Mapping project in AKOS

Mag. Tanja Muha
Marko Simončič
Budva, 27.9.2016
### Basic statistics about Slovenia

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>2,062,874</td>
</tr>
<tr>
<td>Area (in km²)</td>
<td>20,274 km²</td>
</tr>
<tr>
<td>Number of municipalities</td>
<td>212</td>
</tr>
<tr>
<td>Number of urban municipalities</td>
<td>11</td>
</tr>
<tr>
<td>Number of settlements</td>
<td>6036</td>
</tr>
<tr>
<td>The average population density</td>
<td>102 inh./km²</td>
</tr>
<tr>
<td>Average altitude</td>
<td>556.8 m</td>
</tr>
<tr>
<td>Highest point</td>
<td>2,864 m</td>
</tr>
<tr>
<td>Number of households</td>
<td>851,289</td>
</tr>
<tr>
<td>Average household size</td>
<td>2.42</td>
</tr>
</tbody>
</table>
In 2004 Slovenian Surveying and Mapping Authority started with the development of the central database, called consolidated cadastre of public infrastructure.

Data included:
- Real estate and owners
- Public utility infrastructure, such as roads, railways, sewage, water, electricity, and other
- Electronic communications network connection points

<table>
<thead>
<tr>
<th>CONSOLIDATED CADASTRE OF PUBLIC INFRASTRUCTURE - February 2013</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads</td>
<td>Object</td>
</tr>
<tr>
<td>Railways</td>
<td>Object</td>
</tr>
<tr>
<td>Airports</td>
<td>Object</td>
</tr>
<tr>
<td>Harbours</td>
<td>Object</td>
</tr>
<tr>
<td>Cable railways</td>
<td>Object</td>
</tr>
<tr>
<td>Electric energy</td>
<td>Object</td>
</tr>
<tr>
<td>Natural gas</td>
<td>Object</td>
</tr>
<tr>
<td>Heat energy</td>
<td>Object</td>
</tr>
<tr>
<td>Oil</td>
<td>Object</td>
</tr>
<tr>
<td>Water supply</td>
<td>Object</td>
</tr>
<tr>
<td>Sewer</td>
<td>Object</td>
</tr>
<tr>
<td>Waste</td>
<td>Object</td>
</tr>
<tr>
<td>Green surfaces</td>
<td>Object</td>
</tr>
<tr>
<td>Water infrastructure</td>
<td>Object</td>
</tr>
<tr>
<td>Natural resources</td>
<td>Object</td>
</tr>
<tr>
<td>Electronic communications</td>
<td>Object</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads</td>
<td>139,543</td>
</tr>
<tr>
<td>Railways</td>
<td>7,526</td>
</tr>
<tr>
<td>Airports</td>
<td>89</td>
</tr>
<tr>
<td>Harbours</td>
<td>1,096</td>
</tr>
<tr>
<td>Cable railways</td>
<td>164</td>
</tr>
<tr>
<td>Electric energy</td>
<td>1,391,296</td>
</tr>
<tr>
<td>Natural gas</td>
<td>387,879</td>
</tr>
<tr>
<td>Heat energy</td>
<td>67,738</td>
</tr>
<tr>
<td>Oil</td>
<td>214</td>
</tr>
<tr>
<td>Water supply</td>
<td>886,337</td>
</tr>
<tr>
<td>Sewer</td>
<td>702,296</td>
</tr>
<tr>
<td>Waste</td>
<td>3,758</td>
</tr>
<tr>
<td>Green surfaces</td>
<td>0</td>
</tr>
<tr>
<td>Water infrastructure</td>
<td>7,844</td>
</tr>
<tr>
<td>Natural resources</td>
<td>0</td>
</tr>
<tr>
<td>Electronic communications</td>
<td>2,427,668</td>
</tr>
</tbody>
</table>
Public view of Consolidated cadastre of public infrastructure
Legal background for mapping of electronic communications

Article 14 of Electronic Communications Act (ZEKom-1)
(entry in the register)

(1) The owner of a communications network and associated infrastructure referred to in the second paragraph of Article 9 of this Act must supply information on the types and location of the networks, and of the facilities as far as they form part of the associated infrastructure, directly to the body responsible for surveying and mapping, for the purpose of in the register of infrastructural networks and facilities, in accordance with the regulation governing entry in this register. Every amendment to this information shall be reported to the competent body within three months of its occurrence.

(2) The owner of a public communications network and associated infrastructure must, in addition to the information referred to in the preceding paragraph, supply information on the existing state of affairs and the capacity of the network termination point directly to the body responsible for surveying and mapping, for the purpose of entry in the register referred to in the preceding paragraph, in accordance with the regulation referred to in the preceding paragraph. Every amendment to this information shall be reported to the competent body within three months of its occurrence. The information contained in the record of the existing state of affairs and the capacity of the network termination point shall not be public. In addition to the body responsible for surveying and mapping, the Agency shall have access to all the information entered pursuant to this paragraph for requirements relating to implementation of this Act, as shall the bodies responsible for the implementation of Article 11 of this Act. The Agency shall, by means of a general act, prescribe in detail the information to be entered and the method of collection of the information, determine the categories of other users by method of access to this information in order to provide adequate protection of any business secrets of owners, and regulate other matters arising from implementation of this provision.

(3) The Agency may, for requirements relating to implementation of this Act, require persons liable under the first paragraph of this Article to supply information on the availability of the networks and facilities referred to in the first paragraph of this Article, on which it shall keep its own records, and allow interested parties to inspect this information in relation to procedures it is conducting.
Article 15 of Electronic Communications Act (ZEKom-1) (supervision)

The Agency shall oversee the implementation of the provisions of this Chapter and of the regulations and acts issued pursuant thereto, and cooperate with the inspectorate responsible for construction in doing so.

The Agency has a possibility to act as a supervisor whether the input data is reported or not and if the data is correct. The fine for the medium or large firm (in case they don’t report data) is from 50.000 - 400.000 €.
AKOS was included into the **mapping project in 2012**, together with the Ministry of education, science and sport – Directorate for the Information Society and The Surveying and Mapping Authority of the Republic of Slovenia

On the basis of the Electronic Communications Act, AKOS adopted secondary legislation in order to make sure that business secret of the owners of infrastructure will be protected.

**General act on entry, collection and access to data in the register of infrastructural networks and facilities.**

- Dealing with more detailed prescriptions of the legal demands
- Classification of the users of data
- Exchange Format

**Input attributes** give the description of the termination point and they need to report: ID number, type of change, cadastral code, code of building inside the cadastral unit, ID of the building address, address connected to the ID, household, type of connection (fibre, coax, copper, wireless), maximum number of possible connections on the building, minimum capacity, active connection (yes/no), ID number of the owner of the broadband connection, coordinates from the state coodinute system

**Public view**

Users with lowest priority: each user of the register has the public view, which contains information if the building has the connection point or not

**Owners of the infrastructure**

Users with medium priority: owners of the infrastructure who report data can access their own data and public access

**Overall access**

Users with top priority: mapping authority, relevant ministry and NRA; for the purpose of the mapping, analysis, geographic segmentation, designation of white areas; establishing the economic interest database.

General act on entry, collection and access to data in the register of infrastructural networks and facilities - [http://www.uradnilist.si/1/objava.jsp?urlurid=20133890](http://www.uradnilist.si/1/objava.jsp?urlurid=20133890)
Publically available information about possible capability

<table>
<thead>
<tr>
<th>Katastrska občina</th>
<th>Številka stavbe</th>
<th>Katastrski vpis</th>
<th>Število delov stavbe</th>
<th>Vrednost nepremičnine</th>
<th>Grafični prikaz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1738 DRAVLJE</td>
<td>1584</td>
<td>DA</td>
<td>76</td>
<td>na voljo samo za del stavbe</td>
<td></td>
</tr>
</tbody>
</table>

**Legenda:**
- Podatki Registra nepremičnin
- Podatki Katastra stavb
- Podatki drugih upravljavcev

### Katastrska občina 1738 Številka stavbe 1584

**Podrobnosti podatki o stavbi**

- **Naslov stavbe:** Ljubljana, Stegne 7
- **Neto tlorisna površina stavbe (m2):** 6445,9
- **Površina zemljišča pod stavbo (m2):** 1431
- **Dejanska raba stavbe:** nestanovanska
- **Število etaž:** 7
- **Številka pritlične etaže:** 2
- **Višina stavbe (m):** 25,4
- **Leto zgraditve:** 1979
- **Leto obnove strehe:** 2008
- **Leto obnove fasade:** -
- **Material nosilne konstrukcije:** 2 - beton, železobeton
- **Dvigalo:** Da
- **Vrsta ogrevanja:** 1 - daljinsko ogrevanje
- **Priključek na vodovodno omrežje:** Da
- **Priključek na električno omrežje:** Da
- **Priključek na kanalizacijsko omrežje:** Da
- **Priključek na omrežje plinovoda:** Ne
- **Priključek na omrežje za kabelsko TV:** Da
- **Vrsta (tip) stavbe:** 1 - samostojeca stavba
- **Način temeljenja:** 1 - pasovni, točkovni temelji
- **Priključek na tehnološki plin:** Ne
- **Priključek na industrijski tok:** Da
- **Priključek na komprimiran zrak:** Ne
- **Čistilna naprava:** Ne

**Podatki o širokopasovnem internetu**

- **Omogočena zmogljivost:** 100 Mb/s

**Seznam delov stavbe**
Guidance and content of cadastre of the communications networks and associated facilities

Type of data needed to be provided directly to the Surveying and Mapping Authority

The installations of communication networks and associated infrastructure which must be recorded in cadastre:
- The communication line of the same type and the same owner on the same route and the same position with type indication (coax, copper, fibre)
- Cable ducts
- Shaft
- Base stations
- Radio station
- Antenna tower,
- Telecommunications distribution cabinet
- The area of communications facilities
Later on, **AKOS establish its own database**, with all the inputs, which are already available and with the additional data collected from owners of electronic communications infrastructure, in order to get complete picture of the networks available in Slovenia.

Own database have a lot of advantages:
- reusing already collected data
- adding different information and various databases (FWBA, base stations, MDFs, etc.)
- responsive database
- flexible
- open source

PostgreSQL is a powerful, open source object-relational database system. It has more than 15 years of active development and a proven architecture that has earned it a strong reputation for reliability, data integrity, and correctness.

PostGIS is a spatial database extender for PostgreSQL object-relational database. It adds support for geographic objects allowing location queries to be run in SQL.
AKOS is using **free and open source** Geographic Information System – QGIS as a tool to show results of various analysis and complex research.
Izbira vpogleda.

Občina
Naselje
Ulica
Hšna številka

Počisti
Izhi

Seznam naselij

Analize
Vse
Po lastnikih
Po vrsti GPT
Po min. zmogljivosti
Po naseljih

Legenda

AKOS internal webviewer
<table>
<thead>
<tr>
<th>Id</th>
<th>Tehnologija</th>
<th>Lastnik</th>
<th>Aktiven</th>
<th>Minimalna zmogljivost</th>
<th>Podrobnosti</th>
</tr>
</thead>
<tbody>
<tr>
<td>90335</td>
<td>kabelski priključek</td>
<td>EJ ELEKTROMTRIČNOM trgovina, proizvodnja, instalacije d.o.o.</td>
<td>Ne</td>
<td>3 Mbps</td>
<td></td>
</tr>
<tr>
<td>1976037</td>
<td>bakrski parica</td>
<td>TELEKOM SLOVENIJE, d.d.</td>
<td>Da</td>
<td>30 Mbps</td>
<td></td>
</tr>
</tbody>
</table>

Prikazano 1 do 2 od 2 zapisov
AKOS establish its own database, with all the inputs, which are already available and with the additional data collected from owners of electronic communications infrastructure, in order to get complete picture of the networks available in Slovenia. It is based on free and open source software (Quantum GIS, PostgreSQL, PostGIS).

Paradigm shift in collecting data in AKOS:

- **GEOSPATIAL DATA**
  - RETAIL
  - WHOLESALE
  - INFRASTRUCTURE
  - SPECTRUM
    - BRO
    - RUO
Practical examples of analysis

Density of population by settlements
Practical examples of analysis

Number of households by settlements
Practical examples of analysis

Number of settlements without registered household
Practical examples of analysis

Number of network termination points by municipalities
Settlements without network termination points
Density of white spots on 2km x 2km grid
Practical examples of analysis

Types of technologies of network termination points per municipalities
Practical examples of analysis

White spots in particular municipality
Households in municipality with and without network termination point

Legenda
- gospodinjstva z OPT
- gospodinjstva brez OPT

Kartografska podlaga
Državna pregledna karta merila 1:250.000
West – east, statistical regions
Practical examples of analysis

Download speed of mobile network per resident
Practical examples of analysis

Simulation of coverage with assessed base stations
Concentration point with length of lines
Practical examples of analysis

Concentration point
Coverage with mobile signal of base station per speed
Retail prices analysis – flagship products
Practical examples of analysis

Analysis by type of service
Practical examples of analysis

Analysis by number of owners
Practical examples of analysis

Analysis by number of retail providers
Simulation of optimal base station location
Study case - Ljubljana
Thank you.

tanja.muha@akos-rs.si