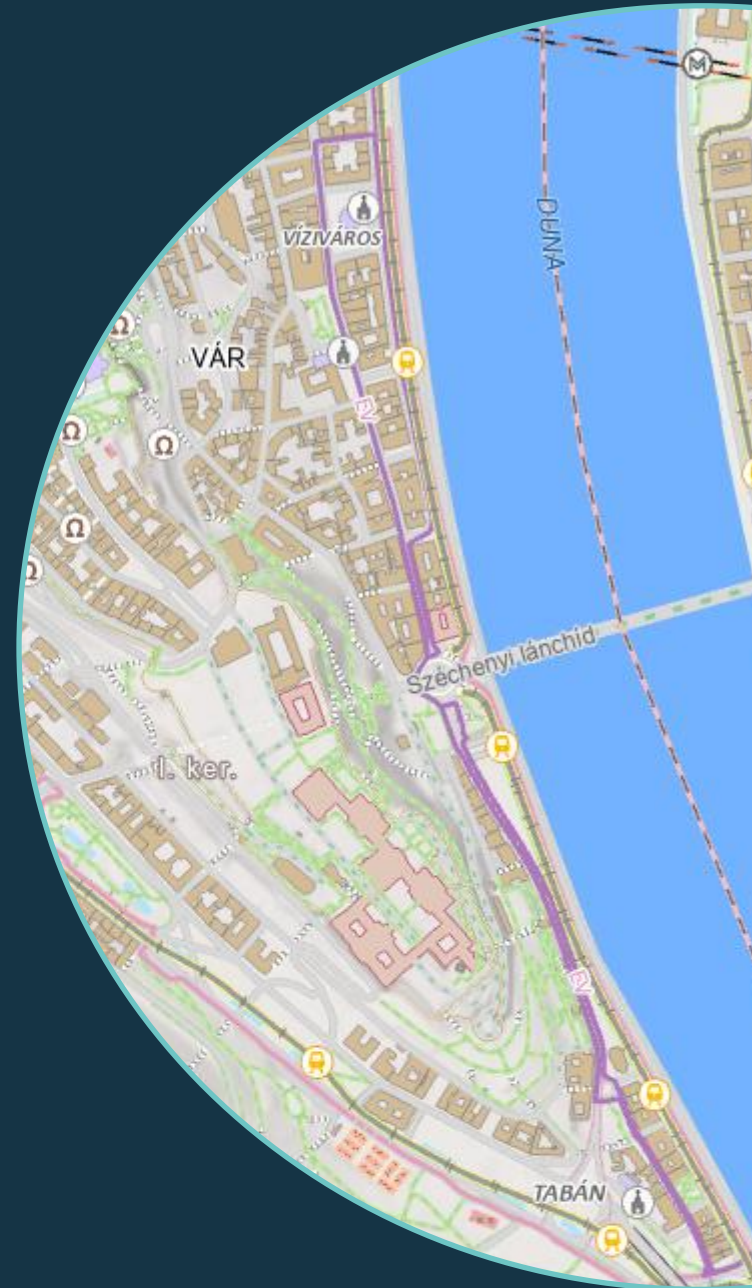# GeoNames of the National Geospatial Map of Hungary (NGMHu)

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CONTENT

NATIONAL GEOSPATIAL MAP OF HUNGARY - NGMHu

The National Geospatial Map of Hungary (NGMHu) is the **country's first complex online geospatial base map service with unified and homogeneous data** derived from national remote sensing data and central databases, for example the land registry, transportation networks or LPIS system for land cover information.

Based on authentic state data
Closed source of data, only available on this platform

24/7 hour available online service
Continuously, long-term, new online map service

Regularly updated database
Yearly updated service according to update frequency of data sources

Real time navigation is not supported
No information available for real time navigation for transportation

Unified geometry and homogeneous coverage
Geometrically and visually unified database for the territory of Hungary

Modern online map service available via Internet
Complex WMTS service that meets the modern needs

It can be tailored to individual needs
it can be created with a unique legend, data content and easily combined with other map services

Contains basic thematic data:
no land parcels information and it's topographical numbers.

INTEGRATED DATA CONTENT OF NGMHu

1. Administrative and block of cadastral parcels boundaries

2. Generalized buildings

3. Transportation networks and stations

4. Hydrography and water facilities

5. Land cover and land use information
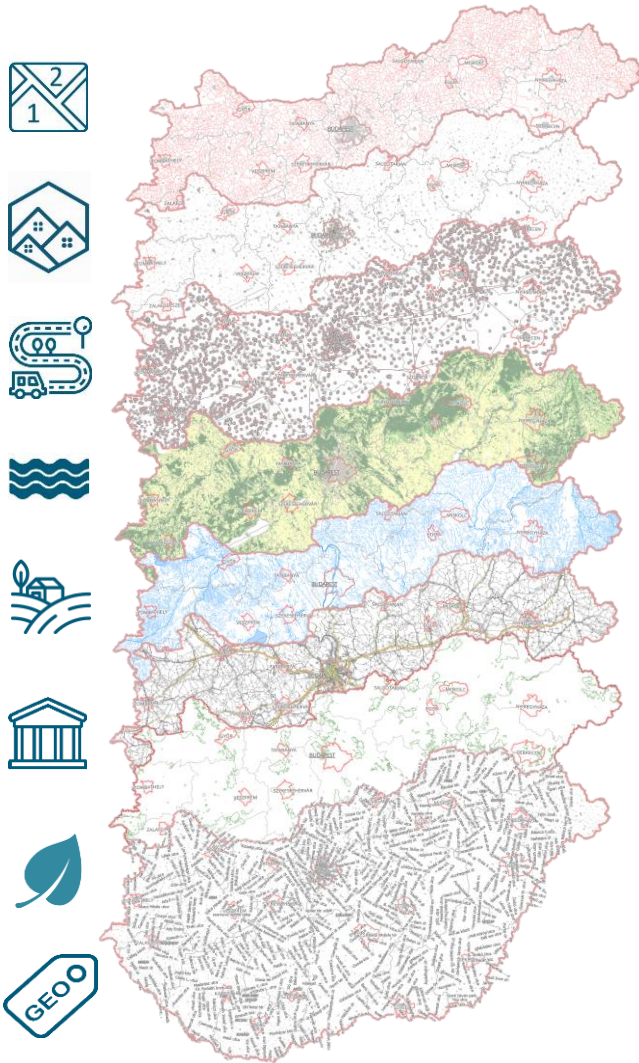
6. Social, cultural and industrial facilities

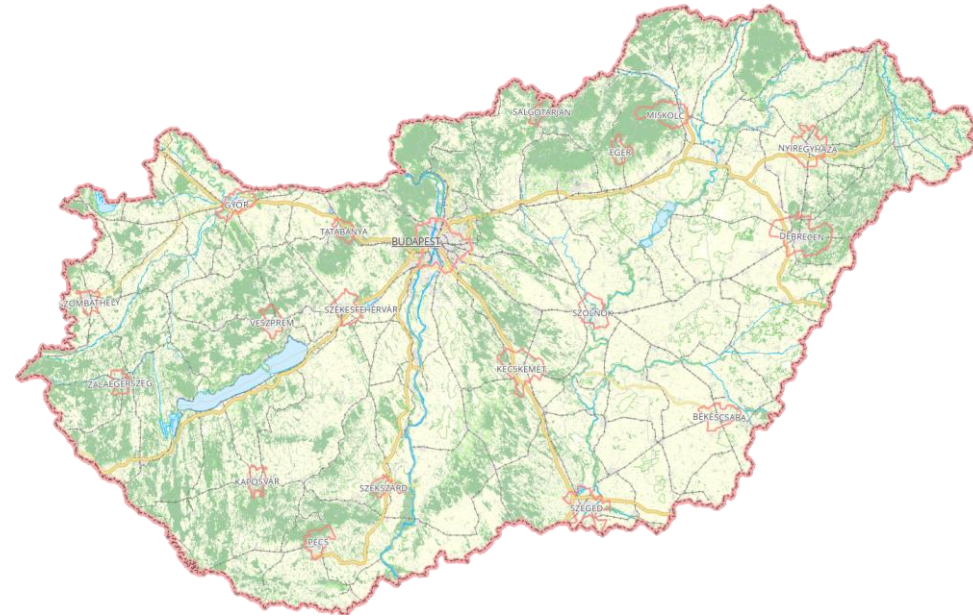7. Nature conservation information

8. **Geographical names**

INTEGRATED DATA CONTENT OF NGMHu

Unified geometry and homogeneous coverage
Geometrically and visually unified database for the
territory of Hungary

NGMHu in 1:2 000 000 source: nta.lechnerkozpont.hu

Input database layers of NGMHu in 1:2 000 000 source: A. Olasz

MAP SYSTEM OF NGMHu

Unique map style has been developed for each zoom level; the displayed data content on the particular zoom level is increasing when using the online map service as we move into larger scales.

1:2 000 000

1:200 000

1:1000

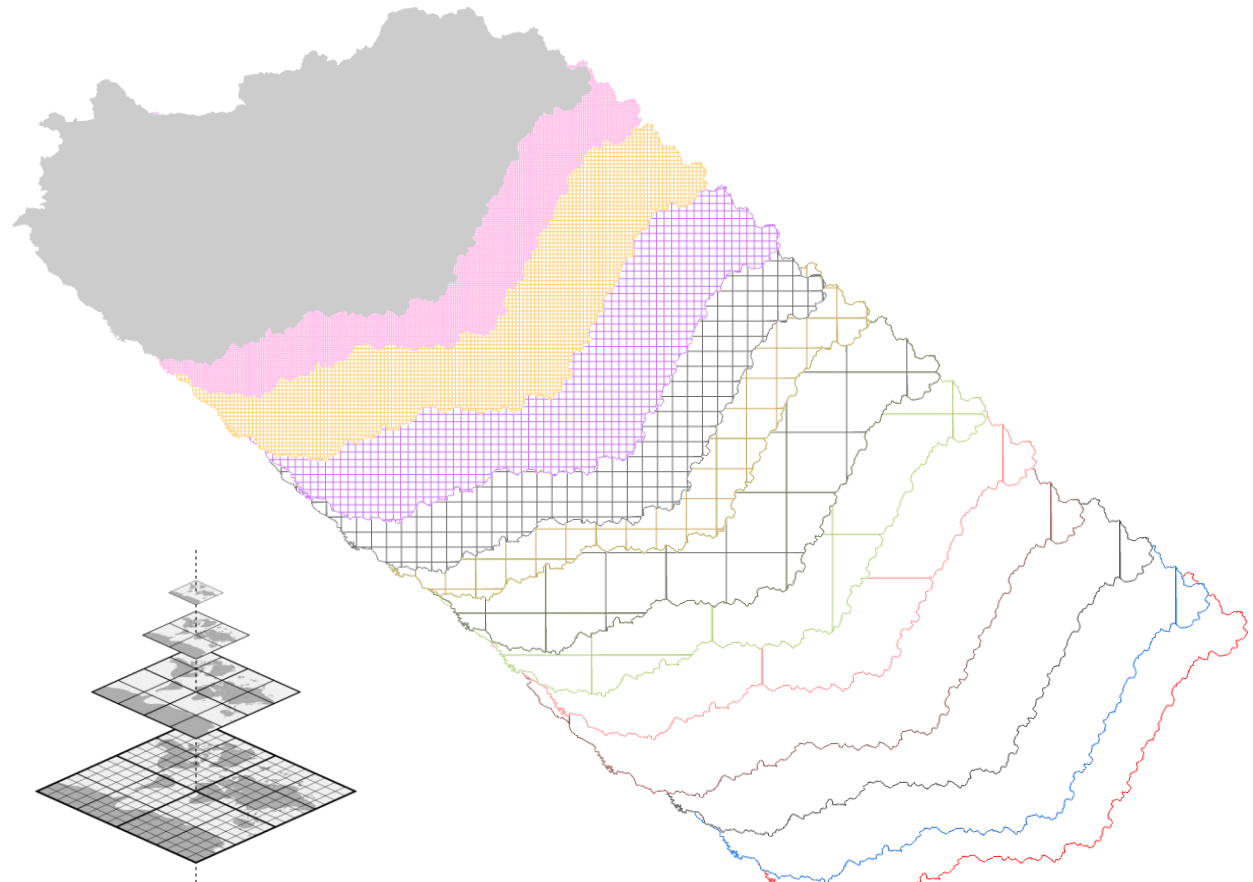*NGMHu in different zoom levels, source: nta.lechnerkozpont.hu*
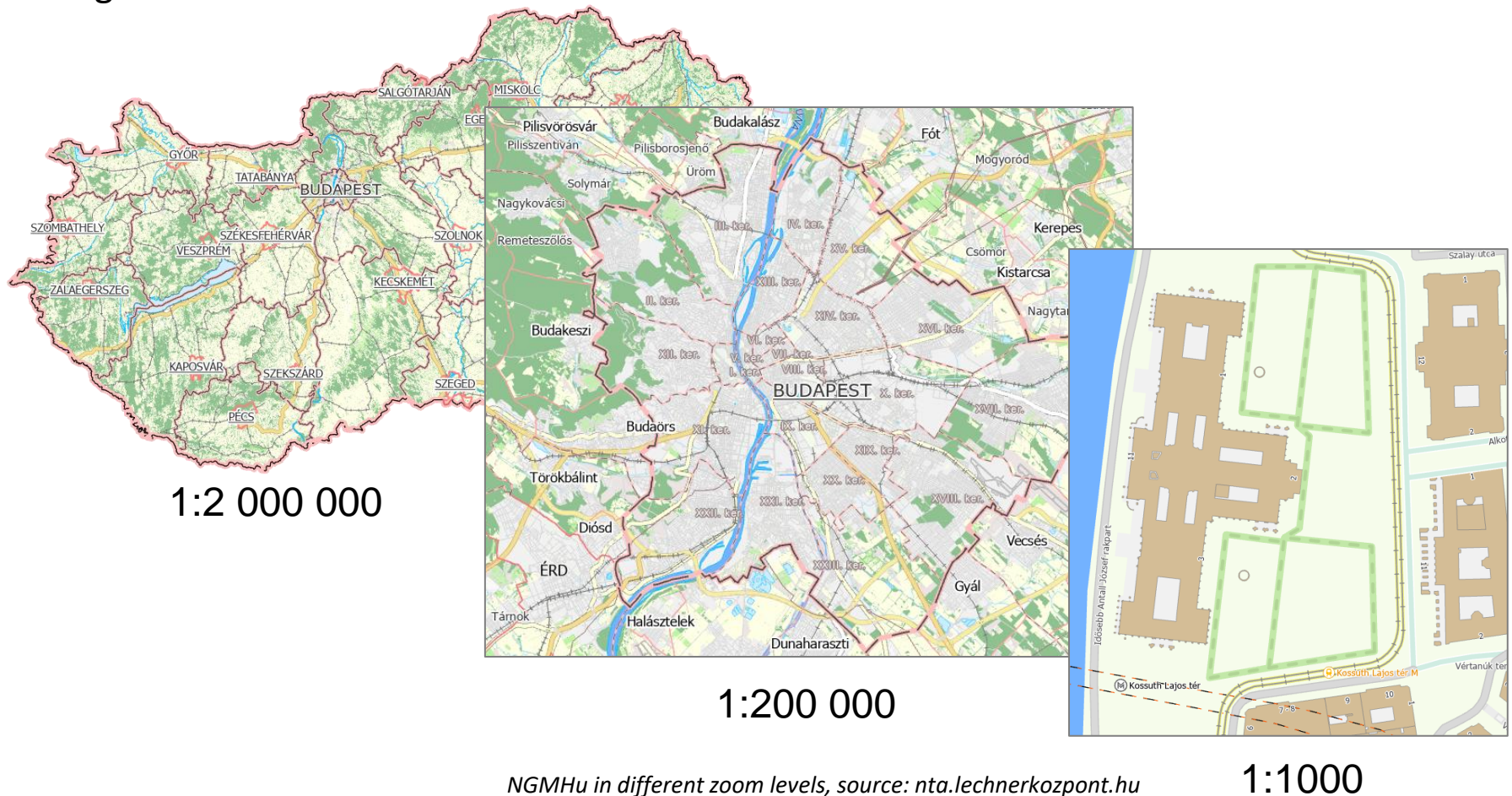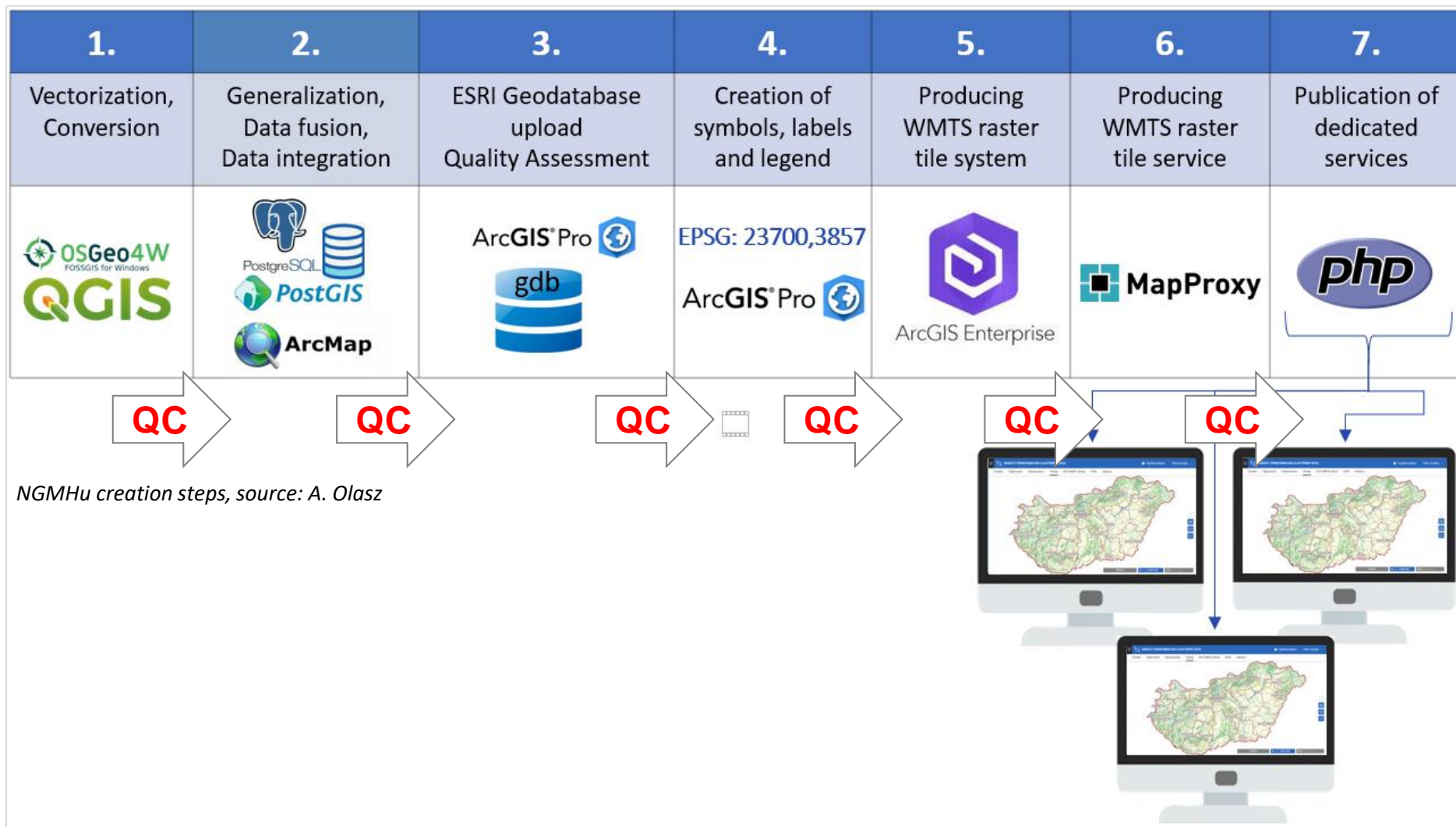
MAP SYSTEM OF NGMHu

Two different map tile cache systems have been developed, including 12 zoom levels in the Hungarian unified national projection (EOV) and 13 levels in the **Web Mercator projection system**, the number of the tiles are fixed:

N.	Zoom level
19	1:1128
18	1:2257
17	1:4514
16	1:9028
15	1:18 056
14	1:36 112
13	1:72 224
12	1:144 448
11	1:288 895
10	1:577 791
9	1:1 155 581
8	1:2 311 162
7	1:4 622 324
6	1:9 244 649
5	1:18 489 298
4	…

NGMHu tiles in different zoom levels, source: A. Olasz

Arc**GIS** Pro

STEPS AND THE USED SOFTWARE ENVIRONMENT OF NGMHu

1.	2.	3.	4.	5.	6.	7.
Vectorization, Conversion	Generalization, Data fusion, Data integration	ESRI Geodatabase upload Quality Assessment	Creation of symbols, labels and legend	Producing WMTS raster tile system	Producing WMTS raster tile service	Publication of dedicated services

NGMHu creation steps, source: A. Olasz

NGMHu DATA MODELS

Own data model (database table level) created for all the categories:

1. Administrative and block of cadastral parcels boundaries

2. Generalized buildings

3. Transportation networks and stations

4. Hydrography and water facilities

5. Land cover and land use information

6. Social, cultural and industrial facilities

7. Nature conservation information

8. **Geographical names**

NGMHu DATA QUALITY ISSUES

1. Vectorization

- **code tables and constrains are used in order to minimize the human errors**. Before data integration, **GIS based quality control processes are made**, such as: road and water bodies can't intersects on the ground level, minimum area of the lakes are limited to 10 m^2, etc.

2. Data integration

2.1 Attribute check: all the tables are checked if the input doesn't match the model table constrains. For example, if:

- the land cover codes are not matching the data model codes.
- The amount of the record of the source data must be the same as in the NGMHu data table record for example the amount of the buildings.
- Names of the public areas such as street names must be correct name, clearance SQL.
- House numbers must be only correct numbers no text allowed.
- Area of any feature object polygon can't be 0 and length of the lines also can't be 0.

2.2 Geometry check: For example: the buildings geometry intersects the water bodies.

- Topology check of the administrative boundaries can't happen: intersects or holes within the polygons.
- All of the vectors must be within the territory of Hungary except water bodies.
- Transportation networks can't cross the buildings only on allowed codes of buildings such as the level of the building above roads.

NGMHu DATA QUALITY ISSUES

2.2 Geometry check

- Crossing between transportation networks can be allowed only definite codes. Each of the roads and railways has the attribute of the levels above top each other.

- The higher level of administration unites must be built up from the lower level of unit boundaries. The cartographic line features of the administration units must be identical to polygon feature boundaries.

- The state border line can't be acute-angled, less than 10 degrees.

- the block of cadastral parcels boundaries can't intersects.

- The points of the height of the mountains must follow the height of the digital terrain model.

- The cemetery can't intersects the block of cadastral parcels boundaries.

2.3 Generalization check

- Only valid geometry can be allowed, if it exist must be repaired before integration. Result of the generalization or merging process can cause invalid geometry.

- The minimum area it is used for the generalization of the buildings.

- For the small scale zoom levels we create a different data table using reduced number of land cover categories (dissolving the geometry).

- For the small scale zoom levels we use higher level of rivers to visualize.

4. ESRI Geodatabase upload: quality double check

- Valid geometry check again when we upload to ESRI Geodatabase from PostGIS.

- The source and the end database amount of the records must be the same.

- Very important to keep the projection systems and geographical dates EPSG: 23700. Web Mercator EPSG 3857 during the whole workflow.

5. Creation of the symbology, labels, legend issues

- Vectorization done in QGIS using one symbology, for publication of WMTS I have developed an ESRI ArcGIS Pro symbology in order to create the service using ArcGIS Enterprise software environment.

- Visual check of symbology after ArcGIS version update is done, we have faced some errors made after version update. Such as: set scale of visibility changed some features disappeared due to the version update, or different fonts are lost instead of names random numbers appeared on the tiles. Transparency levels were not supported.

- Due to the characteristic of the data source for example the name of the streets are not attributes of the lines, then hard to place the name correctly on the middle of the street and repeated regularly if we pan the map. Public area names stored in point feature dataset, historically.

Placements of the texts, examples:

- rivers must be curved following the river line,

- boundary names must follow the boundary line on both side of the line,

NGMHu DATA QUALITY ISSUES

- POI's texts can't be overlapped with each other, or POI point symbols.

- Label priority ranking 0-1000, and Label Weight Ranking order in ArcGIS Pro was introduced to solve or help the labelling conflicts

- Different font size for different zoom levels are set for each feature class text group

Label Weight Ranking, Label Priority Ranking and labels according to zoom level, source: A. Olasz

6. Producing the WMS and WMTS map services

After the production of the WMS quick global visual check.

Production of the tile service (WMTS) takes around 1 month (on my workstation), separated the „raster like" land cover then it is around 2 weeks. Tile systems causing numerous problems:

- near the „artificial" tile borders texts can be repeated of continuous features: lakes

- separated tiling process for the „raster like" land cover layer due to the symbols and the rest of the point-line-polygon layers together.

Global visual check up on the WMTS tiles, searching for anomalies, human or machine errors.

All the 12 EOV 13 WM zoom level must be set up as a „paper map" all the visualizing order, symbology, labels must be set according.

The advantage of using WMTS is the client side speed of loading.

7. Publication of the dedicated services do different clients
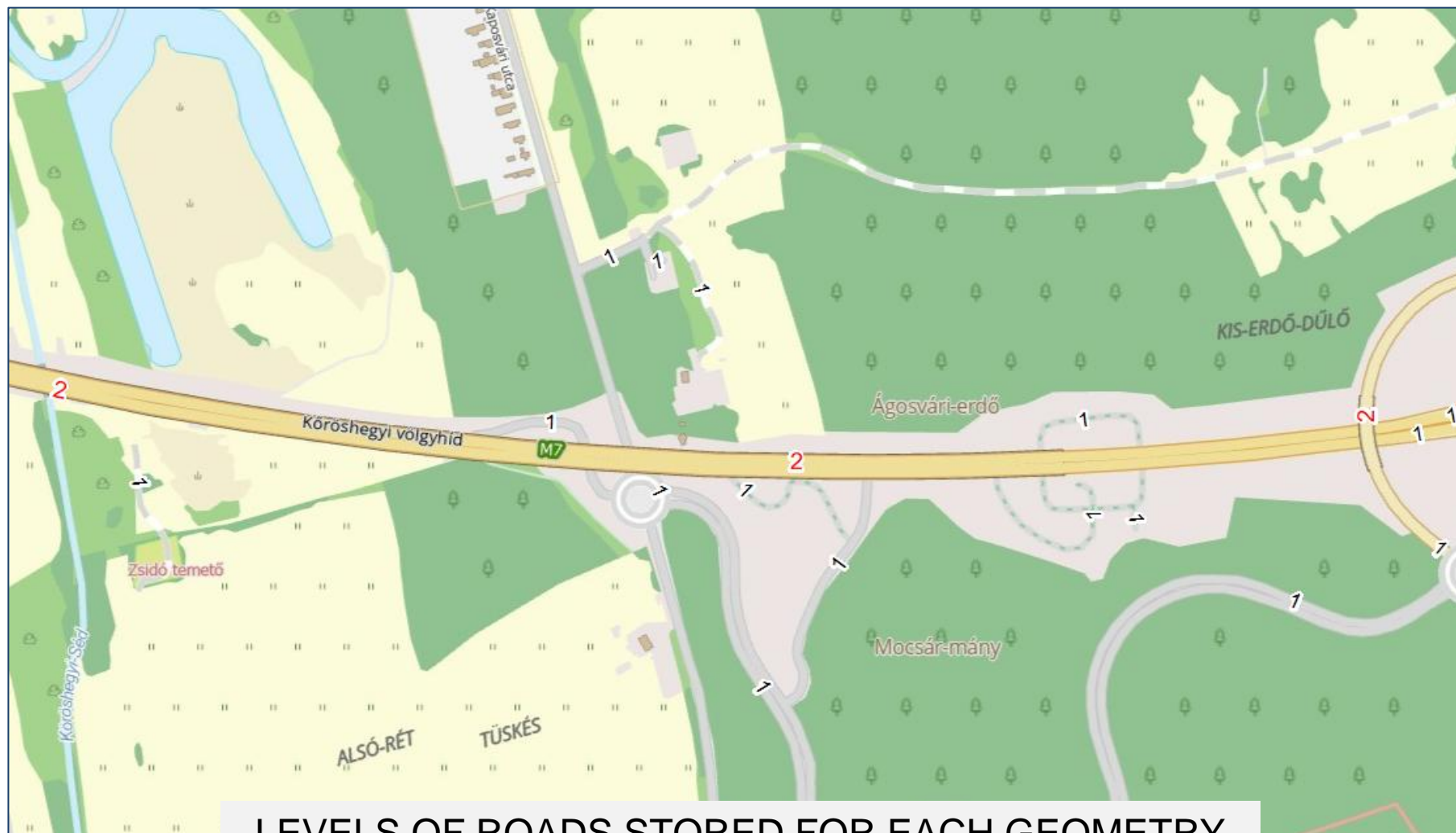
Visualization quality of WMTS services can be effected if the client side using different zoom levels. The applied desktop, online or mobile systems can stretch irregularly the premade tiles.
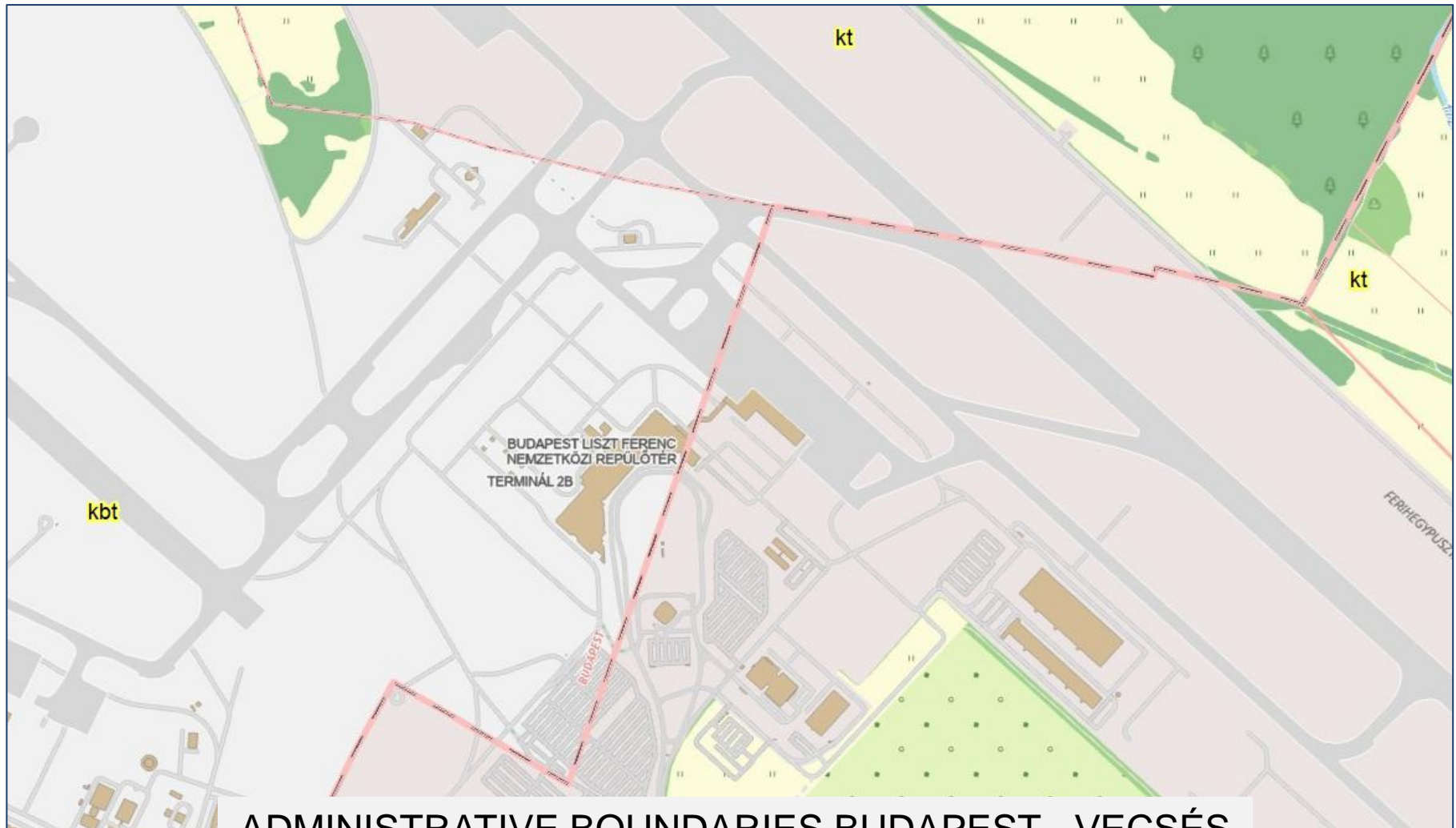
ADMINISTRATIVE BOUNDARIES BUDAPEST - VECSÉS

LEVELS OF ROADS STORED FOR EACH GEOMETRY
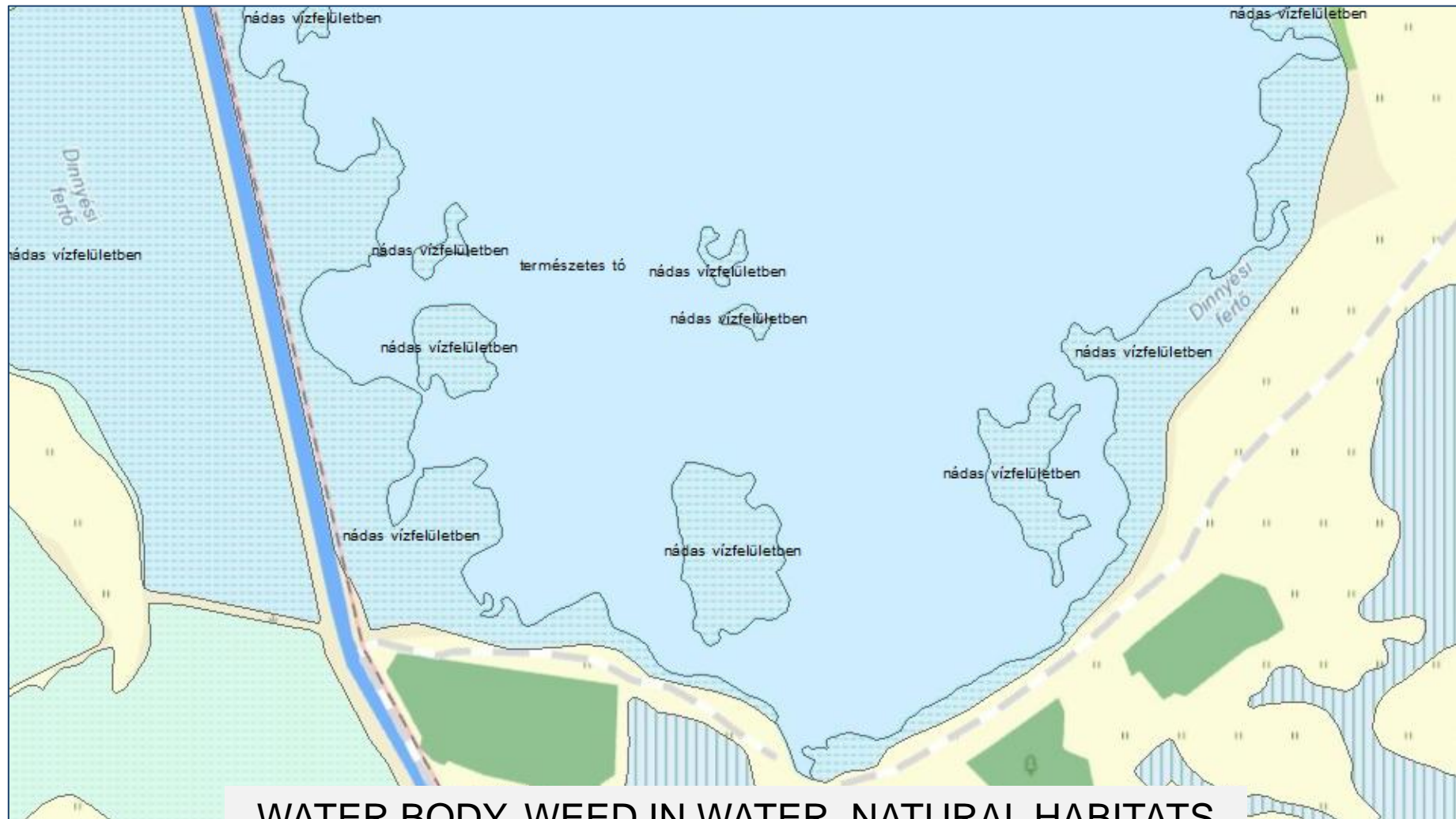
WATER BODY, WEED IN WATER, NATURAL HABITATS
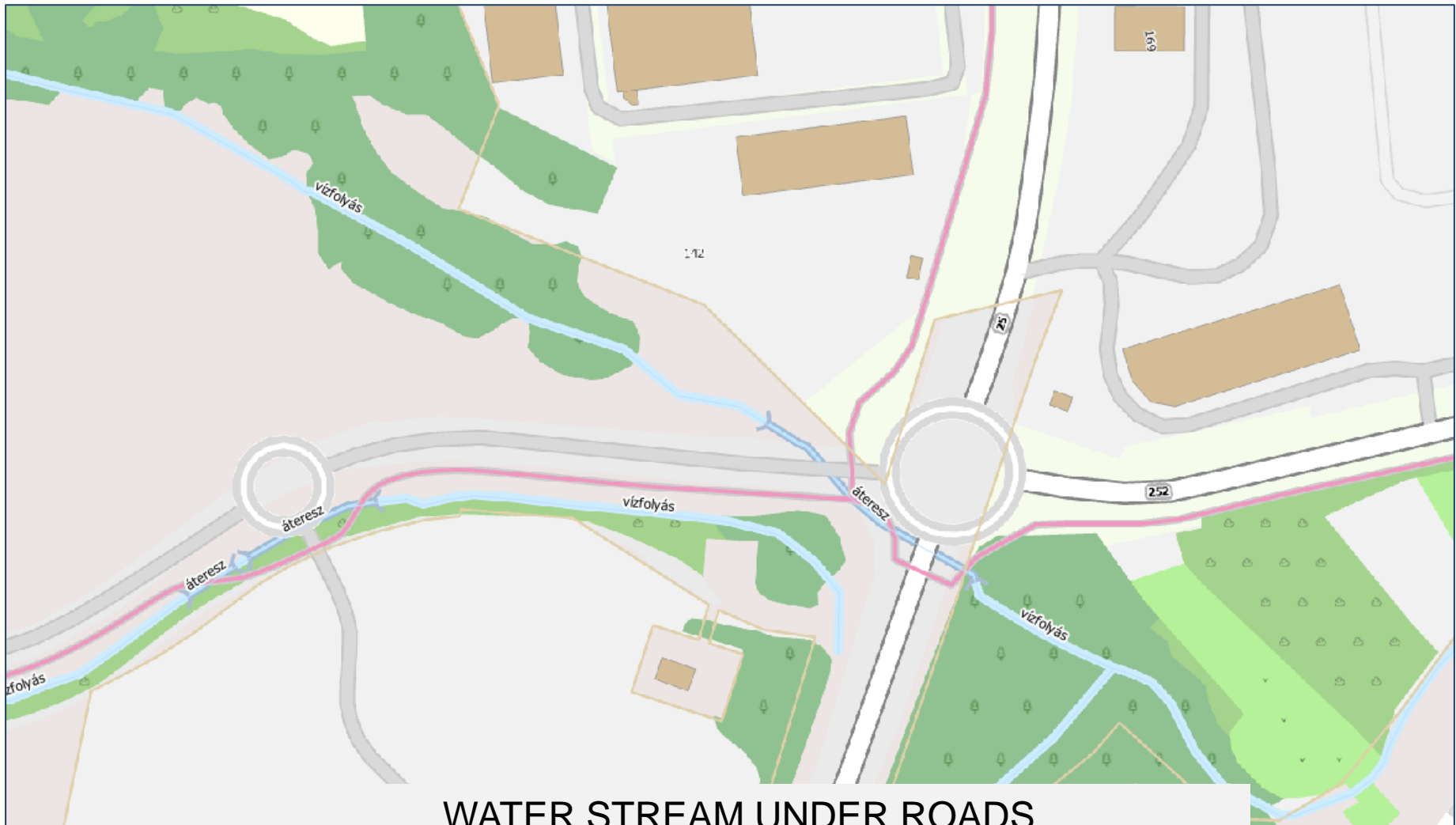
WATER STREAM UNDER ROADS
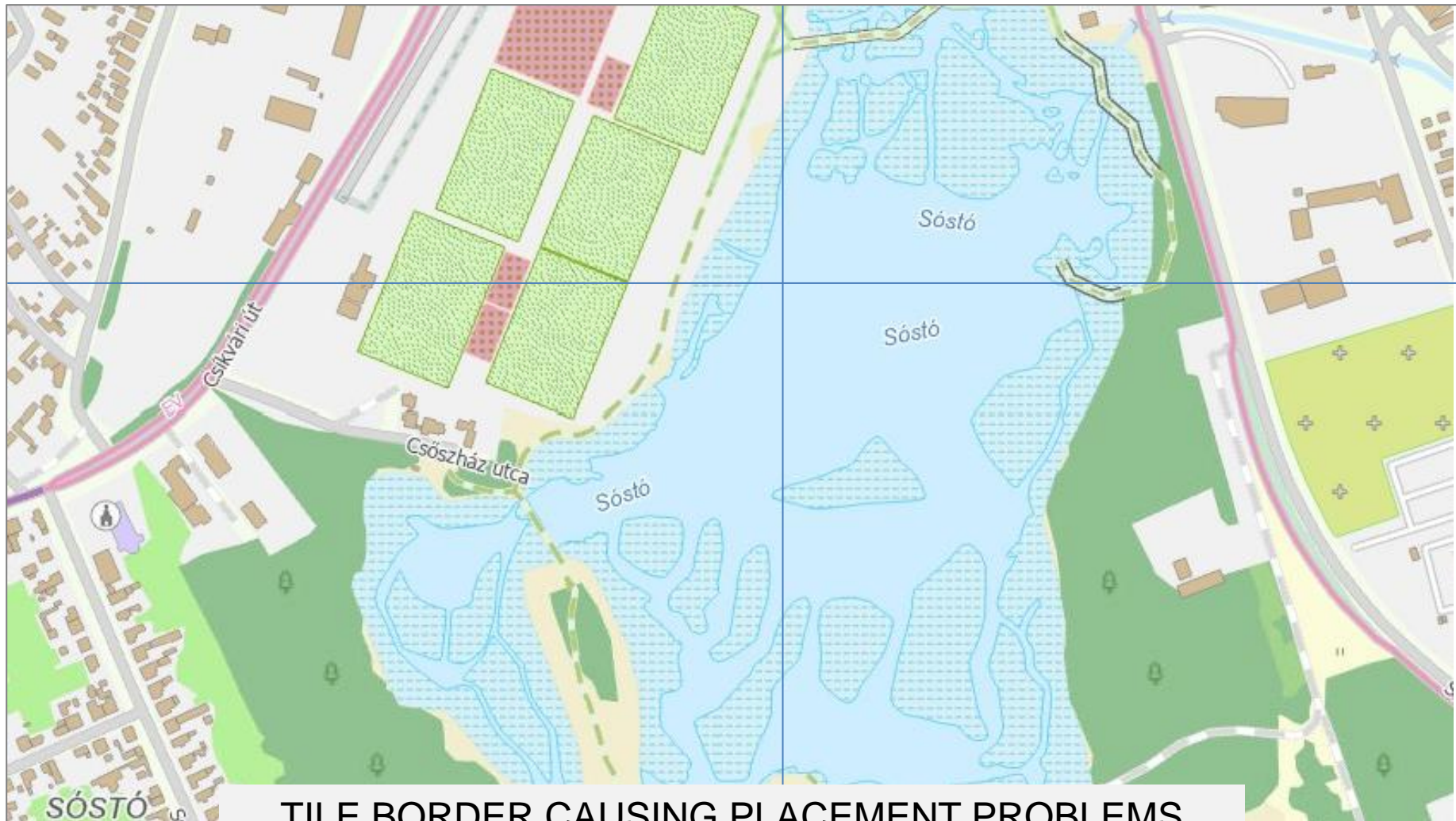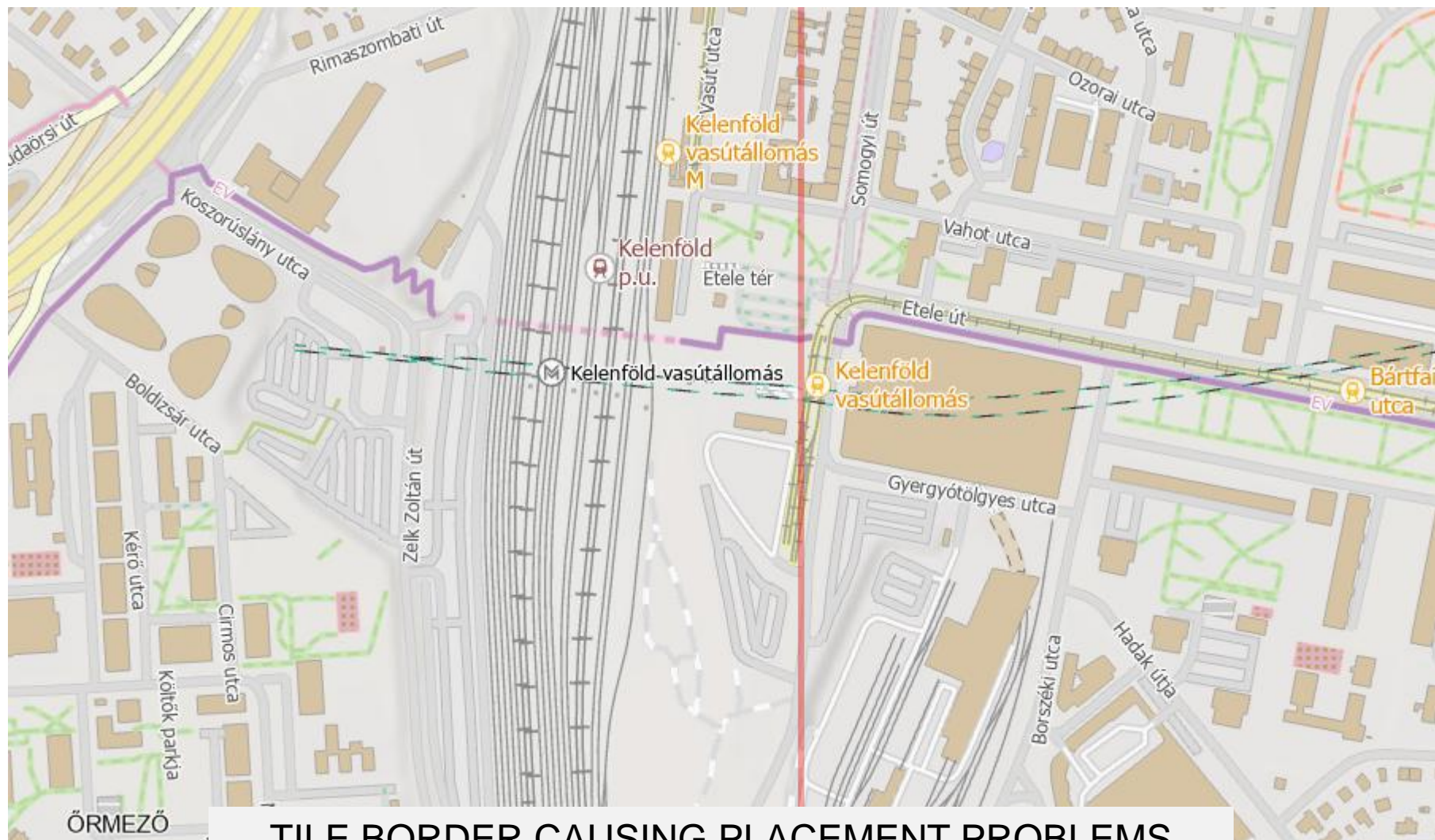
TILE BORDER CAUSING PLACEMENT PROBLEMS

TILE BORDER CAUSING PLACEMENT PROBLEMS

"RANDOM" PLACEMENT PROBLEMS

IRREGULAR STRETCH TILE ON THE LEFT 1:23044

NGMHu GEONAME QUALITY ISSUES

Source

The NGMHu Legend **contains 176 legend elements** in 8 categories, category 8 is the Geonames

Category 8 is the Geonames (with Writing Patterns): 45 types of writing patterns in 4 groups

Nearly **200 thousand names** (geographical names and geographical indications) from **840 different sources** (map and texts) has been incorporated. State data such as Geographical Names Gazetteer (FNT) and state topographic maps (1957-1972 hazai, 1976-1996 EOTR) name data were used.
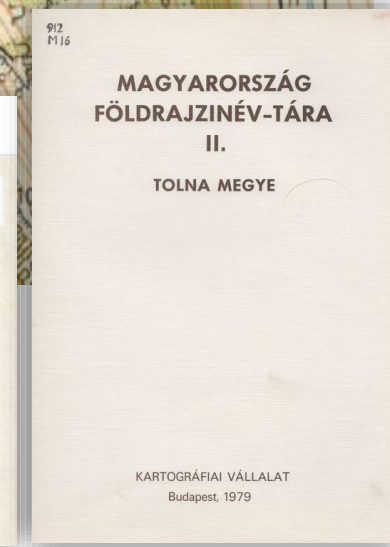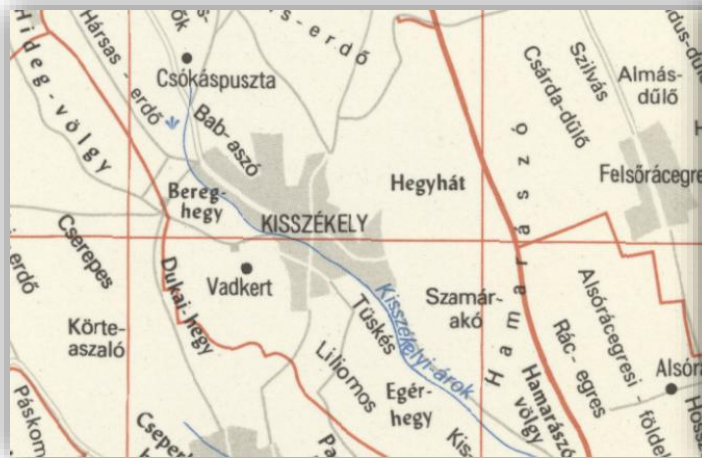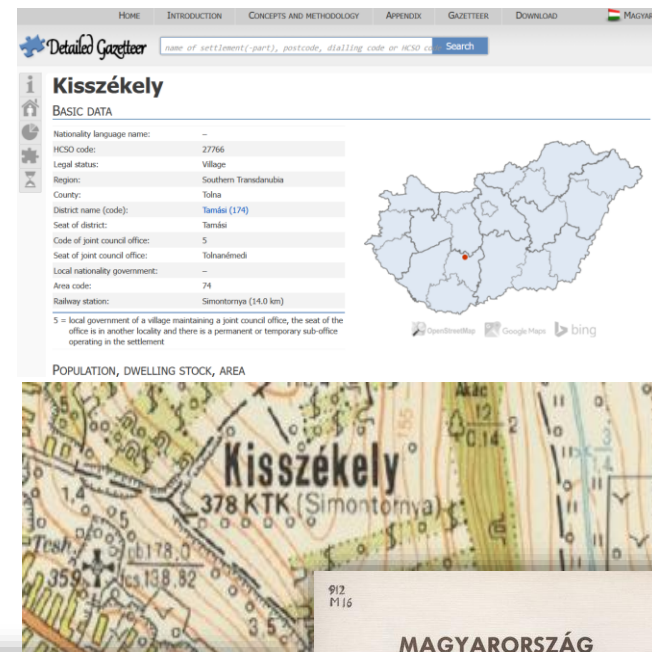
NGMHu GEONAME ISSUES - Location and name formats

Requirements:

- each name data has a point geometry

- in the case of point objects, its exact location (EOV coordinate pair)

- in the case of names of area like objects, the approximate center of the area denoted by the given name

- in the case of valleys, the middle of the valley line

- area-related names rotated (based on the land cover parcel polygon containing the point)

- area names that cross administrative borders may be repeated

- spelling errors must be corrected.

Pilisszentlélek

- road sign: Hute
- Correct version: Huť
  (verzálisan: HUŤ)

Minority language settement names in the Official Gazetteer of Hungary

- by Hungarian Statistical Office
- since 1995 a list about the minority language settlement names
- the only state-level official source of the minority language settlement names
- the list is based on the minority language signposts (reversed in other Central European countries)

LIST OF SETTLEMENT NAMES IN THE RELEVANT MINORITY LANGUAGE AS WRITTEN ON THE LOCALITY NAMEPLATE

Agendorf (Ágfalva)
Alkár (Mátraszentimre)
Andovci (Orfalu)
Ata (Áta)
Baćin (Bátya)
Bawarz (Babarc)
Békéšska Čaba (Békéscsaba)
Bikić (Bácsbokod)
Bogdan (Dunabogdány)
Bootsch (Pócsa)
Burjad (Borjád)
Chitighaz (Kétegyháza)
Deutschhütten (Németbánya)
Dewrenten (Döbrönte)
Donaudorf (Dunafalva)
Etsching (Ecseny)
Gahling (Máriakálnok)
Gerstleck (Kercseliget)
Gornji Četar (Felsőcsatár)
Großbudmer (Nagybudmér)

Ahlaß (Olasz)
Almasch (Bácsalmás)
Apateu (Körösszegapáti)
Atscha (Vértesacsa)
Bätania (Battonya)
Bedeu (Bedő)
Berkina (Berkenye)
Bizonja (Bezenye)
Bohl (Bóly)
Boschok (Palotabozsok)
Cenadul Unguresc (Magyarcsanád)
Čikerija (Csikéria)
Deutschpilsen (Nagybörzsöny)
Dolné Peťany (Alsópetény)
Dušnok (Dusnok)
Fićehaz (Fityeház)
Ganna (Ganna)
Gestic (Várgesztes)
Gornji Senik (Felsőszölnök)
Großdorf (Vaskeresztes)

Aljmaš (Bácsalmás)
Altglashütte (Óbánya)
Apati (Bátaapáti)
Baar (Bár)
Batanja (Battonya)
Behrend (Beremend)
Berzel (Ceglédbercel)
Boden (Fazekasboda)
Bonnhard (Bonyhád)
Brlobaš (Szentborbás)
Čerňa (Bakonycsernye)
Čív (Piliscsév)
Dewetsch (Pécsdevecser)
Dolnji Senik (Alsószölnök)
Edeck (Etyek)
Fünfkirchen (Pécs)
Gereschlak (Geresdlak)
Giula (Gyula)
Gowisch (Villánykövesd)
Großmanok (Nagymányok)

From 2023 we include them in NGMHu with accurate location, correct spelling. All the Geonames went under quality a check by linguistic expert.

Types of minority language settlement names in Hungary

- **Historical names**
- **Constructed names**
- **Dialectical names**
  - majority of minority place names in Hungary
  - mostly phonological versions

Minority place names have an origin independent of the Hungarian name:
Mlynky (Slovak), Roggendorf (German)

City of Győr on the first Hungary map (1528) with two names:
German: Rab (Raab)
Foreign names of Győr in non-minority languages:
Arrabona (ancient Latin)
Jaurinum (medieval Latin)
Yanıkkale (Turkish)
Giavarino (Italian)

Minority place names are phonological versions of the Hungarian name:
Tukulja (Croatian)
Teckel (German)
Тукуља (Serbian)

Minority place name is version of the old German name:
Plajgor (Croatian)
Bleigraben (formerly German)

Minority place names are versions of the Hungarian name with the spelling of the minority languages:
Mohatsch (German),
Mohač (Croatian)

Minority place name is completely identical to the Hungarian name
Narda (Croatian)

Types of minority place names, source: A. Sasi; The Problems of Minority Language Settlement Names in Hungary 2022

Quality assurance handling the Geonames

- source criticism, assess the authenticity of the source, rank of the sources are made

- direct data reconciliation with local governments, local indiviuals

- nature conservation, monument protection, water management – direct name reconciliation, revision

- use of data from the geographical name collection with a name density of 1: 10 000 scale

- Geographical Names Gazetteer (FNT) database coordinates were improved

- Through the reconciliation of FNT and National Statistical Office (KSH) place name data, 95% of the approximately 10 500 suburban and other urban settlement parts KSH place name databases have become searchable with point-like coordinates.

THANK YOU FOR YOUR ATTENTION!

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Access NGMHu after registration: http://nta.lechnerkozpont.hu

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