# Broadbnad Mapping System in Montenegro

Montenegro

Agency for Electronic Communications and Postal Services (EKIP)

Dubravka Aleksić – Manager for Electronic Communication Networks and Infrastructure Matija Tomčić – Manager for GIS

28 September 2023





## Montenegro

- Population: 620.029
- Teritory: 13.883 km<sup>2</sup>
- Capital City: Podgorica
- The Capital: Cetinje
- Municipalities: 25
- Settlements: 1.307



## **Content:**

- 1. NATIONAL LEGISLATION RELATED TO THE MAPPING
- 2. MAPPING SYSTEM STRUCTURE, DATA AND USERS
- 3. ELECTRONIC COMMUNICATION INFRASTRUCTURE
- 4. BROADBAND COVERAGE
- 5. CHALLENGES IN WORK
- 6. FUTURE STEPS OF EKIP IN THE PROCESS OF MAPPING



#### NATIONAL LEGISLATION RELATED TO THE MAPPING

- 1. THE LAW ON ELECTRONIC COMMUNICATIONS
- 2. THE RULE BOOK ON THE TYPE, MANNER OF DELIVERY AND DISCLOSURE OF DATA ON ELECTRONIC COMMUNICATIONS INFRASTRUCTURE AND ASSOCIATED FACILITIES WHICH MAY BE OF INTEREST FOR THE SHARED USE (IN ACCORDANCE WITH THE LAW ON ELECTRONIC COMMUNICATIONS)
- 3. LAW ON THE USE OF INFRASTRUCTURE FOR THE INSTALLATION OF HIGH-SPEED ELECTRONIC COMMUNICATION NETWORKS
- 4. DIGITAL TRANSFORMATION STRATEGY OF MONTENEGRO 2022-2026.



#### **MAPPING SYSTEM IN EKIP- DATA AND USERS**

#### **Data**

- Electronic communication infrastructure and associated equipment
- Planned electronic communication infrastructure
- Broadband coverage

#### <u>Users</u>

- Operators
- Planners and designers
- National and local Institutions
- Public access



#### MAPPING SYSTEM IN EKIP- RELATED TO THE RELEVANT DATA

#### **From operators:**

- <sup>-</sup> Antenna poles
- Other poles
- Buildings for EC equipment placement
- Ducts and cables
- Air cables
- Planned EC infrastructure

#### File used within the system:

- .shp
- .xls
- .pdf
- .kml

#### From National institutions:

- Cadastre and State Property Administration:
  - Municipalities
  - o Settlements
  - Residential buildings
  - Cadastral parcels
- National Statistic Authority-MONSTAT:
  - $\circ$  Population
  - $\circ$  Households



#### ELECTRONIC COMMUNICATION INFRASTRUCTURE – DATA IMPORT/INDIVIDUAL ENTRY

#### Entry of individual data:

An individual entry is possible directly on the map, by adding the specific individual infrastructure.

#### Import of grouped data:

Group import is possible via shapefiles sent for the group of objects who we want to add, update or delete.



#### **MAPPING SYSTEM IN EKIP- STATISTICAL DATA**

#### **EC infrastructure:**

- <sup>–</sup> 606 antena poles
- 729 buildings for EC equipment placement
- <sup>-</sup> 8.009,60km ducts
- <sup>-</sup> 3.699,75km air cables

#### **Shared EC infrastructure:**

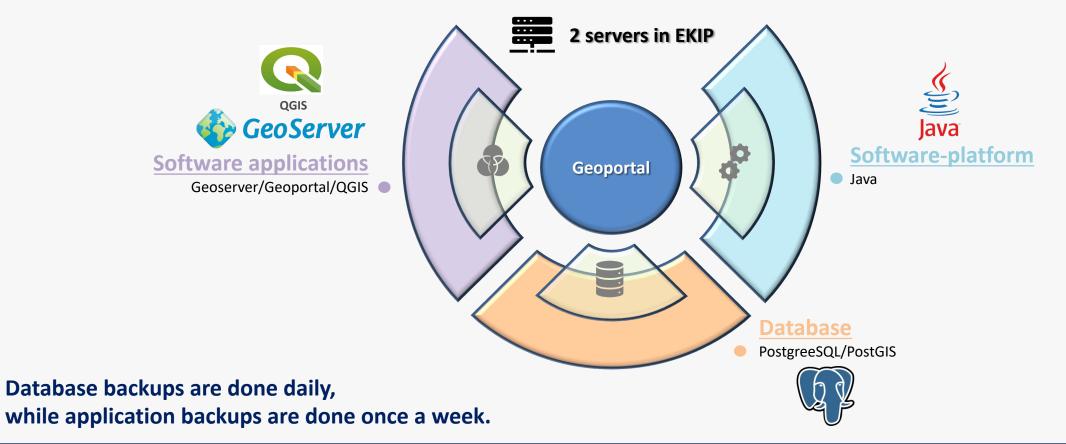
- <sup>-</sup> 329 antenna poles
- <sup>–</sup> 229 buildings for EC equipment placement
- <sup>-</sup> 735 km ducts

#### Users:

- 17 Operators
- <sup>-</sup> 13 Planners/designers
- <sup>-</sup> 5 Local Institutions (Bar, Cetinje, Niksic, Podgorica i Mojkovac)
- <sup>-</sup> 4 National Institutions



#### **MAPPING SYSTEM IN EKIP- COMPONENTS**





#### MAPPING SYSTEM IN EKIP- HARDWARE AND SOFTWARE

#### Two Servers:

HPE ProLiant DL380 Gen10 server product+upgrades:

- 1 x Intel<sup>®</sup> Xeon<sup>®</sup> Gold 6126 processor with 2.6 GHz, 12 cores, and 120W for HPE DL380 Gen10 server
- 2 x HPE 16 GB Dual Rank x 8 DDR4-2666 CAS-19-19-19 Registered Smart Memory
- 8 small form factor drive bays Hot plug
- 3 x 1.2 TB SAS, enterprise, 10Krpm, SFF HDD with smart carrier
- HPE 1 Gb 331 i Ethernet adapter 4-parts per controller
- HPE Smart Array P408i-a Controller
- 2 x HPE 500W Flex Slot Power Supplies

Sofware platform: Java SDK v.1.8.0\_261(JDK8)

#### Software application:

Geoserver v. 2.17.2 Geoportal v.1.0

#### **Database:**

PostgreSQL v.12.4.1 PostGIS v.3

## **Desktop software application:**

QGIS v.3.15



#### MAPPING SYSTEM IN EKIP- ACCESS LEVELS TO THE WEB PORTAL

#### **Public access :**

- Geographical location and ownership of the EC infrastructure
- Review of actual broadband coverage
   Username: korisnik
- Password: korisnik

#### Link: http://geoportal.ekip.me

KIP GIS X	+		- 0 ×
← → C ▲ Not secure   212	69.25.52/ekipgis/login/auth		🖈 🧰 🛊 😝 E
	Agencija za elektronske komunikacije i poštansku	djelatnost Zahtjev za registraciju 💌	·
	Prijava na sistem		
	Korisničko ime:          korisnik         Lozinka:         korisnik         Promijeni lozinku	<ul> <li>Pośtovani korisnici,</li> <li>dobrodośli na web portal na kome możete pregledati mapiranu jektronsku komunikacionu infrastrukturu operatora elektronskih komunikacija. Podacima o elektronskoj komunikacionoj infrastrukturi operatora możete pristupi ir pidvijivanjem:</li> <li>Korisničko ime: korisnik</li> <li>Dataji u vezi korisničkih pristupa kao i procedura za otvaranje korisnikko pristupa nalaze se u UPUTSTVU koje możete preuzeti kordja.</li> <li>Muturu shapefile datoteka za dostavu podataka o elektronskoj fomunikacionj infrastrukturi uputstvo za korisóčenje goerenciarena za otvaranje korisnikko pristupa nalaze se u UPUTSTVU koje możete preuzeti kordja.</li> <li>Nap datoteke mozete preuzeti podje.</li> <li>Napotena: Agencija za elektronske komunikacije i pośtansku girtarstrukture na osnovu podatak koje u dostavi operatori</li> </ul>	
# २ o म 🔒	<u>e</u> = • •	vlasnici elektronske komunikacione infrastrukture.	∧ <i>(i</i> , <b>1</b> 60 ¢)( ENG 21112000). □



#### **BROADBAND COVERAGE – VISUALIZATION**

The visual representation of broadband internet coverage is based on data provided by operators on endpoint locations. Next to spatial data, endpoints characterize attribute data related to:

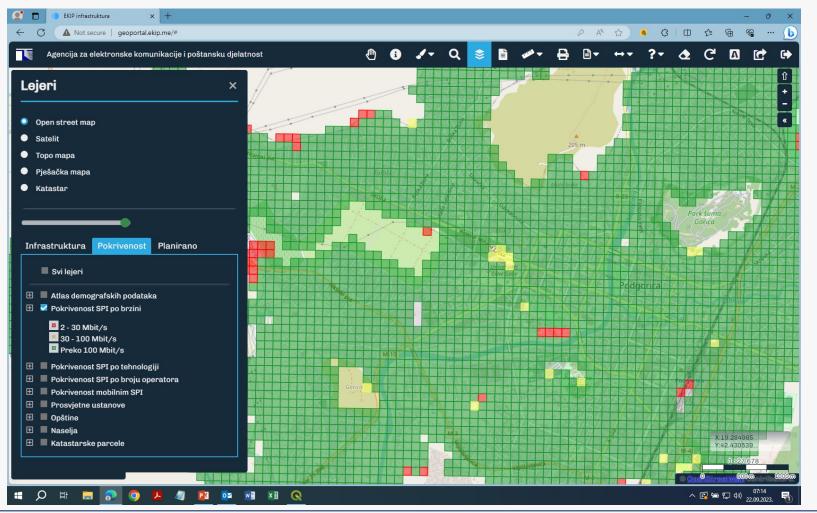
- Ownership of the endpoint,
- Type of endpoint,
- Broadband technology and
- Broadband speed.

Broadband coverage is shown in grids of 100x100m, which are formed on the bases of locations of endpoints:

- By speeds (coloured by dominant speed in grid)
- By technologies (coloured by dominant technology in grid as well as show of all available technologies in grid)
- By number of operators which provide services (coloured by number of available operators in grid as well as show of all available operators in grid)



#### **BROADBAND COVERAGE – VIEW BY SPEEDS**





#### EKIP infrastruktura × + 0 C ▲ Not secure | geoportal.ekip.me/# 🖉 A^ 🏠 🔞 🤤 🛯 🗅 🖆 🖓 … 🜗 ٠ 🕑 Agencija za elektronske komunikacije i poštansku djelatnost • Lejeri Open street map Satelit 🕘 Торо тара Pješačka mapa Katastar Infrastruktura Planirano 📕 Svi lejeri 🗄 📕 Atlas demografskih podataka 🗄 📕 Pokrivenost SPI po brzini 표 💆 Pokrivenost SPI po tehnologiji FTTX 🔲 KDS/HF VDSL ADSL 🗄 📕 Pokrivenost SPI po broju operatora Pokrivenost mobilnim SPI Prosvjetne ustanove 🗄 📕 Opštine 🗄 📕 Naselja 📕 Katastarske parcele 📕 🔎 🖽 へ 🚱 🔄 🔛 🕼 22.09.2023. 0 4 📲 💁 📲 🗶 馯

#### **BROADBAND COVERAGE – VIEW BY TECHNOLOGIES**



#### EKIP infrastruktura × + 0 A ☆ ♦ ♀ □ ↓ ⊕ ⊗ ▲ Not secure | geoportal.ekip.me/# C .... ()> 🖑 🚯 ?-C 🛛 🖸 Agencija za elektronske komunikacije i poštansku djelatnost $\leftrightarrow \bullet$ Lejeri Open street map Satelit 🕘 Торо тара • Pješačka mapa Katastar Infrastruktura Pokrivenost Planirano 📕 Svi lejeri doorica 🗄 📕 Atlas demografskih podataka 🗄 📕 Pokrivenost SPI po brzini 🗄 📕 Pokrivenost SPI po tehnologiji 🗄 💆 Pokrivenost SPI po broju operatora 1 operator 2 operatora 📕 3 operatora 4 operatora 🗄 📕 Pokrivenost mobilnim SPI 🗄 🔳 Prosvjetne ustanove 🗄 📕 Opštine X:19.281087 🗄 🔳 Naselja V-42 45396 🗄 📕 Katastarske parcele へ 🛃 🖮 🏪 🕼 22.09.2023. 🚛 🔎 🛱 🔚 🛜 🥥 🔼 🥼 📴 💀 🔊 🔊 导

#### **BROADBAND COVERAGE – VIEW BY NUMBER OF OPERATORS**

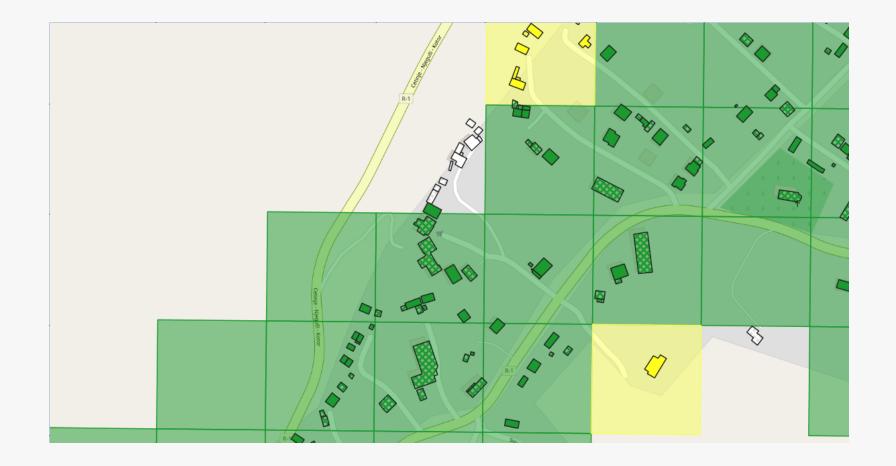


#### **BROADBAND COVERAGE – CACULATION METODOLOGY**

- Broadband coverage caculation metodology are based on:
  - Endpoints by operators,
  - Number of households in settlments by MONSTAT,
  - Position bildings on the maps with number of residential units by Cadastre and State Property Administration
  - Borders of municipalities and settlements by Cadastre and State Property Administration
- Calculation of percentage coverage of households:
  - We didn't have data on households within buildings, we obtained this data by dividing the number of households by the total number of residential units in each individual settlement. The result of this division yielded a coefficient representing the average number of households in residential units in each individual settlement.
  - There is a grid of 100x100m. Than, at the position where the endpoints are located, we created buffers with a radius of 100 meters. Each square of the grid touch by buffers is colored depends on dominant technology or speed. Also, each building overlap these squares are considered to be covered by fixed broadband internet access. Other buildings within the selected or drawn area are considered to be uncovered.



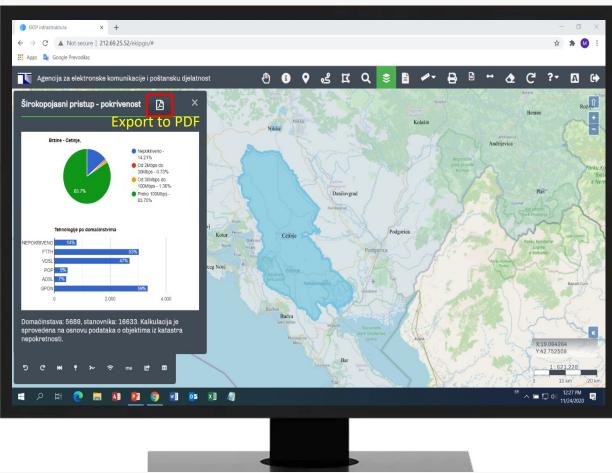
#### **BROADBAND COVERAGE – CACULATION METODOLOGY**



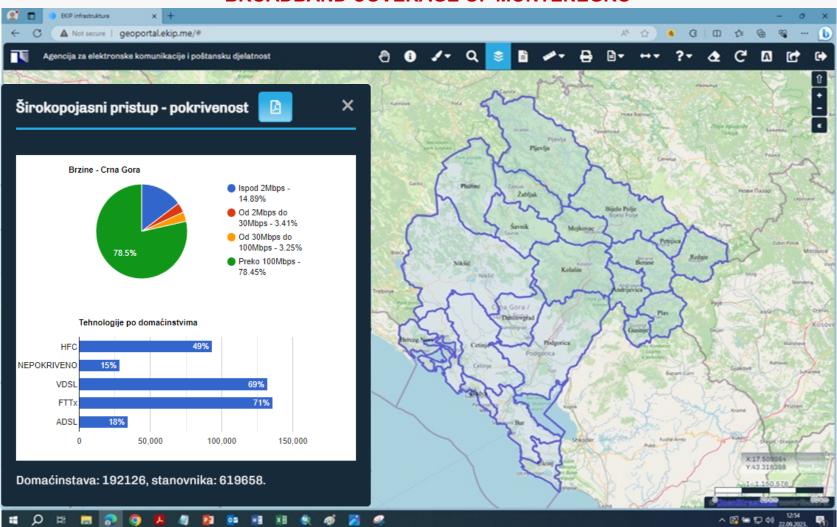


#### **BROADBAND COVERAGE – THE SEMPLE**

- Broadband coverage within the selected **settlement** of Bajice.
- Broadband coverage within the selected Cetinje municipality.
- Broadband coverage within whole Montenegro.







#### **BROADBAND COVERAGE OF MONTENEGRO**



ITU-EMERG-EaPeReg Joint Workshops on Strengthening Broadband Infrastructure and Services across the Europe Region and Beyond

Region and Beyond

### CHALLENGES IN WORK

Certain inconsistencies between the database and the real situation on the ground, the data control in the Geoportal is performed as follows:

- on the basis of the notification about the start of commissioning of the equipment, which we receive from the operator
- by comparing it with data from other systems in the Agency



#### FUTURE STEPS TOWARD THE IMPROVED MAPPING SYSTEM IN EKIP

- Improvement of the Geoportal related to provision of additional functionalities related to the monitoring within defined period of time:
  - Broadband coverage development
  - Electronic communication infrastructure development
  - Planned electronic communication infrastructure and its implementation
  - Implementation of the new accessible WMS services (State address registry)
- Improvement of data control tools to enable data snapping and evaluation of the quality of provided data.



# Thank you for your attention!

Q/A

dubravka.aleksic@ekip.me matija.tomcic@ekip.me

