



# BIRGIT

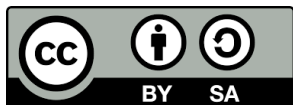
Extract 3D buildings from point clouds  
April 2025



Co-funded by  
the European Union

# Extract 3D buildings from point clouds

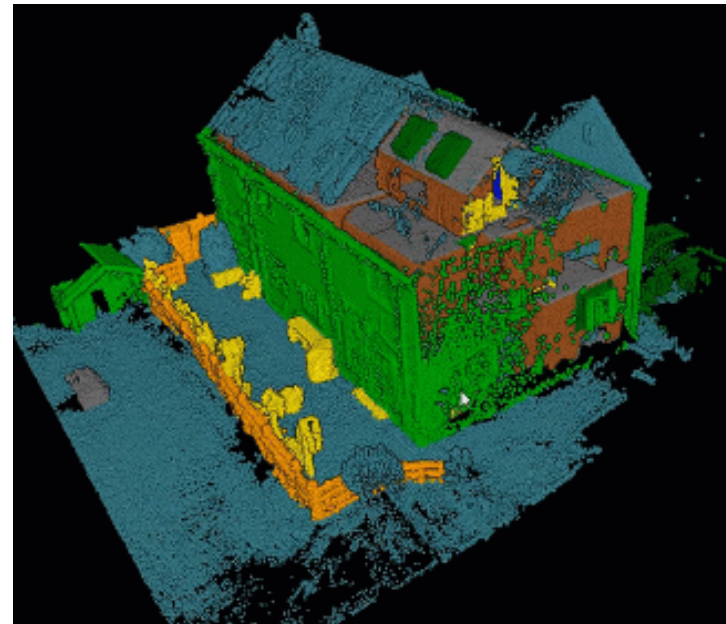
[vlado.cetl@unin.hr](mailto:vlado.cetl@unin.hr)  
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## Learning outcomes

- At the end of this module, the participant is expected to be able to
  - Identify and describe available 3D data sources that can be used for GIS and BIM
  - Experiment with external geodata in QGIS

- In 3D modeling, a point cloud is a set of data points in a 3D coordinate system – commonly known as the XYZ (or e.g. E, N, H) axes
- Each point represents a single spatial measurement on the object's surface
- Point clouds are most commonly generated using 3D laser scanners and LiDAR (light detection and ranging) technology and techniques.
- Point clouds can be also acquired with photogrammetry and total stations (tacheometry)



- Data Sources
  - 3D point clouds are usually available as datasets in spatial data infrastructures (in different formats e.g. LAS, LAZ, GeoTIFF, ASCII points, etc)
  - Openly available LiDAR data on the Internet is available in different formats, coordinate systems, and state of processing (from the cleaned point cloud data to the digital terrain model of the ground)
  - Some Open Data Sources:
    - INSPIRE Geoportal (INSPIRE Data Theme: Elevation)  
<https://inspire-geoportal.ec.europa.eu/>
    - Archaeology of Slovenia  
[https://arheologijaslovenija.blogspot.com/p/blog-page\\_81.html](https://arheologijaslovenija.blogspot.com/p/blog-page_81.html)
    - Zagreb Lidar sample data example (available for BIRGIT Project in the assignment data folder)

# QGIS

- <https://github.com/qgis/QGIS>

## Features

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### 1. Flexible and powerful spatial data management

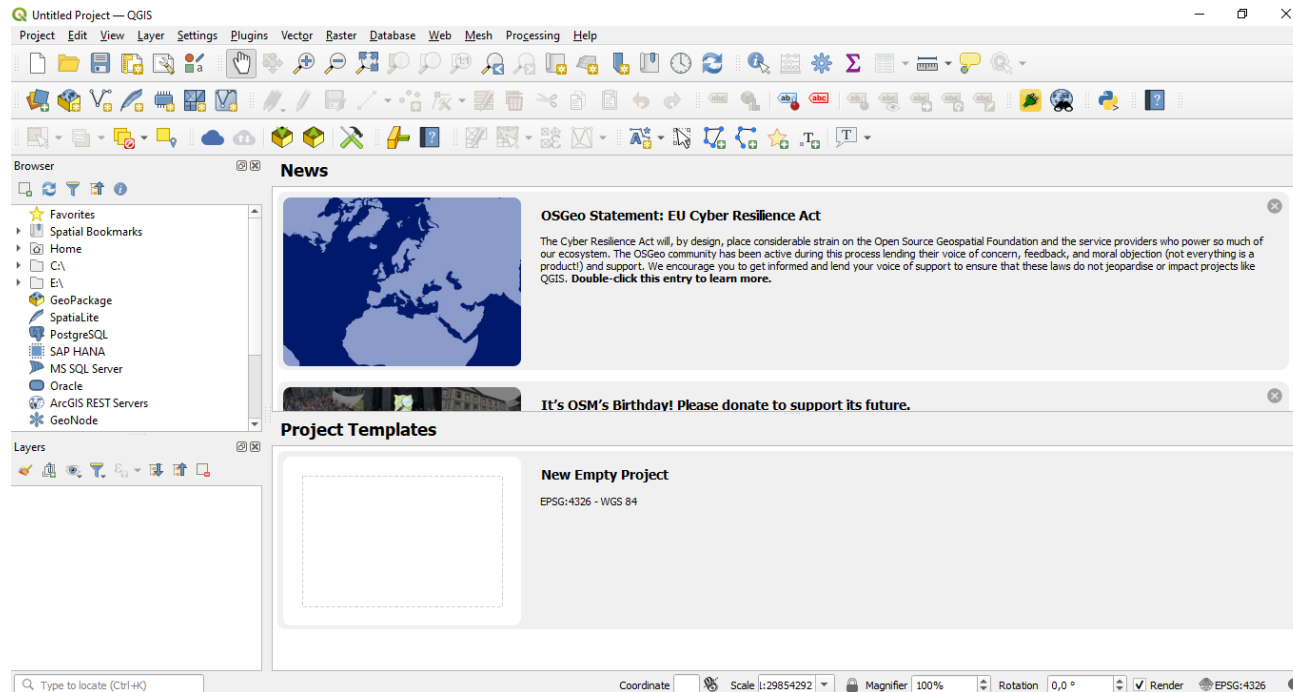
- Support for raster, vector, mesh, and point cloud data in a range of industry-standard formats
  - *Raster formats include:* GeoPackage, GeoTIFF, GRASS, ArcInfo binary and ASCII grids, ERDAS Imagine SDTS, WMS, WCS, PostgreSQL/PostGIS, and [other GDAL supported formats](#).
  - *Vector formats include:* GeoPackage, ESRI shapefiles, GRASS, SpatiaLite, PostgreSQL/PostGIS, MSSQL, Oracle, WFS, Vector Tiles and [other OGR supported formats](#).
  - *Mesh formats include:* NetCDF, GRIB, 2DM, and [other MDAL supported formats](#).
  - *Point-cloud format:* LAS/LAZ and EPT datasets.

## QGIS

- <https://github.com/qgis/QGIS>
- Data abstraction framework, with local files, spatial databases (PostGIS, SpatiaLite, SQL Server, Oracle, SAP HANA), and web services (WMS, WCS, WFS, ArcGIS REST) all accessed through a unified data model and browser interface, and as flexible layers in user-created projects
- Spatial data creation via visual and numerical digitizing and editing, as well as georeferencing of raster and vector data
- On-the-fly reprojection between coordinate reference systems (CRS)
- Nominatim (OpenStreetMap) geocoder access
- Temporal support

## QGIS (<https://qgis.org/en/site/>)

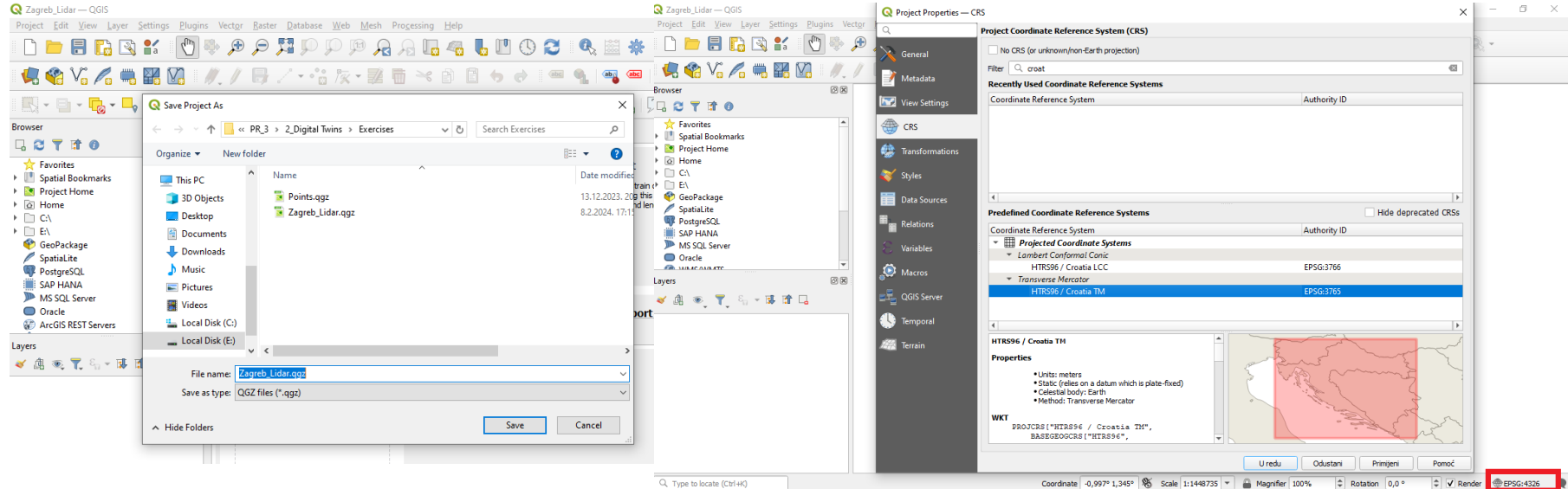
- Free, open-source software that allows users to create, edit, visualize, analyze, and publish geospatial information





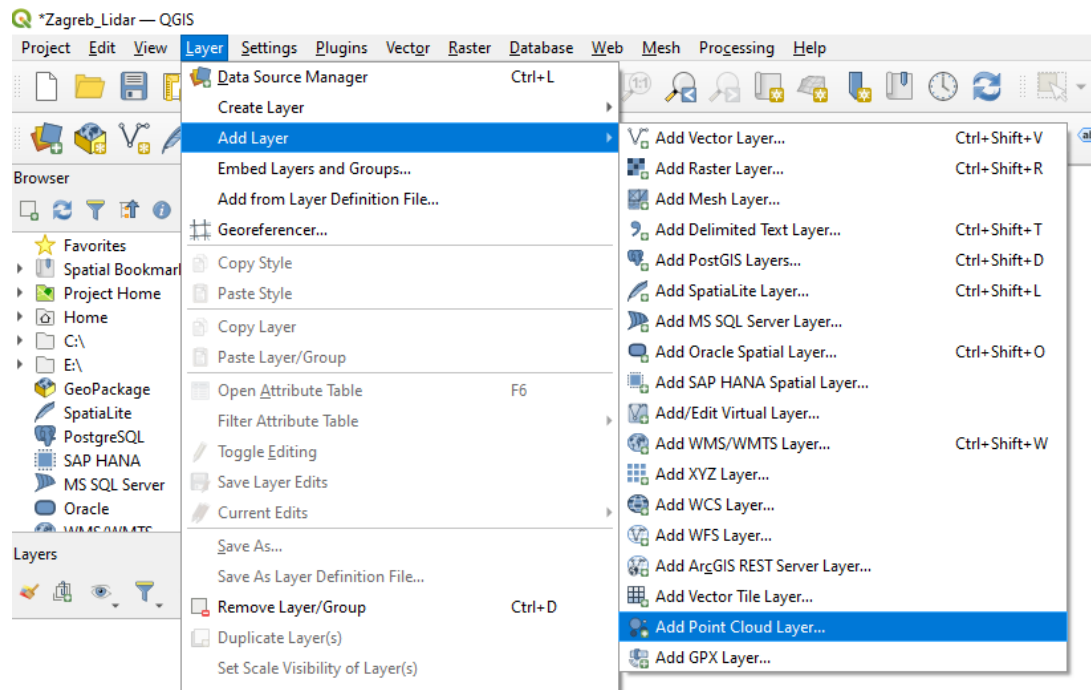
## QGIS (Version 3.28 Firenze or higher)

- Project (New Zagreb\_Lidar) and CRS definition (EPSG 3765 – HTRS96/ Croatia TM)



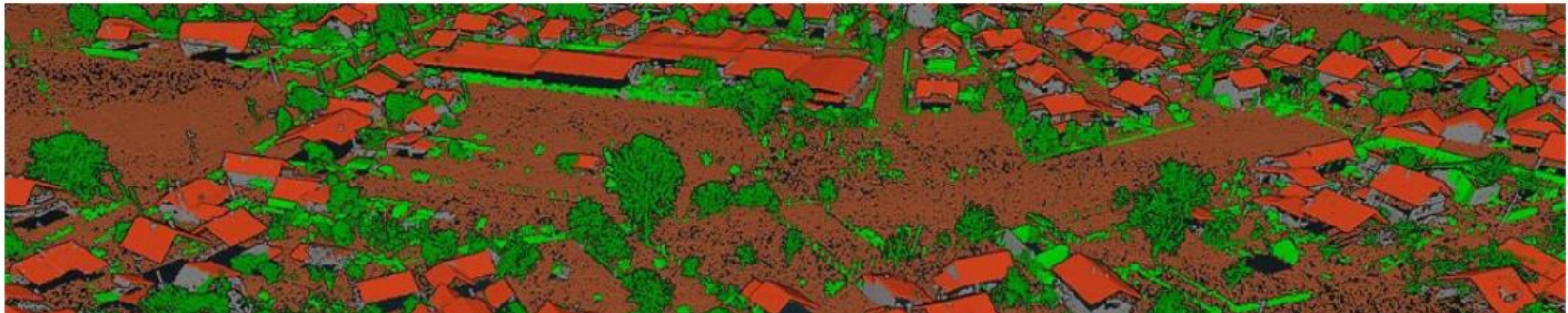
## QGIS

- Import Sample Data (Zagreb\_Lidar\_Example)

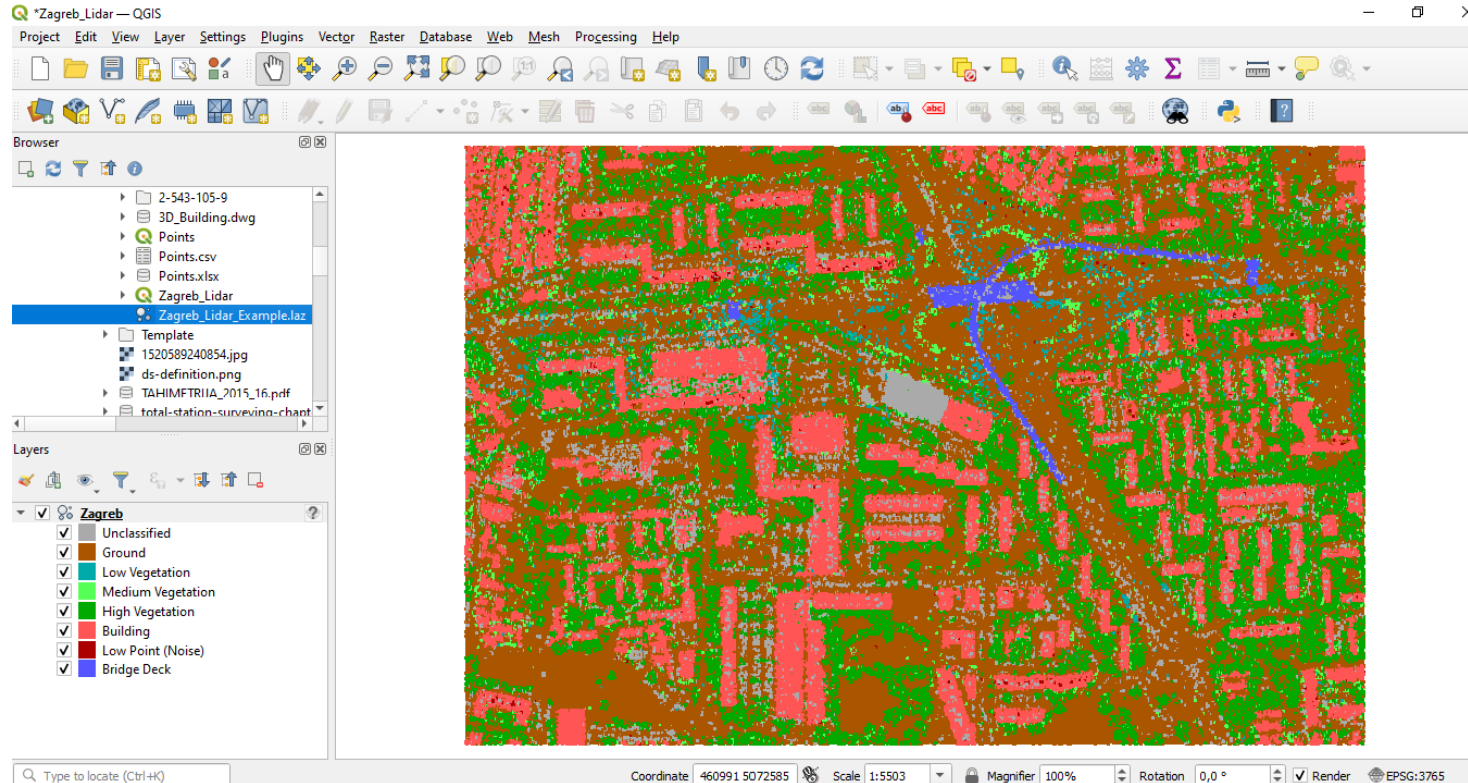


## Sample Exercise Data (Zagreb\_Lidar\_Example)

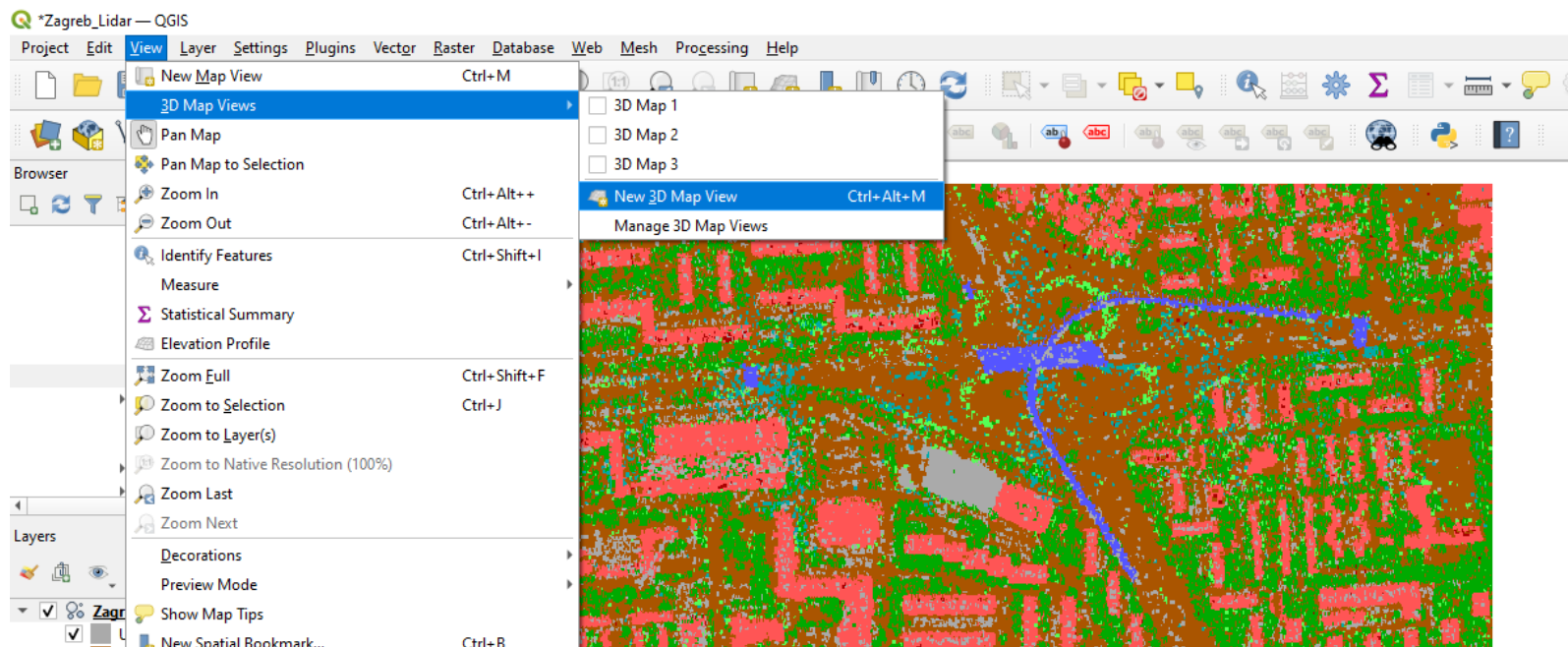
- File Description
  - aerial LiDAR surveying of the Republic of Croatia, namely:
    - 4 points/m<sup>2</sup> outside urban areas (~ 70% of the area)
    - 8 points/m<sup>2</sup> urban areas (~ 30% of the area)
    - 20 points/m<sup>2</sup> river and embankment corridors
  - aerial photogrammetric survey of the Republic of Croatia
    - spatial resolution GSD (Ground Sample Distance) 0.15 cm



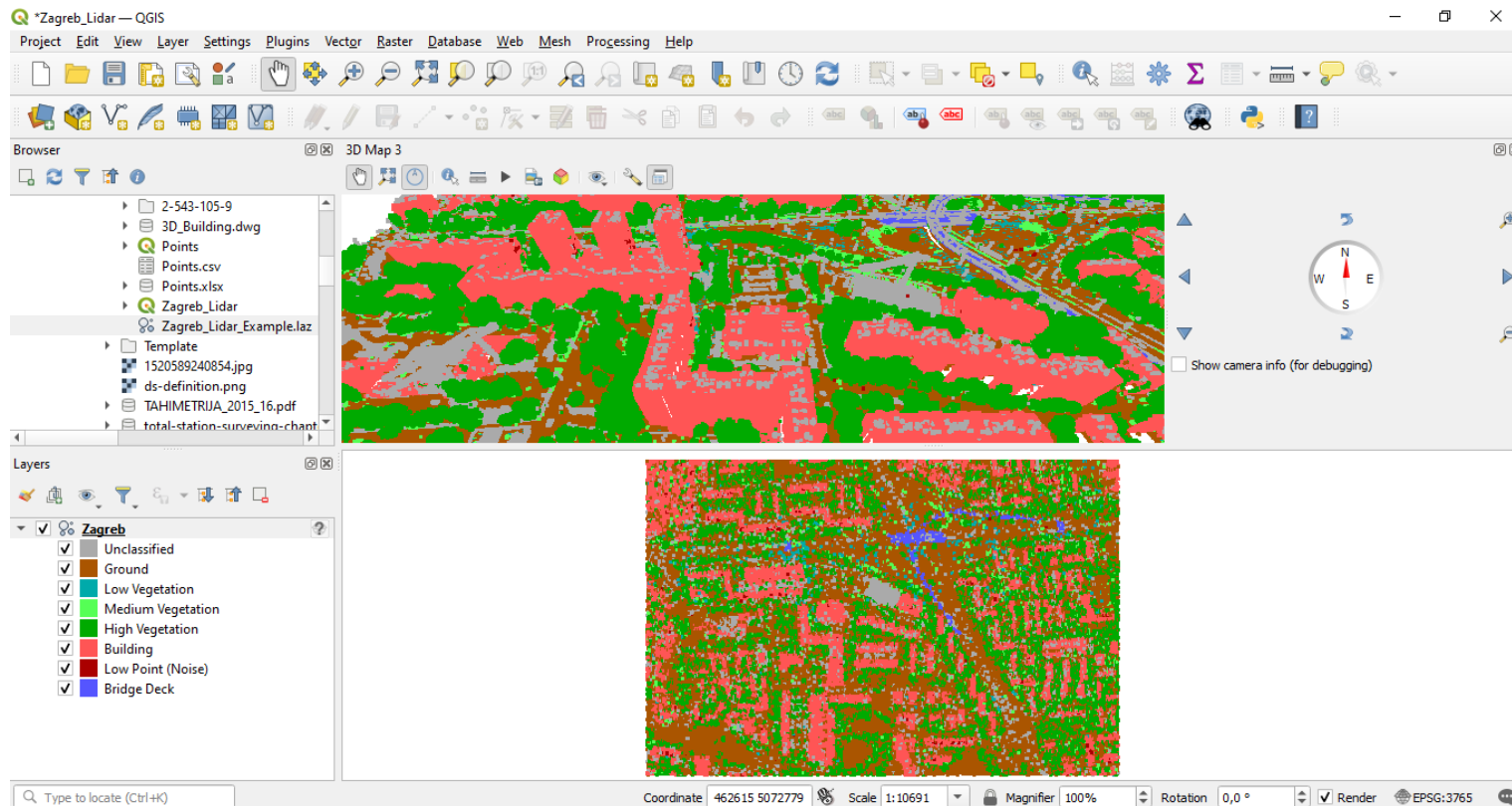
## QGIS - Import Sample Data (Zagreb\_Lidar\_Example – part of the city)



## QGIS - Visualization (Zagreb\_Lidar\_Example – part of the city)

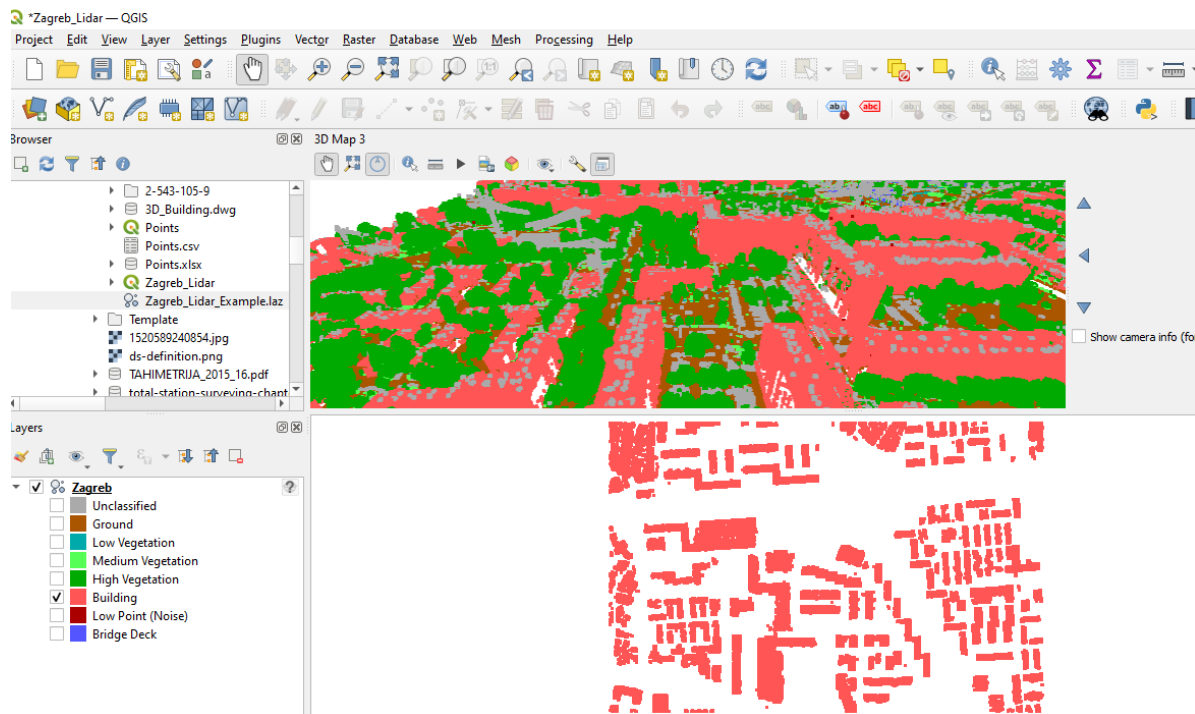
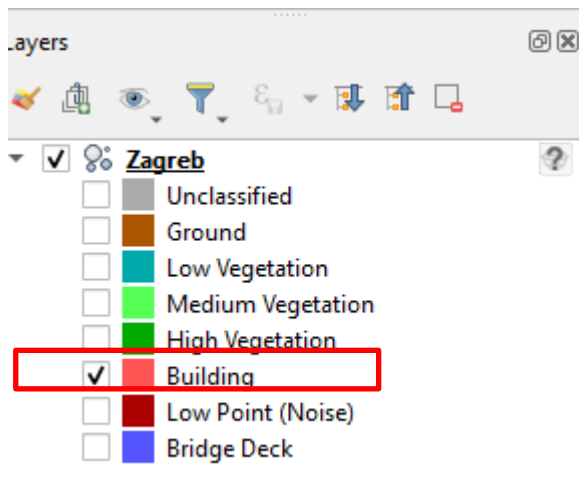


## QGIS - Visualization (Zagreb\_Lidar\_Example – part of the city)

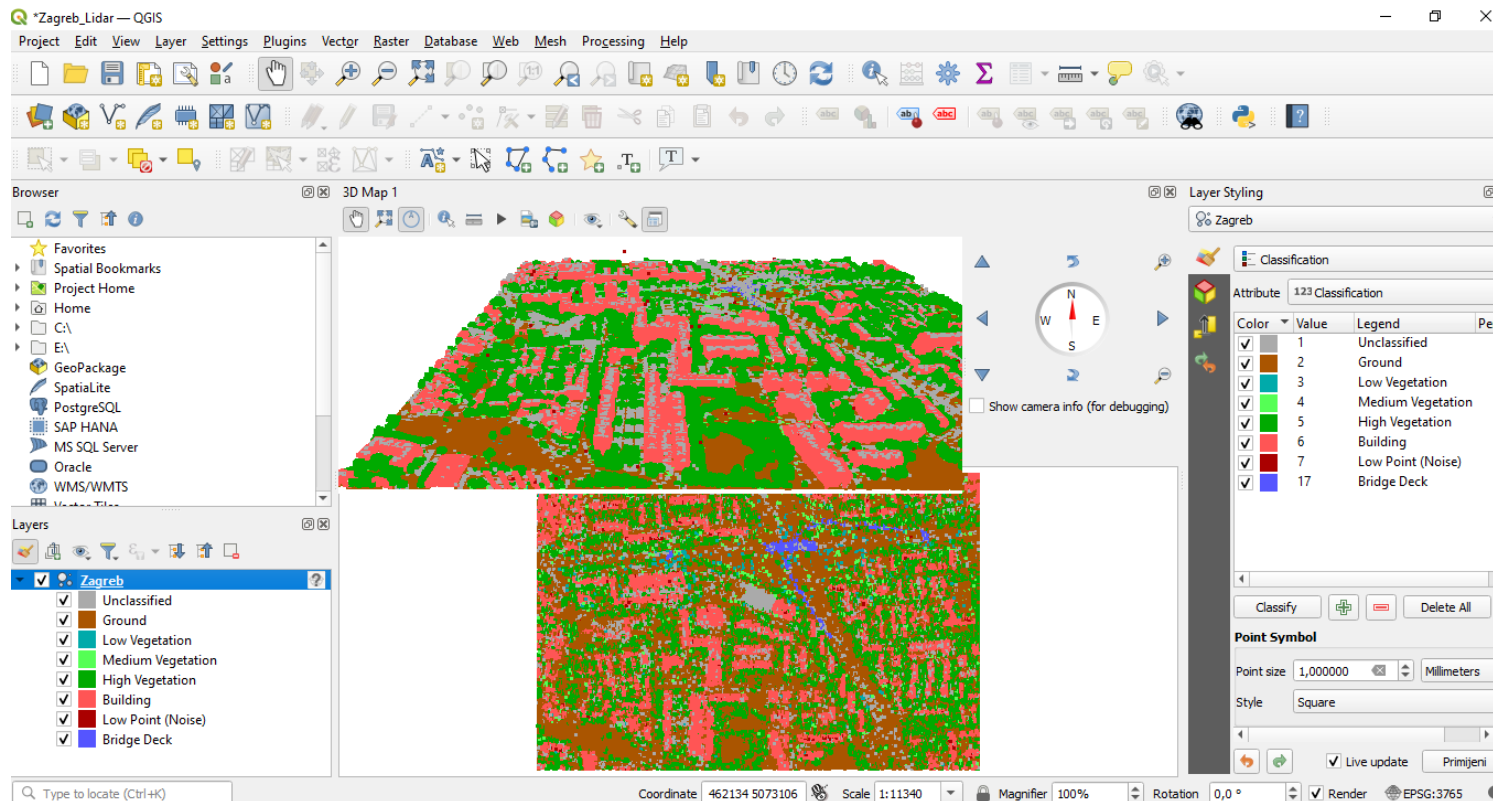




## QGIS – Building Extraction (Zagreb\_Lidar\_Example – part of the city)

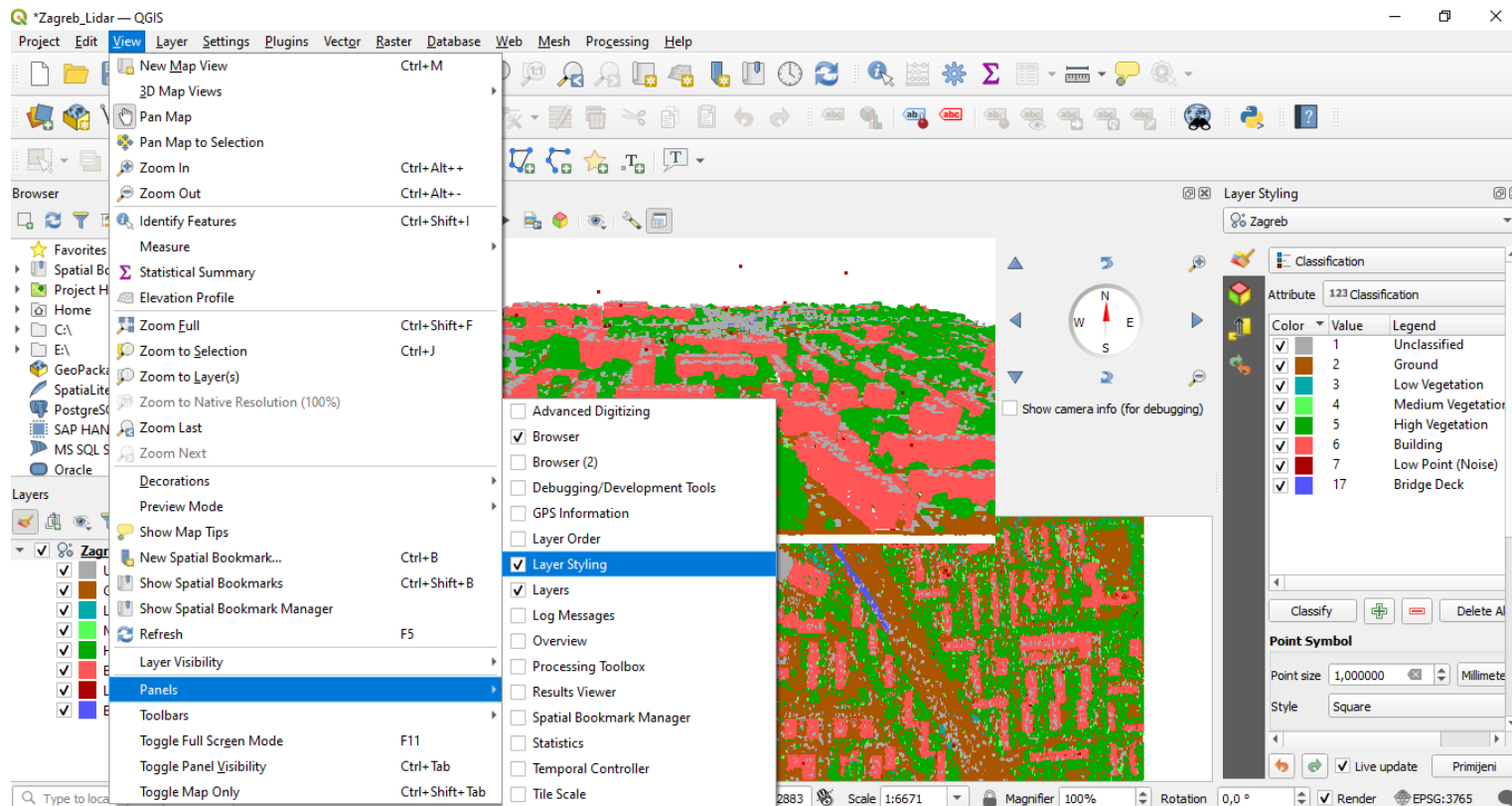


## QGIS – Building Extraction (Zagreb\_Lidar\_Example – part of the city)

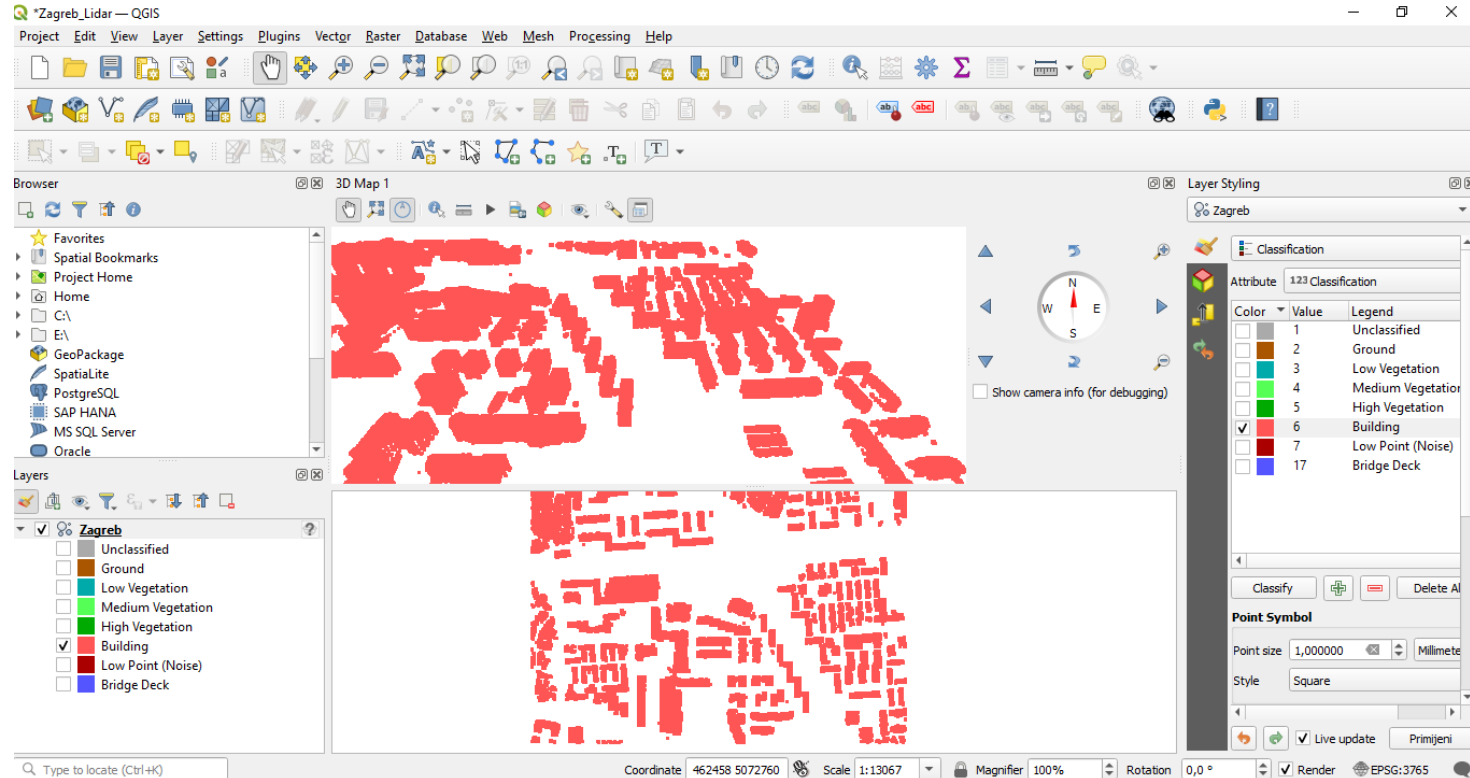




## QGIS – Building Extraction (Zagreb\_Lidar\_Example – part of the city)



## QGIS – Building Extraction (Zagreb\_Lidar\_Example – part of the city)



- <https://qgis.org/en/site/>
- [https://docs.qgis.org/3.28/en/docs/user\\_manual/working\\_with\\_point\\_clouds/point\\_clouds.html](https://docs.qgis.org/3.28/en/docs/user_manual/working_with_point_clouds/point_clouds.html)
- [https://arheologijaslovenija.blogspot.com/p/blog-page\\_81.html](https://arheologijaslovenija.blogspot.com/p/blog-page_81.html)
- <https://www.youtube.com/watch?v=v-ZMRpk0mv8>

## Thank you for your attention

Some logo's and links to web site and social media here



<https://birgitproject.eu/>