



REPUBLIKA HRVATSKA
Državna geodetska uprava



Državna geodetska uprava

Use of historical data for buildings legalization process

EuroSDR Workshop - Historical and Time Stamped Data for SDGs



Igor Vilus, Sanja Mimica, Saša Cvitković
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Introduction


Introduction



- in the territory of today's Republic of Croatia during the 20th century, due to specific historical and socio-economic circumstances, two periods are significant in terms of illegal construction
 - the first period is from the end of World War II to the mid-1960s, when mass reconstruction was carried out (construction was often done without permits especially outside urban areas)
 - the second period began at the end of the 1970s and lasted until the mid-1990s
- 

Introduction



- the aforementioned facts led to the situation that a significant number of constructed buildings were not legal, which represented a problem on a number of levels, from social (a large number of such buildings were the first and only real estate for a certain number of families) to problems for local governments in terms of building and planning adequate communal infrastructure
 - based on all of the above, the Government of the Republic of Croatia made a decision to implement the legalization of illegally constructed buildings in order to regulate the situation related to the illegally constructed buildings as much as possible under the given circumstances
- 



The data used

OFFICIAL MAPPING

- Different scales from 1:5000 to 1:250 000
- Covering the territory of whole country
- Available in raster/vector form
- Available on SGA Geoportals
- SGA maps are source for all other thematic maps



CROATIAN BASE MAP (HOK5)

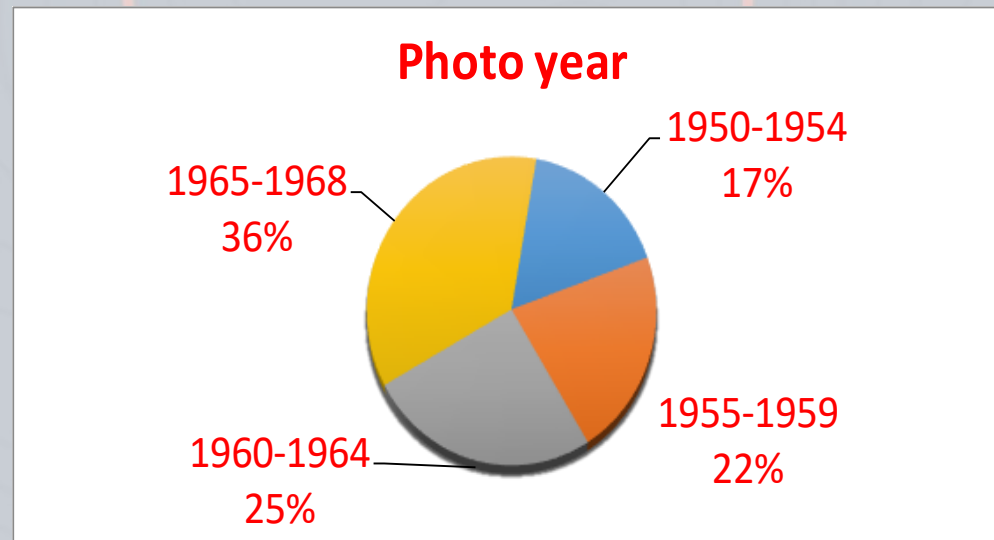
- Scale – 1:5 000
- Analogue/digital format
- Sheet size 50 x 70 cm
- One sheet covers the area of 575 ha
- Multicolor print (3 or 4 colors)
- Scanned in 300 dpi resolution
- TIFF format
- CBM production > from 1954 to 2008
- 9803 sheets produced in total



Aerophotogrammetric survey 1950 - today

➤ Aerial survey - 1950 to 1968

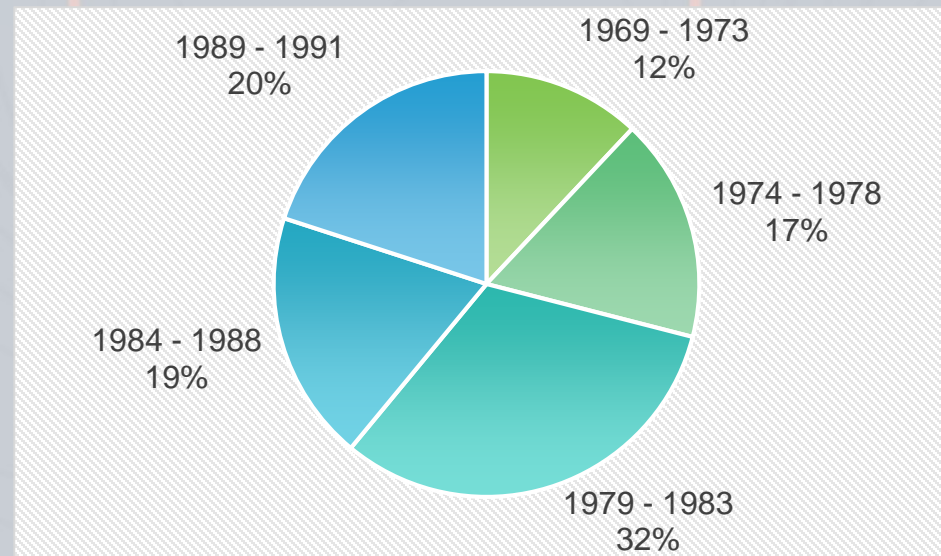
- Analog camera
- scales (from 1:5000 to 1:32000)
- covered more than 90% of the territory
- Used for legalisation of non legal buildings



Aerophotogrammetric survey 1950 - today

➤ Aerial survey - 1969 to 1991

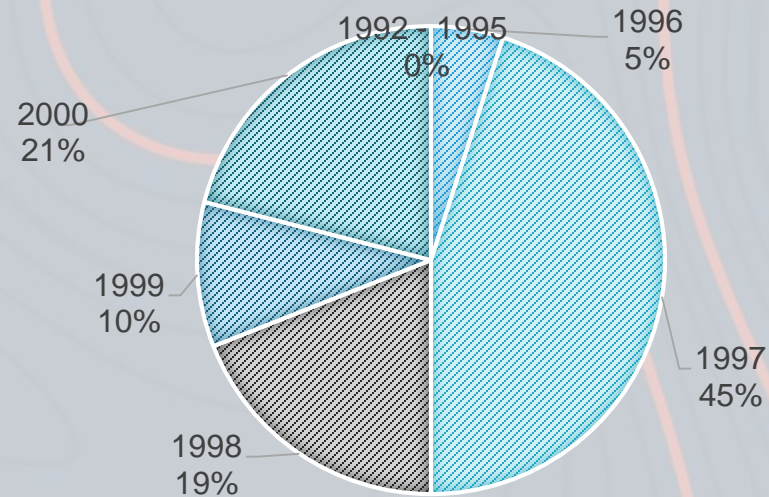
- Analog camera
- scales (from 1:4000 to 1:36000)
- covered more than 95% of the territory
- Used mostly for topographic map productions



Aerophotogrammetric survey 1950 - today

➤ Aerial survey 1992 to 2000

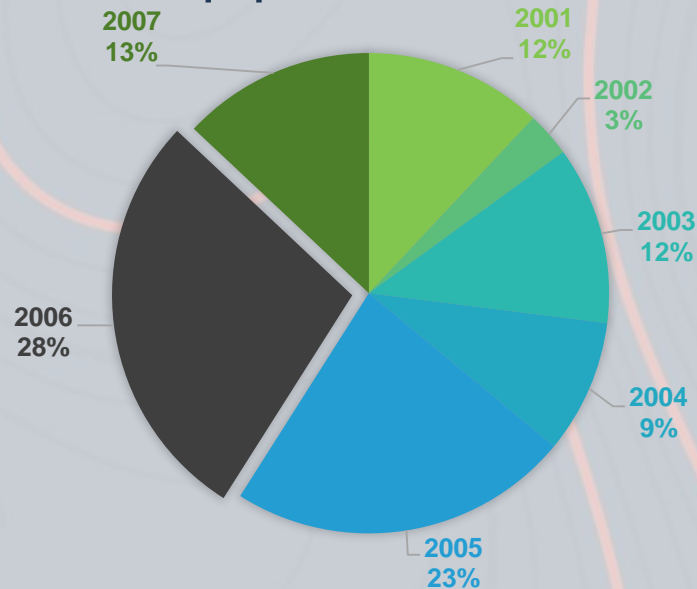
- Analog camera
- Cyclic aerial survey
- scales (from 1:10000 to 1:22000)
- covered 100% of the territory
- Used for topographic map productions



Aerophotogrammetric survey 1950 - today

➤ Aerial survey 2001 to 2007

- Analog and digital camera (2006)
- Cyclic aerial survey
- scales (from 1: 2000 to 1:20000), GSD 0,30
- covered 100% of the territory
- Used for DOP / topographic map productions



Aerophotogrammetric survey 1950 - today

➤ Aerial survey 2008 - today

- digital camera
- LPIS project , cooperation with Ministry of agriculture
- GSD 0,30m)
- Used for production of DOP / topographic map

➤ 2009 – 80%

➤ 2011 – 100%

➤ 2014 – 2016 – 100%

➤ 2017 – 2018 – 100%

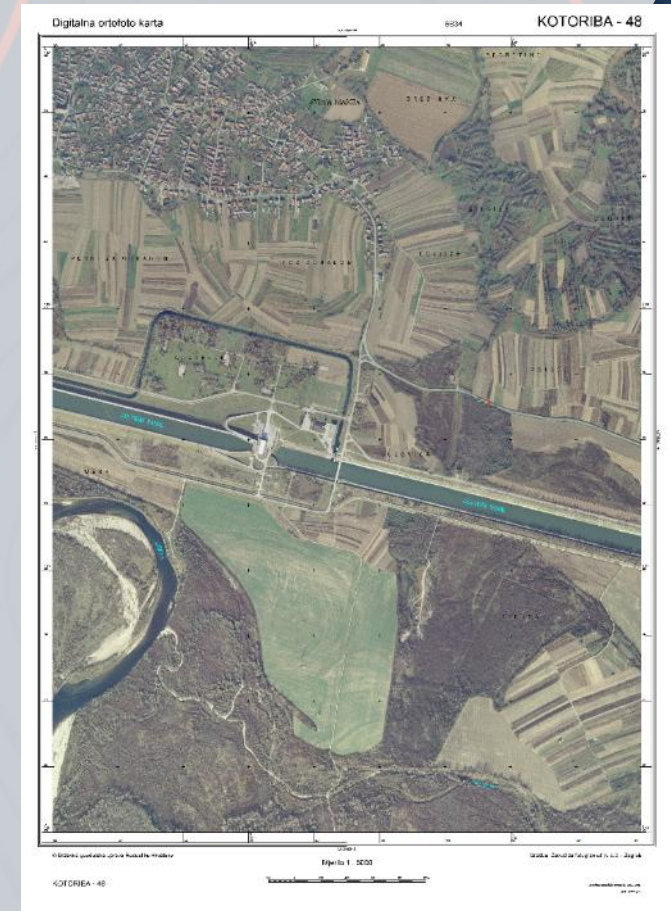
➤ 2019 – 2020 – 100%

➤ 2021 – 2022 – 100%

➤ 2023 – 2024 – 100% (planned; work in progress)

DIGITAL ORTHOTOPHOTO MAP IN SCALE 1:5000 (DOF5)

- From 1998 – 2006 was produced 3028 maps (31%)
- 54% black/white 46% color
- Projection Gauss Kruger, Bessel ellipsoid



DIGITAL ORTHOTOPHOTO MAP IN SCALE 1:5000 (DOF5)

- Continuous production – 10945 maps (56500 km²)
- Production frequency - 2 years
 - 2007 – 2009 – 100%
 - 2011. – 100%
 - 2014 – 2016 – 100%
 - 2017 – 2018 – 100%
 - 2019 – 2020 – 100%
 - 2021 – 2022 – 100%
 - 2023 – 2024 – 100% (planned)
- Projection HTRS96/TM, GRS80 ellipsoid



PROJECT „MULTISENSOR AERIAL SURVEY OF THE REPUBLIC OF CROATIA FOR THE PURPOSES OF DISASTER RISK REDUCTION ASSESSMENT”

- **Beneficiary and project coordinator:** State Geodetic Administration
Project partners: Geodetic Faculty of the University of Zagreb and the City of Zagreb
Co-financing of the project: Croatian Waters
- **Implementation period:** May 2020 – December 2023.

The goal was to provide homogeneous products based on high-quality spatial data, which will serve as a basis for modeling and disaster risk assessment.



AERIAL PHOTOGRAMMETRIC SURVEY AND AERIAL LIDAR SURVEY

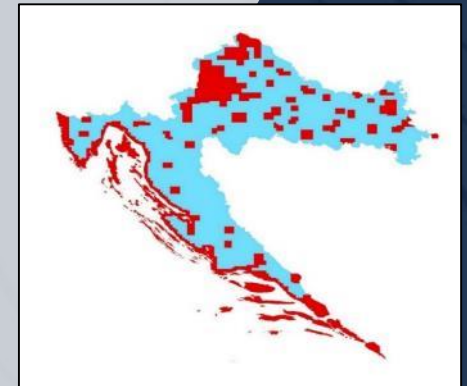
- Digital Terrain Model (DTM) and Digital Surface Model (DSV) – datasets obtained from LIDAR data
- Classified aerial and corridor LIDAR survey data
- Digital Orthophoto Maps in a scale of 1:5000 (DOF5)

Requirement - Minimum achieved density of points for aerial LIDAR survey of the Republic of Croatia:

- 4 points per m^2 in non-urban areas (uninhabited and sparsely populated places)
- 8 points per m^2 in urban areas (higher density cities and settlements)

Requirement - Minimum achieved density of points for aerial LIDAR survey of river banks (3501 km):

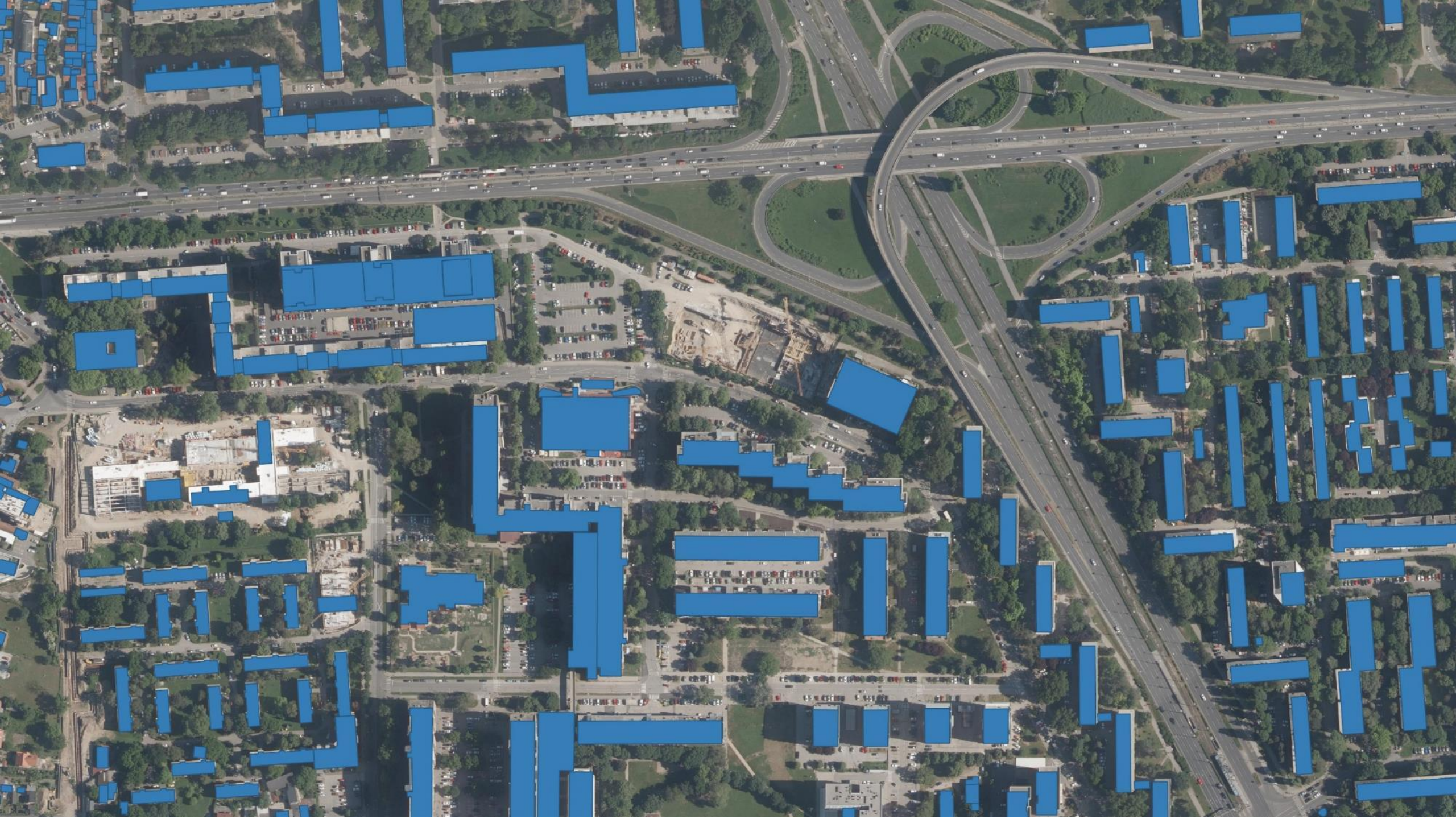
- 20 points per m^2 on river banks and their corridors with a total width of at least 500 m

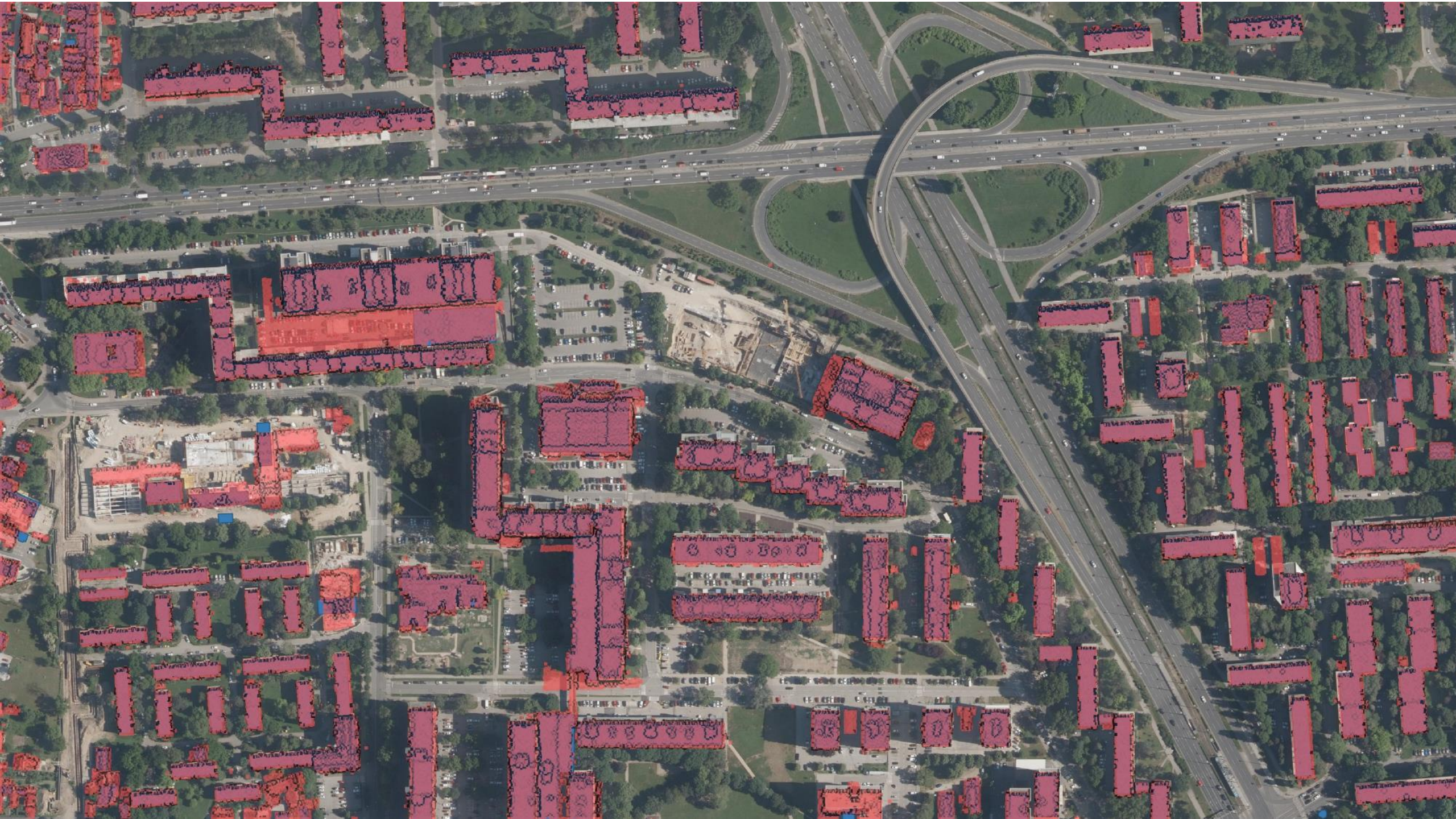


PRODUCTS CREATED ON THE BASIS OF AERIAL PHOTOGRAMMETRIC AND AERIAL LIDAR SURVEY

- Digital Terrain Model (DTM) created on the basis of aerial LIDAR survey with a grid size of 1 m
- Digital Surface Model (DSM) created on the basis of aerial LIDAR survey with a grid size of 1 m
- Digital Terrain Model (DTM) created on the basis of corridor aerial LIDAR survey with a grid size of 0.5 m
- Digital Surface Model (DSM) created on the basis of corridor aerial LIDAR survey with a grid size of 0.5 m
- Original unclassified aerial and corridor LIDAR survey data
- Classified aerial and corridor LIDAR survey data
- Digital orthophoto maps (DOF5)









SOURCE_ID=11048
DENSITY=17.86 samples / m²



2D Savica



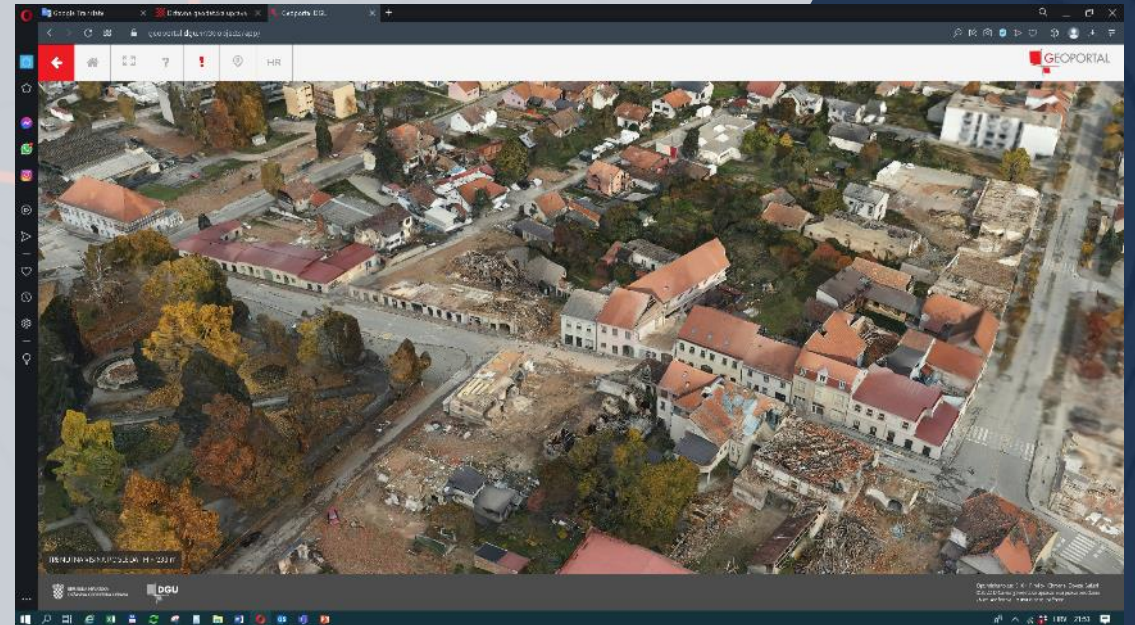
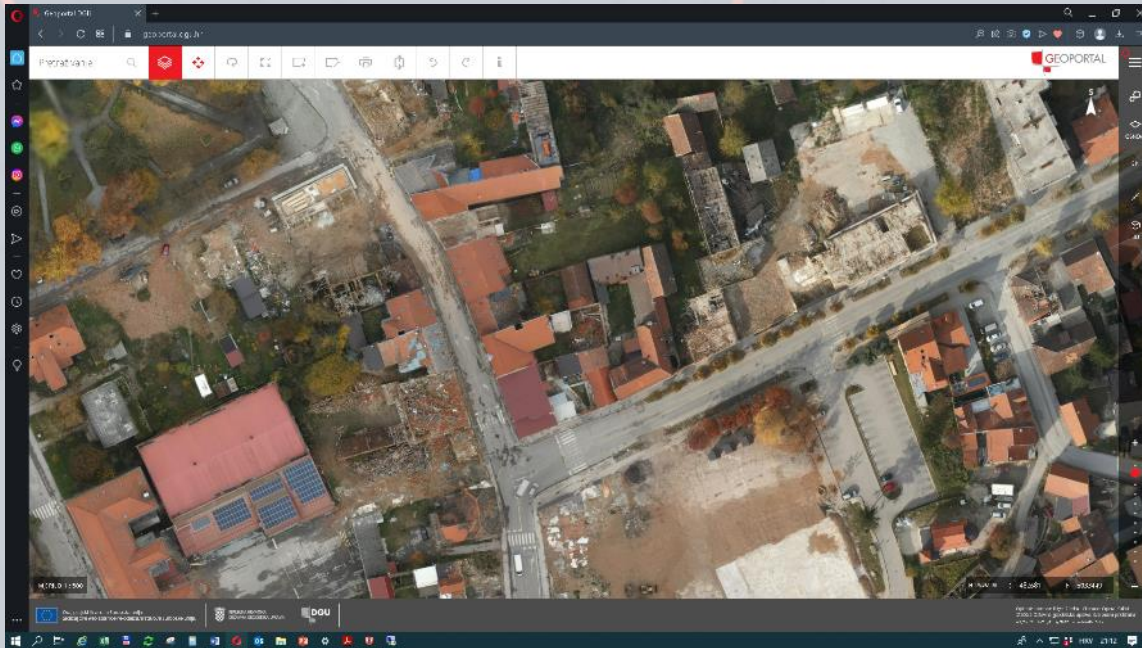
3D Savica

DRONE imagery on construction areas included in the annual program of cadastral surveys

➤ from 2021 – 2024 app. 85000 Ha

➤ Project results:

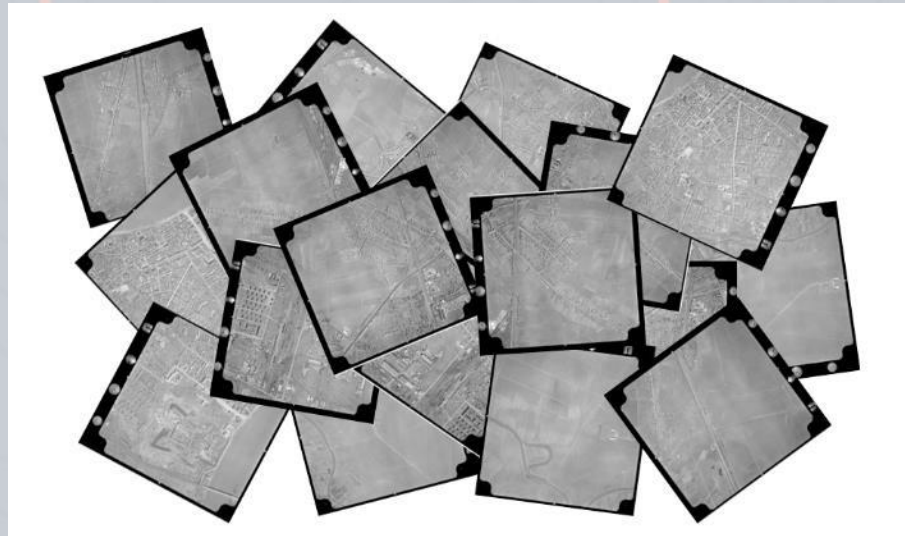
- digital terrain model (DTM)
- digital surface model (DSM)
- classified point cloud
- digital orthophoto maps 0,05 m
- 3D Mash



Good practice – legalization of illegal buildings (1968)

INPUT DATA

- scanned aerial photogrametric images in scale: 1:3000, 1:4000, 1:5000, 1:6000, 1:7000, 1:8000, 1:10000, 1:20000, 1:32000
- not selective incomplete accompanying documentation
- delivered more than 35,000 images



Good practice – legalization of illegal buildings (1968)

Methodology

task was to produce as accurate data that will be used for issuing certificates that the construction was recorded prior to 1968.



Good practice – legalization of illegal buildings (1968)

all images are after georeferencing also ortho-rectified with the DTM for increasing of positional accuracy

Without DTM
Only georeferenced



With DTM
Georeferenced + ortho-rectified



Good practice – legalization of illegal buildings (1968)

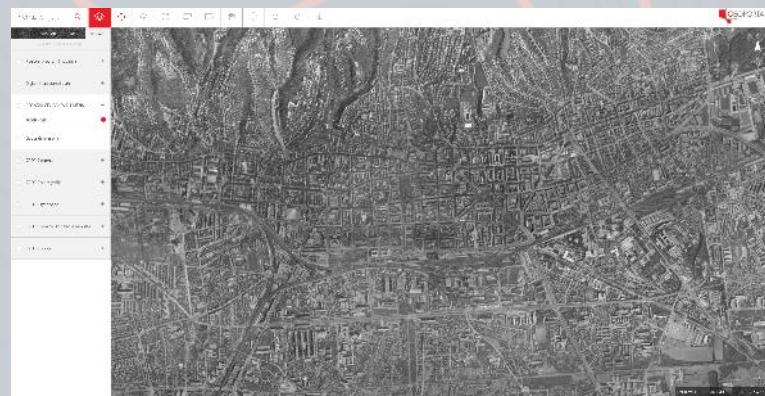
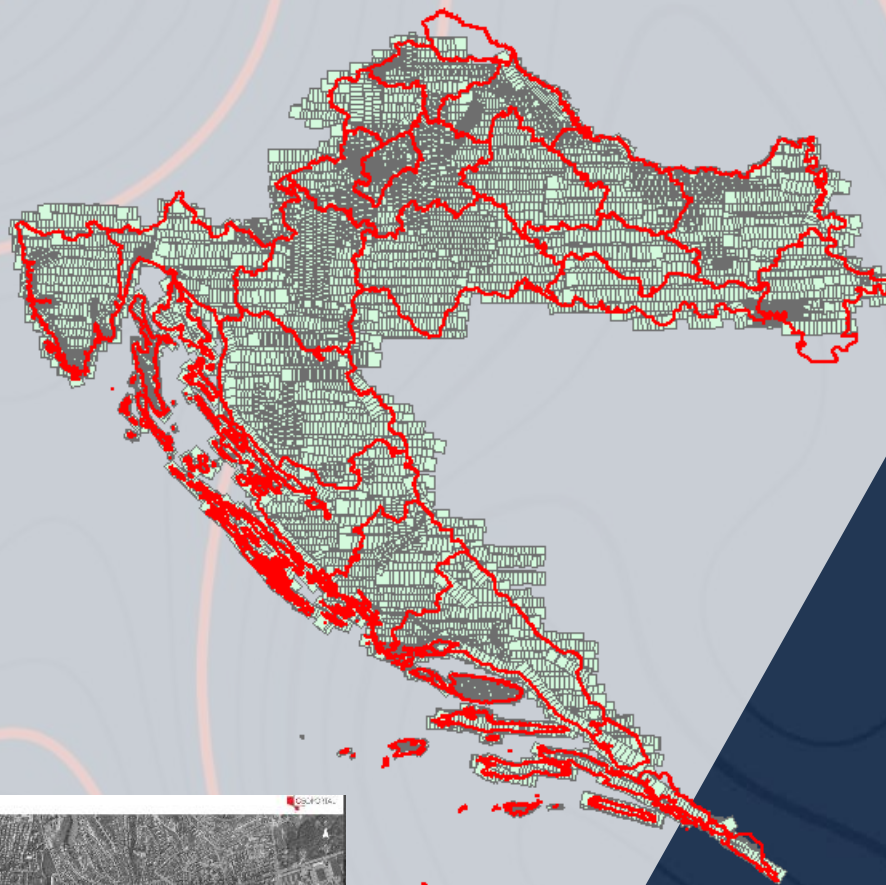
Production process



Good practice – legalization of illegal buildings (1968)

Results

- covered more than 90% of the territory
- more than 35 000 images in 105 different projects
- some areas covered in 3 or more different scales and year of capturing (eg. area of Zagreb)
- DOP in scale 1:5000



Good practice – legalization of illegal buildings (1968)

Result is high quality and very usable product for different purposes

2011

1968



2011

1968





Formal framework and process

Legislation and Regulations

- Law on Construction (Official Gazette 153/13, 20/17, 39/19 and 125/19)
- Law on Dealing with Illegally Constructed Buildings (Official Gazette 86/12, 143/13, 65/17 and 14/19)
- Law on State Survey and Real Estate Cadastre (Official Gazette 112/18 and 39/2022)
- other rules, regulations and by-laws



Usage of aerial photogrammetric images

- one of the tools in the legalization process, but not the only source of information
- in combination with other relevant documentation, technical review and field research - significantly affects the reliability of building detection for the legalization process



Participation of SGA in legalization procedures

- Since 2006, SGA has been participating in the legalization process for buildings recorded/visible on materials under its jurisdiction
- SGA - issuance of certificates based on examination of aerial photogrammetric images, DOF5, HOK, cadastral report, copy of cadastral plan, title deed, etc.



Buildings constructed before 1968.

- February 15, 1968 – date of General Legalization
- everything built in the territory of the Republic of Croatia until February 15, 1968 - is in accordance with the appropriate permit
- by examination of the aerial photogrammetric image from the air made on the basis of the recording made before February 15, 1968.
- by examination of the other cartographic materials of the State Geodetic Administration from that time or, if necessary, other appropriate evidence



example

Year 1961.



Task: Split_1961.

Year 1966.



Task: Reambulacija_VGI
Sarajevo_Primorje_1_1966.

example of the certificate



REPUBLIKA HRVATSKA
DRŽAVNA GEODETSKA UPRAVA

Sektor za infrastrukturu prostornih podataka
Služba za izdavanje i razmjenu prostornih podataka
Odjel za izdavanje prostornih podataka

KLASA: 938-08/22-02/34
UR. BR.: 541-05-02-01/3-22-2
Zagreb, 9.5.2022. god.

Na temelju članka 159. Zakona o općem upravnom postupku (»Narodne novine«, br. 47/09, 110/21), a na zahtjev Goran Vujančić, Amruševa ulica 8, Zagreb, izdaje se:

UVJERENJE

Identifikacijom je utvrđeno da je građevina označena kao I, locirana na k.č.br. 1787 k.o. Markuševac, za koju se izdavanje uvjerenja traži, prikazana na snimci iz zraka izrađenoj temeljem snimanja iz zraka 1968. godine.

Sastavni dio ovog uvjerenja je kopija snimke iz zraka.

Sukladno Zakonu o upravnim pristojbama (»Narodne novine«, br. 115/16.) te Uredbi o tarifi upravnih pristojbi (»Narodne novine«, br. 92/2021, 93/2021 I 95/2021), upravna pristojba po Tar.br.1 i Tar.br.4. ne naplaćuje se.

Sukladno Zakonu o državnoj izmjeri i katastru nekretnina (»Narodne novine«, br. 112/18, 39/22) stvami troškovi se ne naplaćuju.

Prilog: 1

Ovlašteni geodetski referent:

Ivana Kozina



REPUBLIKA HRVATSKA
DRŽAVNA GEODETSKA UPRAVA
SREDIŠNJI URED
SEKTOR ZA INFRASTRUKTURU PROSTORNIH
PODATAKA
SLUŽBA PROSTORNIH PODATAKA, SERVIS I
ARHIVA
ODJEL PROSTORNIH PODATAKA I SERVIS I

Zadatak:
ZAGREB_1965

Godina snimanja: 1965
Niz: R-212
Broj snimka: 3485

KOPIJA SNIMKE IZ ZRAKA



I i II - građevine za koje se izdaje Uvjerenje

Izradio:

Gordana Poklepović

Ovlaštena osoba:

Gordana Poklepović

Legalization of illegally constructed buildings until 2011.

- a large number of illegally constructed buildings throughout the country
- Law on Dealing with Illegally Constructed Buildings, 2012.
- *all buildings that are visible on the digital orthophoto map of the State Geodetic Administration made on the basis of aerial photogrammetric surveying started on June 21, 2011 or on the digital orthophoto map made on the basis of aerial photogrammetric survey until June 21, 2011 can be legalized.*



example



Varaždin_AF_2003.



DOF_2004./05.



example of the certificate



Sektor za infrastrukturu prostornih podataka
Služba za izdavanje i razmjenu podataka

KLASA: 938-08/24-03/102
URBROJ: 541-05-02-02/5-24-2
Zagreb, 15.03.2024.

Na temelju članka 168. Zakona o državnoj izmjeri i katastru nekretnina (NN 112/18), članka 159. Zakona o općem upravnom postupku (NN 47/09), a na zahtjev Ana Valek, Bezjakova ulica 81, 2344 Maribor, Slovenija izdaje se:

UVJERENJE

da je zgrada, za koju je identifikacijom utvrđeno da je smještena na katastarskoj čestici broj 7017/9 k.o. Premantura, vidljiva na digitalnoj ortofoto karti u mjerilu 1:5000, izrađenoj na temelju aerofotogrametrijskog snimanja Republike Hrvatske započeto 21. lipnja 2011. godine - DOF5/2011.

Sastavni dio ovog uvjerenja je preslika DOF5/2011 na kojoj je zgrada za koju se uvjerenje izdaje označena crvenim brojem 1.

Ovo se uvjerenje izdaje u svrhu dokazivanja da je zgrada vidljiva na digitalnoj ortofoto karti u mjerilu 1:5000, izrađenoj na temelju aerofotogrametrijskog snimanja Republike Hrvatske započeto 21. lipnja 2011. godine - DOF5/2011.

Sukladno Zakonu o upravnim pristojbama (Narodne novine, br. 11/5/16) te Uredbi o tarifi upravnih pristojbi (Narodne novine, br. 92/2021, 93/2021, 95/2021) upravna pristojba po Tar. br. 1. i Tar. br. 4. ne naplaćuje se. Sukladno Zakonu o državnoj izmjeri i katastru nekretnosti (NN 112/18 i 39/22) čl. 171. st. 2. stvarni troškovi ne naplaćuju se.

Prilog: DOF5/2011
Izdala: Anita Butorac



REPUBLIKA HRVATSKA
DRŽAVNA GEODETSKA UPRAVA
Sektor za infrastrukturu prostornih podataka
Služba za izdavanje i razmjenu podataka
U Zagrebu, 15.03.2024. god.

Sekcija: 1-111-4
List broj: 12
Godina snimanja: 2011
Koordinatni sustav: HTRS96/TM

PRESLIK DIGITALNE ORTOFOTO KARTE (DOF5/2011)

Mjerilo izvornika 1: 5000
Mjerilo preslika 1: 2000

Ovaj preslik DOF je prilog uvjerenja: KLASA: 938-08/24-03/102, URBROJ: 541-05-02-02/5-24-2



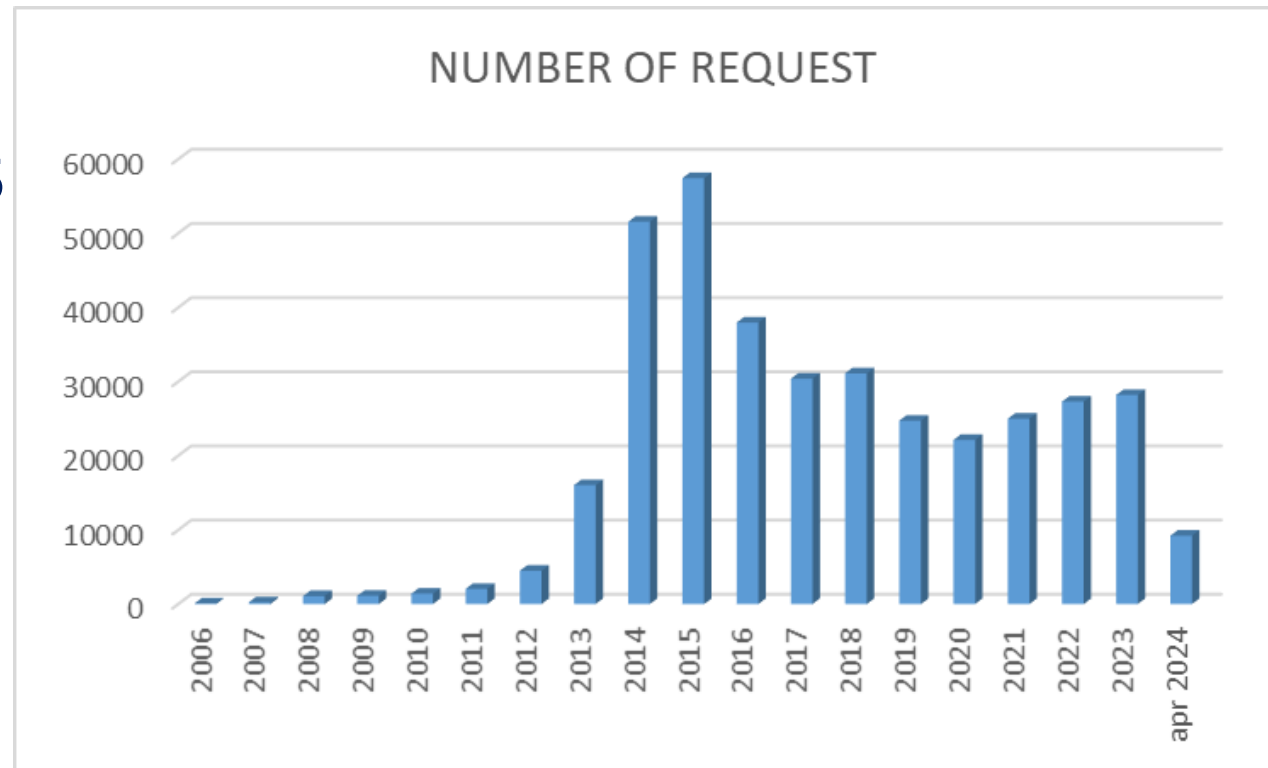
Izdala:
Anita Butorac, geod.teh.

Voditeljica Službe:
Sanja Mimica, dipl.ing.geod.

Participation of SGA in legalization procedures

- Issuance of the Certificate on the time of registration of the building on the images made on the basis of the image capturing made before February 15, 1968.

- Total: 371 535

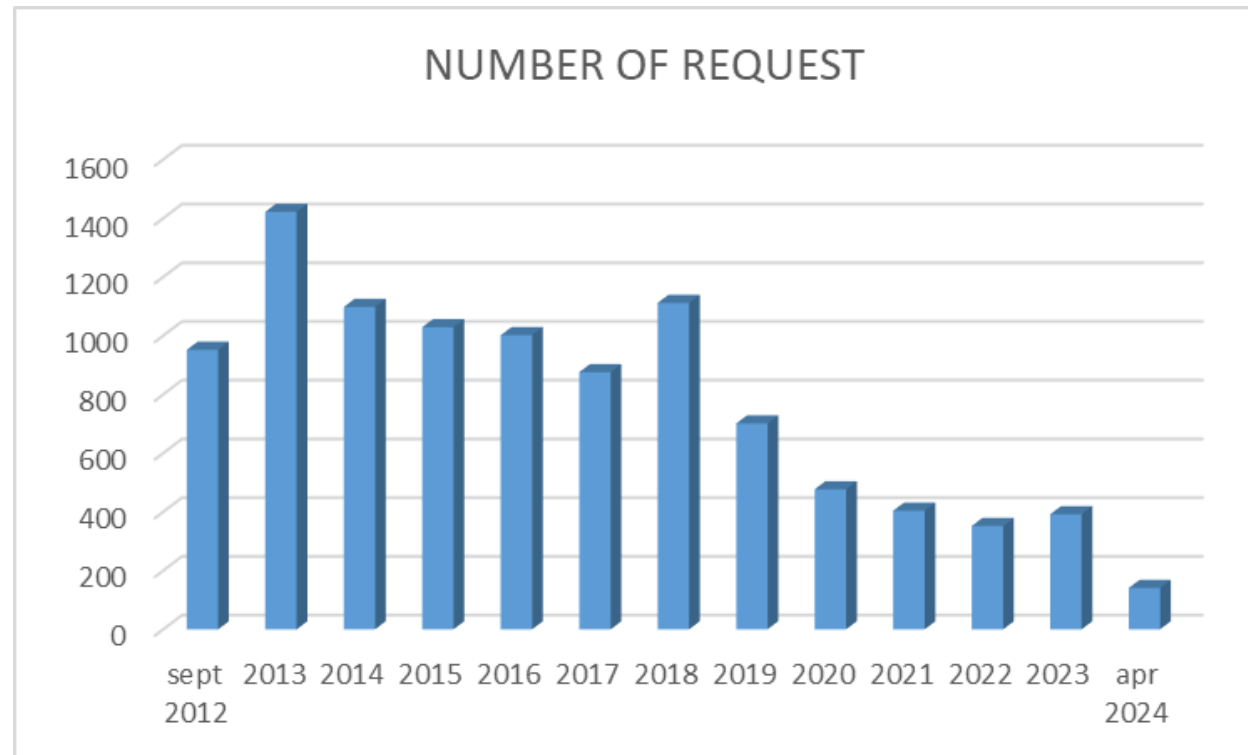


increase in the request for the issuance of the Certificate 1968.

Participation of SGA in legalization procedures

- Issuance of the Certificate on whether the building is visible on the digital orthophoto map made on the basis of the aerial photogrammetric survey started on June 21, 2011 (DOF5/2011)


- Total: 9 958



representation of received requests for issuing Certificates 2011.

Participation of SGA in legalization procedures



- Limited number of employees, analog aerial images, lack of flight plans, ...
 - Aerial images from the Military Geographical Institute – 35 000 images, up to 1968
 - 2013 – DOF68 mosaic
 - development of application for the issuance of certificates, 2014 - uploaded aerial images 1954 - 1968
- 


Application for certificate issuing

The screenshot displays a web browser window with the following elements:

- Browser Tab:** DGU - Aplikacija za izdavanje
- Address Bar:** legalizacija.dgu.hr/app.php
- Logo and Title:** REPUBLIKA HRVATSKA Državna geodetska uprava
- Navigation Tabs:** Mapa, Popis izdanih kopija, Administracija korisnika, Pregled izdanih kopija
- Map Interface:** Aerial view of a residential area with a scale of 1:2000. A toolbar includes navigation and printing tools. A status bar at the top right reads "Automatsko osvežavanje" and "Dobrodošli, Maja Fudurić Iljanić".
- File List (Sadržaj):**
 - 3063.tif, 3062.tif
 - 1968
 - 7107.tif
 - 7108.tif** (highlighted)
 - 7109.tif
 - 7110.tif
 - 7935.tif
 - 7936.tif
 - 7937.tif
 - 7938.tif
 - 6880.tif
 - 6881.tif
 - 6882.tif
 - 6883.tif
 - 1967
 - 6005.tif
 - 5970.tif
 - 5971.tif
 - 5972.tif
 - 6006.tif
 - 6007.tif
 - 1965
 - 3643.tif
 - 3644.tif
 - 3645.tif
 - 3646.tif
 - 3602.tif
- Search Form (Pretraga):**
 - Katastarski ured/Ispostava: [Dropdown menu]
 - Katastarska općina: [Dropdown menu]
 - Broj čestice: [Text input field]
 - Traži: [Search button]

Application for certificate issuing



- Developed in year 2014.
 - basic GIS functionalities - zoom, pan, layer management, swipe...
 - enables annotations, review and archiving of issued certificates at the cadastral parcel level
 - basic data are individual aerial photogrammetry images by year of capturing (up to 1968), additionally number of other SGA materials is used - HOK, DOF2011, cadastral plan etc.
- 



Conclusion

Conclusion

- Through the process of legalization, the actual situation in the territory of the Republic of Croatia in terms of constructed buildings has been registered to a large extent, and thus the audit, inventory and registration of constructed buildings has been made
- The legalization process, to some extent, enabled the poorer parts of society to register ownership and dispose of real estate, which reduced social differences in society
- For the local self-government, the legalization and consequently the registration of illegally constructed buildings made it possible to better deal with the infrastructural needs of the population in terms of the design and construction of water supply, sewerage networks and wastewater treatment plants

Conclusion



- If we were to develop the application today, we would include additional layers/datasets such as TTB and especially LIDAR data
 - It would be recommendation to try to perform the detection of potential objects (buildings) in advance using a machine learning models by comparing a number of different sets of original data
- 