

Creation of True Orthophotos for 150 Administrative-Territorial Units in Urban Areas

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About CNC

CNC has a history of almost 70 years. Founded in 1958, has undergone several changes of name and has constantly enriched its field of activity.

The Mission of CNC:

- To update national cartographic databases
- To manage the geodetic networks
- To perform quality control works for all the geodetic, photogrammetric, and cartographic projects
- To participate in the development of national and international projects for the production of 2D and 3D datasets.



National Agency for Cadastre and Land Registration

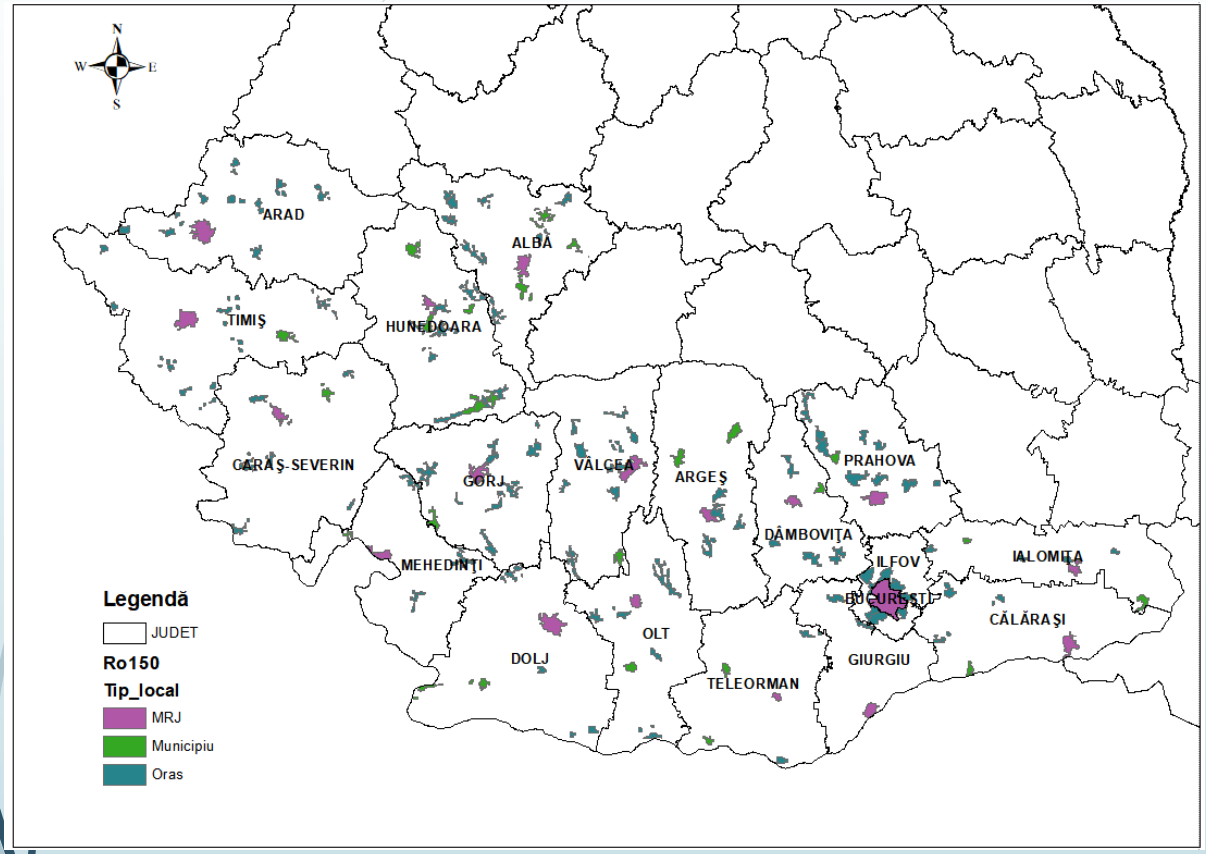
- **National Center of Cartography**
- **42 Cadastre and Land Registration Offices**

Departments at CNC:

- Photogrammetry
- Geodesy and ROMPOS
- Research and development
- Cartography and IT
- GIS

https://www.cartografie.ro

Creation of True Orthophotos for 150 cities
General data



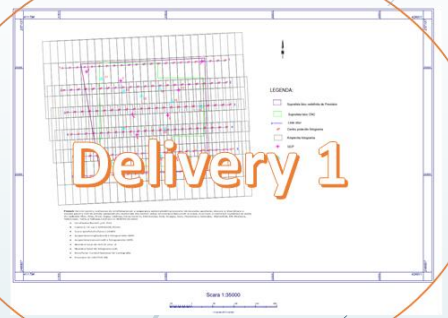


- **Project duration**: 2022-2025
- **Project objectives**:
  - •acquiring aerial images and performing aerial triangulation;
  - •generating the dense point cloud and the digital surface model;
  - •generating the true-orthophotos.

Project areas:

- 149 cities;
- Bucharest - additional oblique images and 3D mesh.

Creation of True Orthophotos for 150 cities
Technical specs



Flight plan

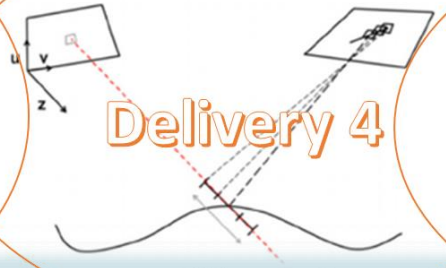


Image acquisition

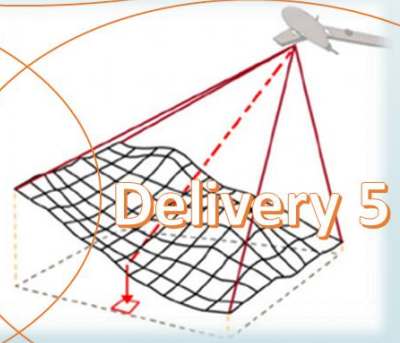

Field measurements



Aerial triangulation



DIM generation



Ortho-rectification

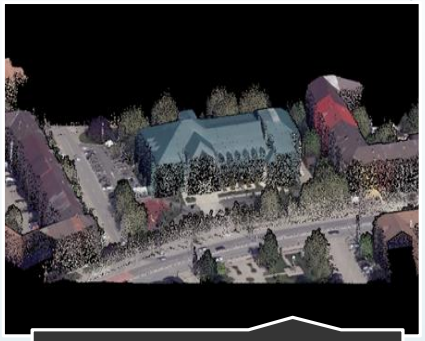


- image overlap: 80%, 60%
- no snow, clouds, fog
- Sun angle > 30°
- low level of vegetation
- GSD: 4/9/15 cm (depending on the city type)
- points (GCP, CHK) pre-marked before flight and clearly visible in the images; minimum number and distribution of points (eg. 10 GCP and 10 CHK for a city)
- GNSS and levelling measurements for points (3D accuracy=± 5cm)

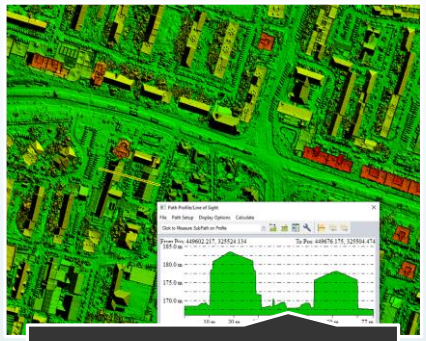
Maximum length of the levelling	Geometric leveling tolerance - for back and forward method
150 m	$\pm 20\sqrt{L}$ mm

Quality control works: a team with expertise in photogrammetry and geodesy from CNC.

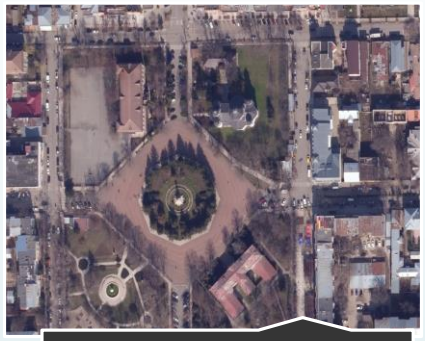
Creation of True Orthophotos for 150 Administrative-Territorial Units in Urban Areas – Technical specifications



Photogrammetric derived point cloud



Digital surface model



True-ortho

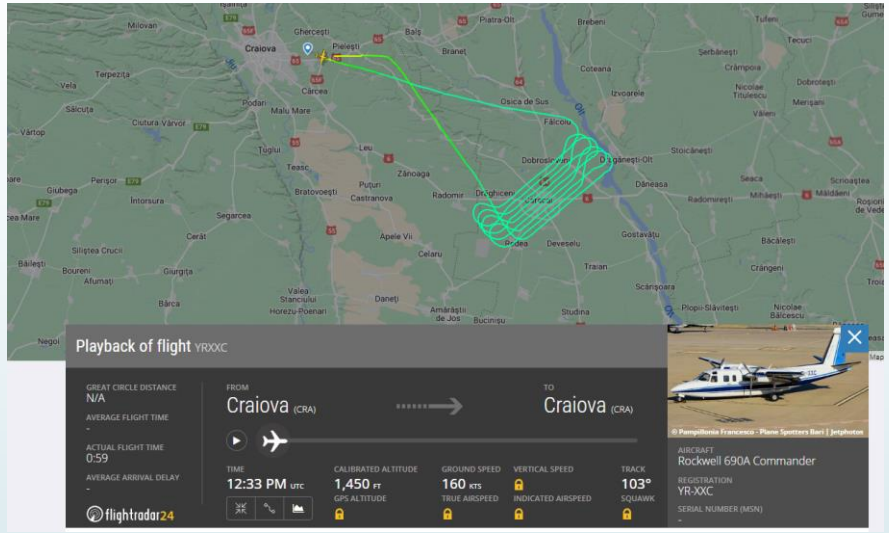
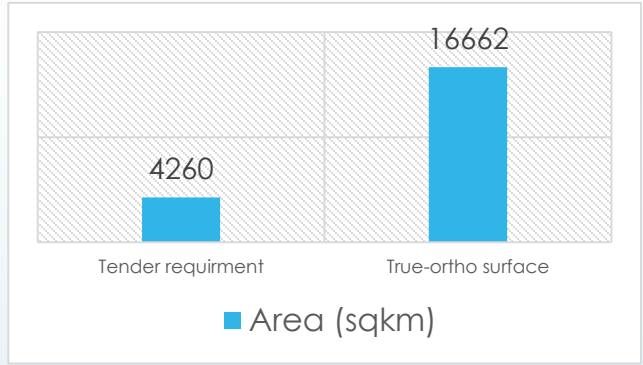


	Image resolution (cm)	True-orthophoto resolution (cm)	True-orthophoto accuracy (cm)	DSM resolution (cm)	DSM accuracy (cm)
Bucharest	4/6	6	± 15	10	± 20
Big cities	4	5	± 12	10	± 20
Medium cities	9	10	± 15	12.5	± 25
Small cities	15	12.5	± 20	20	± 30

All products are delivered in the national reference system (Krasovski ellipsoid 1940, stereographic projection 1970 - corresponding to EPSG code 3844 and Black Sea Normal Altitude System 1975).

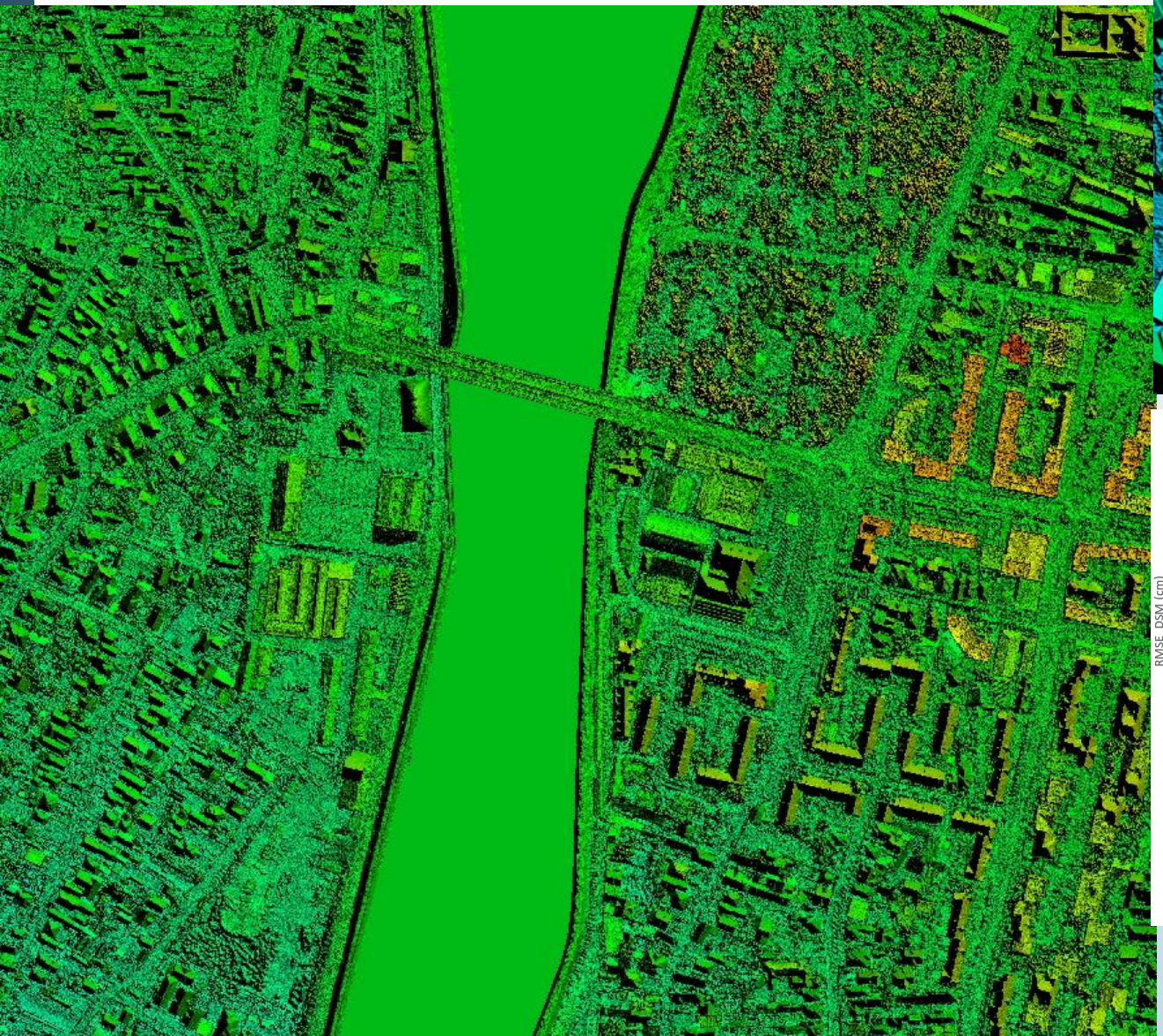
Project statistics

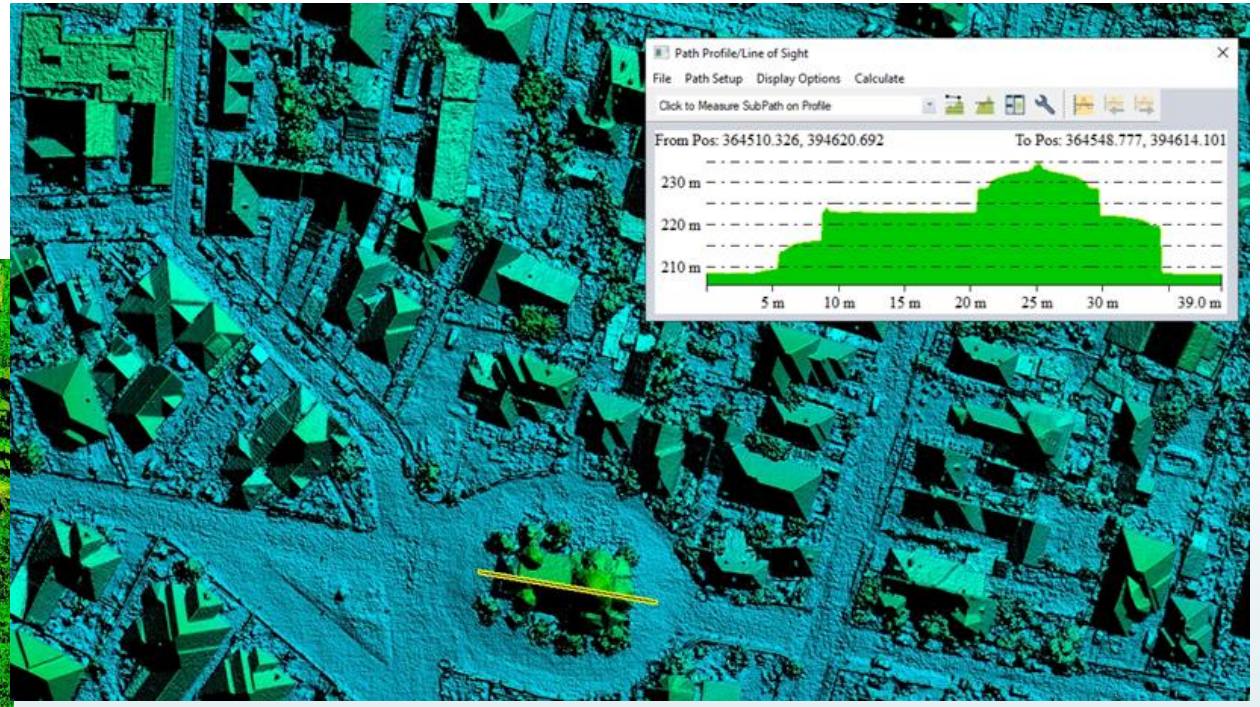
Data type	149 cities	Bucharest
Flight dates	* 71 days	* 10 days
No. flight lines	1.893	155
No. images	138.578	129.815
Photogrammetric cameras	UltraCam Lp and Eagle M2	UltraCam Osprey
No. of points	1668 GCP + 1572 CHK	45 GCP + 45 CHK
GNSS measurements	6.600 hours	
Geometric levelling distance	2 x 17.000 km	
Area covered with products	16.662 km^2	
Storage	660 TB	

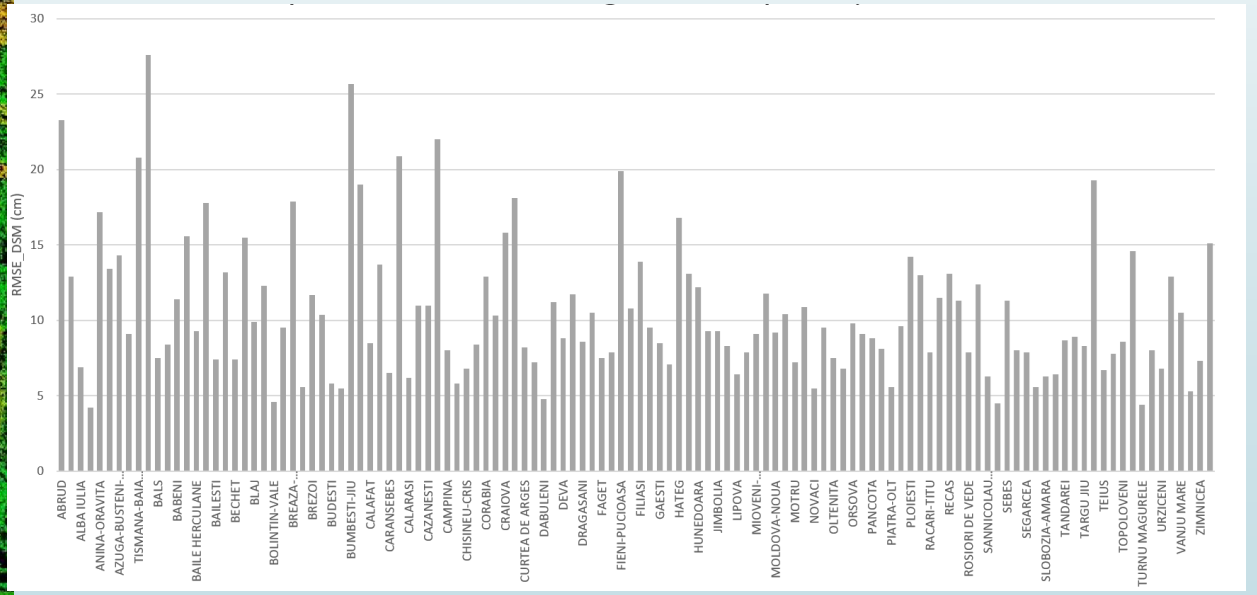




Products – DSM







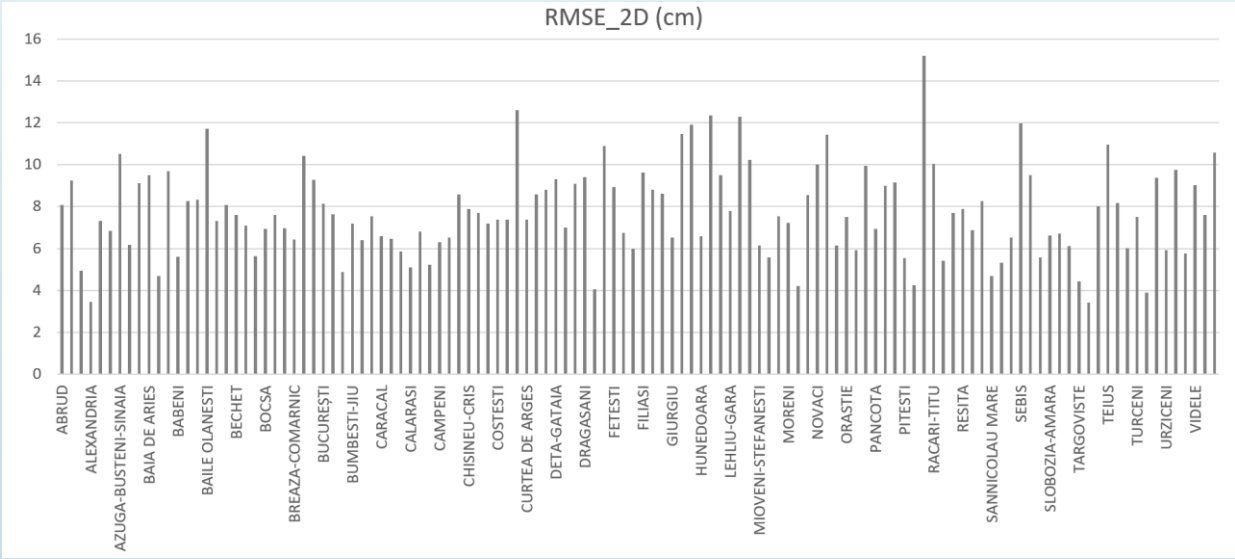
Târgu Jiu

DSM resolution = 10 cm

Products - True Orthophoto





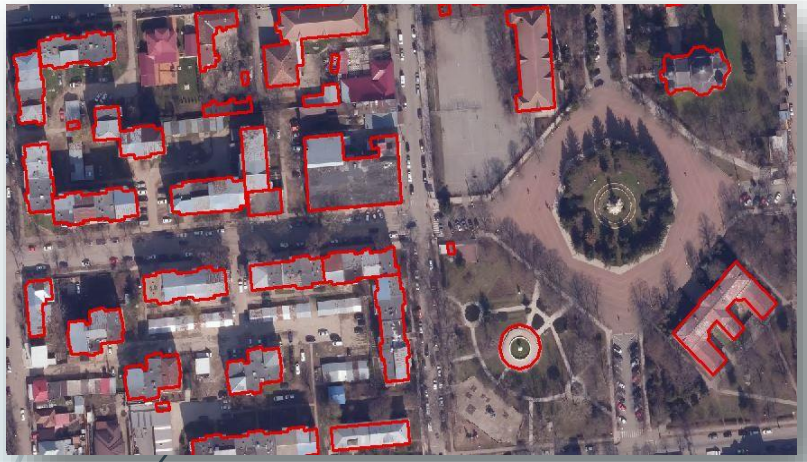


Alba Iulia True-ortho resolution = 5 cm

Products – 3D MESH



USE CASES AND DERIVED PRODUCTS







Cadastre



The data from the project will:

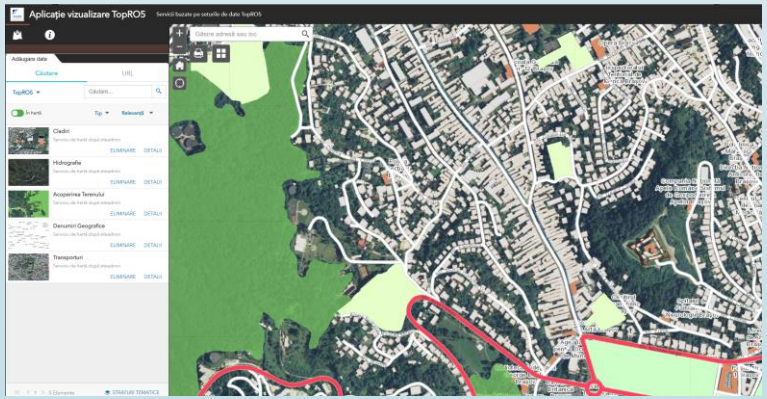
- facilitate the process of verifying the systematic/sporadic cadastre;
- can be used in systematic cadastre activities, by authorized individuals and legal entities, through the following operations: digitization of boundaries on true-orthophotos (2D) or using stereomodels (3D).



TopRO5 Updating



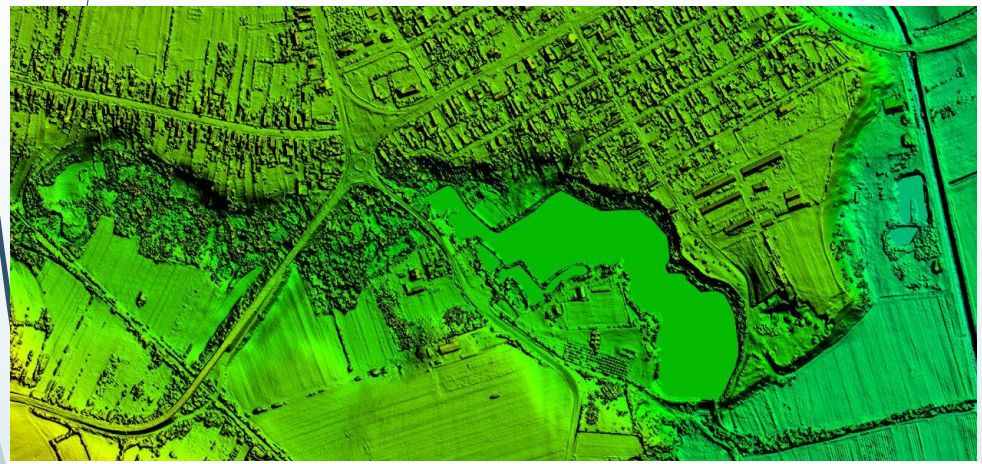
- TOPRO5 is the official geospatial database at national level
- It ensures the geo-spatial data infrastructure within the INSPIRE Directive and it is the basis for the national maps at scale 1:5.000
- The update process will comprise of objects extraction (eg. building footprints, road boundaries), through a semi-automatic method or by vectorization in 2D/3D environment

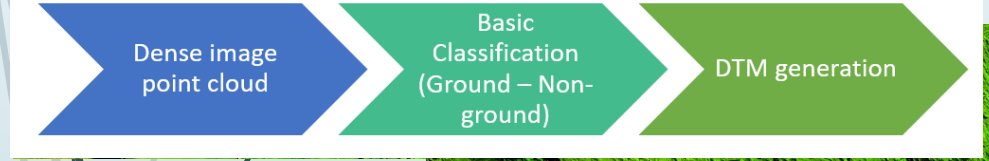


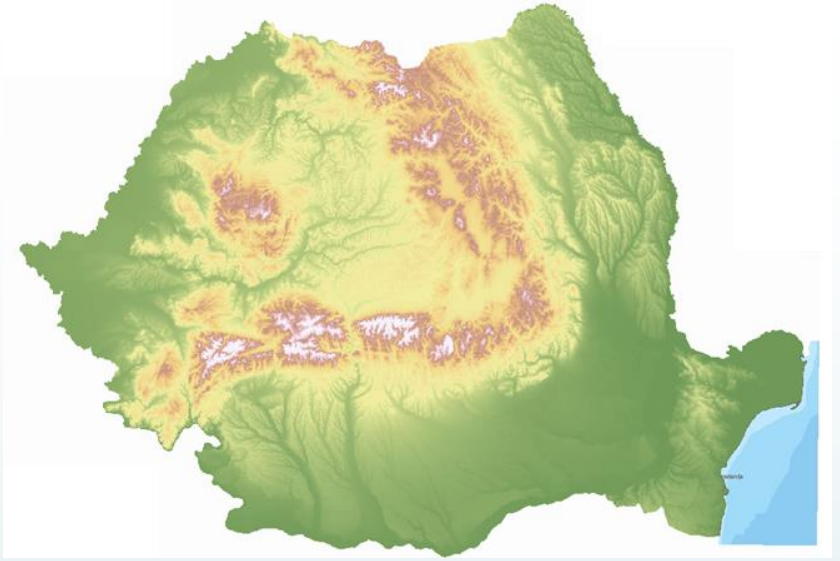


https://geoportal.ancpi.ro/portal/home/

National DTM update



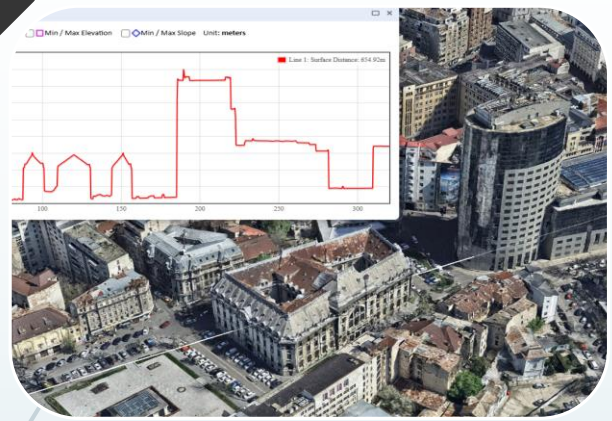




The RGB-coded and filtered dense point cloud (DIM) will be classified to generate digital terrain models (DTM). These data will be integrated into the national database and disseminated through the ANCPI geoportal.

https://geoportal.ancpi.ro/portal/home/

Use of the 3D mesh for Bucharest



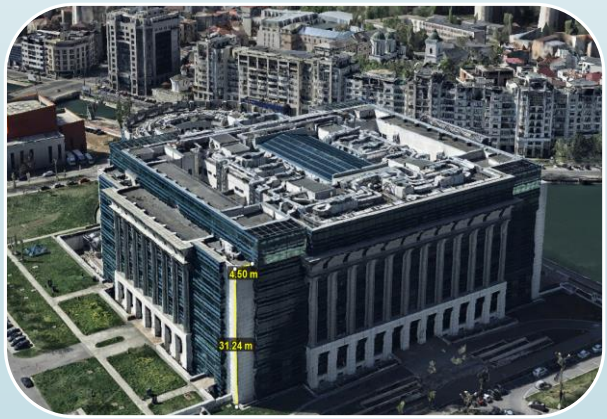
Elevation profile



View 3D dataset



Visibility analysis



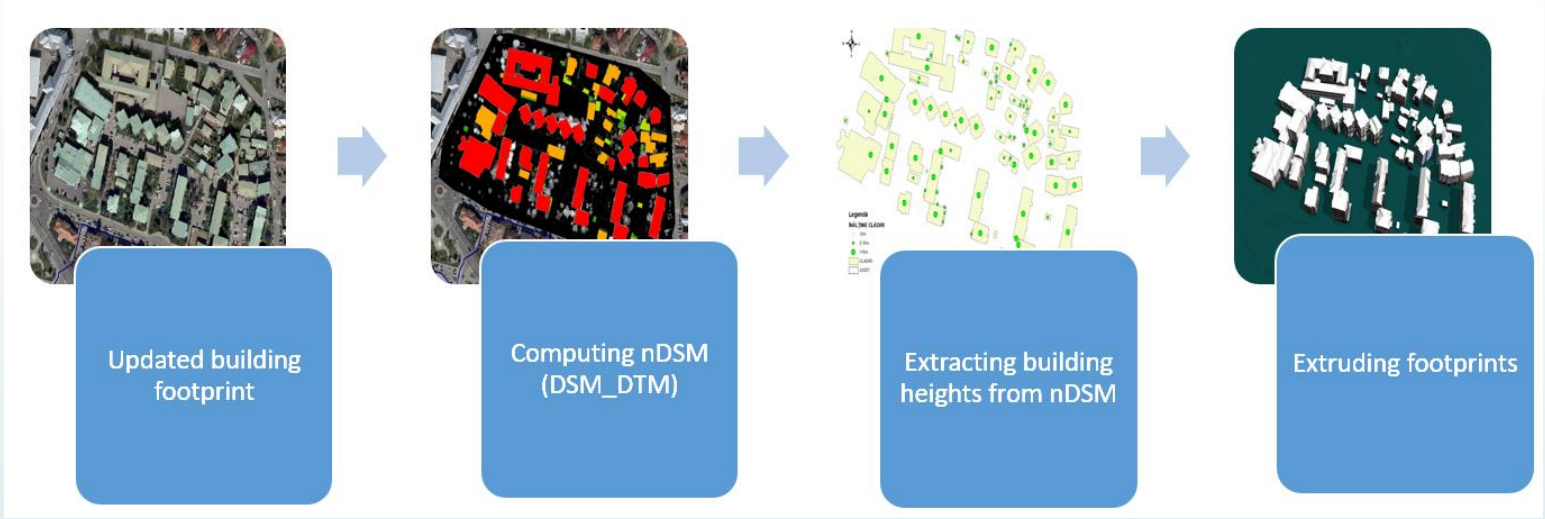
Height or distance measurements

The 3D Mesh will be used for:

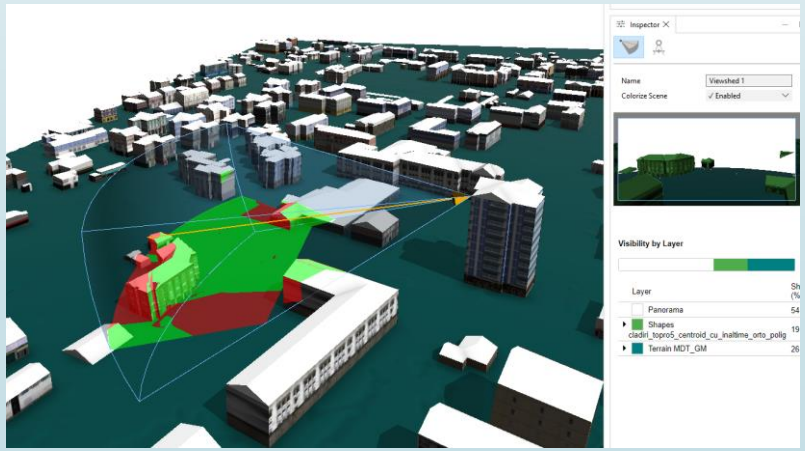
- inspection of buildings in the model;
- use of information for the 3D cadaster;
- height measurements of buildings;
- 3D profiles;
- visibility analysis.

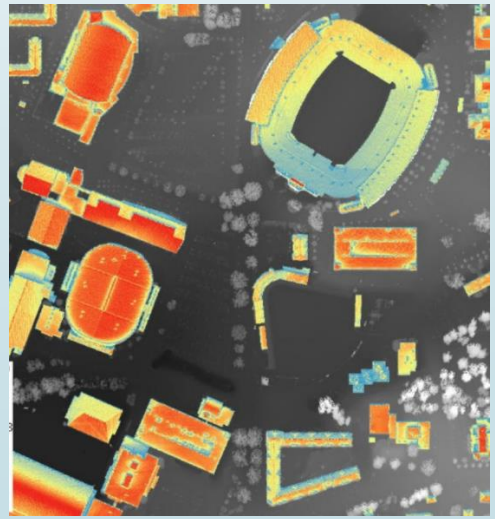
3D building modelling

- identifying the optimal position for installing solar panels;
- estimating urban areas at risk of flooding;
- visibility analyses in the urban environment;
- estimating noise propagation.









Conclusions



- The use of geospatial data by local and central administrations is essential in decision-making;
- The quality of the data must be appropriate to the purpose of the project;
- Quality control is a very important stage in a project and carrying out this activity with professionalism and rigor provides the premises for a successful project;
- Photogrammetry works carried out using precisely determined ground control points lead to good quality products;
- The usefulness of 3D modeling of buildings for analysis and urban planning is obvious and Romania must align itself with developed countries and move from 2D to 3D.

Thank you for your attention!

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