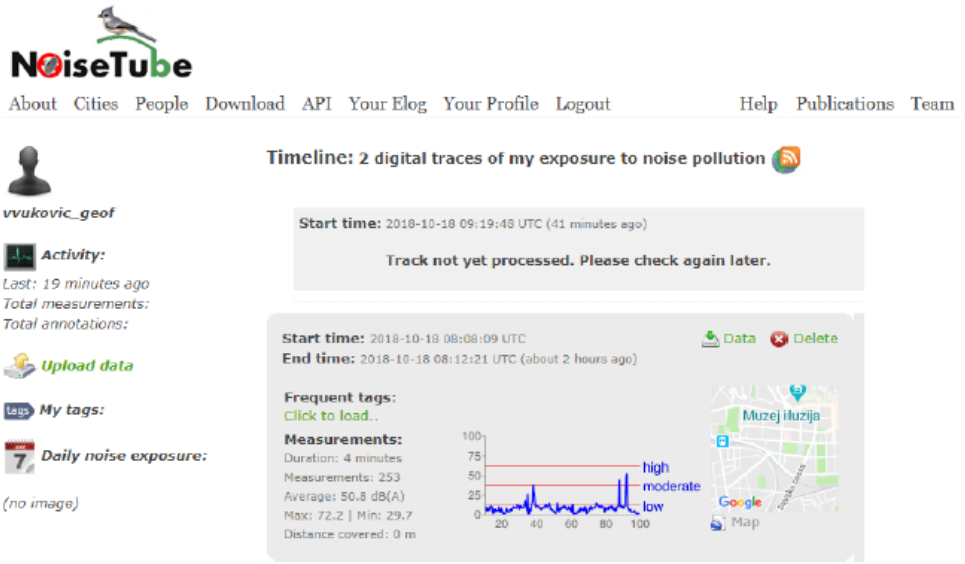
2. Download the NoiseTube Mobile app to your mobile phone. You log in to the application with the data used during registration.

3. Data collection using the NoiseTube application:
   - Before collecting data, it is necessary to enable the measurement to be downloaded to the mobile device, to the NoiseTube server and to enable the application to use the GPS location in the settings of the mobile application.
   - The estimated time for collecting measurement data is about 180 minutes. The application registers the measurement every 1 second. Each student should collect about 10,000 measurements for their area.
   - The recommendation for the duration of one measurement session is 10-15 minutes. Then stop the measurement, wait for it to be saved, and start a new measurement. If the measurements are saved correctly, it will be displayed in the app under *My tracks*.



- Measurements should be collected on weekdays in the morning and afternoon or evening intervals, always for the same period (e.g. measured in the morning from 8 am to 10 am, in the afternoon from 4 pm to 6 pm). Choose the measurement period arbitrarily because it depends on your free time but follow the instructions.

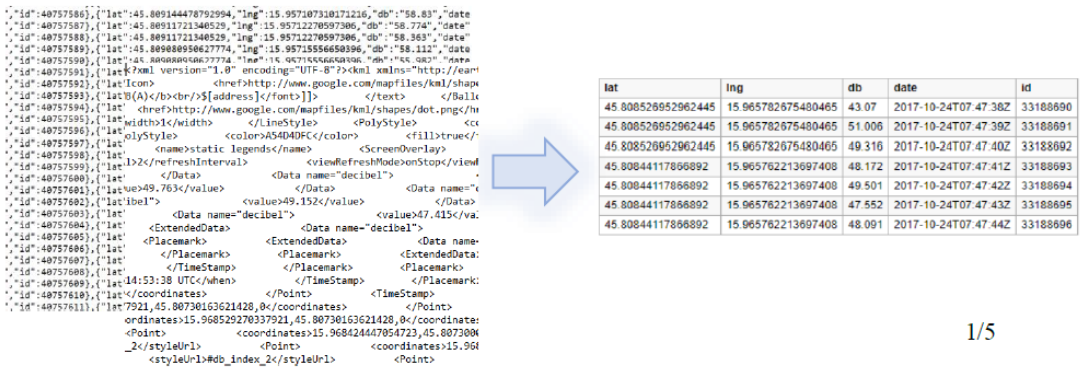
4. All measurements are publicly available at www.noisetube.net within 24 hours. The *Your Elog* menu contains data that needs to be downloaded in .kml format.



If the measurements do not appear on the specified page, you can find them stored in the phone's memory in .xml format.
During the measurement, the following data were recorded: noise level in decibels, geographical coordinates in the WGS84 reference coordinate system and the date and time of the measurement.

Instructions for processing measurement data and creating a cartographic display in QGIS

Data downloaded in .kml format cannot be processed in QGIS - it needs to be converted to .csv format. Data conversion is possible by "editing" in Notepad or using an online converter http://konklone.io/json/ or https://www.convertcsv.com/kml-to-csv.html (Figure 1).



lat	lng	db	date	id
45.808526952962445	15.965782675480465	43.07	2017-10-24T07:47:38Z	33188690
45.808526952962445	15.965782675480465	51.006	2017-10-24T07:47:39Z	33188691
45.808526952962445	15.965782675480465	49.316	2017-10-24T07:47:40Z	33188692
45.80844117866892	15.965762213697408	48.172	2017-10-24T07:47:41Z	33188693
45.80844117866892	15.965762213697408	49.501	2017-10-24T07:47:42Z	33188694
45.80844117866892	15.965762213697408	47.552	2017-10-24T07:47:43Z	33188695
45.80844117866892	15.965762213697408	48.091	2017-10-24T07:47:44Z	33188696

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Figure 1. Online converter from GeoJSON to CSV

Note: If invalid measurements appear in the data set, they must be dropped before entering them in the program (e.g. no coordinates were recorded, high value of db was recorded, etc.).

1. <u>Loading digital orthophoto map in QGIS</u>

   A list of spatial services of the city of Zagreb is available on the website https://geoportal.zagreb.hr/ProstorniServisi.aspx (*WMS – Web Map Service*).

   Copy the URL and create new connection with it in the new WMS layer. You can follow the path *Layer→Add layer→Add WMS/WMST layer*.

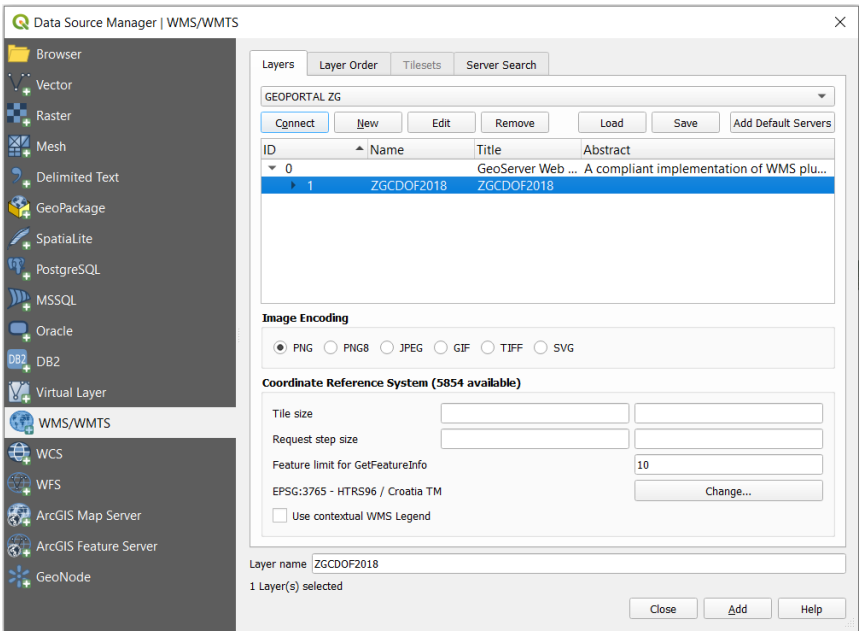

Figure 2. Add WMS layer window

2. <u>Loading measurement data in QGIS</u>

   Adding a new .csv layer with the measured data is enabled by the command *Layer→Add layer →AddDelimitedTextLayer*. Be aware that measured data is in WGS84 system!

   Note: import it in QGIS in WGS84 and then save the data in .shp layer in HTRS96/TM.

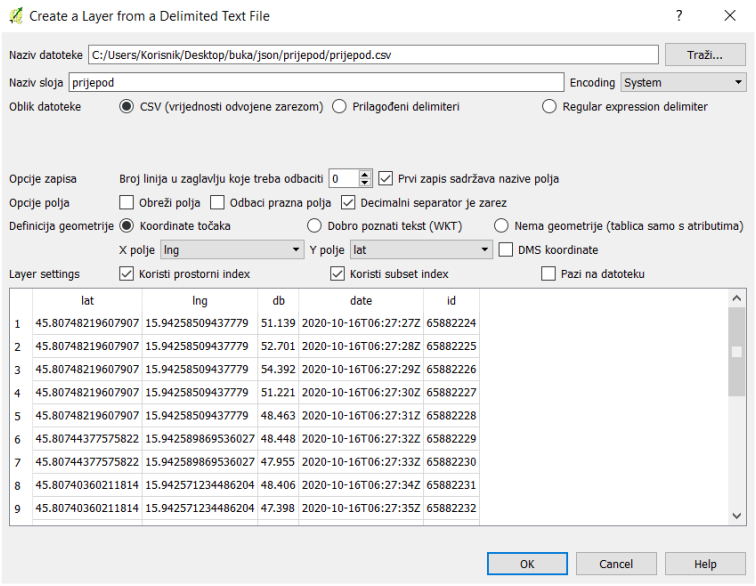

Figure 2. Display of the AddDelimitedTextLayer command window

3. <u>Classification of measurement data</u>

   The loaded data must be divided into classes and the corresponding color must be selected (Figure 4 and 5). The presentation obtained in this way must be presented in the technical report (Figure 6).

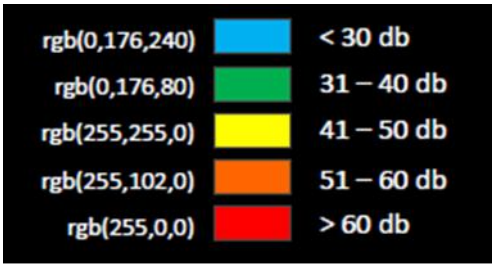

Figure 4. Classification groups of input data

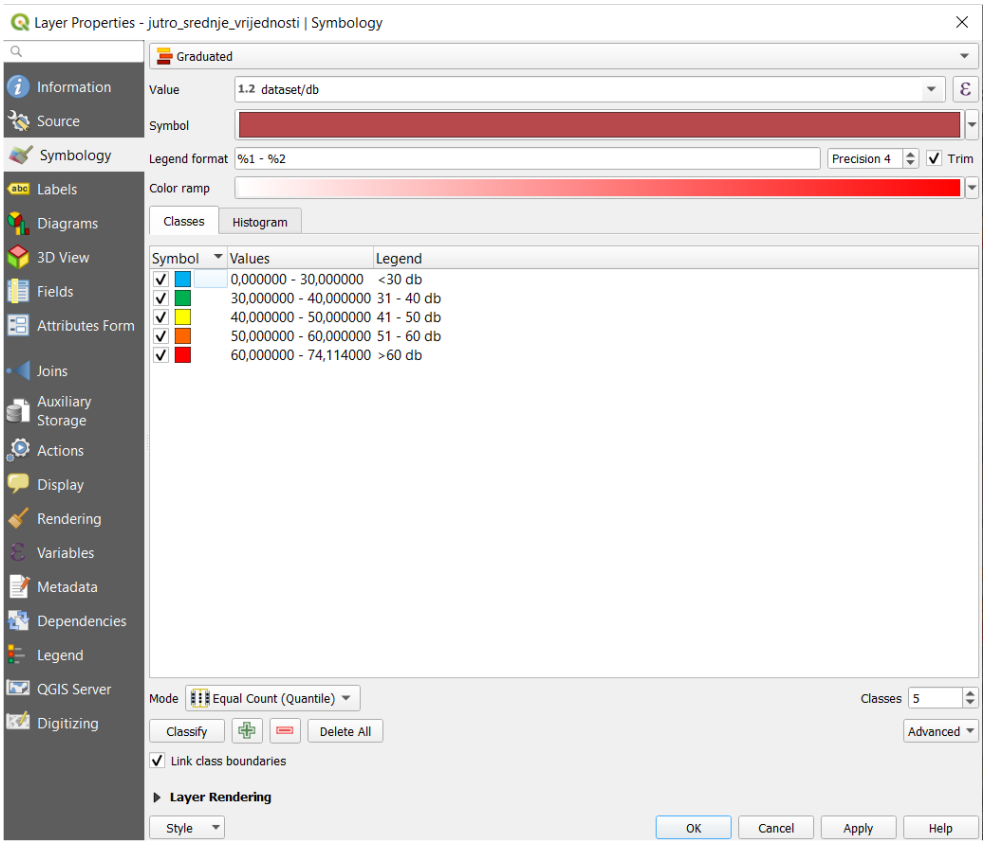

Figure 5. Data classification window

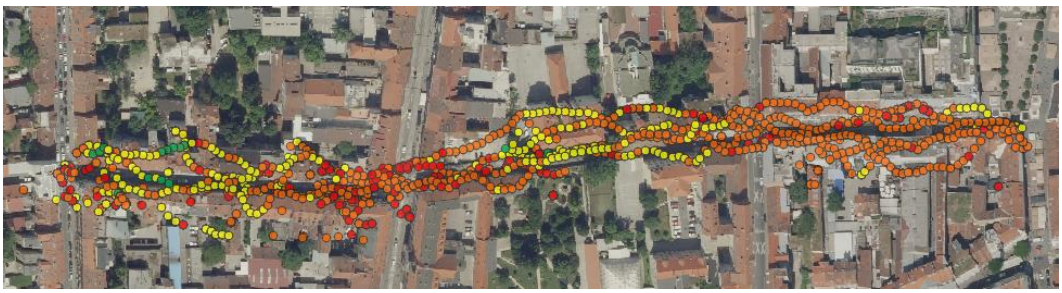

Figure 6. Classified measurement data shown on DOF

4. <u>Setting up a vector grid</u>

The measurement area should be covered by a vector grid (*Figure 7*) using the command *Vector→Research tools→Create grid*.

A vector grid is needed for further analysis, i.e. the cross-section of each polygon with measurement data. This way, data can be obtained such as the number of measurements in a particular square and the mean value of the measurements belonging to that square. The size and type of grid for raster interpolation is arbitrary and each student can adjust it to the display on

their project (e.g. a grid of squares with a side length of 2 meters, a grid of hexagons with a side length of 3 meters, etc.).
Note: Use transparency on the map to display the vector grid to identify the background.

Figure 7. Vector grid

5. <u>Classification of mean values of measurements</u>

a) The calculation of the mean value of the noise level can be performed using the command *Vector→Data management tools→Join attributes by location* (*Figure 8*).

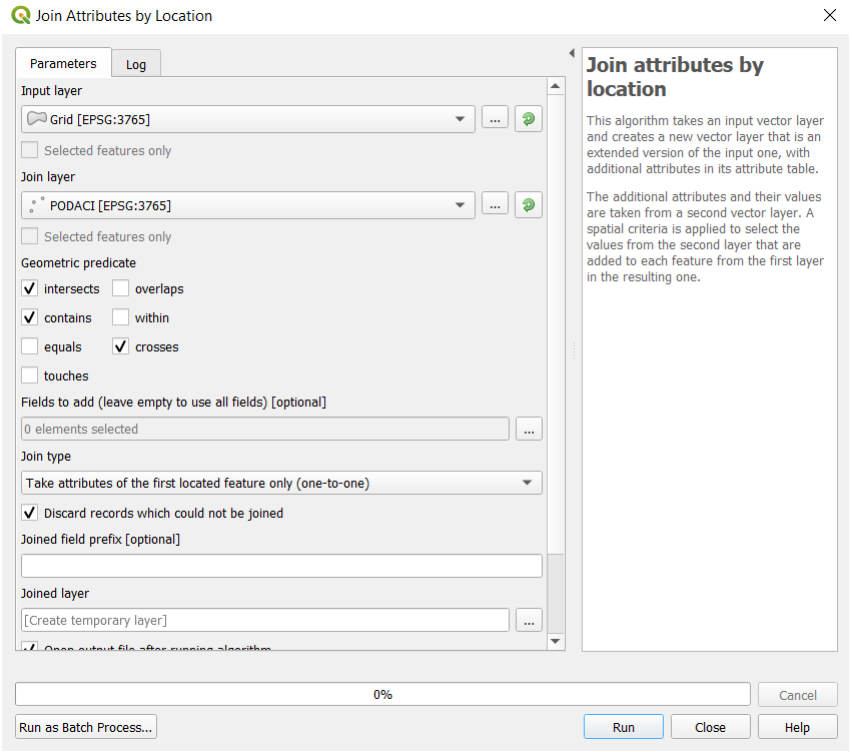

Figure 8. Join attributes by location

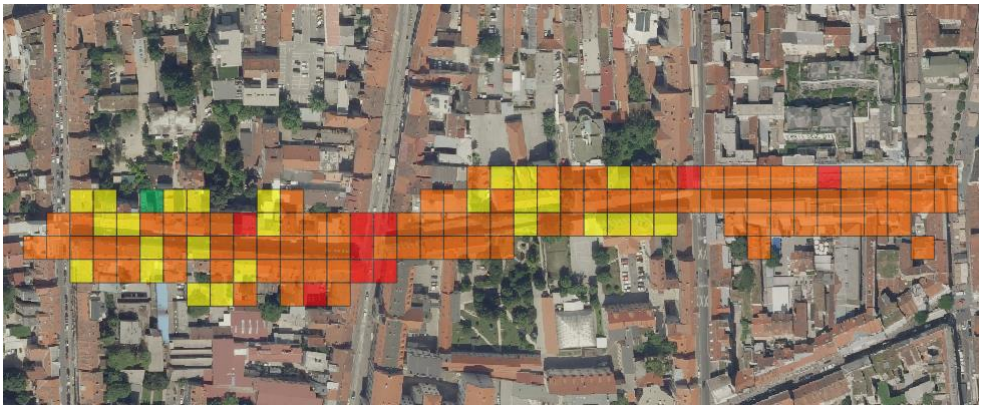

Figure 9. Classification of polygons according to mean values

b) One of the most common interpolation methods is IDW. In the Processing Toolbox search window it was necessary to enter "IDW interpolation “ (*Figure 9*).

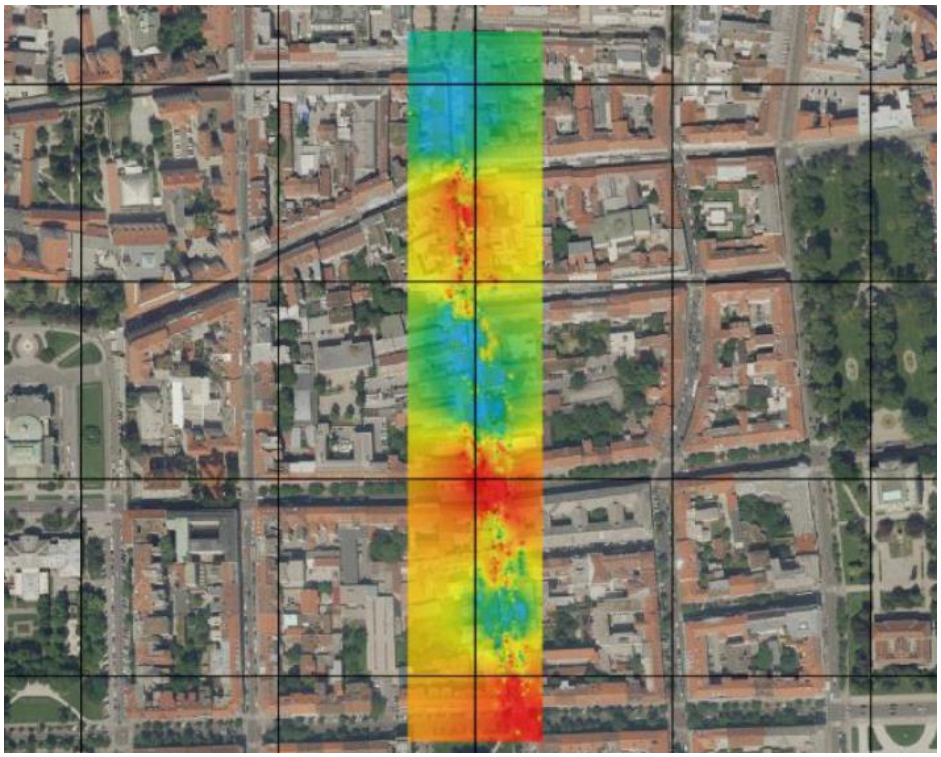

Figure 10. IDW interpolation

c) TIN interpolation

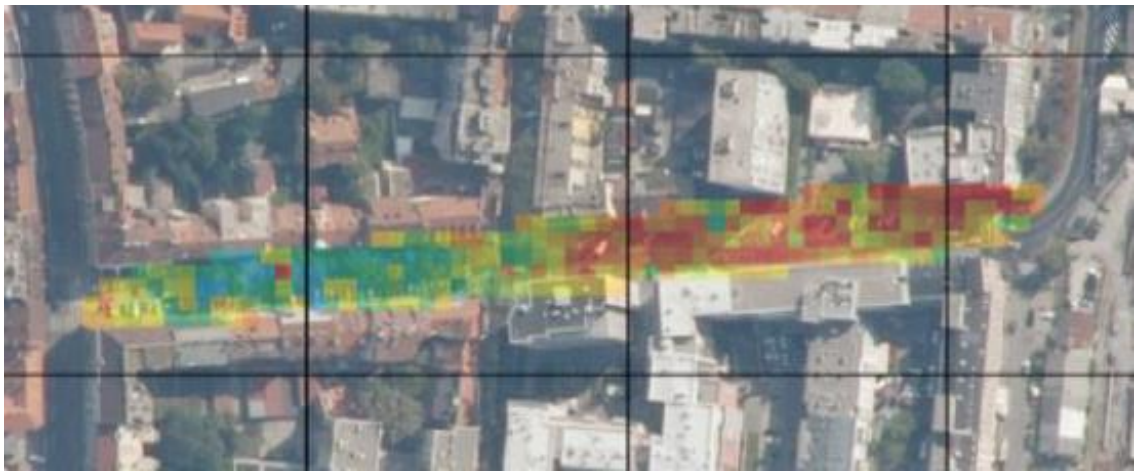

Figure 11. TIN interpolation

6. <u>Creating a map</u>

The map display is done in Map Composer. Process attention to the external content of the map!

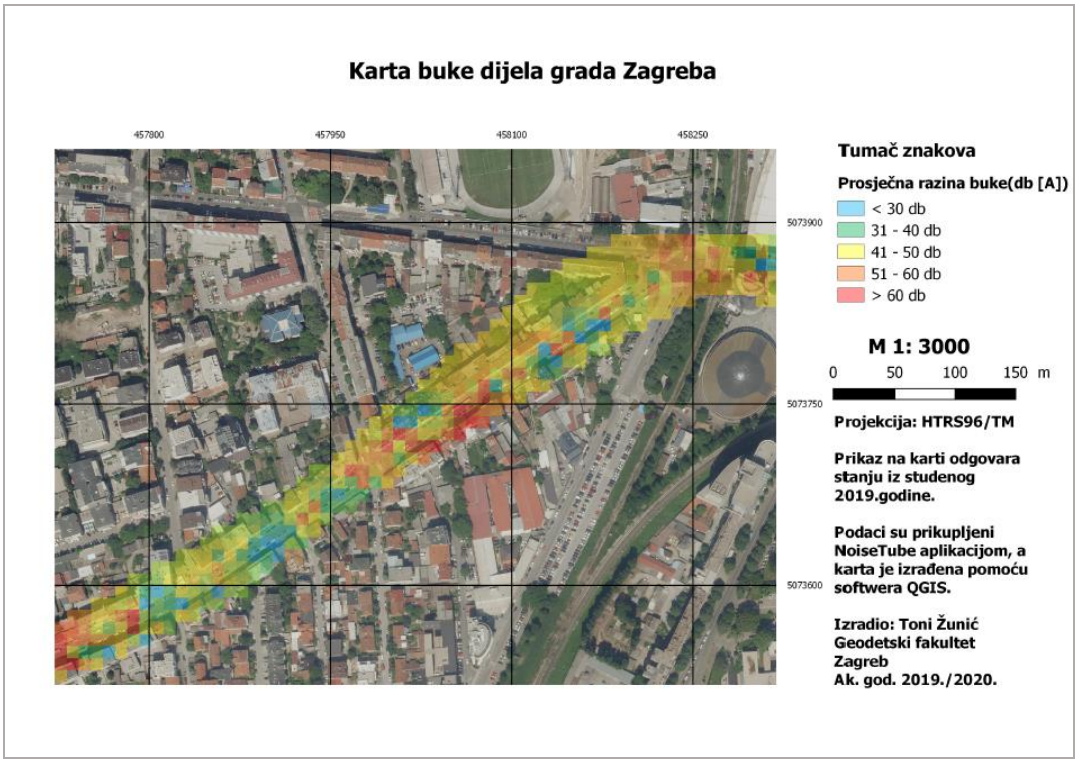

Figure 12. Noise map

Instructions for processing measurement data and creating a map in ArcGIS Online

Data downloaded in .kml format cannot be processed in ArcGIS - it needs to be converted to .csv format, GeoJSON, .gpx or .shp format.

Note: If invalid measurements appear in the data set, they must be dropped before entering them in the program (eg no coordinates are recorded, an extremely high db value is recorded, etc.).

1. Basemap

The Basemap provides the geographical background for the content you want to display on the map. When you create a map, you can choose which background you want to use (*Figure 12*). You can change the background at any time using the map background gallery or your own layer.

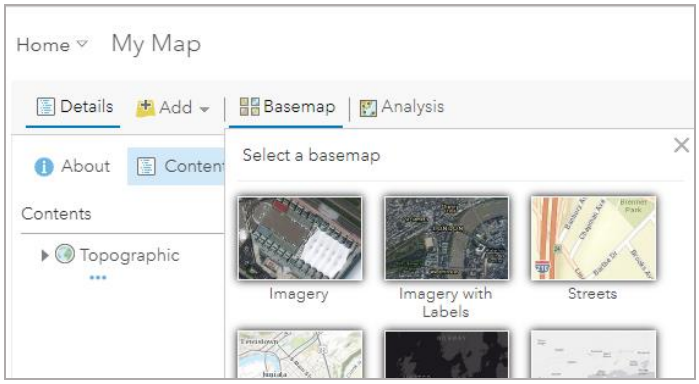

Figure 13. Gallery of available basic maps in ArcGIS Online

2. Upload measurement data to ArcGIS Online

The data can be loaded by selecting the command *Add→Add Layer From File*.

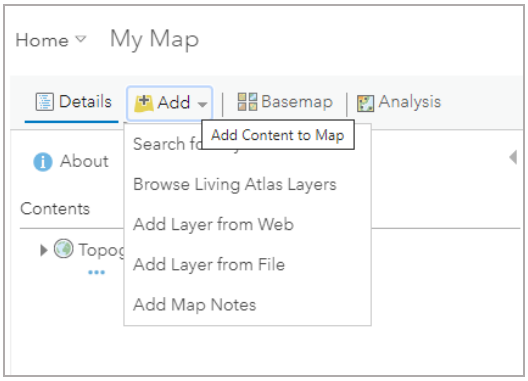

Figure 14. Data Load Menu in ArcGIS Online

3. Classification of measurement data

Loading data opens a layer style change menu. The relevant attribute (decibels) is selected first and then the appropriate data display style. The data should be divided into classes (*Figure 14*).

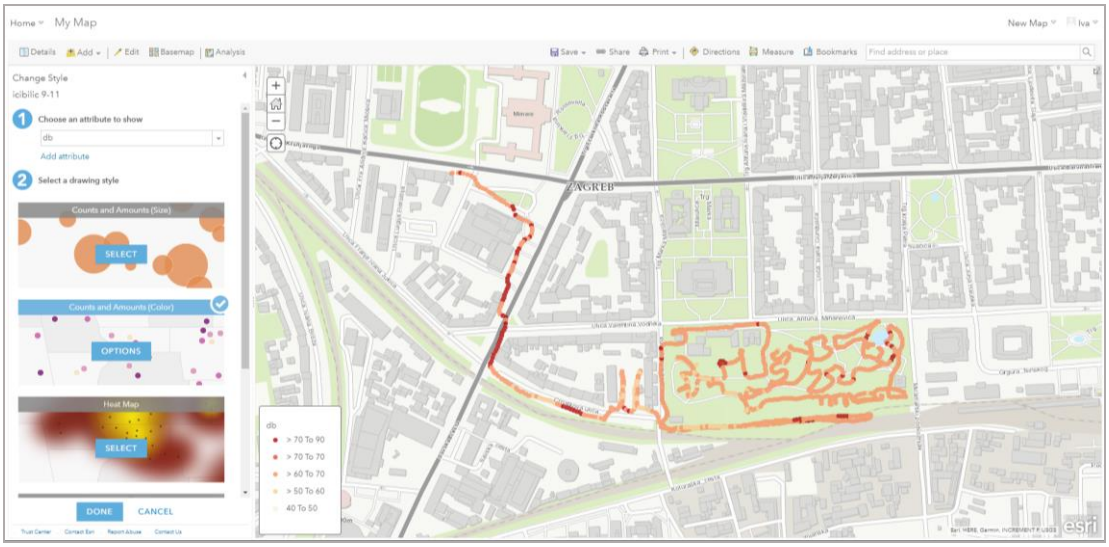

Figure 15. Loaded data layer settings

4. <u>Measurement interpolation</u>

The Analysis menu contains tools that are performed on the selected data. Among them is the *Interpolate points*.

Figure 16. Interpolation result in ArcGIS Online