BULGARIA - BROADBAND CONNECTIVITY

Mapping Methodology

Main aspects of the methodology

The collection of data on the coverage situation was carried out using a methodology developed by the Bulgarian BCO on the basis of a coverage raster. For this purpose, a nation-wide, uniform coverage raster with an edge length of 100 metres was created using the ESRI Shapefile format.

The procedure

The Bulgarian Ministry of Transport and Communications provided with a web GIS application for easy and user-friendly entry of broadband availability information and its assignment to the raster cells. Rasters are made up of a matrix of pixels (also called cells), each containing a value that represents the conditions for the area covered by that cell. Raster data is used in a GIS application when we want to display information that is continuous across an area and cannot easily be divided into vector features. Once supplied, data is constantly available and can be edited and updated at any time. The survey was carried out for the following bandwidth categories (bandwidth information always refers to the minimum downstream bandwidth):

Bandwidth	
For mobile network	For fixed network
<100 Mbps	<100 Mbps
<1000 Mbps	<300 Mbps
>1000 Mbps	<1000 Mbps
	>1000 Mbps

When collecting data, the following technologies for networks are distinguished:

Fixed and mobile
FTTH
FTTB
FTTx bitstream
FTTN/C
xDSL
VDSL
LAN, RLAN
CaTV
Fixed Wireless Access (FWA)
Satellite
LTE
3G, 4G, 5G
5G in 3.4-3.8 GHz
other

In the following table from OMDIA Broadband coverage report, for 2023 was presented the state of broadband coverage at the end of June 2023 in Bulgaria:

Technology	Bulgaria 2023		EU27 2023	
	Total	Rural	Total	Rural
DSL	85.5%	75.7%	79.7%	67.4%
VDSL	22.5%	19.7%	52.6%	37.8%
VDSL2 Vectoring	0%	0%	38.7%	22.0%
FTTP	88.6%	73.7%	64.0%	52.8%
Cable modem DOCSIS 3.0	70.9%	28.3%	41.1%	9.5%
Cable modem DOCSIS 3.1	0%	0%	33.6%	5.3%
FWA	18.8%	9.8%	68.5%	59.6%
5G	70.9%	20.1%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	45.1%	11.3%	50.6%	15.2%
Satellite	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.1%	95.4%	97.7%	92.2%
Overall NGA broadband	95.8%	82.3%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	88.6%	73.7%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	88.1%	70.0%
At least 30Mbps	95.1%	-	93.3%	-
At least 100Mbps	93.6%	-	89.0%	-
At least 1Gbps	28.4%	-	75.6%	-
At least 1Gbps upload and download	-	-	-	-

The highest availability value in the relevant raster cell is determined and displayed, based on the selected technology and bandwidth.

The information by the broadband providers operating in the region is displayed at municipal level and not individually for each raster cell or at community level in order to protect the trade secrets of the telecommunications companies.

Basic data used

To be able to perform evaluations for widely varying spatial units, the individual coverage raster were enriched with a wide range of administrative information. In this context, the most important connection is the assignment of each raster cell to the municipality in which the cell is located. For raster cells in boundary areas between two or more municipalities, a weighted assignment was performed based on the number of subscribers of the municipality concerned in the relevant cell. The connection to the corresponding district is also established through the association with a municipality.

The number of households per raster cell was determined using the data base provided by the Single Information point (SIP)[1], National statistical institute. Moreover, random checks against available information were performed on the data. All data are regularly updated and adapted if possible.

Data collection approach

The telecommunications operators provide data in SIP and also provide information to CRC with their annual questionnaires for activity of the enterprises. The data was analysed according to the requirements of the European Commission (EC) and the Body of European Regulators for Electronic Communications (BEREC).

The majority of companies chose to provide their data using the web GIS. Data is entered based on the technology and bandwidth offered for each provider.

In addition to the direct collection of data via the web GIS, the providers can use an upload function to transmit their existing coverage polygons or other maps they have at their disposal to web GIS application, which will then perform the conversion to raster level. The telecommunications companies deliver their data in a wide range of different standard GIS formats.

Calculation of broadband availability

All raster cells entered or delivered by the telecommunication operators were combined with the information of the technology offered, the bandwidth as well as the availability to form one table. The broadband coverage raster was created on the basis of this table by listing for each raster cell the maximum broadband availability irrespective of provider for each of the categories (all, fixed, mobile) and for relevant bandwidth categories.

Error analysis and quality assurance

The telecommunication operators in Bulgaria have statutory obligation to provide data for their digital infrastructure and network via Electronic Communications Network and Physical Infrastructure Act (ECNPIA).

In Bulgaria there are more than 600 operators who provide public electronic communications networks or services. Since 2018, with the adoption of ECNPIA which transposes Directive 2014/61/EU on measures to reduce the cost of deploying high-speed electronic communications

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[1] SIP

networks, operators have obligation to provide data in SIP. The operators obliged under the ECNPIA provide the SIP with the relevant information in the formats specified in the Ordinance on data formats and on the conditions and procedures for providing access to information in the SIP. Until now, most of the operators from big cities are providing data in SIP, but these in small and rural areas have non-digital data and do not provide data in SIP.

MTC applies a complex data verification process after every data transmission to identify, clarify and correct possible inconsistencies in the broadband coverage data. This includes, apart from a formal check of the data, plausibility checks regarding logic and consistency with existing infrastructure and topographical features.

In order to minimize and limit this source of error, MTC continues its efforts to encourage the remaining companies to supply their coverage data.

In addition, the following error groups/sources, which can affect the outcome of the broadband availability illustration and calculation, have been identified:

- Discrepancies in the data delivered by the operators;

- Delayed transmission of up-to-date coverage data;

- Delayed provision and transmission of information on new development areas;

- Household figures/basic statistical data differ from the actual local situation.

- If a raster cell of 100 x 100 metres is served by several operators, only the data of the operator providing the greater proportion of broadband coverage in the raster cell is used.

- Wireless broadband coverage is made available by the telecommunication operators, in part by providing a percentage of the raster areas covered by wireless broadband solutions. Here, the provided percentage of coverage is combined with the populated area within the raster cell with the households. The sources of error described cannot be calculated and evaluated by way of a mathematical error analysis. An overlapping of error sources is possible. Moreover, an empirical verification of the data based on random checks is not appropriate because of the large data quantities and areas. However, the comprehensive verification routines described and the comparison against further available datasets as well as the chosen approach, the error tolerance for the aforementioned sources can be assumed to be very small.

Data visualization and analysis

The mapping of mobile and fixed networks adhered to the guidelines set forth in the EU Guidelines on State aid for broadband (2023/C36/01). These guidelines align with the directives from the Body of European Regulators for Electronic Communications (BEREC) regarding geographic surveys and network deployments. Several key factors were meticulously considered during the mapping process:
  • Optical Connectivity: Assessment of existing optical connectivity to a termination point within a populated area.

- Network Performance Metrics: Analysis of peak time conditions, packet loss, jitter, latency, and throughput, the latter defined per RFC2544 as the maximum data transfer rate achievable on the network.
- Service Consistency: Evaluation of the uniformity in service quality delivered to end-users and the interaction with other concurrent services.
- Environmental Influences: Consideration of how local environmental conditions might impact signal distribution characteristics such as interference and reflections.

The data was compiled with a precision of 100 meters by 100 meters, ensuring detailed and actionable insights for the subsequent deployment of digital infrastructure. This thorough mapping initiative is fundamental to pinpointing specific areas in need of state intervention, thus fostering a more connected and resilient Bulgaria.

The combined data of the broadband coverage raster are visualized with web GIS application (https://sipbg.gov.bg/Web/?configUrl=https://sipbg.gov.bg/Web/BaseProject/Configs/config.json). The integrated search function permits simple and user-friendly searches for various spatial units which can then be navigated to on the map. The following spatial searches are possible:

- Municipality and populated area;
- Address.

Moreover, it is possible to freely navigate the map by adjusting the map section using the options zoom in, zoom out and move.
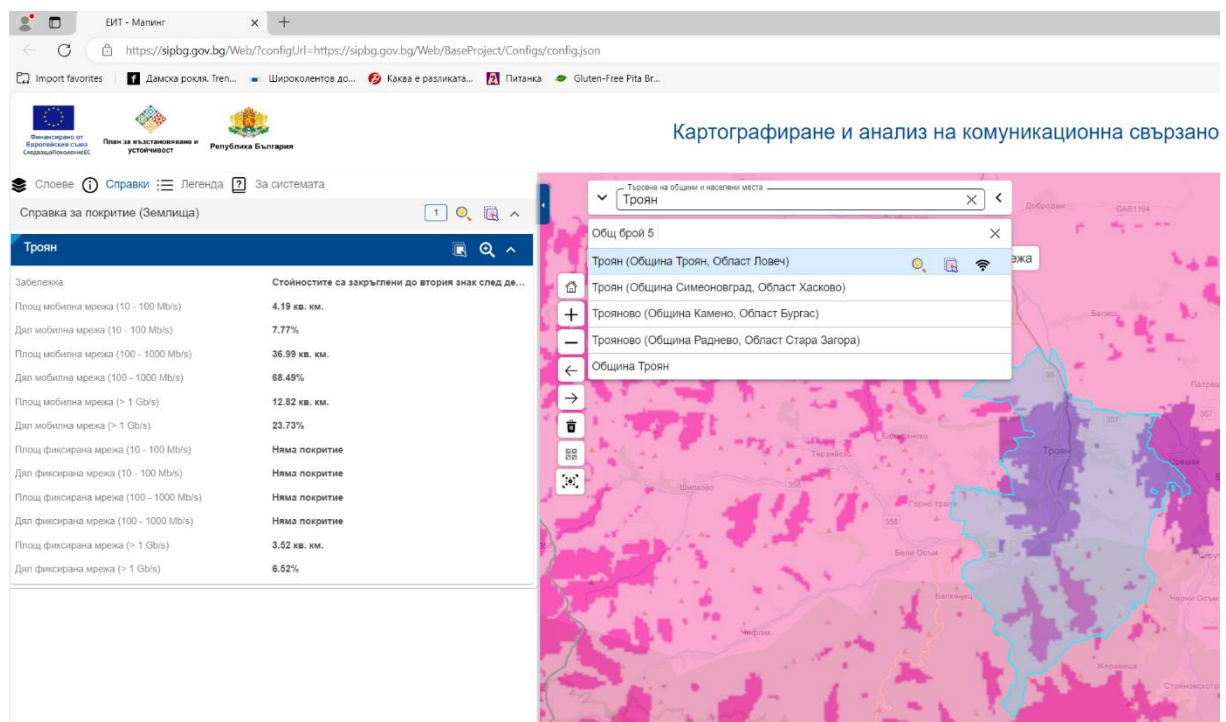
For example, the displayed map from populated area search (Troyan, Troyan municipality, Lovech region) is enriched with supplementary information for mobile or fixed networks per square meter in the area, etc.

All tools available in the web GIS application are illustrated in the figure above. There are the following tools:

Tool	Description
≋	Layers
ⓘ	References
☰	Legend
☐?	About the system
🔍	Zoom in
▦	Mark
📶	Reference for coverage
⌂	Home
+	Zoom in
−	Zoom out
←	Previous extent
→	Next extent
🗑	Clear
▦	Base maps
⦂⦂	Draw coordinates

Commercial broadband availability

Availability data is collected both in business and industrial as well as in mixed-use areas, where private households and companies are present. The data base was generated by combining data from various sources and subsequently refined and partially cleansed. The data base does not claim to be complete.

The commercial broadband coverage displayed is based on data obtained from the broadband providers and subsequently processed by MTC. As commercial broadband solutions are often highly customized, the actual local coverage situation may be different.

Annex 1

Providers of data in SIP, whose data was used for mapping needs

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Bulgartransgaz EAD	Boyana EOOD
Izoglas Communications EOOD	Bulgartel AD
Overgaz Networks AD	Bulsatcom EOOD
ERP Sever AD	Bumerang FM EOOD
A1 Bulgaria EAD (**A1**)	Burgasnet OOD
Road Infrastructure Agency	Bulgarian Telecommunications Company EAD (**VIVACOM**)
Atlantis Net OOD	Varna Net OOD
Boryana EOOD	Vestitel BG AD
Kivi-TV OOD	Com Net EOOD
Virginia-R N EOOD	Komnet Bulgaria Holding OOD
Digital Communications OOD	Komnet Sofia EAD
Dobrudzha Cable EOOD	CoolBox AD
State agency "Electronic governance"	Lucky OOD
Evolink AD	M Sat Cable EAD
Electronika NS EOOD	Minprojekt EAD
I Connect OOD	Multimedia BG EOOD
Inter Carrier EOOD	Net 1 EOOD
Cable Televison Delta OOD	NetBox EOOD
Cablenet (Ruse) OOD	Neterra EOOD
Netcom (Karnobat) EOOD	Aprilci Municipality
Net-surf.net EOOD	Burgas Municipality
Networks-Bulgaria EOOD	Elhovo Municipality
Nino R 27 OOD	Pernik Municipality
Novatel EOOD	Razgrad Municipality
Puldin NET EOOD	Sofia Municipality
Puldin TV OOD	SCAT – Petecom OOD
Resonance EOOD	Sofia Connect EAD
Sky Fibre AD	SSV EAD
Scat TV OOD	Telecable AD
SKAT Telecom OOD	Transcable TV OOD
Telecommunication Company Varna EAD	Cetin Bulgaria (**CETIN**)
Telia Carrier Bulgaria EOOD	United Towers Bulgaria EOOD
Teranet EOOD	

Providers of data for Annual reports of CRC are available on: https://crc.bg/ords/f?p=723:12:30286394632914 - Register of providers of public electronic communications networks and services

Frequently asked questions and answers

General questions

A comprehensive mapping of broadband Internet access throughout the country has been conducted. This survey has generated a current snapshot of both private and public digital infrastructure, alongside service quality, utilizing standard metrics for broadband network mapping. The assessment and analysis of communications connectivity and broadband coverage was made with web-based GIS application, integrating data from the Single Information Point (SIP), the Communications Regulatory Commission (CRC), and various telecommunications providers. This approach facilitated the identification of geographic areas slated for enhancement via state aid under the RRF project.

The data was compiled with a precision of 100 meters by 100 meters, ensuring detailed and actionable insights for the subsequent deployment of digital infrastructure. This thorough mapping initiative is fundamental to pinpointing specific areas in need of state intervention, thus fostering a more connected and resilient Bulgaria.
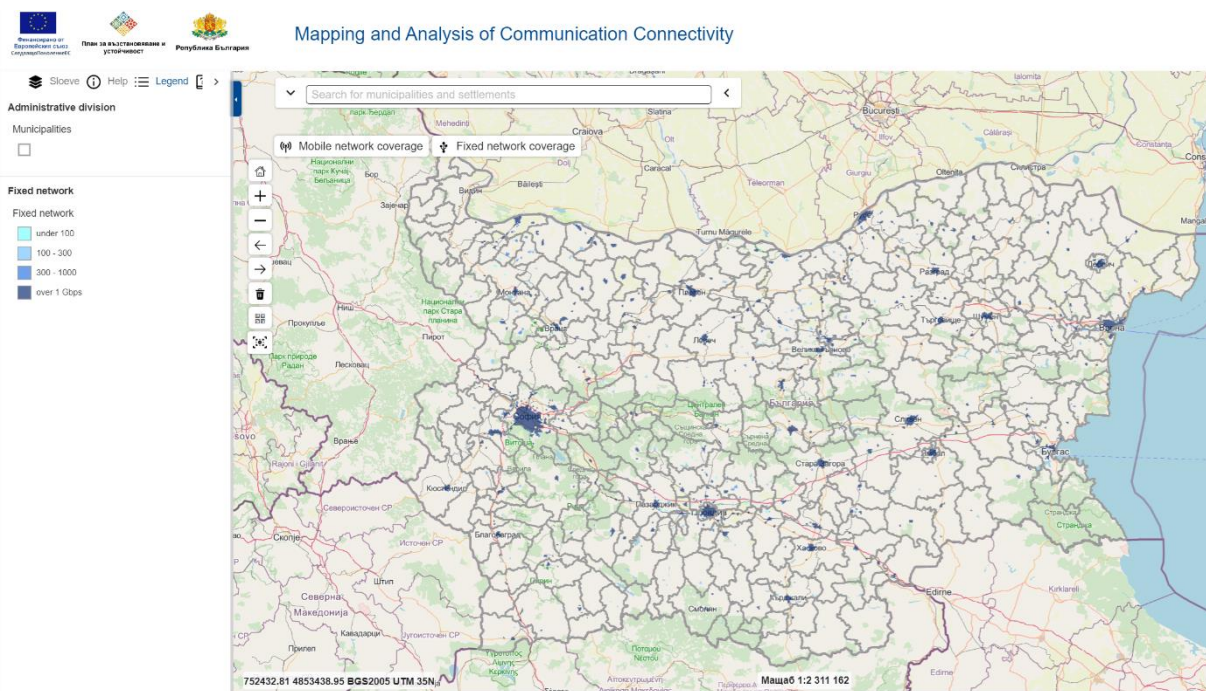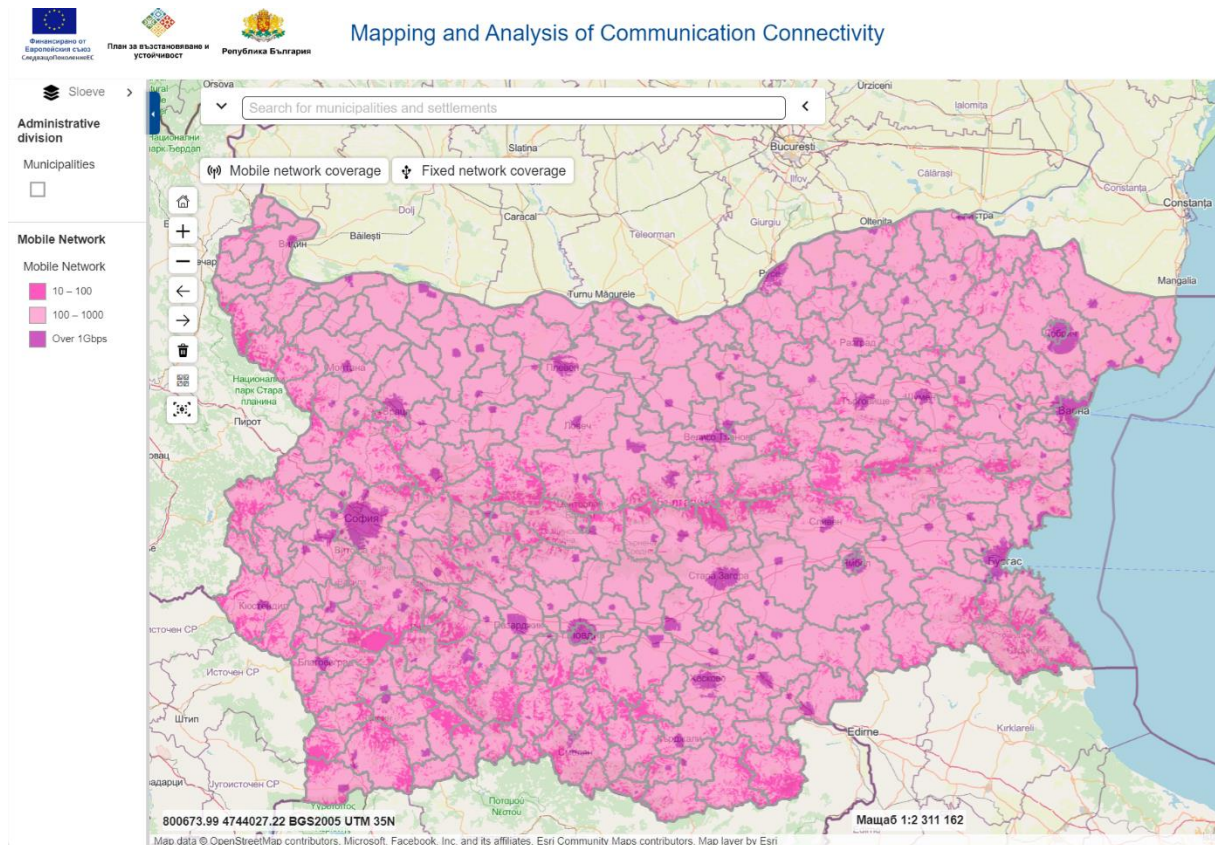
Who uses the Mapping of Communication connectivity in Bulgaria?

The Mapping of Communication connectivity in Bulgaria, made by web GIS application to SIP, can be used by all citizen and stakeholders, and this case for needs of RRF project for large scale deployment of digital infrastructure.

Why are there broadband providers missing in the provider directory?

All broadband providers in Bulgaria are regularly requested to make available their data. Some providers have not yet transmitted any data, in particular due to lack of time or lack of technical abilities. Data are transmitted and provided on a voluntary basis. Companies which are currently not listed will be included in the list as soon as they provide data. You are welcome to inform us of missing broadband providers (telecommunications companies), for example via the contact details on the SIP.

Are the companies obliged to make their data available?

Telecommunications companies made available their broadband coverage data to the Ministry of Transport and Communications on a voluntary basis. Thus, municipalities that are actually covered may be displayed as not fully covered in individual cases.

How can broadband providers contribute?

The broadband data portal, which was set up specially for broadband providers, offers various options for easily and quickly entering or updating availability data.