



Republic of North Macedonia

Broadband Competence Office

Report

Skopje, September 2020

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Introduction

Pursuant to amendments to the Law on Electronic Communications (July 2019), the National Broadband Competence Office (NBCO) is defined as expert and advisory body for support of broadband network investments. Pursuant to the Law, NBCO is accountable before the minister of information society and administration for the operation thereof.

The National Broadband Competence Office (NBCO) was established in October 2019 upon decision of the minister of information society and administration and after the Parliament of the Republic of North Macedonia (PRNM) adopted amendments to the Law on Electronic Communications in July 2019 ("Official Gazette of the Republic of North Macedonia" no. 153/2019).

Pursuant to Article 71-a paragraph (2) of the Law on Electronic Communications ("Official Gazette of the Republic of Macedonia ", no. 39/2014, 188/2014, 44/2015, 193/2015, 11/2018, 21/2018 and "Official Gazette of the Republic of North Macedonia" no. 98/2019 and 153/2019), NBCO shall assume the following competences:

- Shall participate in the work of the broadband competence office network in the European Union and in the region,
- Shall issue opinions and proposals for faster development of electronic communications, and in particular of broadband in the country,
- Shall cooperate with state authorities, state administrative bodies, public enterprises, local self-government units, public institutions and legal entities with public authorizations and fully state-owned trade, and shall provide support for development plans/projects/studies related to broadband networks, as well as support in implementation thereof,
- Shall issue opinions and proposals for utilization and needed development of fibre-optic infrastructure that has been constructed or is to be constructed with public funds,
- Shall participate in establishment of target areas that would use state aid in construction and development of broadband networks,
- Shall issue opinions and proposals during construction of broadband networks with utilization of state aid for: potential technical solutions, investment and business models, criteria for selection of operator, price policy and related issues,
- Shall participate, issue opinions and proposals in preparation of plans for promotion of broadband in the country,
- Shall participate in public discussions and consultations related to construction of broadband networks with utilization of state aid,
- Shall participate in determining free WiFi internet access locations in municipalities,
- Shall participate, issue opinions and proposals in development of future national strategic documents and development plans related to broadband development,
- Shall monitor implementation of adopted national strategic document and plans for broadband development in the state, meeting national broadband targets set forth therein and shall issue opinions and proposals for review thereof,
- Shall, at least semiannually, deliver a report to the minister of information society and administration on broadband development in the country related to development of broadband market in the European Union pursuant to DESI (The Digital Economy and Society Index), as well as report on implementation of adopted strategic documents and plans for broadband development in the country, meeting of national broadband goals set forth therein.

REPORT ON IMPLEMENTATION OF ADOPTED STRATEGIC DOCUMENTS AND PLANS FOR BROADBAND DEVELOPMENT

Activities conducted by NBCO in NOBP implementation

Pursuant to Article 71-b paragraph (1) under the Law on Electronic Communications ("Official Gazette of the Republic of Macedonia ", no. 39/2014, 188/2014, 44/2015, 193/2015, 11/2018, 21/2018 and "Official Gazette of the Republic of North Macedonia, no. 98/2019 and 153/2019), NBCO consists of seven member, of which one assumes the position of NBCO president. Upon Decision Amending the Decision on Establishment of National Broadband Competence Office (NBCO) 11/1-3237/17 no. 11/1-3237/33 from 27.12.2019 by the minister of information society and administration, NBCO operates with six member, of which one assumes the position of president thereof. NBCO considers there is a need to complete NBCO composition with the full number of members pursuant to the law.

Во периодот април – септември 2020 година, Националната канцеларија за бродбенд компетентност (НКБК) одржа вкупно седум седници преку интернет (online).

On 25 March 2020, NBCO members adopted appendixes to the Rules of Procedure with a view to further specify the manner of operation during the declared state of emergency in the country. In such conditions, NBCO sessions shall be held via electronic communication means that allow utilization of audio and video communication platforms, whereas agenda items shall be voted via electronic mail.

NBCO seventh session, held online on 28 April 2020 due to the declared state of emergency in the country, included discussions on the need to amend the "Template on the Form and Content to be Covered under the Report on Broadband Market Development pursuant to DESI", as well as preparation of recommendations to set up, i.e. to utilize existing underground cable system constructed with public funds. Inter alia, it was concluded that the recommendations to set up i.e. to utilize existing underground cable system constructed with public funds should also be adopted by the Government to be implemented obligatorily, i.e. to be an integral portion of the package laws regulating construction.

During online session held on 28 May 2020, NBCO members unanimously adopted Recommendations on Installing Underground Cable System Funded by Public Funds and Utilization of Existing Underground Cable System.

The document will help meet national fixed broadband targets set forth in the National Operational Broadband Plan (NOBP), further develop the government fiber optic network for the needs of security structures in the state, to connect free Wi-Fi hotspots via fiber optic, and will also create conditions for development of the Fourth Industrial Revolution. The document's summary covers recommendations for PE MB and other public institutions that construct infrastructure objects financed by public funds, and also includes technical characteristics of broadband communication network elements (underground cable system, fiber optic cables and possible constructions of underground cable system).

During online session held on 22 June 2020, NBCO unanimously adopted amendments to the "Template on the Form and Content to be covered under the Report on Broadband Market Development pursuant to DESI". The template was amended with a view to reorganize data to allow streamlined comparison of data for the indicator "Coverage" in the Republic of North Macedonia with corresponding indicators of EU member states.

During online session held on 16 July 2020, NBCO unanimously adopted "NBCO Proposals and Comments Concerning the Proposed Text of the National ICT Strategy, Proposed Action Plan and State-of-Play Document". The consultants that worked on the proposed National ICT Strategy deemed NBCO proposals and comments extremely valuable and of high quality, thus integrating every single one in the final version of the documents that are integral part of the National ICT Strategy.

The eleventh NBCO session, held online on 31 August 2020, included discussions on the need to prepare and adopt proposed recommendations to secure free wireless Internet access on open public spaces in municipalities via Wi-Fi hotspots. During the discussion, it was established that the recommendations should, inter alia, include grounds for adoption thereof, general goals to be attained by setting free public Wi-Fi hotspots, manner of choosing locations for free public Wi-Fi hotspots, entities competent to secure the service Free Internet Access, decentralized (each

municipality signs a contract with operator/s) or centralized concept (one state institution signs contract with operator/s) in all municipalities, procedure and competences in establishment of free Wi-Fi hotspot parameters: minimum speed, guaranteed number of users that would be simultaneously accommodated, time-limited use, availability of Wi-Fi in the public hotspot etc.

NBCO online session held on 18 September 2020 included discussions on the progress in preparation of NBCO Report no. 2, as well as provisions under the Work Plan of the Government of RNM 2020-2024 related to NBCO competences which include NBCO obligations.

During online session held on 29 September 2020, NBCO adopted NBCO Report no. 2 for development of broadband in the state and NBCO implementation.

In summary, in the period April - September 2020, the National Broadband Competence Office (NBCO) has adopted the following documents:

- Recommendations on Installing Underground Cable System Funded by Public Funds and Utilization of Existing Underground Cable System;
- Amendments to the Template on the Form and Content to be Covered under the Report on Broadband Market Development pursuant to DESI;
- NBCO Proposals and Comments Concerning the Proposed Text of the National ICT Strategy, Proposed Action Plan and State-of-Play Document.

In April 2020, the National Broadband Competence office (NBCO) joined the European Broadband Competence Office (BCO network)¹.

Conducted activities in NOBP implementation

Agency for Electronic Communications (AEC)

In the period April – September 2020, the Agency for Electronic Communications collected data for its personal GIS system, i.e. for the Single Information Point pursuant to the Law on Electronic Communications.

Two projects are currently undergoing implementation in the Agency for Electronic Communications: hardware procurement project and project for development of software – System for Support of NOBP Implementation. The hardware procurement project is in its final phases (administrative finalization), whereas the project for development of System for Support of NOBP Implementation is in implementation phase. Some of the functionalities off the software solution and support of NOBP implementation will include activities to review white, gray and black zones and to map utilization of service “internet access at settlement level”.

Concerning the process of mapping utilization of service “internet access at settlement level”, AEC will lodge circular letters to all operators to review fast and ultrafast internet access coverage zones (existing and planned coverage according to technology and access speed), and to lodge data for utilization of service “internet access at settlement level” in standardized format, in a structure that would be compatible with the new system for support of NOBP implementation. This would allow data to be entered immediately after launch of the new system (in implementation process).

Both activities are planned to be concluded during November 2020.

PE Macedonian Broadcasting (PE MB)

PE Macedonian Broadcasting has instigated several activities related to the need to initiate preparation of feasibility study for national transport fiber optic network (NTON).

¹ https://ec.europa.eu/digital-single-market/en/bco-network-directory?field_dsm_bco_address_country=MK

The process has concluded of mapping public institutions (schools, universities, research hubs and other educational institutions, healthcare institutions, ministries, courts, local self-governments and other state bodies and authorities) that would connect to NTON.

Together with the NOBP preparation working group established by MISA, PE MB delivered a letter to all public institutions at central and at municipal level, whereby separate lists for public institutions and municipalities were created based on gathered data and conducted analysis, as follows:

a) a total of 1,358 spots have been mapped of public institutions at central level in Skopje and in other cities wherein those institutions have regional units or offices. Descriptive information and GPS coordinates are available for all spots;

b) a total of 1,152 spots have been mapped of institutions at municipal level across all cities in the country (buildings of municipalities, primary and secondary schools, public enterprises and other enterprises founded by the municipalities). Descriptive information and GPS coordinates are available for all spots.

PE MB has only processed data lodged by local or central-level institutions. Thus, there is a deficit of certain number of spots for which the institutions have not lodged data.

The process has concluded of mapping free Wi-Fi hotspots that would be connected to NTON. PE MB has gathered and process a total of 455 proposed Wi-Fi hotspots from municipalities. PE MB did not limit municipalities on the number of proposals for Wi-Fi hotspot locations, but it requested that proposed hotspots be locations with higher frequency of passers-by/citizens and locations of particular significance for the municipalities, regardless of whether they are in urban or rural areas. PE MB sent a letter to NBCO to review and approve proposals lodged by municipalities for Wi-Fi hotspot locations, with examples of municipalities that were found to have adequate proposals, which other municipalities should follow when preparing their proposals.

Data from mapping of both institution groups were processed, summarized and entered in PE MB GIS platform and would be available for use in preparation of the feasibility study and for other purposes. At present, a limited number of employees in PE MB have access to this GIS platform.

The process of mapping of the current fiber optic infrastructure constructed with public funds and potential utilization thereof for construction of NTON is completed in part. PE MB considers this activity is not completed in full because not all data are delivered by institutions that have constructed fiber optic infrastructure with public funds (MEPSO, NER, PE State Roads, Ga-Ma and PE Railways (Infrastructure)). Reasons behind this are lack of records on constructed infrastructure, given that it was constructed many years ago, without categorization and detailed information on the route and materials of the fiber optic network or connection points, lack of adequate staff etc. During NBCO meeting held in June 2020, it was decided to prepare proposed recommendations for records of fiber optic infrastructure. Those were distributed to institutions that have constructed fiber optic infrastructure with public funds.

Report on Broadband Development in the Country

Pursuant to the Law on Electronic Communication, NBCO shall *"at least semiannually, deliver a report to the minister of information society and administration about development of broadband in the country relative to development of the broadband market in the European Union, pursuant to DESI (The Digital Economy and Society Index), and report on implementation of adopted strategic documents and plan for broadband development in the country, meeting national broadband targets set forth therein"*.

To meet this obligation, in February 2020 NBCO adopted the "Methodology Determining the Digital Economy and Society Index in the Republic of North Macedonia " and [Template on the Form and Content of the Broadband Market Development Report Pursuant to DESI](http://www.bco.mioa.gov.mk). (www.bco.mioa.gov.mk)

The Methodology is based on EU's DESI Methodology and, according to this Methodology, NBCO is competent to monitor only the dimension "Connectivity".

During the session held on 22.06.2020, NBCO adopted amendments to the Template on the Form and Content that should be covered under the Report on Development of the Broadband Market pursuant to DESI, with a view to reorganize data to streamline comparison of the indicator “Coverage” for RNM with corresponding indicators of EU member states.

This Report is prepared pursuant to the adopted Template on the Form and Content of the Broadband Market Development Report Pursuant to DESI.

When preparing the report on broadband market development in the dimension “Connectivity”, as source of information for specific sub-dimensions and indicators, NBCO used data from:

- Agency for Electronic Communications, predominantly²,
- State Statistical Office³,
- National Bank⁴,
- Information on RNM's Attained Progress for the Needs of the Sub-committee on Innovation, Information Society and Social Policy (March 2020)

Note:

This Report compares indicators for RNM with the “DESI Report”⁵ published by the European Commission (EC) on 11.06.2020.

CONNECTIVITY – INDICATORS

Indicators for dimension “Connectivity” for RNM are listed in Table 1.

Table 1. Indicators for dimension “Connectivity” (September 2020)

Indicators	Description	Unit	Value/ Reference date	Value/ Reference date
1a1 Fixed broadband coverage	% of broadband covered households ⁶ : xDSL, xDSL, cable (basic and NGA), FTTP or WiMax networks	% of households	97.87% (Q1/2019)	97.87% (Q1/2019)
1a2 Fixed broadband take-up	% of households subscribed to broadband: xDSL, cable (basic and NGA), FTTP or WiMax networks	% of households	70.91% (Q3/2019)	72.95% (Q1/2020)
1b1 4G coverage	% of settlements with 4G coverage: measured as medium coverage of telecommunication operators in every country	% of households	99.365% (Q4/2019)	99.38% (Q2/2020)
1b2 Mobile broadband take-up	Number of mobile internet subscribers per 100 inhabitants	Subscribers per 100 inhabitants	70.06% ⁷ (Q3/2019)	64.83% (Q1/2020)
1b3 Preparedness for 5G	Portion of the spectrum intended and awarded for 5G utilization by the end of 2020 in so-called 5G	% of harmonized spectrum		

² www.aec.mk

³ www.stat.gov.mk

⁴ www.nbrm.mk

⁵ <https://ec.europa.eu/digital-single-market/en/connectivity>

⁶ Number of households in the country amounts to 564,296. (Source: State Statistics Office)

⁷ Indicator „Mobile Broadband Take-Up“ from the previous NBCO report has been corrected. Details thereto given in item 8 of this chapter

	pioneer bands. These bands include 700 MHz (703-733 MHz and 758-788 MHz), 3,6 GHz (3400-3800 MHz) and 26 GHz (1000 MHz in 24250-27500 MHz). All three frequency bands have equal weight		0%	22.2% ⁸ (14.07.2020)
1c1 Fast broadband (NGA) coverage	% of households subscribed to broadband with at least 100 Mbps download speed. Affected technologies include FTTH, FTTB, cable Docsis 3.0 and VDSL	% of households	78% (Q1/2019)	78% (Q1/2019)
1c2 Fast broadband take-up	% of households subscribed to broadband with at least 30 Mbps	% of households	21.03% (Q3/2019)	27.43% (Q1/2020)
1d1 Ultra-fast broadband (NGA) coverage	% of households subscribed to broadband with at least 100 Mbps download speed. Affected technologies include FTTH, FTTB and cable Docsis 3.0	% of households	43.8% (Q1/2019)	43.8% (Q1/2019)
1d2 Ultra-fast broadband take-up	% of households subscribed to broadband with at least 100 Mbps	% of households	0.98% (Q3/2019)	1.74% (Q1/2020)
1e1 Broadband price index	Broadband price index	Scale (0-100)		

COMPARISON WITH INDICATORS OF EU MEMBER STATES

1. Total income of telecom operators (in MKD, excluding VAT)

Data on operators' total income cover 2019 and are listed in Table 2.

Table 2. Income from telecommunication services

Service	Income in 2018 (in MKD)	Income in 2019 (in MKD)
Landline	2,131,578,000.00	2,026,590,000.00
Fixed internet access	3,990,676,000.00	4,126,204,000.00
Mobile telephone line	6,823,893,000.00	7,076,195,000.00
Mobile internet access	1,468,488,000.00	1,628,726,000.00
Business internet users ⁹	555,277,292.00	489,512,212.00

Source: Agency for Electronic Communications

⁸ Approvals to use radiofrequencies to test 5G

⁹ Refers only to individual service, does not cover income from bundle package services. The income from business internet users is calculated in the total income from fixed access and services and mobile access and services

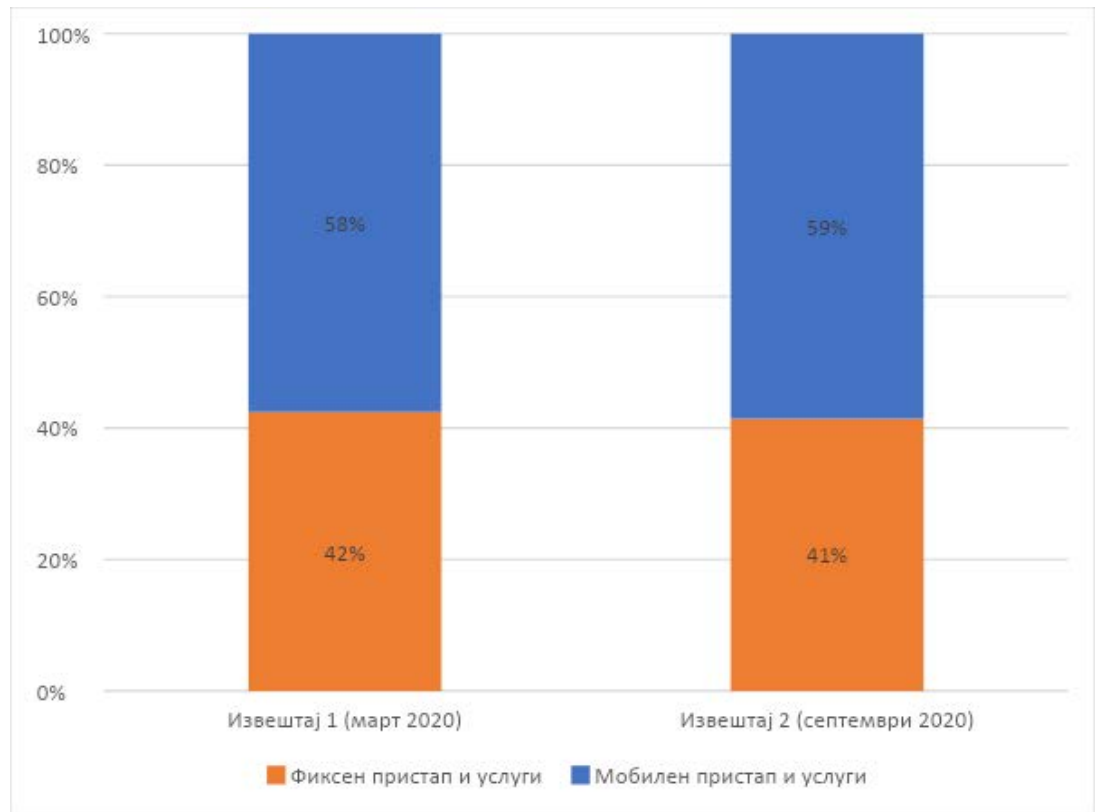


Figure 1: Share of income from telecommunication services (Source: AEC)

2. Broadband Coverage

A. Fixed broadband coverage

A total of **552,327 households** have fixed broadband coverage, which accounts for **97.87%** of the total number of households in RNM.

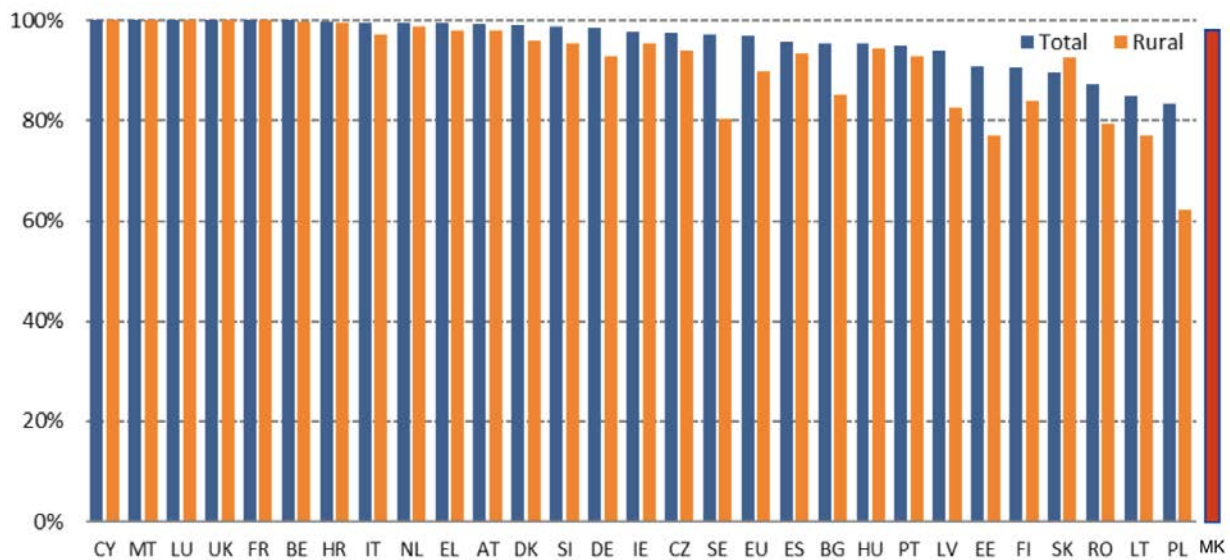


Figure 2: Basic fixed broadband coverage (% of households) (Sources: EC, NOBP, AEC)

A total of **445,233 households** have fixed fast broadband coverage (download speed of at least 30 Mbps and not above 100 Mbps), accounting for **78%** of the total number of households in RNM.

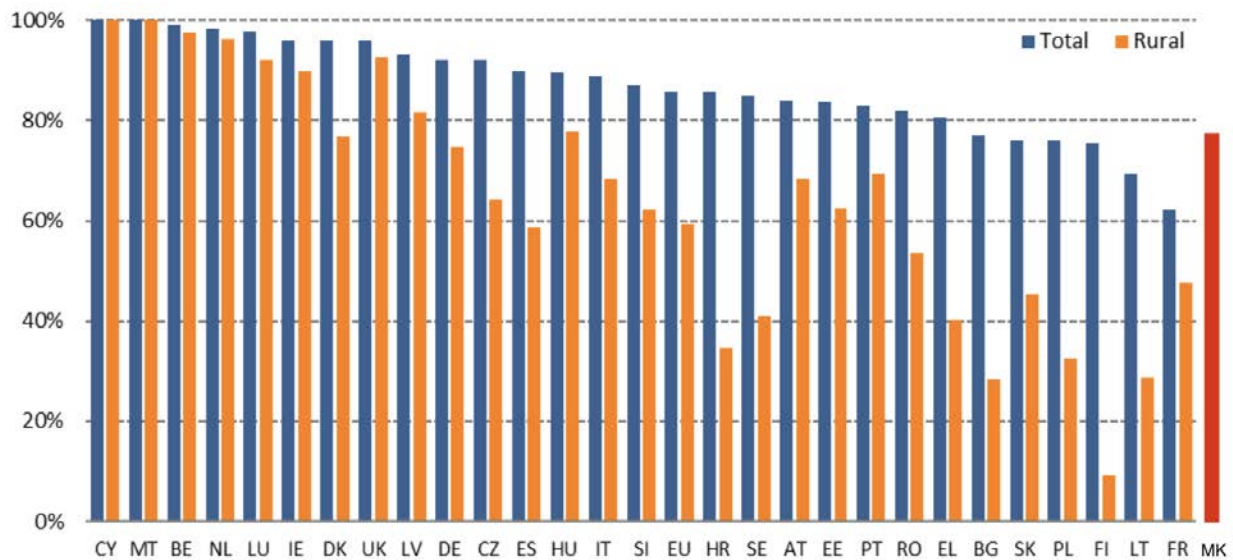


Figure 3: Fast broadband network coverage (% of households) (Sources: EC, NOBP, AEC)

A total of **249,979 households** have fixed ultra-fast broadband coverage (download speed of at least 100 Mbps), which accounts for **43.8%** of the total number of households in RNM.

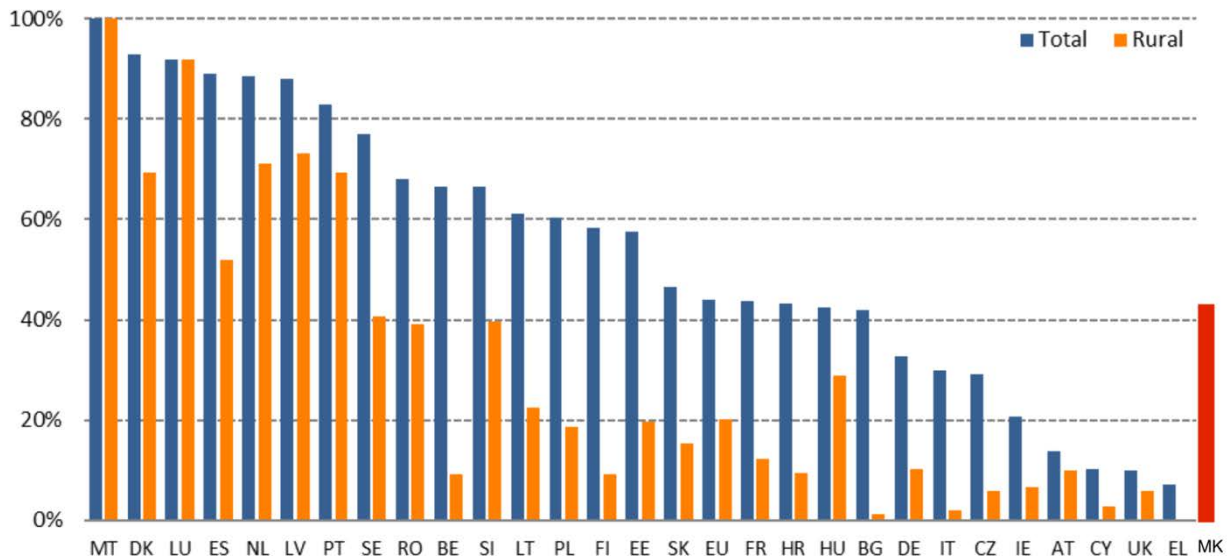


Figure 4: Ultra-fast broadband network coverage (% of households) (Sources: EC, NOBP, AEC)

B. Mobile broadband access coverage

In RNM, 99.56% of the population has 4G (LTE) network coverage (from at least one mobile operator). The average 4G availability (as average value from coverage of both operators) is 99.38% of the population in RNM

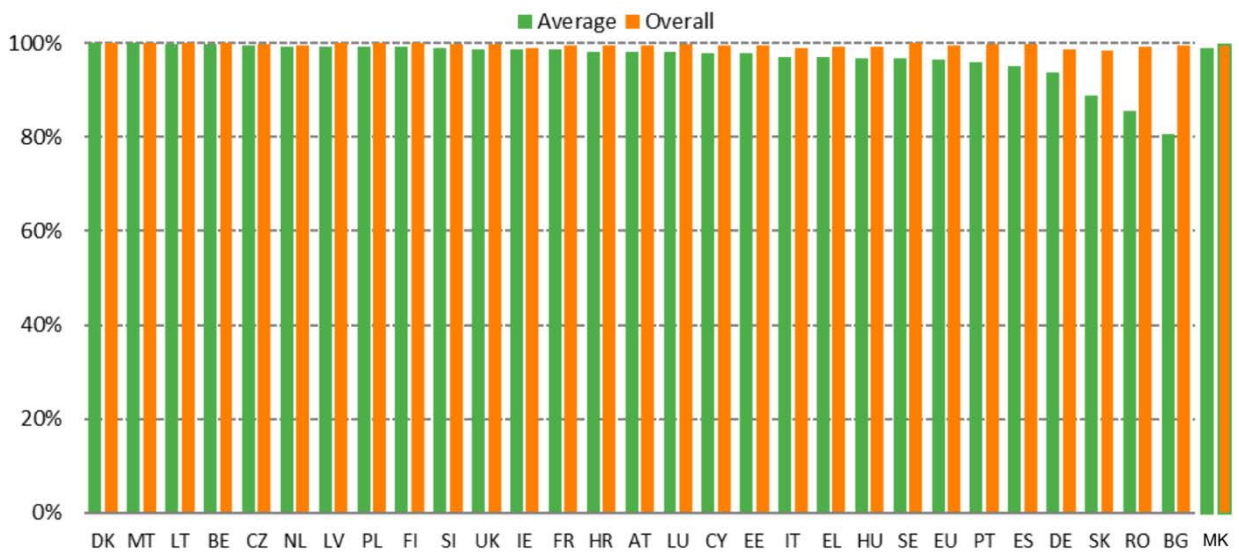


Figure 5: 4G coverage, percent of households (Sources: EC, AEC)

3. Fixed broadband take-up (% of households)

Fixed broadband take-up amounts to **72.95%**, i.e. **411,682 households** in RNM have signed fixed broadband subscriber contracts. (Source: Agency for Electronic Communications).

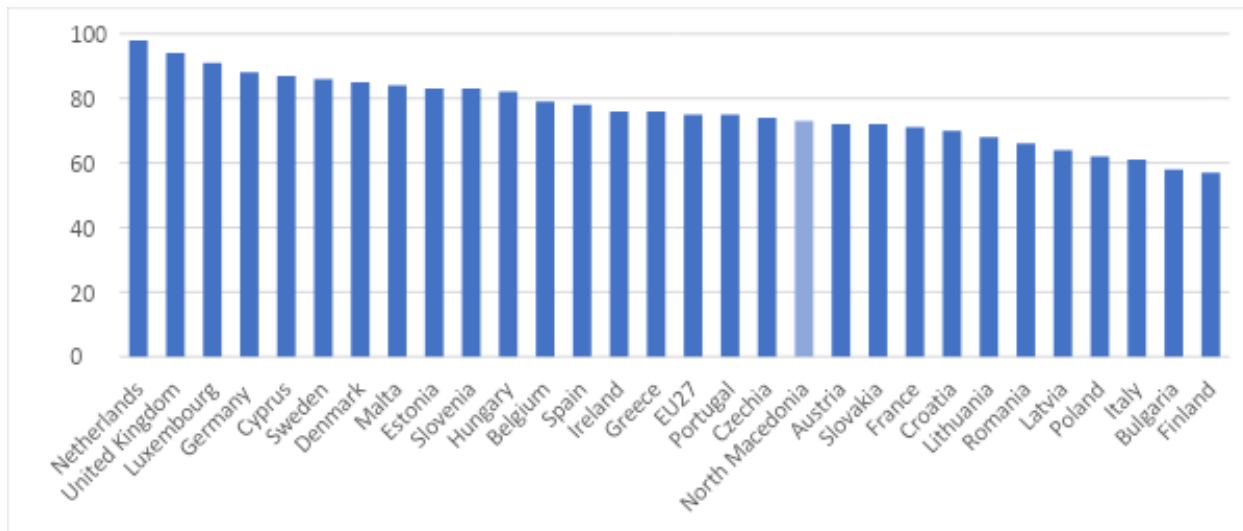


Figure 6: Households – fixed broadband subscribers (Sources: Eurostat, AEC)

Fixed broadband take-up notes an **increase** in the period between the two NBCO reports, March/2020 – September/2020.

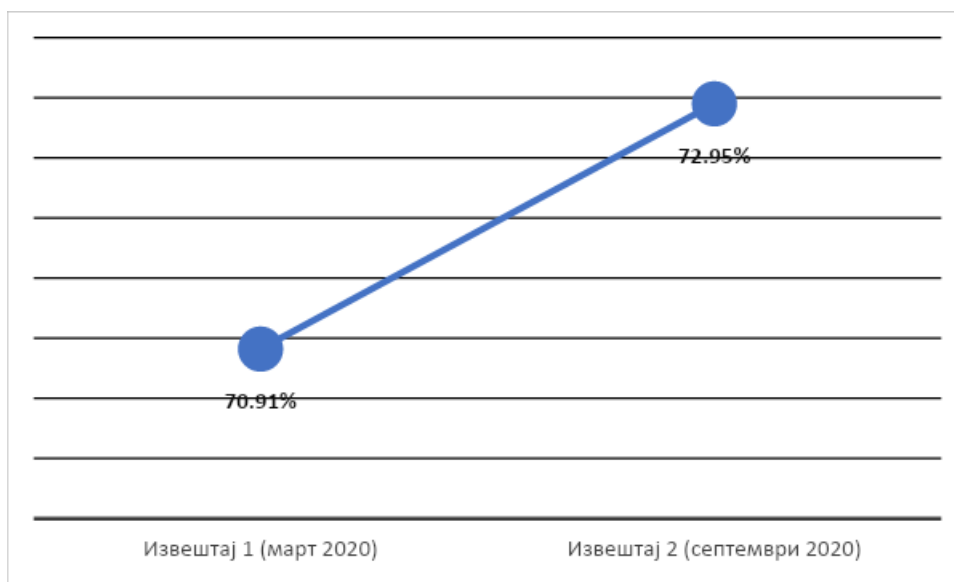


Figure 7: Change of the number of households-fixed broadband subscribers in RNM (Source: AEC)

4. Fast broadband take-up (% of households)

Fast broadband take-up for Q3/2019 amounts to 27.43%, i.e. 154,825 households have signed fixed fast broadband subscriber contracts (for download speed of at least 30 Mbps and not above 100Mbps). (Source: Agency for Electronic Communications)

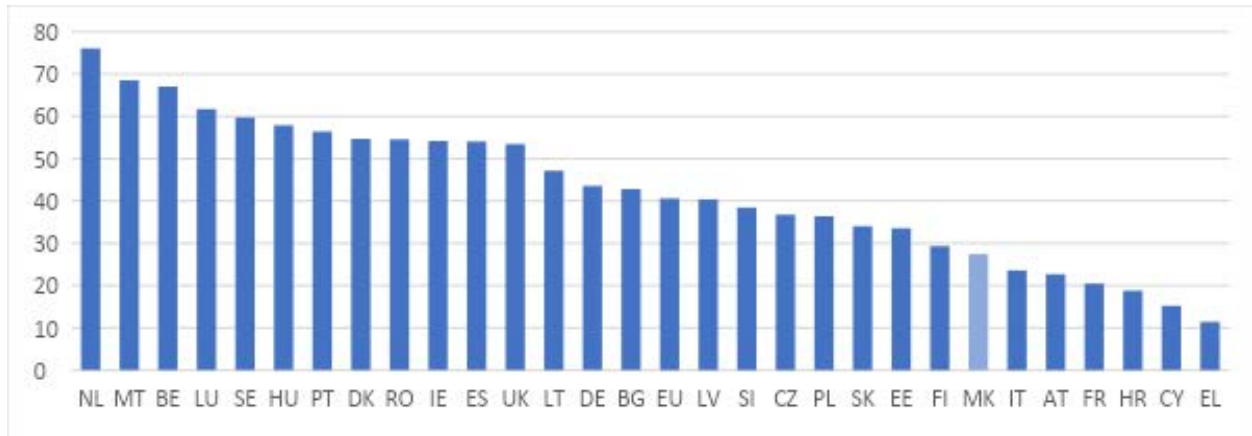


Figure 8: Households - fixed fast broadband subscribers (Sources: Digital Agenda for Europe, AEC)

Fixed fast broadband take-up notes an **increase** in the period between the two NBCO reports, March/2020 – September/2020.

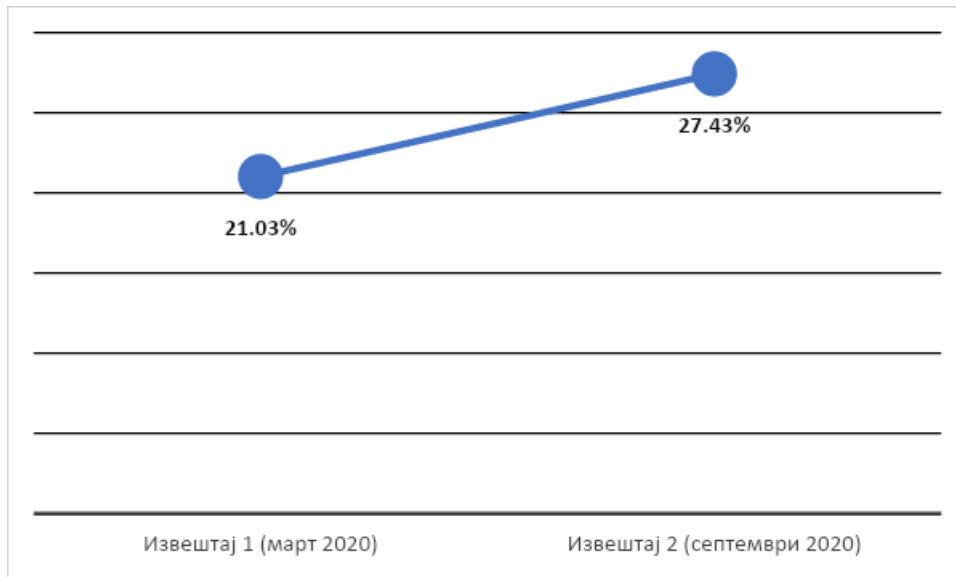


Figure 9: Change of the number of households-fixed fast broadband subscribers in RNM (Source: AEC)

5. Ultra-fast broadband take-up (% of households)

Ultra-fast broadband take-up for Q3/2019 amounts to 1,74%, i.e. **9.869 households have signed fixed ultra-fast broadband subscriber contracts (for download speed of at least 100 Mbps)**. (Source: Agency for Electronic Communications)

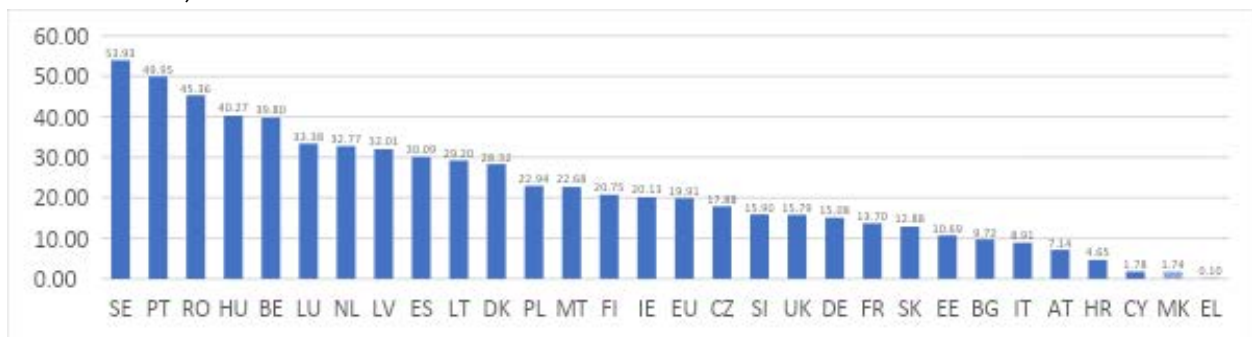


Figure 10: Households-fixed ultrafast broadband subscribers (Sources: Digital Agenda for Europe, AЕК)

Ultra-fast broadband take-up notes an **increase** in the period between the two NBCO reports, March/2020 – September/2020.

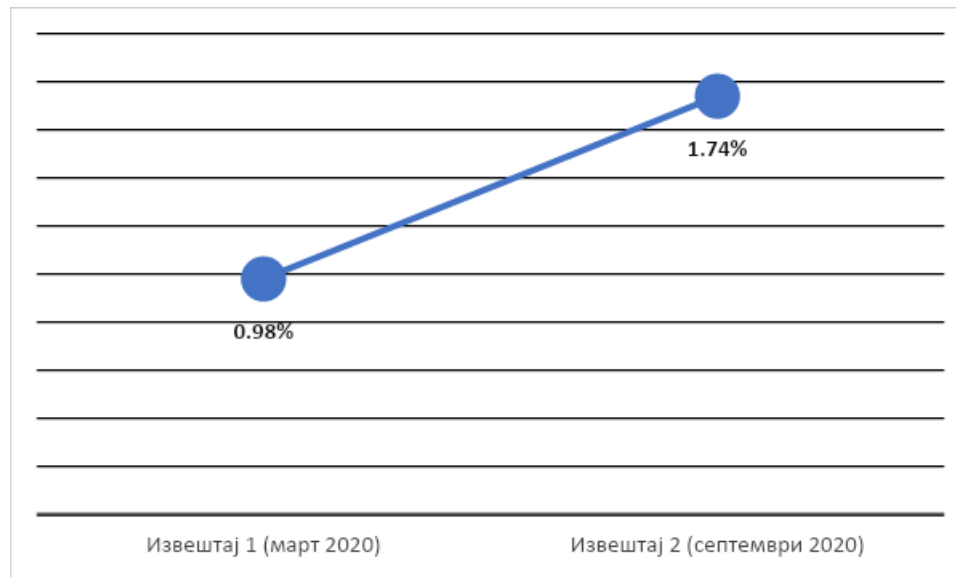


Figure 11: Change of the number of households-fixed ultra-fast broadband subscribers in RNM (Source: AЕК)

6. Fixed broadband take-up, market share per technology

Table 3. illustrates the percent of technology used to provide fixed broadband:

Табела 3. Fixed broadband market share per technology

Technology	Market share (%) (March2020)	Market share (%) (September2020)
DSL (including VDSL)	30.75	29.14
Кабел (including Docsis 3.0)	34.29	33.29
FTTH+B	13.87	15.45
Other (LL-Leased Lines, LAN, Fix LTE)	21.09	22.12

Soucre: Agency for Electronic Communications

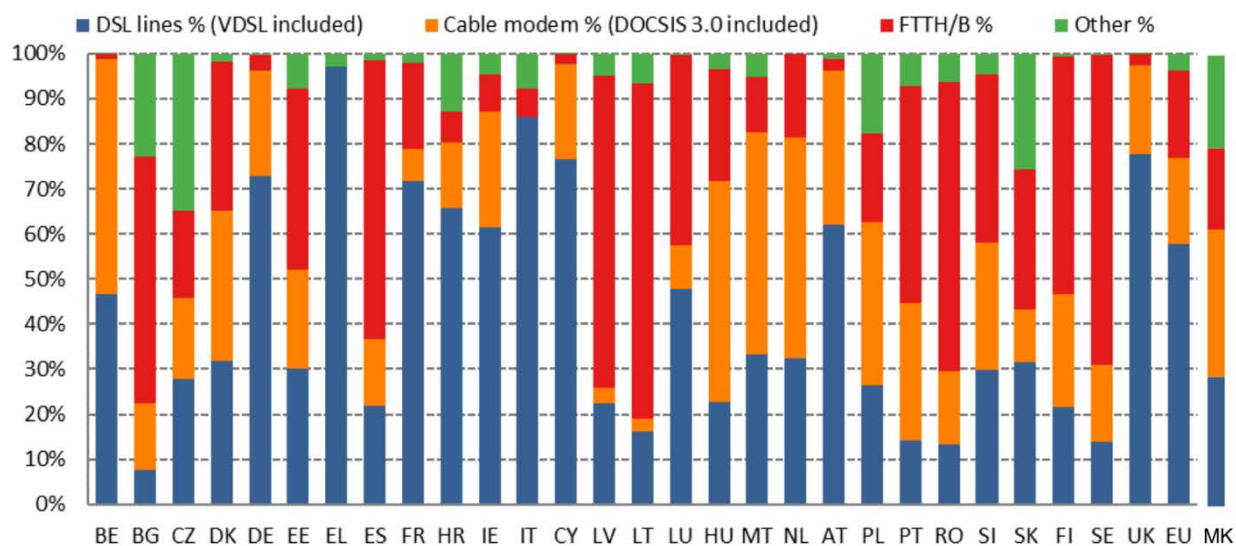


Figure 12: Technologies used to provide fixed broadband (Sources: Eurostat, AEC)

The share of access via fibre-optic infrastructure (FTTH+FTTB) in the total number of fixed broadband subscribers in RNM, amounting to 15.45%, is comparable to the average value of access via fibre-optic in the 28 EU member states, which amounts to 19%. Although at level of EU average the dominant technology is xDSL to which a competitor technology is the cable with Docsis 3.0, in RNM, according to the shares, the cable technology Docsis 3.0 has exceeded xDSL technology.

In RNM, the share of NGA subscriber contracts¹⁰ (download speed of at least 30 Mbps) in relation to the total number of fixed broadband subscriber contracts amounts to 35.79% and notes **increase** in the period between the two NBCO reports, March/2020 – September/2020.

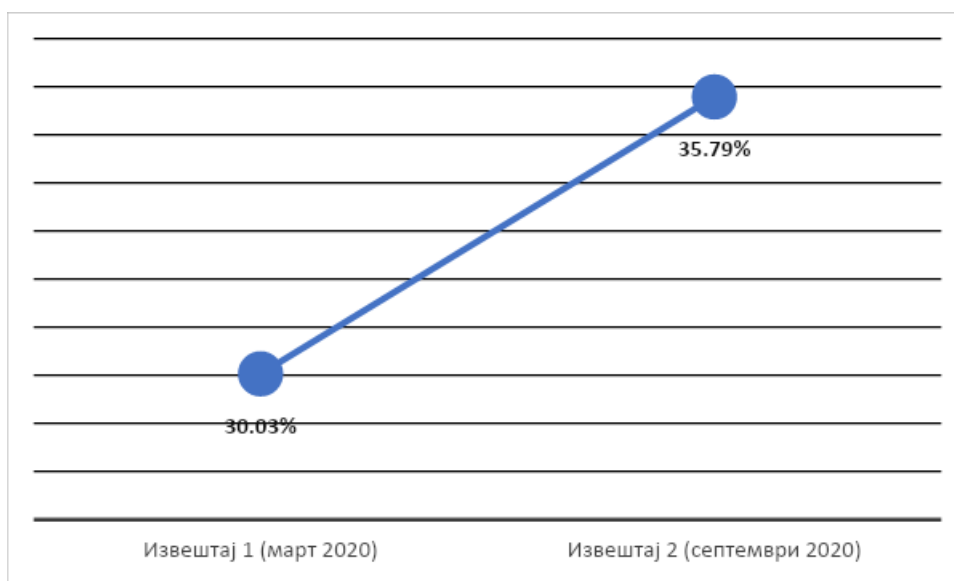


Figure 13: Change of the share of NGA subscriber contracts in RNM (Source: AEC)

¹⁰ Residential and business users

7. Fixed broadband market competition ¹¹

In RNM, the share of the incumbent operator “Makedonski Telekom” on the fixed broadband market in Q3/2019 amounts to **39.83%** according to the total number of subscribers (residential and business) and all fixed broadband technologies. On the other hand, the share of new operators on the fixed broadband market amounts to **60.17%**. (Source: Agency for Electronic Communications)

This ratio according to market share between the incumbent operators and new operators in RNM is relative to the average of the 28 EU member states, wherein incumbent telecommunication operators still control 40% of subscribers.

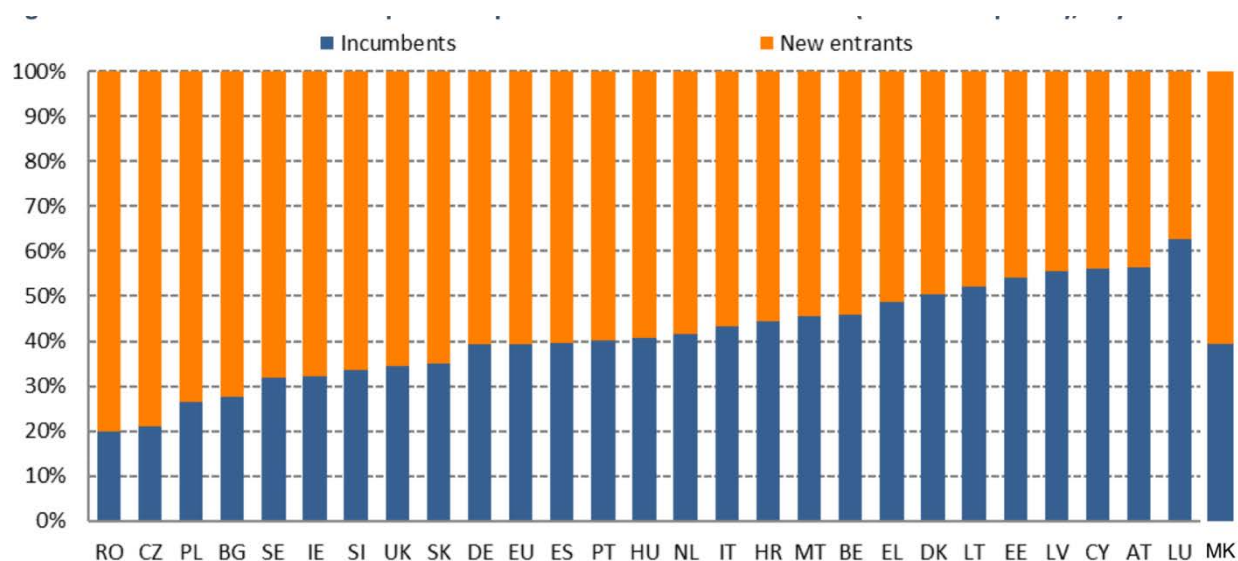


Figure 14: Fixed broadband market share according to number of subscribers (Sources: EC, AEC)

8. Mobile broadband take-up (subscribers per 100 inhabitants)

The first NBCO Report from March/2020 states that the mobile broadband take-up for Q3/2019 accounts for **81.61%**, i.e. **the total number of subscribers that use mobile broadband amounts to 1,695,160**¹² (Source: Agency for Electronic Communications)

The Agency for Electronic Communications lodged a notice letter advising that after publication of the first NBCO report, one mobile operator informed the Agency of a correction to the lodged number of subscribers that use mobile broadband access therefrom, which, in turn, entails correction of the Q3/2019 broadband take-up.

Thus, the corrected value of Q3/2019 broadband take-up amounts to **70.06%**, i.e. the total number of mobile broadband subscribers amounts to 1,455,276¹³ (Source: Agency for Electronic Communications1).

¹¹ Lists fixed broadband market share at national level for incumbent operator and for new operators, according to number of users.

One of regulatory measures to decrease domination of the incumbent operator on the market is unbundled access to local loop, i.e. xDSL technologies. Thus, the share of the incumbent operator on the fixed broadband market is shown according to technology, as follows: total and separate for NGA, DSL, VDSL, cable, FTTH/B.

¹² Total population in the country: 2.077.132. (Source: State Statistical Office)

The Q1/2020 mobile broadband take-up amounts to **64.83%**, i.e. the total number of mobile broadband subscribers amounts to 1,346,214¹⁴ (Source: Agency for Electronic Communications).

The Agency for Electronic Communications lodged a notice letter informing that “each year, the third quarter – Q3 – notes increase of the number of mobile network subscribers, given that this quarter covers the period of summer vacations when a large number of citizens that live and work abroad come back to RNM and use services in mobile networks therein, mostly using prepaid”.

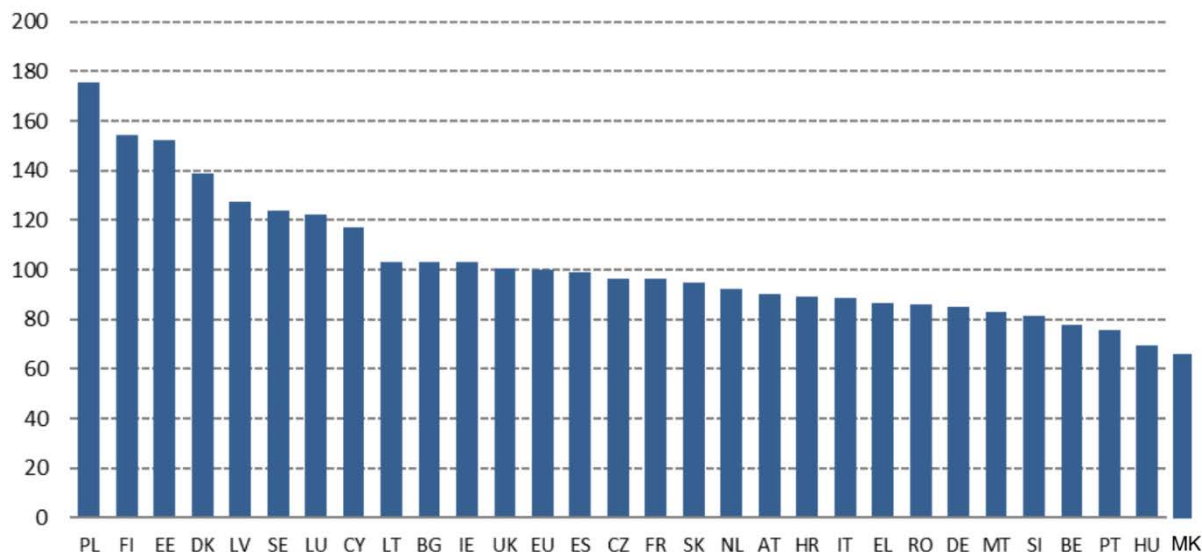


Figure 15: Mobile broadband take-up (Sources: EC, AEC)

8. Preparedness for 5G

The indicator “Preparedness for 5G “ indicates the portion of spectrum assigned for 5G means in the state in relation to 5G pioneer bands.

The Agency for Electronic Communications lodged a notice letter informing that the state-of-affairs of 5G pioneer bands in the Republic of North Macedonia is as follows:

- Band 700 MHz, (703-733 and 758-788 MHz):

On 01.02.2020, the process of releasing this band concluded, i.e. DVB-T channels from this band were moved to lower frequencies. There are currently no users of radiofrequencies in this band, i.e. all 60 MHz can be assigned. To do so, adequate conditions for utilization thereof in the Plan of Purpose and the Plan on Assignment and Utilization of Radiofrequencies for this band. To sum up, at present there are no 5G frequencies assigned from this band.

- Band 3.6 GHz, (3 400-3 800 MHz):

From this band, 300 MHz are anticipated to be used for 5G. AEC has awarded two temporary licenses for utilization of radiofrequencies to test 5G. Licenses have been awarded to “A1 Macedonia” for frequency band 3.7-3.8 GHz (100 MHz) with expiration date on 14.07.2020 and to “Makedonski Telekom” for frequency band 3.6-3.7 GHz (100 MHz)

¹³ Total population in the country: 2.077.132 (Source: State Statistics Office)

¹⁴ Total population in the country: 2.076.255 (Source: State Statistics Office)

with expiration date on 31.10.2020. In summary, from the total of 300 MHz available, 200 MHz have been awarded for testing.

- Band 26 GHz, (24 250-27 500 MHz):

In North Macedonia, 1000 MHz are available to be awarded to operators for 5G; however, there is a need to reallocate band under the Plan on Purpose and to stipulate adequate requirements for utilization thereof in the Plan on Awarding and Using Radiofrequencies. This means that, at present, we have not granted frequencies for 5G.

All three frequency bands have equal worth; thus, if the full amount in the band is awarded, it would yield outcome of 33.33% value of the indicator "Preparedness for 5G", i.e. one-third of the total maximum outcome.

If we take into account the two temporary licenses for utilization of radiofrequencies to test 5G, the value of indicator "Preparedness for 5G" is **22.2%** by 14.07.2020.

8. Internet (IP) traffic per capita

- The fixed broadband internet traffic per household during a month amounts to **106 GB**. (Source: Agency for Electronic Communications).

The average fixed broadband Internet traffic per household per month notes an **increase** in the period between the two NBCO reports, March/2020 – September/2020.

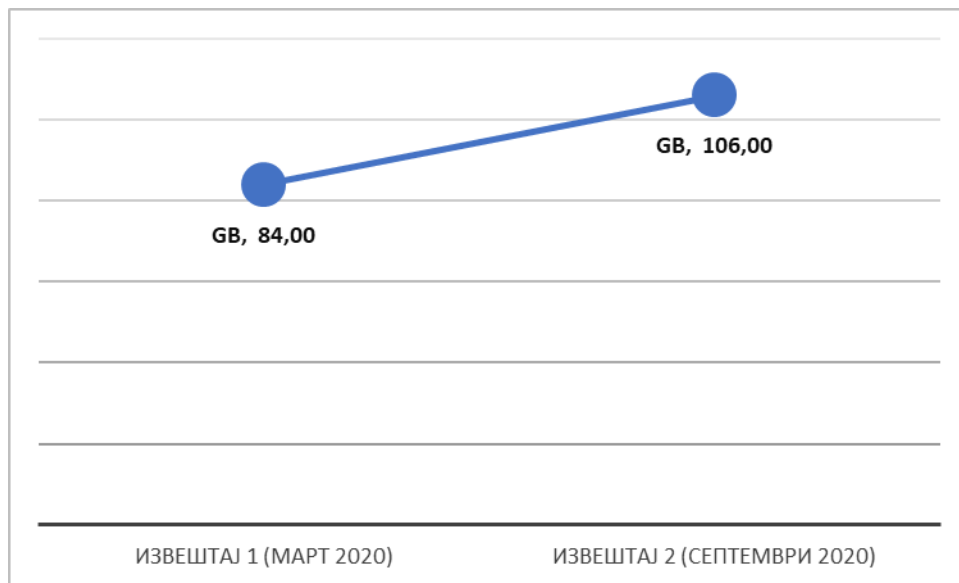


Figure 16: Change of fixed broadband Internet traffic per household in RNM (Source: AEC)

- Mobile broadband internet traffic per subscriber that uses mobile internet during a month amounts to **3.49 GB**. (Source: Agency for Electronic Communications)

The average mobile broadband Internet traffic per subscriber per month notes an **increase** in the period between the two NBCO reports, March/2020 – September/2020.

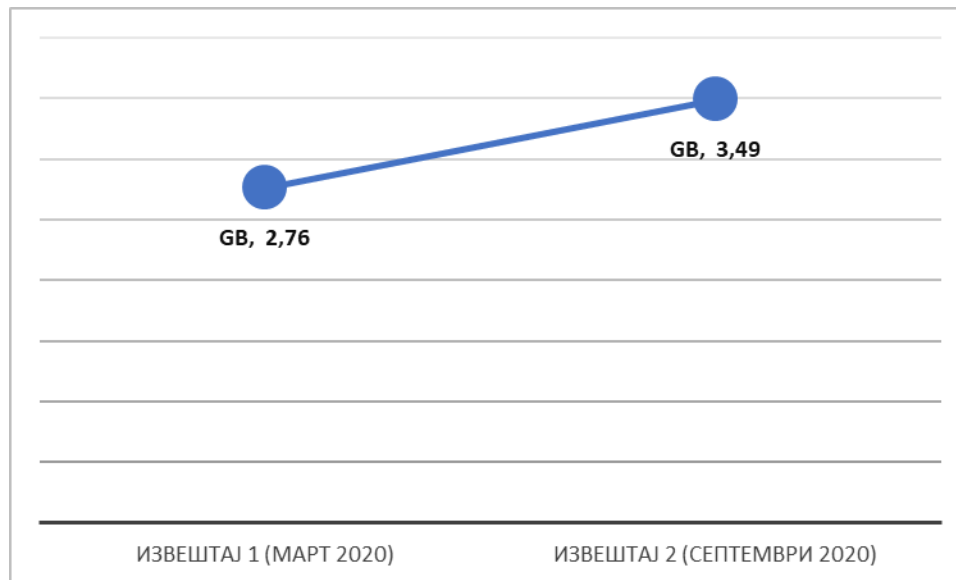


Figure 17: Change of mobile broadband Internet traffic per subscriber in RNM (Source: AEC)

9. Broadband price index ¹⁵

The OECD methodology “Revised OECD Telecommunication Price Baskets” dated December 2017¹⁶ was used to analyze retail prices offered on the fixed broadband service market in RNM. Notably, the methodology anticipates analysis of retail offers of the three highest ranked operators according to market share by number of users, whose joint total share amounts to at least 70%.

The analysis covered retail offers of operators: “Makedonski Telekom”, “A1 Makedonija” and “TRD ROBI – Telekabel”, whose joint share on the fixed broadband market amounts to 86.23%.

1 EUR value = 61.695 MKD (Source: National Bank)

The value of Purchasing Power Parity (PPP) for RNM has been calculated according to data from the World Bank¹⁷ to 2.504938271.

¹⁵ Broadband price index is a result (0 to 100, where 100 is deemed the best) that presents prices for 12 representative broadband baskets from household incomes.

The baskets include three speed categories (12-30 Mbps, 30-100 Mbps and at least 1000 Mbps) and four product types (Internet only, Internet + TV, Internet + Landline and Internet + TV + Landline).

Data about retail prices (in the least expensive month, adapted to Purchasing Power Parity (PPP)) are shown for the three speed categories and the four product types.

¹⁶ [http://www.oecd.org/sti/broadband/DSTI-CDEP-CISP\(2017\)4FINAL.pdf](http://www.oecd.org/sti/broadband/DSTI-CDEP-CISP(2017)4FINAL.pdf)

¹⁷ [https://en.wikipedia.org/wiki/List_of_countries_by_GDP_\(PPP\)_per_capita](https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(PPP)_per_capita) and [https://en.wikipedia.org/wiki/List_of_countries_by_GDP_\(nominal\)](https://en.wikipedia.org/wiki/List_of_countries_by_GDP_(nominal))

Category	Internet		Internet + landline		Internet + TV + landline	
	Offer	Lowest price	Offer	Lowest price	Offer	Lowest price
12-30 Mbps	Cable internet Lightspeed 30/1	500 MKD 8.1 EUR 20.29 (PPP)	A1 Net Neon 15/1	599 MKD 9.70 EUR 24.32 (PPP)	A1 Combo Neon до 15/1 Mbps	799 MKD 13.00 EUR 32.42 (PPP)
30-100 Mbps	Fibre-optic, package Optic 40 40/40	1,000 MKD 16.2 EUR 40.58 (PPP)	A1 Net Neo S до 50/3 Mbps	799 MKD 13.00 EUR 32.44 (PPP)	A1 Combo Neo 4M 50/3 Mbps	1,199 MKD 19.43 EUR 48.66 (PPP)
>100 Mbps	Fibre-optic, package Max Optic 1 Gps/1 Gps	2,199 MKD 3.64 EUR 89.29 (PPP)	Makedonski Telekom XL Package	2,999 MKD 48.61 EUR 121.77 (PPP)	Makedonski Telekom XL Package, up to 300 Mbps / 300 Mbps + Max TV XL	3,508 MKD 56.86 EUR 142.44 (PPP)

10. Roam-like-at-Home (RLAH)

On 11.09.2020, the Agency for Electronic Communications adopted a Decision on stipulating the maximum prices of roaming services in public mobile communication networks, pursuant to which, from 1 July 2019 the maximum average wholesale price for regulated roaming services that an operator can charge (excluding VAT) for regulated data exchange services amounts to:

- From 01.07.2021 to 31.12.2021 0,0077 €/MB
- From 01.01.2022 to 31.12.2022 0,006 €/MB
- From 01.01.2023 to 31.12.2023 0,0045 €/MB
- From 01.01.2024 to 31.12.2024 0,0035 €/MB
- From 01.01.2025 to 31.12.2025 0,003 €/MB
- From 01.01.2026 0,0025 €/MB