

Production of 3D data for Poland

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Head Office of Geodesy and Cartography



Workshop "State-of-the-art of 3D Mapping at national and regional mapping agencies"

22-23 January 2025

3D MODELS

In the Head Office of Geodesy and Cartography we store three types of 3D models in CityGML format:



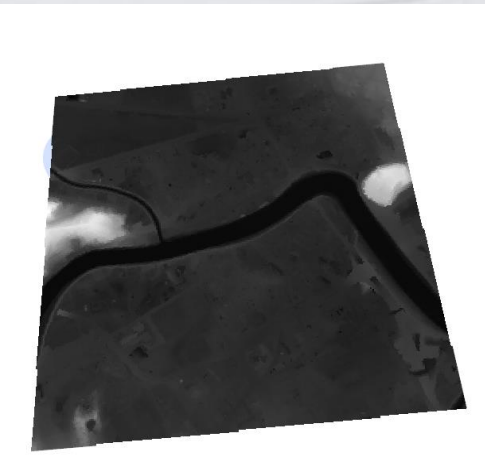
- **3D MODELS OF BUILDINGS**
 - **LOD2 (2018 for 65% of country area)**
 - **LOD1 (2019, 2021, 2022 for the entire country)**
- **3D MODELS OF TREES**
 - **LOD1 (2024 More than 25% counties of Poland, all big cities, rest in progress)**



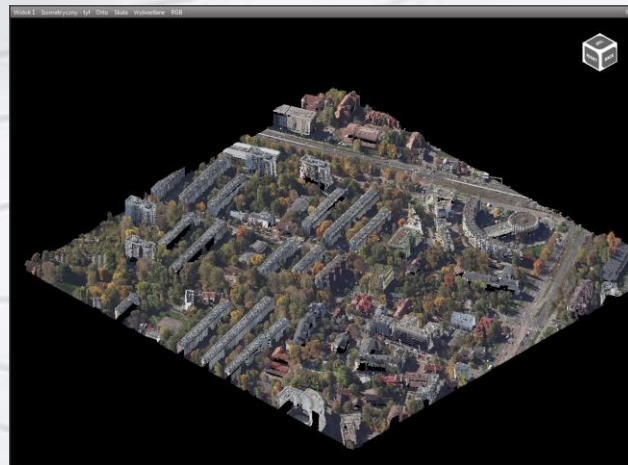
3D MODELS OF BUILDINGS

3D models of building are a three-dimensional representation of a significant part of buildings derived from the BDOT10k database. 3D models of building have been constructed from the compilation three data sources:

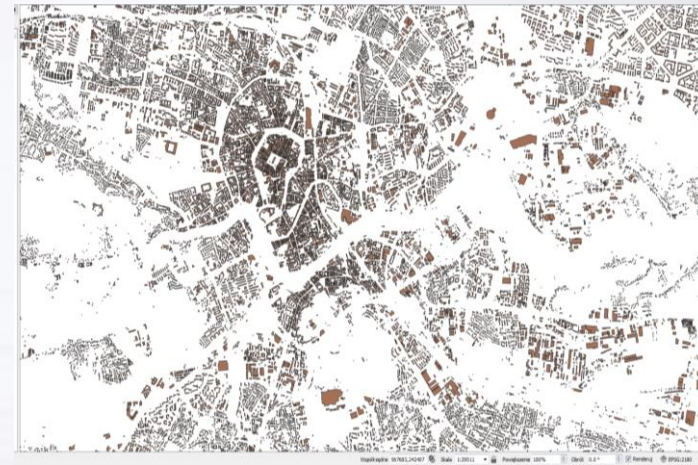
Digital Terrain Model
(grid interval 1.0 m)



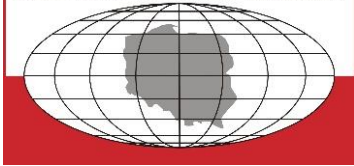
Point cloud from the high
building class



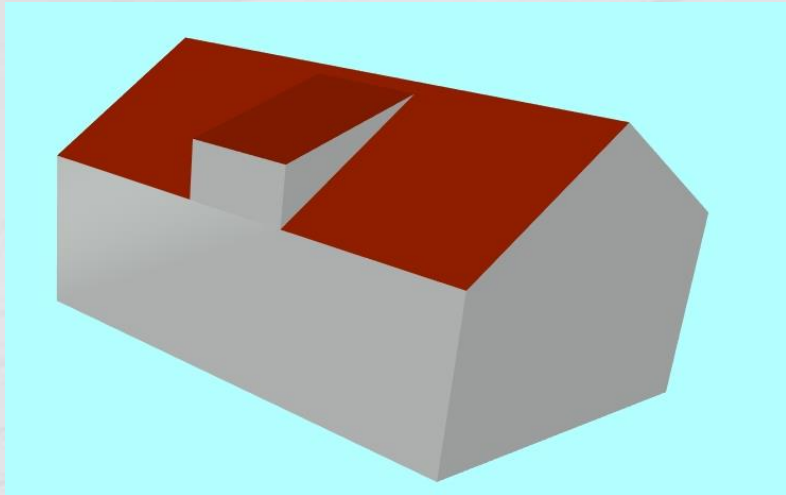
Database of Topographic
Object- BUBD_A class



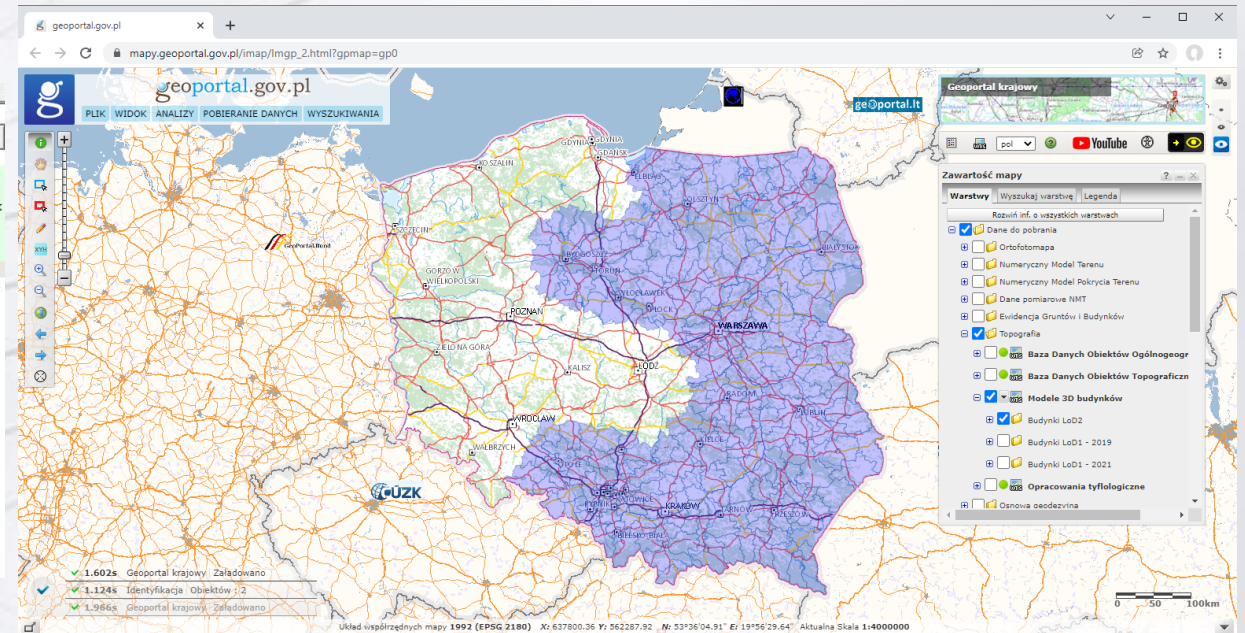
3D MODELS OF BUILDINGS – LoD2



First type 3D models of building were developed based on the CityGML 2.0 standard, the LoD2 level of detail, as part of the task "Construction of 3D models of building" in the project of the Center for Spatial Analysis of Public Administration (CAPAP) for 236 counties covering the area of 10 voivodeship:

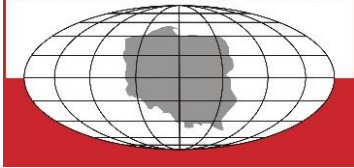


Name	Value
Fields	8
RoofType	1130
buildingId	2768975C-EB71-6AD...
przeStNazw	PL.PZGIK.332.BDOT10k
wersjald	2015-08-18T00:00:00
zrodloDach	ALS_II
aktZrodla	2017
ClassType	Building
Id	ID-1864-2768975C-E...

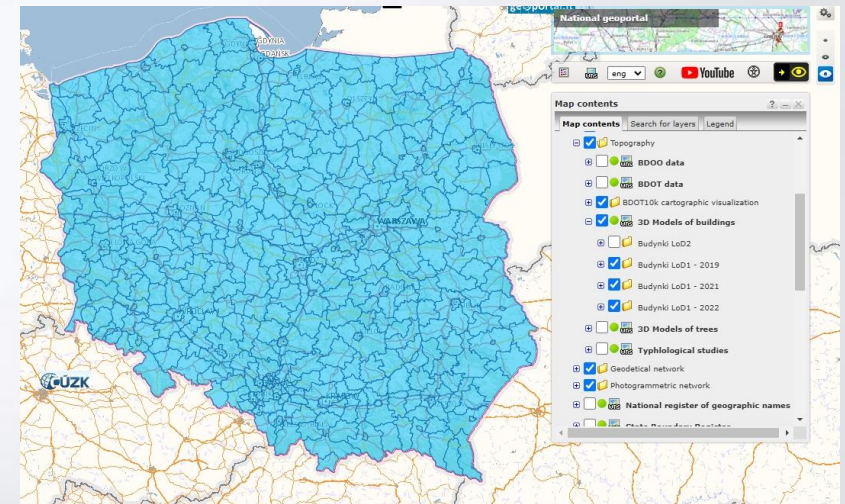
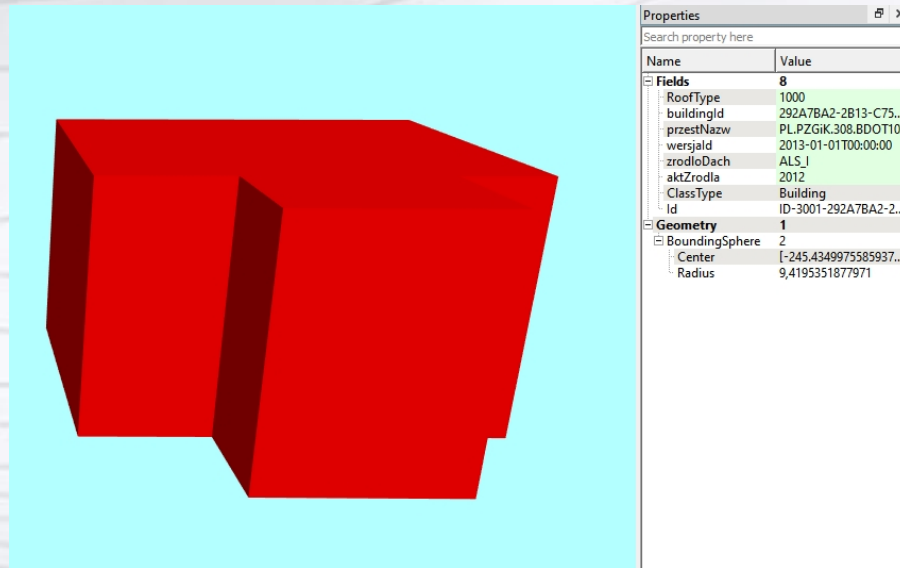


Scope of developing 3D models of buildings in the LoD2 standard

3D MODELS OF BUILDINGS – LoD1



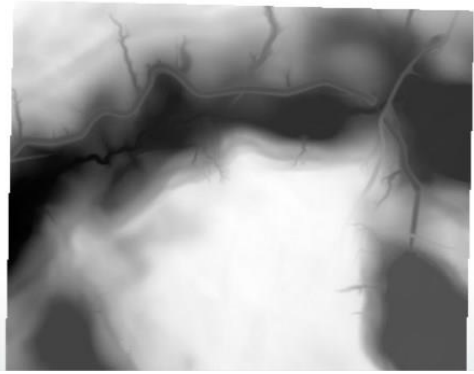
Second type 3D models of building were developed based on CityGML 2.0 standard, the LoD1 level of detail, as part of internal works for the entire country; the LoD1 standard for the presentation of buildings uses solid with a base corresponding a two-dimensional footprint of buildings from the BUBD_A object class in the BDOT10K database and the height obtained from LiDAR Point Cloud Data (building class) as the median of points in the building outline.



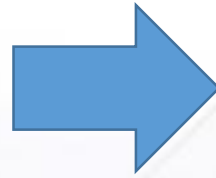
Scope of developing 3D models of building in the LoD1 standard

3D MODELS OF BUILDINGS – LoD1

DEM



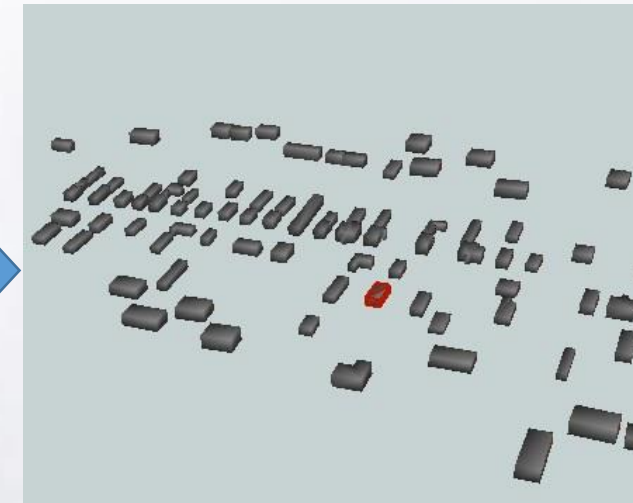
dH



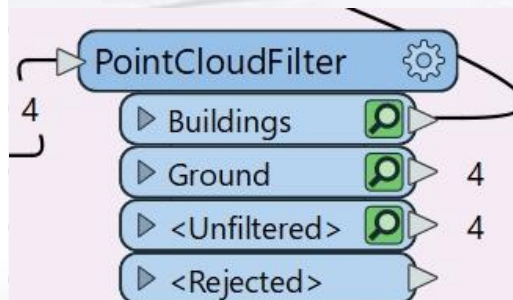
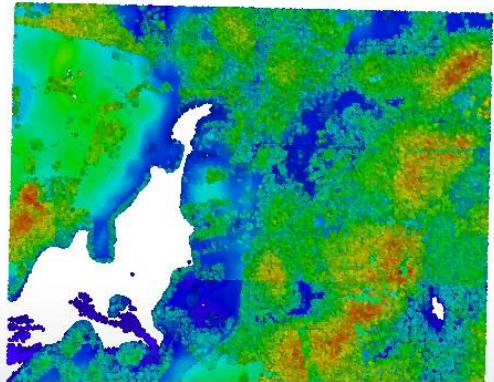
Building Class



3D Models of buildings



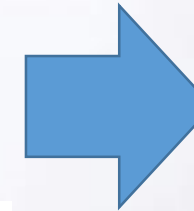
Point cloud



2D vector data footprint



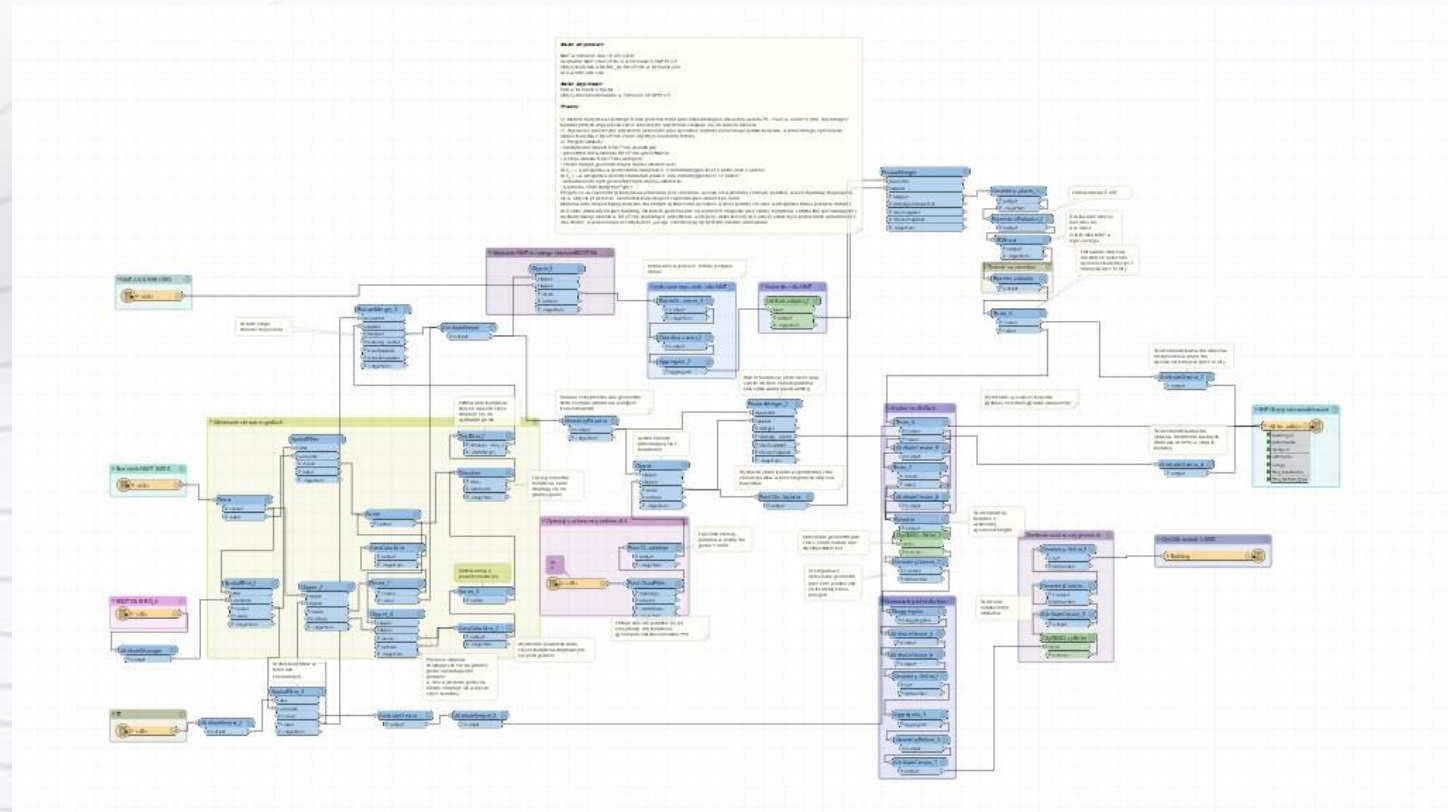
3D solid



3D MODELS OF BUILDINGS – LoD1



3D models of buildings in City GML format, following the LoD1 standard, were prepared as part of GUGiK's own work using Safe Software's FME software:



3D MODELS OF BUILDINGS – LoD1



3D models of buildings in LoD1 have been generated automatically on the basis of current data available in the state geodetic and cartographic resource, with the following assumptions:

- ✓ the height of the ground surface was calculated as the height of the lowest point of the building, determined from the intersection of the building footprint from the BDOT10k Database of Topographic Objects (BUD_A class) with the Digital Elevation Model (DEM) in the PL - EVRF2007-NH height system
- ✓ the height of rooftop surface is determined from the median of the height calculated from LIDAR Point Cloud Data (building class) as the median of points in range of the building ground surface
- ✓ the model building is represented geometrically as a Solid with flat roof
- ✓ each 3D building model has the following attributes:
 - o BDOT10k object identifier (buildingId),
 - o namespace of the BDOT10k object (przestNazw)
 - o BDOT10k object version (wersjalD)
 - o roof geometric data source (zrodloDach):
 - - ALS_I - when using ALS data with a density of 4 points/m² or 6 points/m²
 - - ALS_II - when using ALS data with a density of 12 points/m² or more
 - o timeliness of roof from the ALS point cloud data source (aktZrodla)
 - o roof type 1000 - flat roof (bldg:roofType)

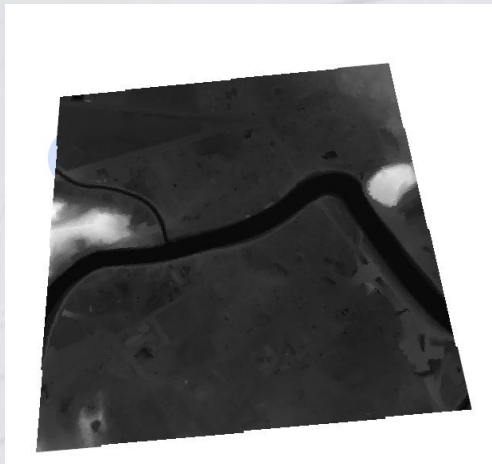


3D MODELS OF TREES

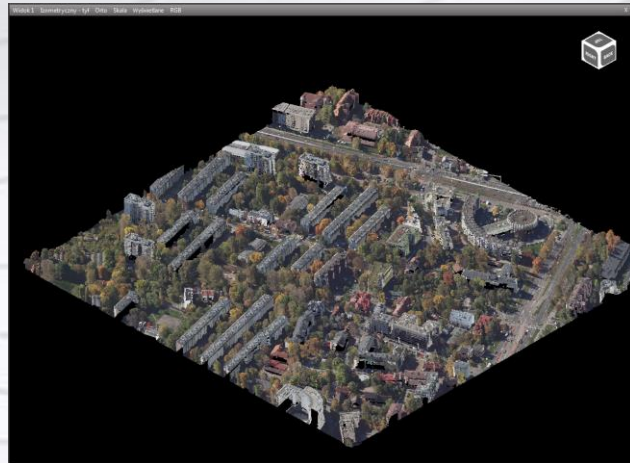


3D Models of trees are generated automatically based on current data available in the national geodetic and cartographic resource, including:

Digital Terrain Model
(grid interval 1.0 m)



Point cloud from the high
vegetation class



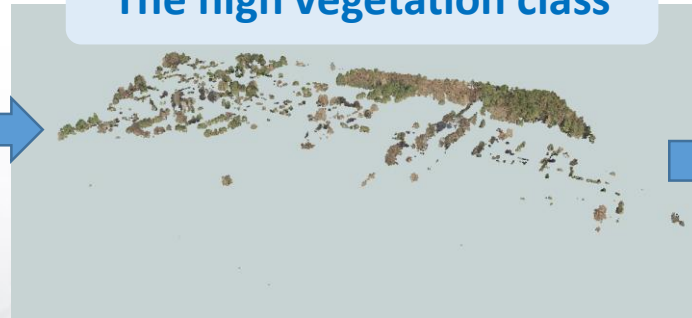
3D MODELS OF TREES



Point cloud



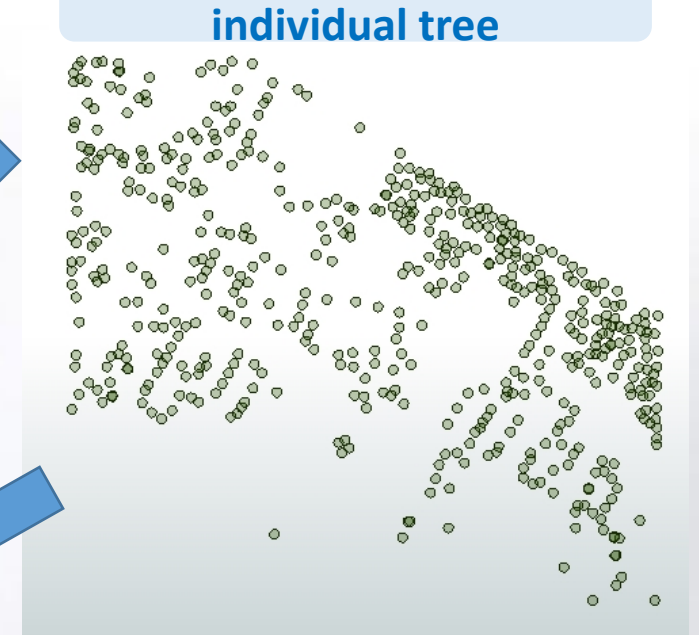
The high vegetation class



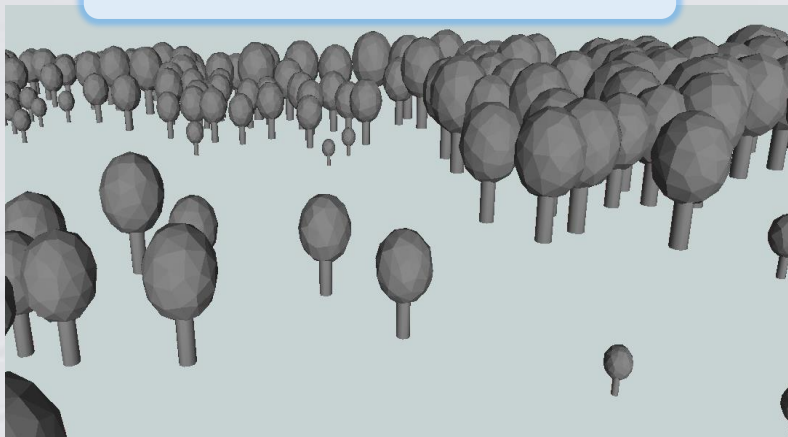
rounding the X, Y
coordinates to
whole meters

neighborhood
analysis

Isolation position of
individual tree



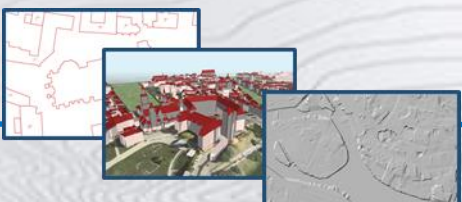
3D MODELS OF TREES



Trees with a height of over 4
meters



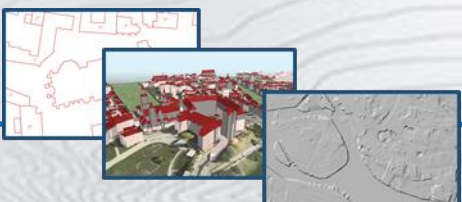
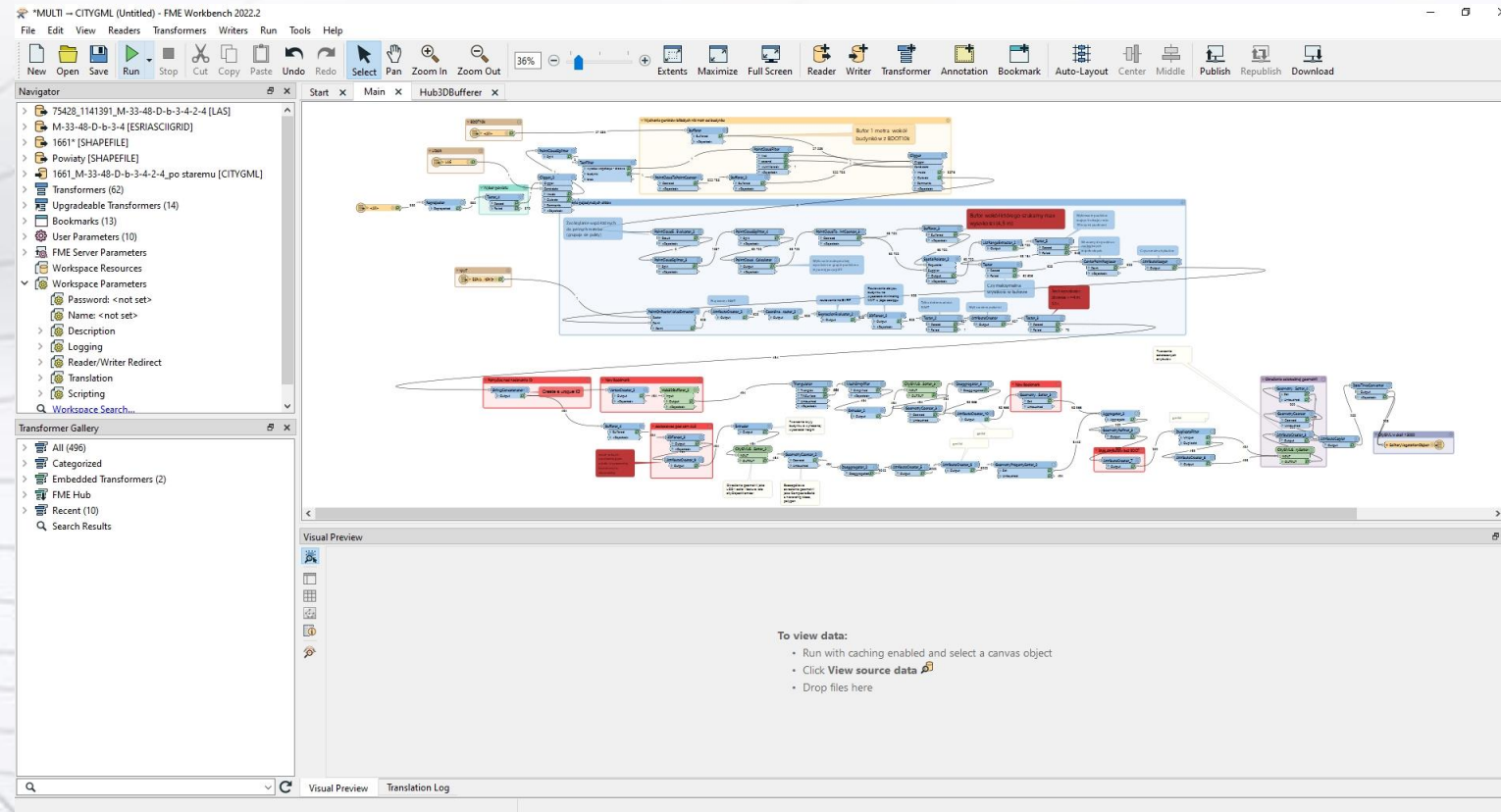
To indicate the location and maximum height of individual trees, a 1-meter grid was created from airborne laser scanning (ALS) points of high vegetation (by rounding the X, Y coordinates to whole meters). This allowed for the isolation of individual tree and determination of their maximum height along neighborhood analysis. 3D models of trees represent trees with a height of over 4 meters.



3D MODELS OF TREES



3D tree models in City GML format, following the LoD1 standard, were prepared as part of GUGiK's own work using Safe Software's FME software:

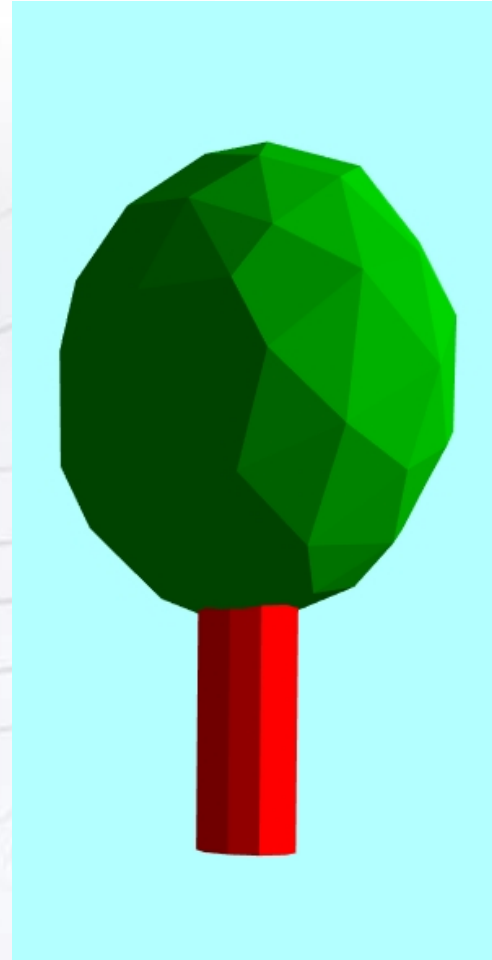


3D MODELS OF TREES



Each 3D model of tree includes the following attributes:

- Object identifier (gml_id)
- Data source (zrodlo)
- Data source accuracy (aktZrodla)
- Tree height (height)
- Ground level height of the tree (h_nmt)

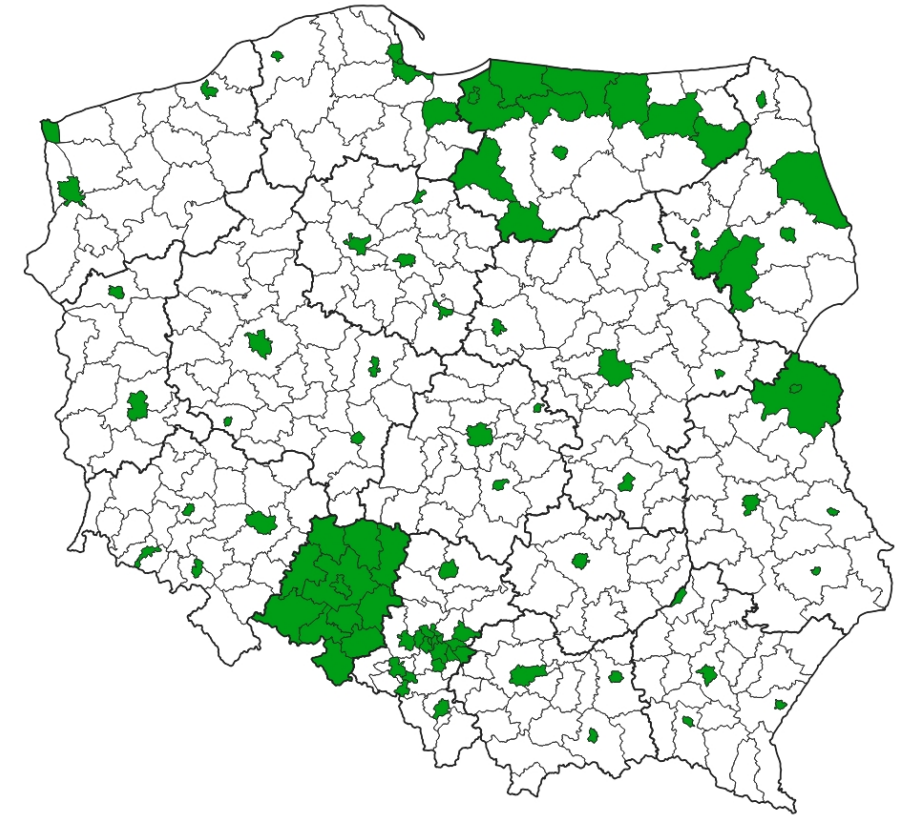


Properties	
Search property here	
Name	Value
Fields	6
Height	13,88 m
zrodlo	chmura punktow
aktZrodla	2023-09-15
h_nmt	114,03
ClassType	SolitaryVegetationObject
Id	ID-2061-N-34-107-A-c-4-4-2_1
Geometry	1
BoundingSphere	2
Center	[4.639684319496155,3.13187241554...
Radius	2,86380837143829

3D MODELS OF TREES



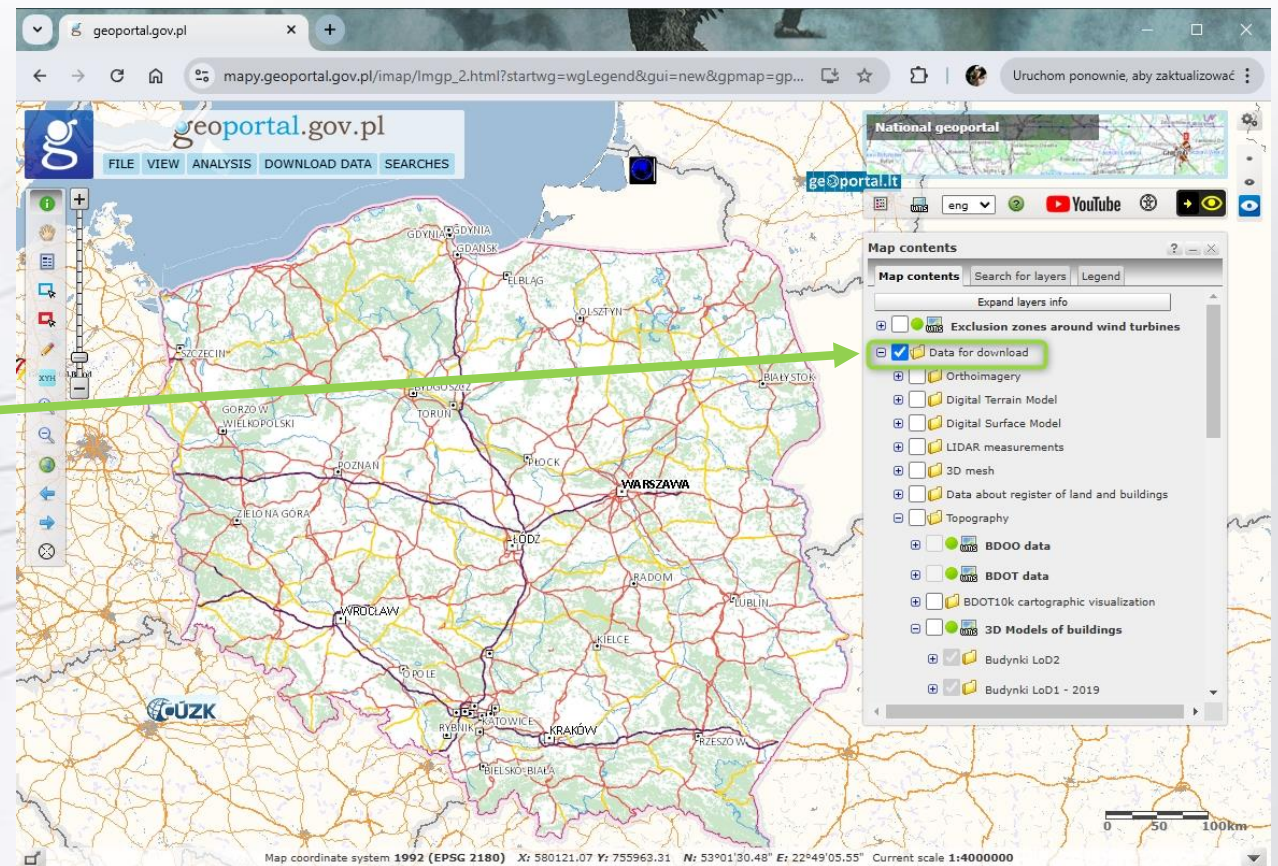
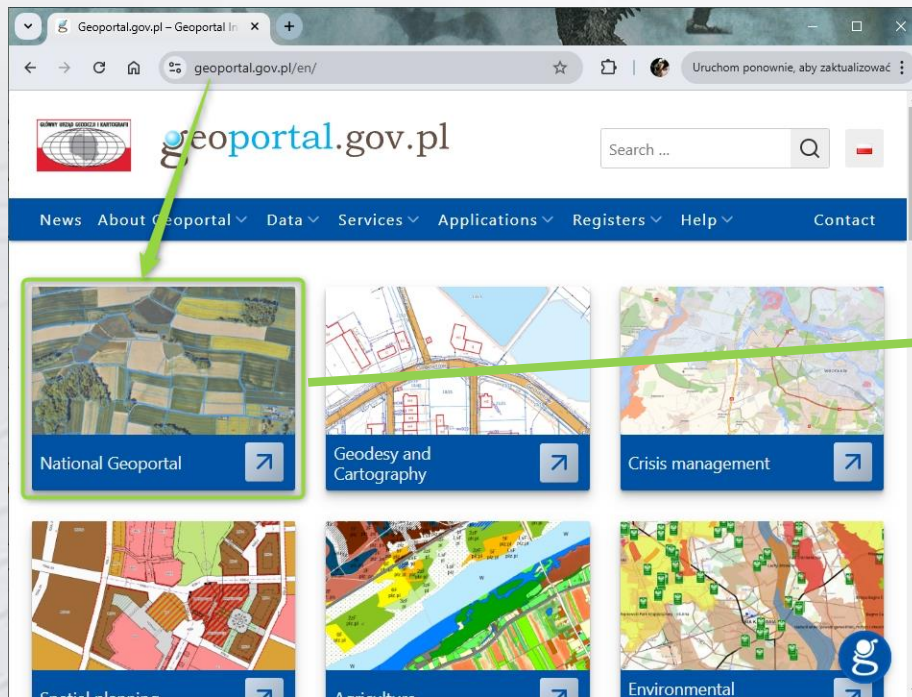
- At the moment, we have 91 counties, including over 70 of the largest cities. There are plans to cover all of Poland with this data.
- The process of generating 3D models of trees is very time-consuming. It also requires powerful hardware with a strong graphics card.
- One county has from 50 to even over a thousand sheets to generate, so the process of generating models for one county can take from 1 to 2 weeks.



Availability of 3D models for download



3D models of buildings and trees are available free of charge and free to use. Downloading data is possible from the www.geoportal.gov.pl website in county packages :



Availability of 3D models for download



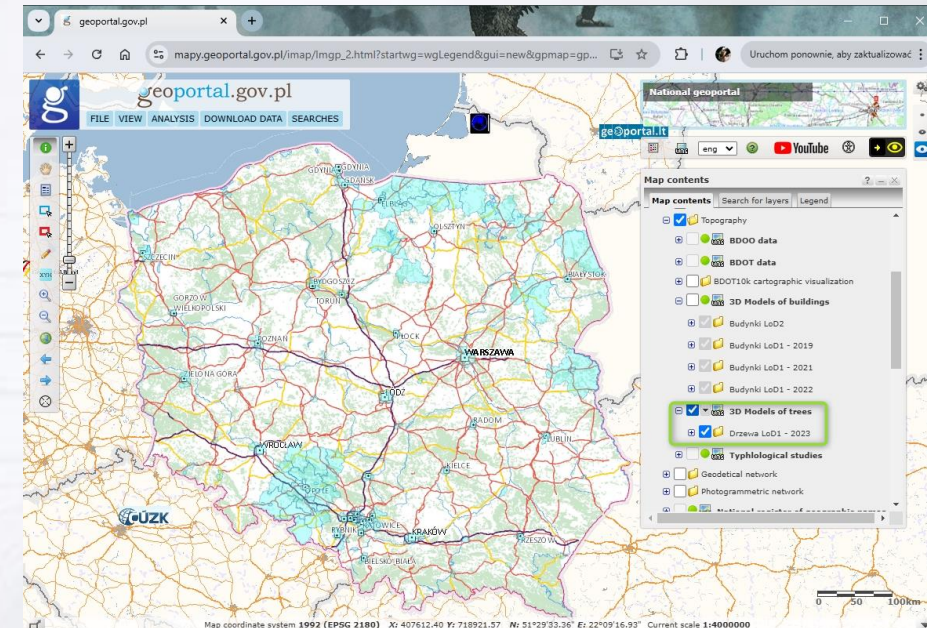
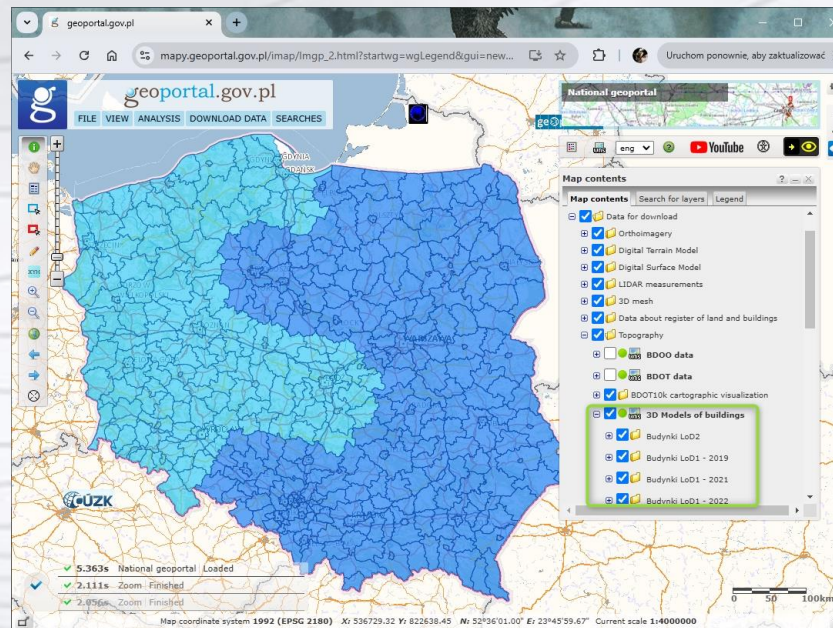
In the "Data for download" section you can see a group of layers:

"Topography - 3D Models of buildings"

- Budynki LoD2
- Budynki LoD1 - 2019
- Budynki LoD1 - 2021
- Budynki LoD1 - 2022

"Topography - 3D Models of trees"

- Drzewa LoD1 - 2023



- We plan to continue filling Poland with 3D models of trees and update models of buildings in LoD1 level of details in the next years
- We have generated over a 100 millions 3D models of trees
- There are many applications of using this data e.g. in last flood, urban planning e.t.c.

Thank you for your attention

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<http://www.gugik.gov.pl>