



**Czech Office for Surveying,  
Mapping and Cadastre**

## **Fundamental Base of Geographic Data of the Czech republic (ZABAGED®)**

**Delivering the most accurate geographic data available for the Czech  
Republic**

**EuroGeographics**

Webinar Series – Spatial Data Quality

June 25, 2020

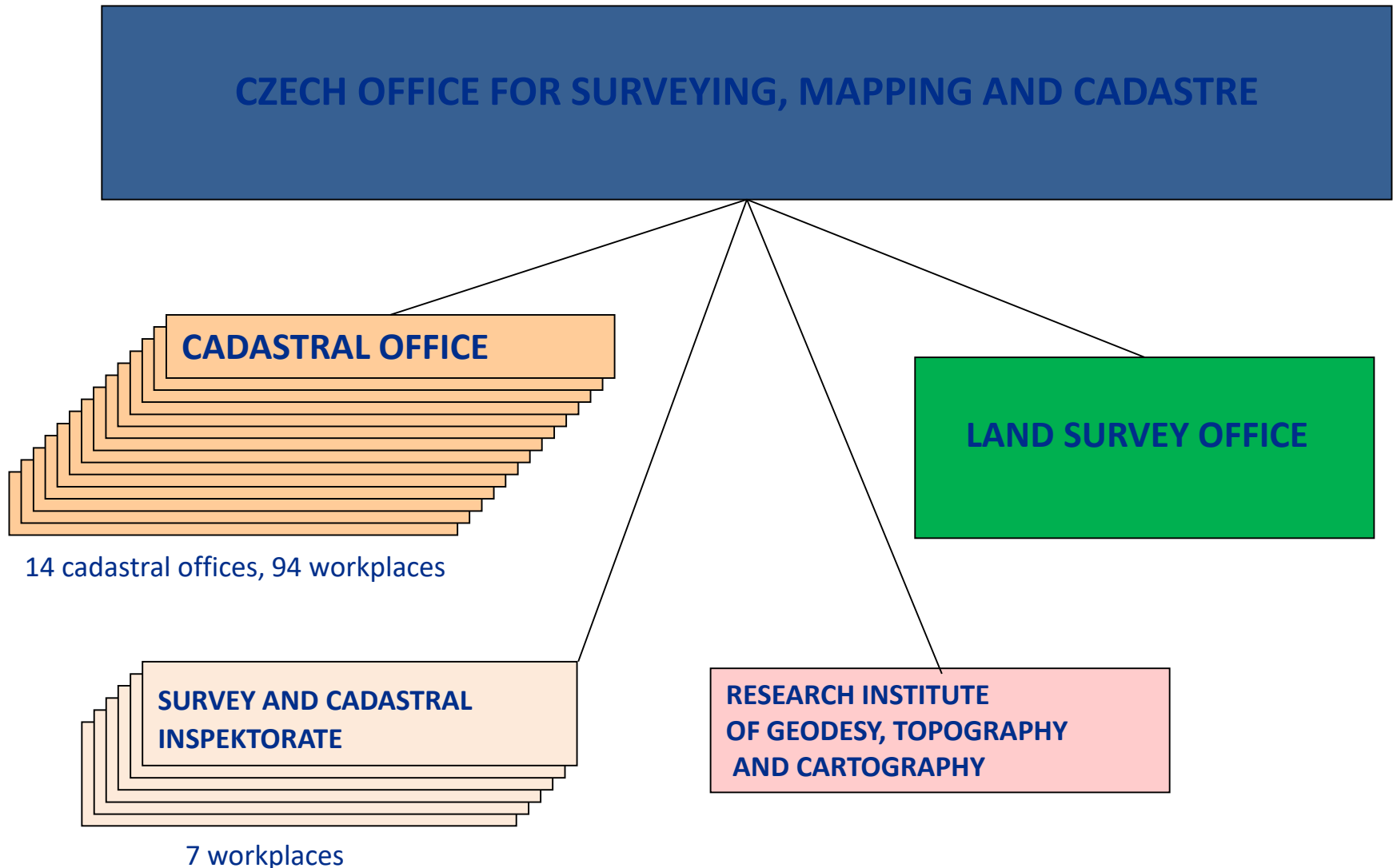


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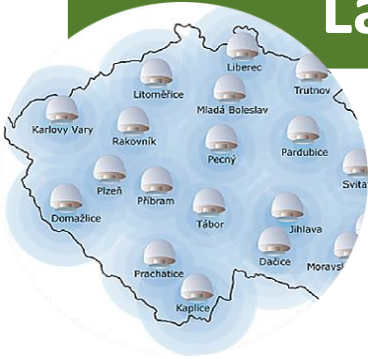
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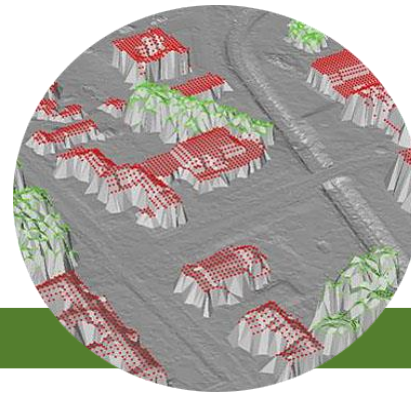
# State Administration of Land Surveying and Cadastre



# Land Survey Office - Main responsibilities



- Maintenance of the Geodetic Foundations of the Czech Republic (horizontal, vertical and gravity foundations)
- Administration of the Czech Positioning System CZEPOS (network of permanent stations GNSS)
- Maintenance and documentation of the State Boundaries
- Air Images acquisition and production of the Orthophoto CR
- **Administration of the Fundamental Base of Geographic Data of the Czech Republic (ZABAGED®) - planimetry**
- Maintenance of ZABAGED® - Basic Elevation Models
- Standardization of Geographical Names and administration of the Czech Gazetteer
- Maintenance of state Basic Topographic Maps
- Administration of the Central Archives of Surveying, Mapping and Cadastre
- Development and maintenance of the Geoportal CUZK



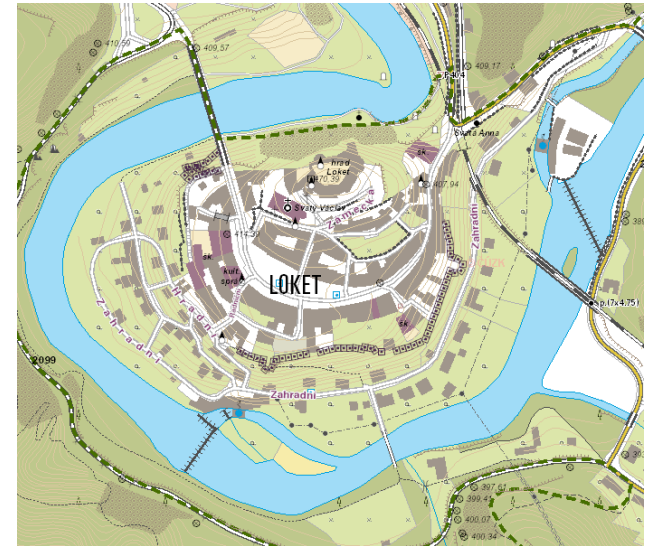


# Main Characteristics

## ZABAGED<sup>®</sup> – Vector Digital geographic vector model of the Czech Republic territory maintained by Land Survey Office

Vector representation of spatial geographical elements including qualitative and quantitative properties, Unique ID's and relations (internal and external)

- 1995 – 2020..... Regular, permanent updating cycles
- Originates from State Base Map CR, scale 1: 10 000, **today higher scale - 5K**
- Since 2006 planimetry data have been maintained in seamless database in centralized system with online access
- Elevation data are stored separately.
- 134 feature types published (131 planimetry), with more then 400 attributes, 17 milion individ. entities
- Attributes quantity, quality characteristics, unique identifiers from thematic (branch) databases.
- Geodetic refence system S-JTSK, Baltic Vertical Datum - After Adjustment

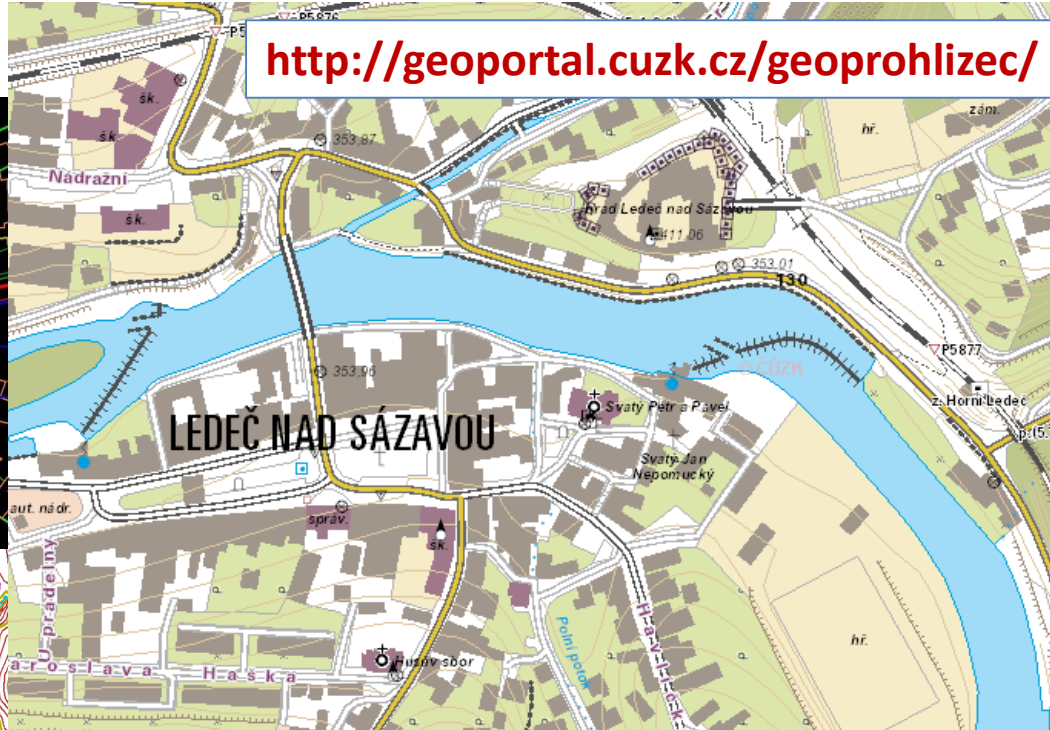
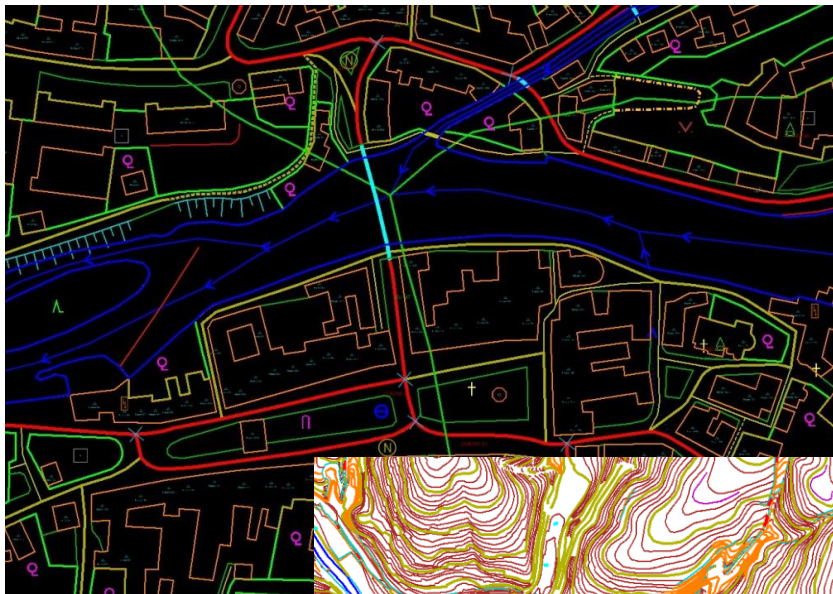


# Main Characteristics

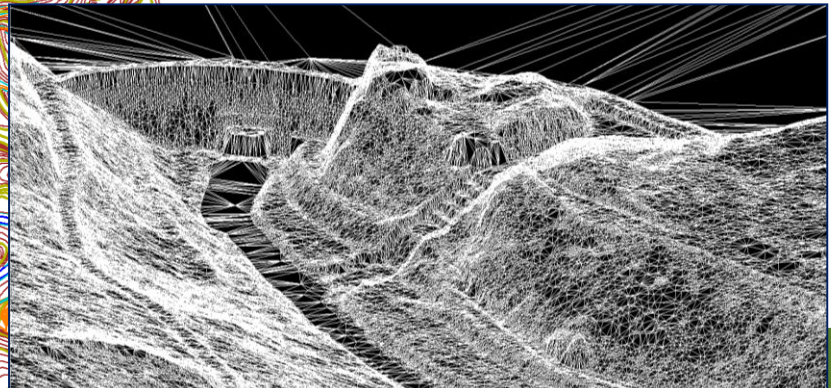
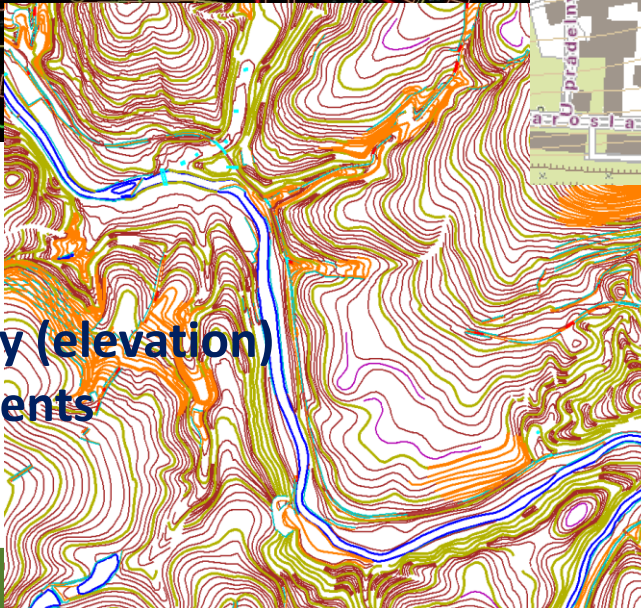
Web portal visualization

<http://geoportal.cuzk.cz/geoprohlizec/>

2D planimetry components



3D altimetry (elevation)  
components





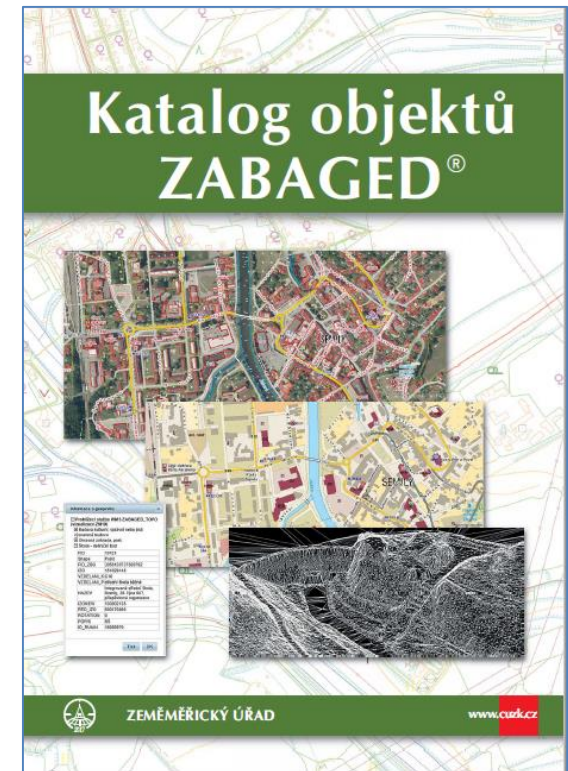
# Data Quality Assurance

ZABAGED® - Put emphasis on data quality:

- Current (actual) state of landscape, land use, settlements, terrain...
- Data and attributes completeness
- Correct data classification
- Logical and geometry topology
- Network consistency
- Geometry accuracy

How to ensure this:

- **Ways of updating** – to define a period for data updating,  
- external sources usage – cooperation with other state authorities
- **Geometry accuracy improvement** – to use suitable **background (underlying)** data with a higher quality - better resolution and position accuracy: Ortophoto CR, aerial imagery, airborne laser scanning data (DTM), cadaster data, external sources, check – field survey



# Data Updating

## Two essential ways:

- Periodic Data Updating
- Continuous Data Updating

### • Periodic Data Updating

In 3- 5 years all data from the territory of the CR are checked and updated mainly using photogrammetric methods, contact with municipality and topographic field survey. Actualization of geographical names is included.

(new variation– **Targeted Periodic Data Updating** – on the base of change indicators)

5.period





# Data Updating – External Sources

- **Continuous Data Updating**

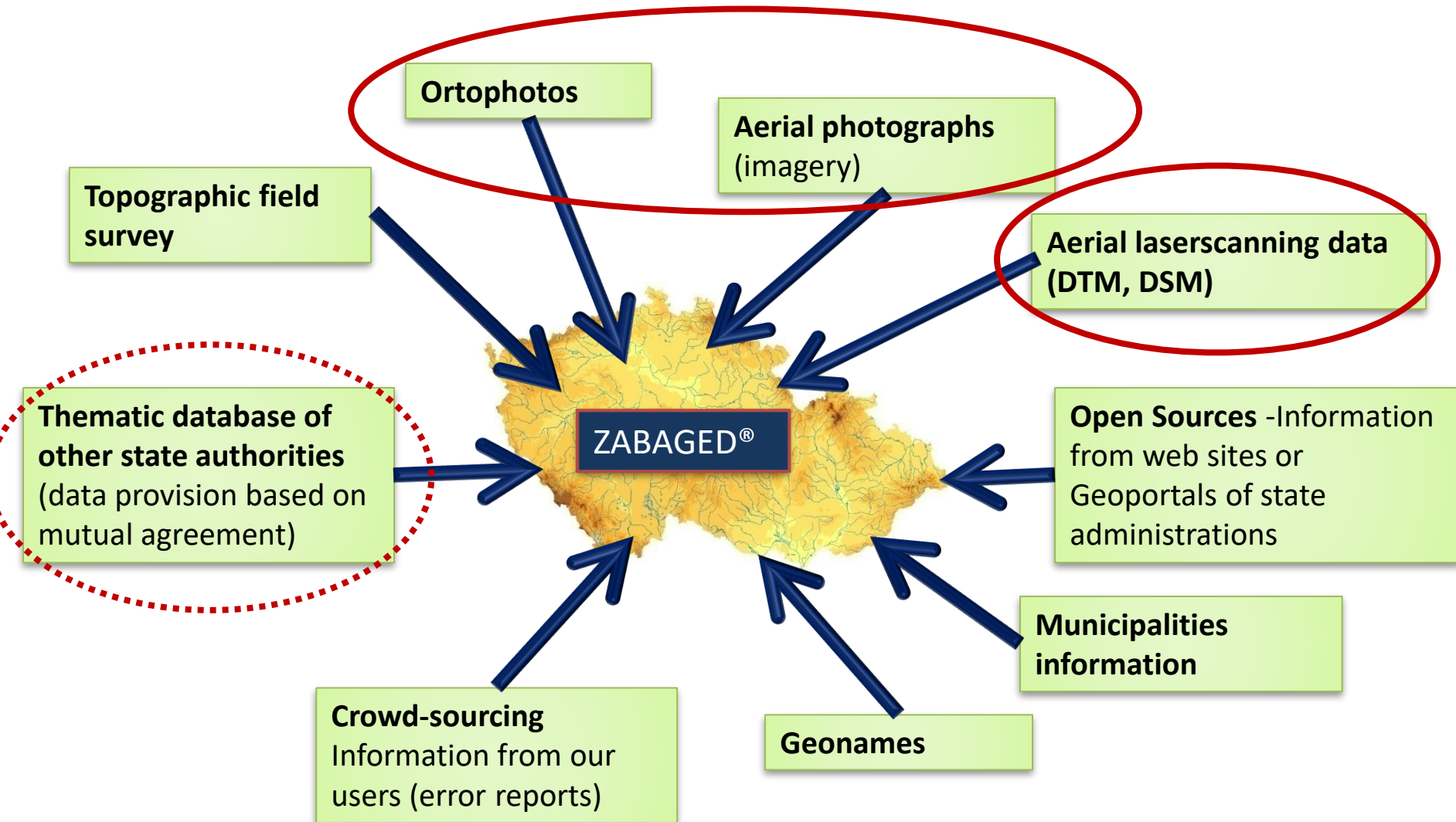
It is connected to collaboration with thematic databases of state authorities. Specific feature types of ZABAGED® are always updated in the whole territory of the CR in the regular period 1 to 4 times a year.

- **Petrol stations** (MPO ČR – *Ministry of Industry and Trade of the CR*)
- **Schools, School facilities** (MŠMT – *Ministry of Education, Youth and Sports* )
- **Waters** (MZe - *Ministry of Agriculture*, VUV – *Water Research Institute*)
- **State Authorities** (MV ČR - *Ministry of Interior CR*)
- **Medical facilities** (MZ ČR - *Ministry of Health CR*)
- **Social facilities** (MPSV ČR - *Ministry of Labour and Social Affairs* )
- **Administrative units and cadastral boundaries, Definition points of address, Buildings** (ČÚZK – *Czech Office for Surveying, Mapping and Cadastre*)
- **Definition points of administrative areas** (ČSÚ – *Czech Statistical Office*)
- **Roads and highways, nodes** (ŘSD - *Roads and Highways Directorate*)
- **Railway network, Railway stations, Railway crossing** (SŽDC - *Railway Infrastructure Administration*)

# Data Updating – External Sources

- **Streets** (obce - **Municipalities**)
- **Airports, Runways, Heliports** (ŘLP – *Air Navigation Services of Czech republic*)
- **Wharfs** (SPS - *State Navigation Administration*)
- **Protected areas** (AOPK - *Nature Conservation Agency of the Czech Republic*)
- **Information about height of selected tall buildings** (RVO – *Register of Height Obstacles* VGHMÚř – *Geographic Service of the Czech Army*)
- **Watershed lines, Meteorological stations** (ČHMÚ – *Czech Hydrometeorological Institute*)
- **Mined material types** (ČGS – *Czech Geological Service*)
- **Power stations** (ERÚ - *Energy Regulatory Office*)
- **Post offices** (Česká pošta – *Czech Post*)
- **Power lines** (private companies - E.ON, ČEPS)
- **Forest type and height, type of forest path** ( UHUL – *Forest Management Institute*)
- **Path** (KČT – *Czech Hiking Club*)

# Main Sources - OVEVIEW



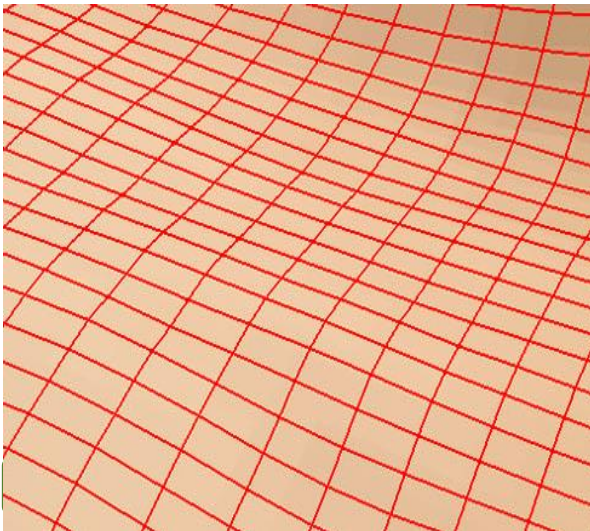


# New ZABAGED Altimetry – Models

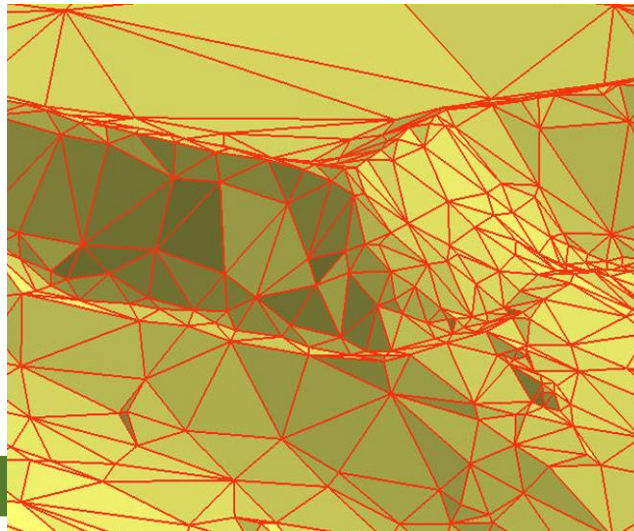
**2008 – 2013 (+ updates) - Project for new elevation mapping of the whole territory of the CZE based on laser scanning technology.**

- 1. Digital Terrain Model 4G (GRID 5 x 5 m) with RMSE = 0.30 m in uncovered areas and 1 m in wooded areas.**
- 2. Digital Terrain Model 5G (TIN form) with RMSE = 0.18 m in uncovered areas and 0.30 m in wooded areas.**
- 3. Digital Surface Model 1G (TIN form ) with RMSE = 0.4 m for well shaped feature and 0.7 m for other features.**

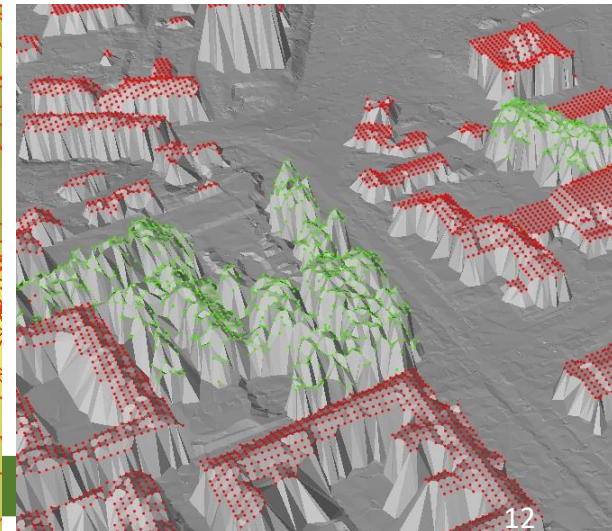
**DTM 4G**



**DTM 5G**



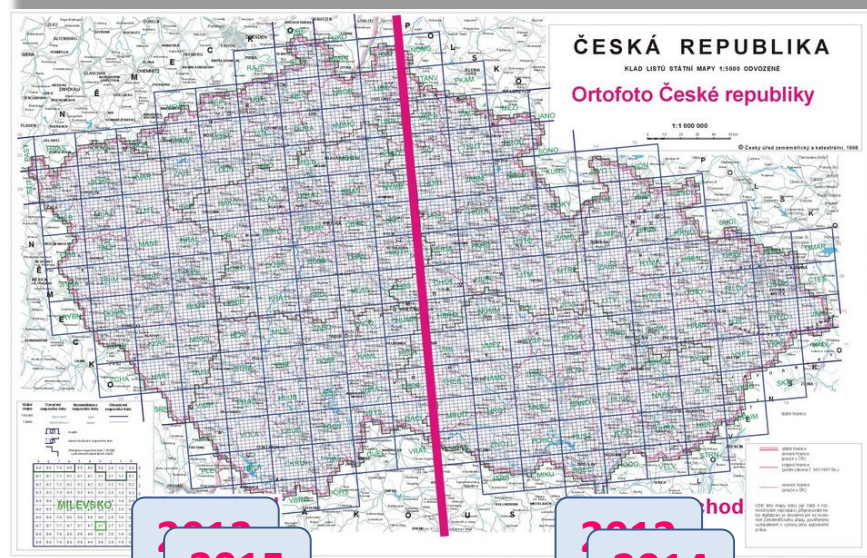
**DSM 1G**



# Orthophoto CR

## PARAMETERS OF ORTHOPHOTOS

- size of pixel 0,20 m (0,12 m has been prepared)
- high color quality
- RMSE = 0,3 m in horizontal plane
- two years periodicity
- national JTSK & UTM/WGS 84 CRS & ETRS 89
- metadata according ISO 19115 are provided through the Geoportal ČÚZK



## Data distribution:

- Data sets
- Viewing services – WMS, WMTS, ArcGIS Server, ECWP
- Prints

2019

2020



# Better positional accuracy for selected feature types

➤ From 2013 – 2019 on the base of aerial laser scanning data (DMR 5G) and Aerial imagery and Orthophotos

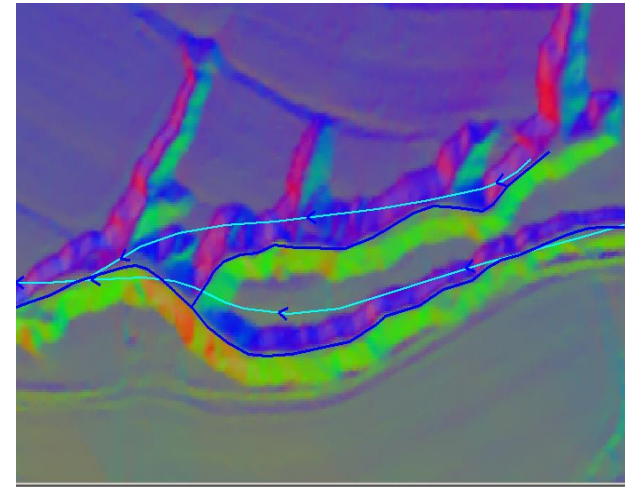
## Selected feature types:

- Roads and highways
- Railways (railway lines)
- Water courses axis
- Riverside (bank) lines
- Height spots (3D)
- Terrain break lines (3D)

+ All the elements lying on these objects, or near them

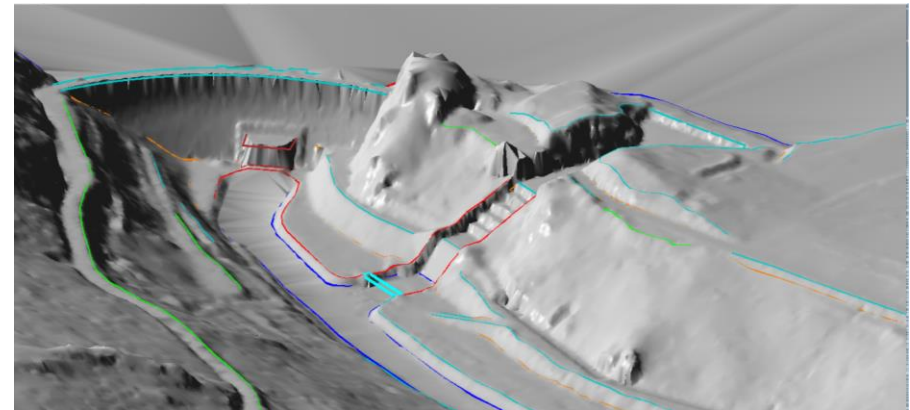
### Source:

Data z ALS  
(DMR 5G),  
ASI,  
Orthophoto,



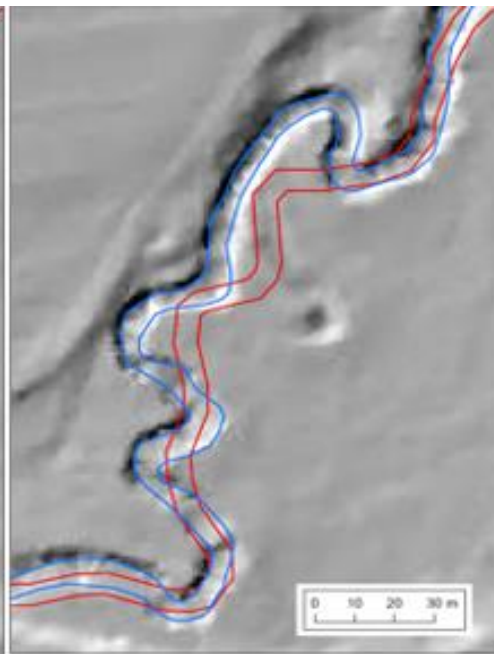
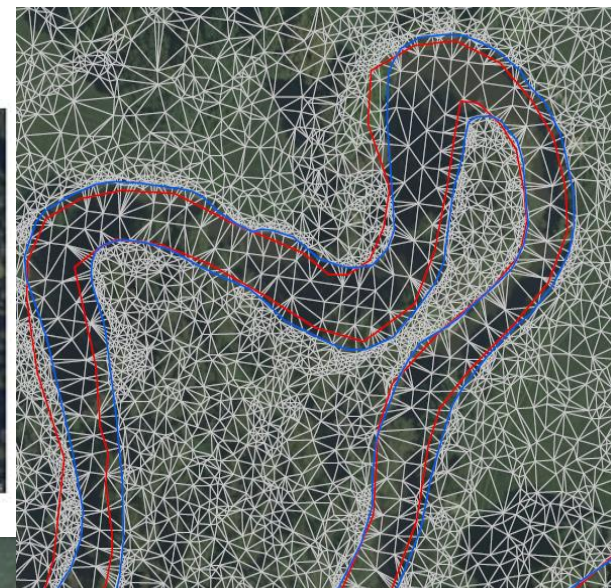
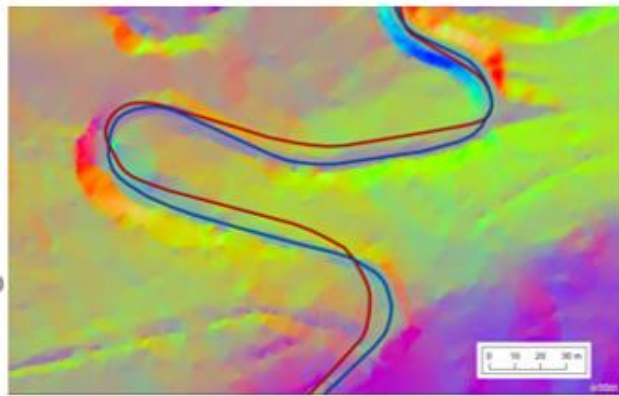
- Others, if they are able to identify in DMR 5G:  
*walls, bridges, waterfalls, dams, weirs, rivendale...(3D)*

**Objective: average position error ( $m_p$ ) to 1 m.**





# Illustrations/Examples - Watercourse Axis





# Illustrations/Examples - Watercourse Axis

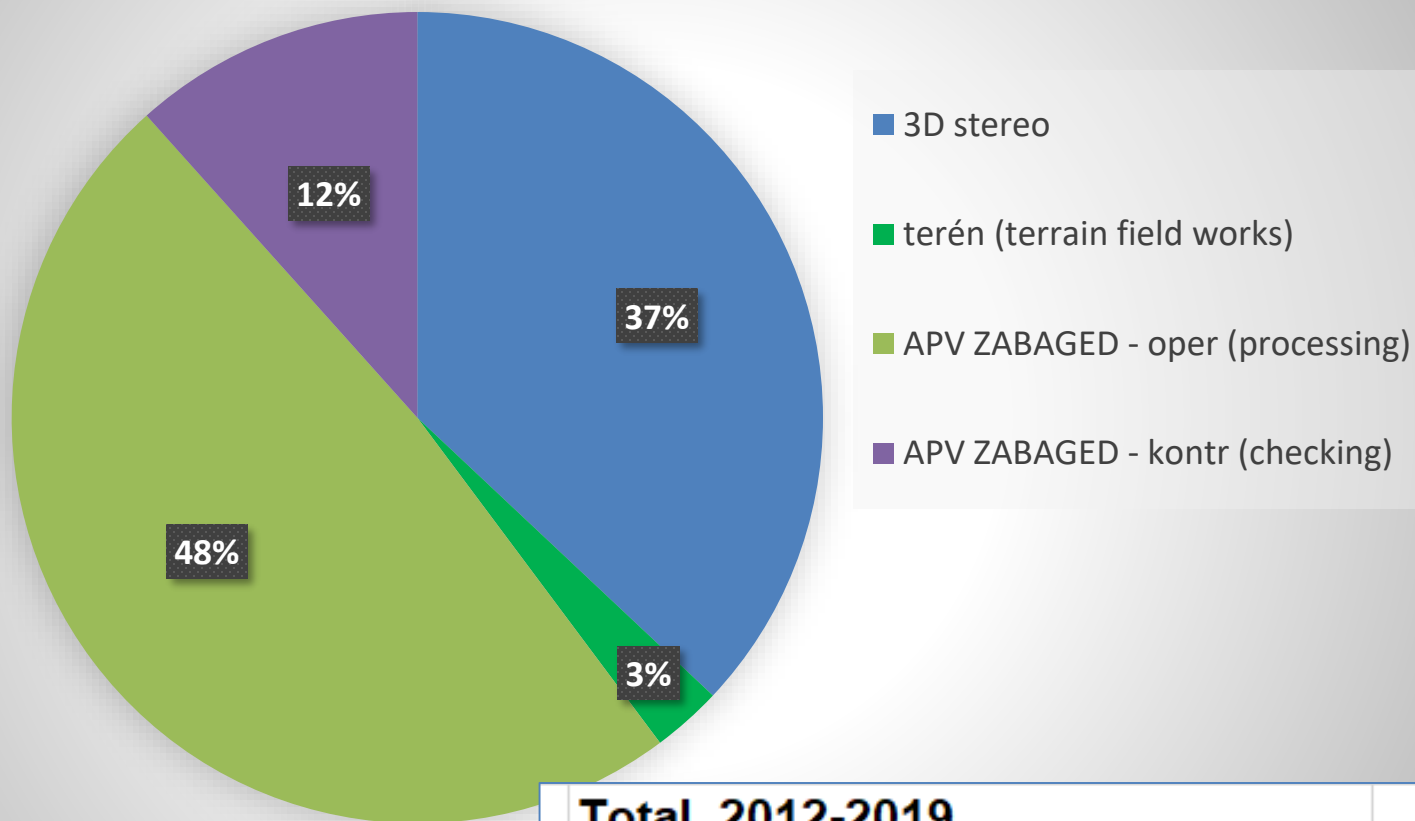


# Statistics - Elements

		Počet prvků (Number of Elements)		Celková délka (v km) (Total Length)		Počet vertexů (Number of Vertexes)	
		7/2012	7/2019	7/2012	7/2019	7/2012	7/2019
	<i>lines:</i>						
ft_an010	Železniční trať (Railway Line)	5 200	5 369	9 428	9 345	259 834	344 299
ft_an050	Železniční vlečka (Railway Branch line)	7 622	7 866	2 626	2 179	74 436	78 939
ft_ap001	Silnice, dálnice (Road)	38 450	39 660	58 242	58 409	2 141 200	2 982 885
ft_bh000	Břehová čára (Riverside/Bank line)	165 316	190 585	41 169	43 748	2 846 674	4 749 262
ft_bh140	Vodní tok (Water Course Axis)	304 994	346 309	112 065	115 670	5 411 745	11 471 949
ft_db080	Pata terénního útvaru (Foot of Terrain Step)	8 504	205 983	2 059	27 957	87 002	2 618 649
ft_db090	Stupeň, sráz (Terrain Step/Break Line)	1 082 051	797 812	185 477	117 575	10 194 606	13 369 219
ft_an015	Železniční kolej (Railway Track)		61 285				
	<i>points:</i>						
ft_ca030	Kótovaný bod (Height Spot)	48 211	62 779			48 211	62 779



# Statistics – Time Consumption (total hours)



## Total 2012-2019

3D stereo	128 487
terén ( <i>terrain field works</i> )	9 678
APV ZABAGED - oper ( <i>processing</i> )	168 662
APV ZABAGED - kontr ( <i>checking</i> )	40 372

# More geometry precise buildings in ZABAGED®



From 2015 – 2021 (plan)

***Assessment of cadastre drawing with regarding to reality and possible discrepancy solve with own (ZABAGED's) drawing according to reality.***

## Main Source:

### • ISKN (Cadastre of Real Estate)

(line parcel boundaries, auxiliary lines, building marks, building definition points)

## Background data:

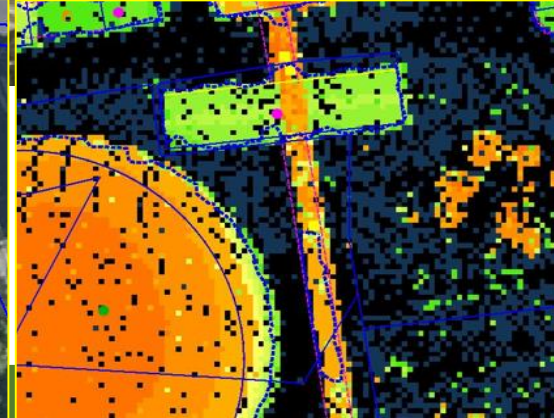
- Ortophoto CZ
- Ortorectified images
- Analytic output from ALS  
(potential buildings)

## Auxiliary sources:

### • ISKN (Cadastre)

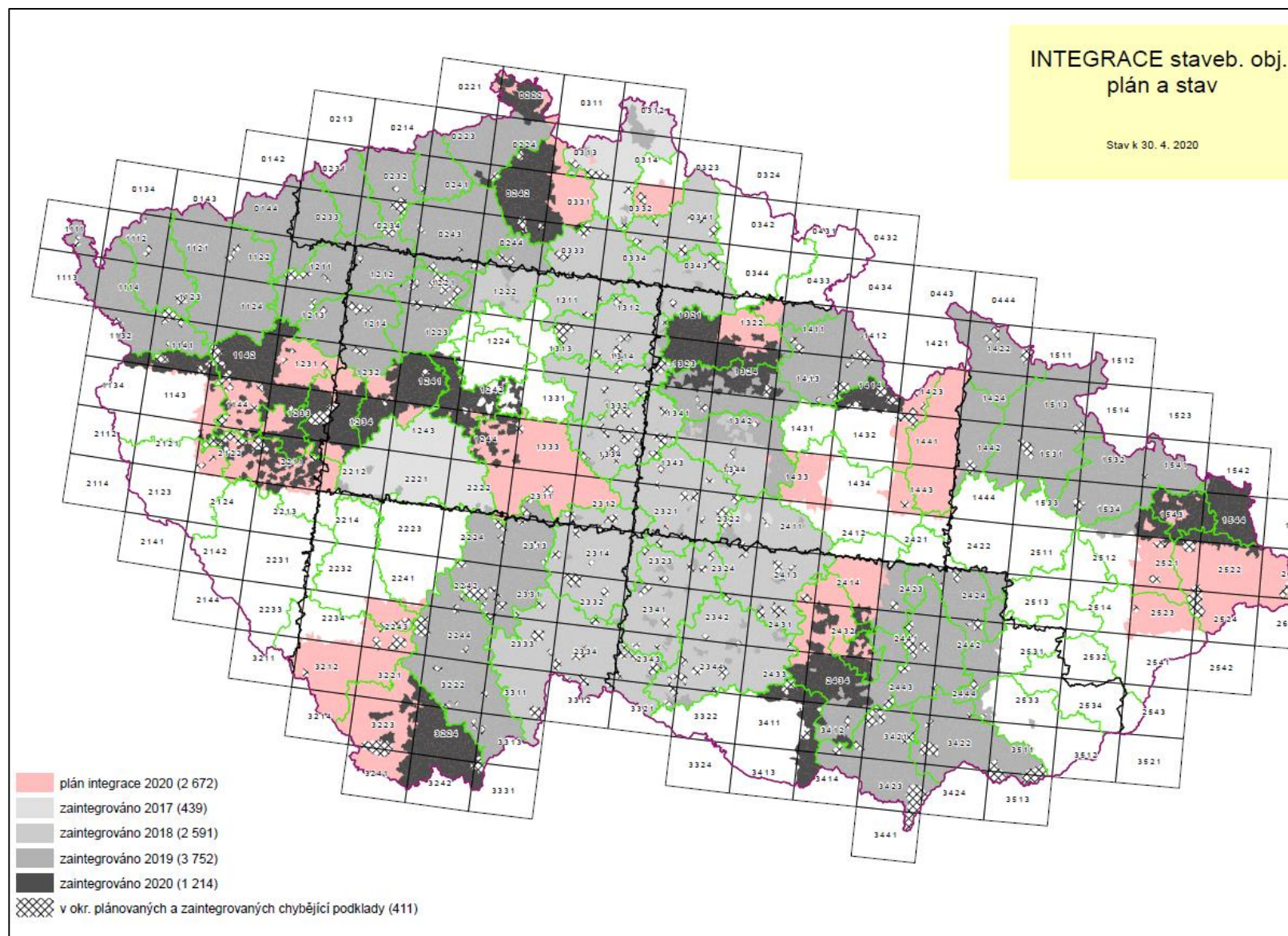
(quality codes of vertexes, change data (new or demolished buildings) since the date of AMS)

### • Current ZABAGED®, Internet





# More precise buildings processing for ZABAGED®





# Illustrations/Examples - Buildings



# Illustrations/Examples - Buildings







# Thank you for your attention!

Contact:

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