



Republic of North Macedonia

*Broadband Competence Office*

## Report

Implementation of the National Operational Broadband Plan

Broadband development in the country

(period April - September 2021)

Skopje, September 2021

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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.

## Implementation of National Operational Broadband Plan in the period April 2021-September 2021

The National Operational Broadband Plan 2019-2029 (NOBP) was adopted on 01.04.2019 by the Government of RNM and is published on the designated website of the Ministry of Information Society and Administration (MISA): <https://mioa.gov.mk/?q=mk/node/2457><sup>1</sup>

NOBP is aligned with strategic goals of the EU's initiative "Digital Agenda for Europe ", as rooftop strategy for development of information society 2010 and EU's strategy "Towards a European Gigabit Society for 2025" from 2016.

NOBP was lodged to the European Commission and to the World Bank that have both issued positive opinions thereto.

### Activities conducted by the Government and the Ministry of Information Society and Administration in NOBP implementation

- **Information on the establishment of an inter-ministerial working group for mutual harmonization and amendments of laws and bylaws related to construction and electronic communications**

The activity is part of the NOBP.

MISA in cooperation with the National Broadband Competence Office (NBCO) has drafted an Information for establishing an Inter-ministerial working group for mutual harmonization and amendment of laws and bylaws related to construction and electronic communications, and the same was adopted at the Government Session held on March 30th, 2021.

The establishment of the Inter-Ministerial Working Group will further harmonize the inter-institutional activities in the field of construction, in order to define and simplify the procedures for construction / installation / use of optical infrastructure (underground cable system and optical cables), 5G infrastructure, especially installation and optical connection of base stations.

The inter-ministerial working group, in addition to representatives of public institutions and state-owned legal entities that manage a certain type of infrastructure (road, energy, gas, etc.), will also be consisted of representatives of operators and chambers of commerce who have submitted proposals for amendments and supplements to Laws and bylaws related to construction and electronic communications.

The inter-ministerial working group is obliged to cooperate with the NBCO and to take into account its recommendations, as well as the European Union's regulation for facilitating and stimulating the establishment of fast electronic communication networks and means.

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<sup>1</sup> eng: <https://mioa.gov.mk/?q=en/node/2459>

- **Information on the adoption of rules for installing underground cable system funded by public funds and utilization of the existing underground cable system**

The activity is part of the NOBP.

MISA in cooperation with NBCO, has drafted an Information on the adoption of rules for installing Underground Cable System Funded by Public Funds and Utilization of Existing Underground Cable System, and the same was adopted at the Government Session held on July 6th, 2021 .

At the same session, the Government has adopted the Recommendations of the NBCO for installing Underground Cable System Funded by Public Funds and Utilization of Existing Underground Cable System. The Recommendations specify the following in particular:

- Local self- governments, public enterprises and other public institutions, in case they publicly fund infrastructure construction works (for example, construction or reconstruction of roads, railways, electricity transmission, gas pipeline, water supply, sewerage, etc.), shall be obliged to build / install new cable ducts in accordance with established features;
- Local self-governments, public enterprises and other public institution shall be obliged to provide the existing free underground cable system and / or free optical cables or fibers for utilization to PE MRD;
- Conditions when PE MRD should build a new underground cable system;
- Manner of installation / utilization / rental of underground cable system, microtubes, optical cables / fibers (with private or public ownership), by PE MRD;
- Cooperation of PE MRD and public institutions with NBCO regarding issues related to the previous points, JP MRD shall be obliged to establish and maintain an electronic spatial register of public and / or publicly managed telecommunication infrastructure, etc.

The Government has adopted the following tasks for the Inter-Ministerial Working Group for Mutual Harmonization and Amendments of Laws and Bylaws Related to Construction and Electronic Communications:

- To consider the possibility of amendments and supplements to specific laws and bylaws, in accordance with the adopted Recommendations,
- To provide priority to the PE MRD for construction and development of the National Transport Optical Network (NTOM), in accordance with the NOBP, during the utilization of free underground cable system and / or free optical cables / fibers built with public funds.

- **Information on providing free state WiFi in open public areas**

The activity is part of the NOBP.

MISA, in collaboration with NBCO, has drafted an information on providing free state WiFi in open public areas, and the same was submitted to the Government for adoption.

The Information proposes the Government to adopt the proposed Recommendations of the NBCO for providing free state WiFi in open public areas, and the selected entity for implementation of the project to be an institution from the central level, ie PE MRD.

Also, it is hereby proposed that, by the end of 2022, the PE MRD shall:

- Shall prepare and submit for approval a list of locations for providing free wireless (WiFi) internet access for the entire territory of the country, in accordance with the adopted Recommendations;

- NBCO and the Agency for Electronic Communications (AEC) shall, in cooperation with MISA, hold public meetings with interested operators and local self-governments for the implementation of the project;
- Shall submit to the Government for approval the proposals for locations with included explanations, especially for: initial technical features of free WiFi hotspots, number of WiFi hotspots for each location, number of operators, time frame for implementation, the expected total annual budget, etc. in accordance with the proposals received from the public meetings;
- Shall announce a public procurement call for selection of one or more operators for providing free wireless (WiFi) internet access at the approved locations of interest for tourists after obtaining the consent, and shall sign Contract(s) with them in accordance with the Recommendations.

## Activities conducted by NBCO in NOBP implementation

According to the Rules of Procedure of the NBCO, in the event of an infectious disease emergency / epidemic caused by the Covid-19 virus, the sessions of the NBCO are held via electronic means of communication that enable the use of audio and video communication platforms.

Pursuant to Article 71-b of the Law on Electronic Communications, NBCO consists of seven members, one of whom is the president of the NBCO. Due to the resignations of two members, NBCO currently consists of five members. Having this in mind, NBCO considers that there is a need to fill the vacancies within the NBCO properly with the total number of members in compliance with the law.

In the period from April 2021 to September 30, 2021, NBCO held a total of eight meetings online. Also, several meetings were held with relevant and concerned institutions in view of implementing the National Operational Broadband Plan (NOBP).

**During April 2021**, the National Broadband Competence Office (NBCO) held two online meetings, and during that period, a significant cooperation was initiated and achieved with several institutions with which the NBCO has a mutual scope of activities. Reference is made to the following:

- For the first time, NBCO members had the opportunity to actively participate in meetings / workshops of the EUBCO network dedicated to broadband development (fixed and mobile). The report on the participation of NBCO members in webinars organized by the European Broadband Competence Office (WBO) network is summarized in the following chapter.
- A representative from the Agency for Electronic Communications (AEC) was invited and has participated on NBCO's meeting, in order to support the process of implementation of the NOBP.
- Cooperation with the Crisis Management Center (CMC) was launched, in order to support and cooperate in the process of implementation of the Project emergency call 112, modernization of the alarm center and other activities. The cooperation is aimed at providing synergy and coordination in the implementation of the NOBP and the needs of the CMC for telecommunication connection.
- A representative from the City of Skopje was invited and has participated on the meeting, in order to start cooperation in the process of implementation of the NOBP, with reference to the project Skopje - Smart City, for which implementation activities have been initiated by the City of Skopje.

**During May 2021**, NBCO held an online meeting. Also, the NBCO continued the established cooperation with the institutions in order to implement the competencies within its scope. For that purpose, the members of the NBCO attended a meeting organized by PE MRD.

- At the meeting, the members of the NBCO reviewed the draft of the "Information on the adoption of rules for installing Underground Cable System Funded by Public Funds and Utilization of Existing Underground Cable

System" ready to be submitted to the Government. NBCO issued a positive opinion on the draft of the Information.

- Additionally, the same meeting was attended by representatives of the Agency for Electronic Communications (AEC) with whom several issues were discussed in respect of the implemented and planned future activities regarding the mutual scope of activities of NBCO and AEC. Appropriate conclusions regarding the topics discussed at the meeting were summarized, prepared and sent to AEC.

Upon an invitation by PE MRD, the members of the NBCO have attended a meeting that focused on several topics of common interest, including: Analysis of the condition of the optical infrastructure built with public funds; implementation of the process of mapping free points with WiFi in the country; but also exchange of ideas and views for effective and efficient cooperation in the implementation of the next phases of the NOBP.

**During June 2021**, NBCO held an online meeting. Also, NBCO held two important meetings with the Director of the Crisis Management Center and the Director of PE MRD, which significantly contribute to strengthening and intensifying the cooperation of the NBCO with these institutions with which it undoubtedly has connections in the implementation processes with respect to the competencies of its scope of work.

The preparation of Information to the Government for providing free state WiFi in open public areas, which is set forth by the Work Program of the Government of RNM for 2021 was discussed at the 30th regular meeting of NBCO held on June 17th 2021. Special attention was paid to the need for necessary continuous cooperation and coordination between the Ministry of Information Society and Administration (MISA), NBCO and PE MRD in the process of implementation of this project which is of national importance, and to take into account the adopted Recommendations of NBCO for providing free state WiFi in open public areas.

- A meeting was held with the director upon an initiative by the Crisis Management Center, during which support was provided for the implementation of the NOBP. Special attention was made on the idea for possible utilization of the optical capacities of the future state National Transport Optical Network (NTOM) having regard to the implementation of activities under the competence of the CMC (connection of 112 centers, development of reporting / alarm network, video surveillance, connection with various types of sensors, etc.).
- In respect to the Government project for providing free state WiFi in open public areas, a meeting was held with the director of PE MRD, where the director was introduced to the adopted Recommendations of the NBCO for providing free state WiFi in open public areas, according to which the main role in the implementation of the project will fall to PE MRD.
- NBCO actively participated in the RCC (Regional Cooperation Council) Study and also in the preparation of Information to the Government on the status of DESI measurements based on the RCC Study on the status of implementation of DESI measurements in the Western Balkan economies (WB6).

**During July 2021** the National Broadband Competence Office (NBCO) held two online meetings.

At the 31st and 32nd regular meeting of NBCO, there was a discussion with respect to clarification and supplement the draft of the "Information on providing free state WiFi in open public areas" which was prepared by the Communications Department of MISA. The National Broadband Competence Office issued a positive opinion on the draft of the Information at the 32nd meeting.

**During August 2021**, there was an online meeting with several significant talking points on the agenda. Several issues were discussed during the meeting, including:

- Implementation of the legal obligation for preparation of the Report that the NBCO submits to the Minister of Information Society and Administration, in respect to the implementation of the NOBP and the development of the

broadband in the country in relation to the development of the broadband market in the European Union, in accordance with DESI (The Digital Economy and Society Index).

- A novelty in the fourth NBCO's Report is that for the first time, the Report will contain data on broadband development according to the categorization of settlements in the country to urban and rural settlements according to data from the State Statistical Office, and to this end, the Agency for electronic communication was asked to deliver data (in cooperation with the State Statistical Office) for the development of the broadband market in the country.

In September 2021, NBCO held one online meeting, adopting hereof the fourth Report of NBCO for broadband development in the country and implementation of National Operational Broadband Plan.

### Participation of NBCO members on webinars organized by the European BCO network

Pursuant to Article 71-a of the Law on Electronic Communications, the NBCO participates in the operation of the network of broadband competence offices in the European Union and in the region.

European BCO network has been established in order to promote the exchange of knowledge and experience between the European Broadband Competence Office (BCO), as well as to overcome obstacles for broadband projects and capacity building in the areas of financing, planning and broadband policies. The European BCO Network has an annual program of activities for key areas of interest, which includes organizing link events, training materials and publications, and seminars on policy, funding, good practice, and broadband issues.

During the period April-September 2021, NBCO's members have actively participated on all webinars Series 6, organized by the European BCO network. Series 6 are comprised of the following webinars:

- On April 13, 2021, a webinar entitled "Green Procurements", where participants had the opportunity to meet and exchange significant experiences in the field of public procurement related to broadband projects, through existing and planned European public procurement directives, concessions and public goods, basic principles.
- On April 20, 2021, a webinar entitled "Last-mile connections - Policy Discussion", which presented the experiences of Sweden and Greece in terms of proposed measures for the implementation of broadband policies to achieve broadband goals.
- On April 27, 2021, a webinar entitled "Last-mile connections – Technology Discussion", which discussed the best existing technologies for the development of broadband networks and achieving the goals of the European Digital Agenda, through the examples of operators and equipment manufacturers for wireless Giga-bit communication networks.
- On April 29, 2021, a webinar entitled "CEF2 digital and 5G communities", where participants were introduced to CEF2 (Connecting Europe Facility) as a key EU instrument for financing development projects through targeted investments at European infrastructure level. This EC project is under the auspices of DG CNECT and is aimed at developing a 5G infrastructure to facilitate and accelerate the deployment and use of 5G by merging connectivity with applications.
- On May 4, 2021, a webinar entitled "5G", which presented the package of cyber security tools on the EU 5G networks, as well as the experience of the City Hall of Dublin, Republic of Ireland, as a coordinated neutral host for 5G networks, whose construction and extension requires coordinated engagement by the local government to fill gaps in connectivity and increase network capacity.



- On May 11, 2021, a webinar entitled "Identity Management and Public Procurement", which discussed the business and technological challenges in the new eco-system of wireless broadband access via WiFi and 5G technologies for end users. At the same time, the EC DG GROW presented the public procurement regulations in an international context, between an EU member state and a third party.

Series 6 comprises of the following webinars:

- On June 22, 2021 webinar entitled "State aid and connectivity in rural areas"
- On July 6, 2021 a webinar entitled "5G communities (CEF2 digital)"
- On September 14, 2021 a webinar entitled "State aid and gap assessment in broadband financing"
- On September 21, 2021 a webinar entitled "Broadband Guide"
- September 28, 2021 webinar entitled "CEF Update and New Goals"
- On October 12, 2021, a webinar entitled "Mapping and State Aid"
- On November 23, 2021 a webinar entitled "Ex-post evaluation of the implementation of state aid measures"

For the period covering this report by the NBCO, the members of NBCO took active participation in the following webinars, organized by the European BCO network:

- On June 22, 2021, a webinar entitled "State aid and connectivity in rural areas, which presented the experiences of projects for broadband infrastructure construction with state aid in Italy, as well as the EC's project for broadband networks monitoring and connection quality in Europe according to the territorial typification.
- On July 6, 2021, a webinar entitled "5G Communities (CEF2 Digital)" discussed the Italian experience of state aid and regional broadband infrastructure policies in "white zones". At the same time, there was a presentation of the DESIRA, which aims at improving the capacity of society and politics in order to respond to the challenges posed by digitalization in rural areas by building knowledge and methodological base for easier access to past, present and future socio-economic impacts of ICT innovation.
- On September 14, 2021, a webinar entitled "State aid and gap assessment in broadband financing", where a representative of the EC DG COMP introduced the participants with the EC's financial instruments for state aid for broadband development, through construction assistance and expansion of fixed and mobile broadband networks, connectivity vouchers, assistance for digitalization of buildings to raise awareness of smart solutions, and so on. The representative of ETNO (European Telecom Network Operators) presented the position of European telecom operators to overcome the investment gap for the construction of optical networks and listed as key elements the regulatory framework, EU financial instruments on both sides - demand and supply, as well as policies: the transposition of the European Electronic Communications Code (EEC), the Broadband Infrastructure Cost Reduction Directive and the shared use of network assets.
- On September 21, 2021, a webinar entitled "Broadband Guide", where a DG CNECT representative had an introductory presentation on the road to a gigabit society in accordance with "2030 digital compass" adopted by the EC in March 2021. There is an ongoing preparation of a new "Broadband Guide", which should merge the aspects of broadband investment with European state aid rules, and is expected to be adopted in Q2/2022 thereof. The content of the Broadband Guide will be as follows: Introduction, Broadband Plan, Investment Model, Infrastructure Selection, Business Model, Available Financing Tools, Action Plan and Implementation, Broadband investments and State Aid. During the presentation of the possible investment business models, it was pointed out that the model with direct investments in the state broadband infrastructure, which is already used by the Nordic countries

and is therefore called "Nordic model", has the most advantages the rest and is characterized by the highest degree of impartiality, the best project control and the greatest availability of infrastructure for society.

- The Webinar entitled "CEF Update and New Goals" that was scheduled for September 28, 2021, was postponed.

## Activities conducted by AEC in NOBP implementation

### Introduction of 5G

For the purpose of providing a continued 5G bands in the 3.x band, there were amendments to the Approvals for utilization of radiofrequencies by NEOTEL, thereat on June 1<sup>st</sup> 2021, the Agency for Electronic Communications has issued an announcement/intention for implementation of a public call procedure with public bidding, for awarding a limited number of approvals for utilization of radiofrequencies. The intention indicates that the subject of public bid is:

- 2x30 MHz in frequency band 694-790 MHz,
- 300 MHz in frequency band 3400-3800 MHz и
- 800 MHz in frequency band 24.25-27.5 GHz.

The Agency has planned to award 3 approvals for utilization of radiofrequencies in the band 700MHz, three approvals for utilization of radiofrequencies in the band 3.x GHz and four approvals for utilization of radiofrequencies in the band 26 GHz, that is:

700 MHz		
Approval	Frequency band	Radiocommunication service
A1	703-713/758-768 MHz	Land mobile
A2	713-723/768-778 MHz	Land mobile
A3	723-733/778-788 MHz	Land mobile
3.x GHz		
Approval	Frequency band	Radiocommunication service
B1	3.5-3.6 GHz	Land mobile
B2	3.6-3.7 GHz	Land mobile
B3	3.7-3.8 GHz	Land mobile
26 GHz		
Approval	Frequency band	Radiocommunication service
C1	24.3-24.5 GHz	Land mobile
C2	24.5-24.7 GHz	Land mobile
C3	24.7-24.9 GHz	Land mobile
C4	24.9-25.1 GHz	Land mobile

During the public debate that lasted until July 5<sup>th</sup>, 2021, three letters of interest have arrived, whereof:

- „Bitstream Mobile“ – for Approvals A1 and B1
- „A1 Makedonija“ – for Approvals : A2, A3, B2 and B3 and
- „Makedonski Telecom “ – for Approvals : B2, A2 and/or A3

On July 8<sup>th</sup>, 2021, AEK has announced the submitted comments in the Letters of interest by the stakeholders, as well as the response to the comments on the web-page.

Since the received number of letters of interest for approvals is higher than the published number of approvals for utilization of radio frequencies for the bands 700 MHz and 3.x GHz, in accordance with Article 134 paragraph 6 line 1 of the LEC, AEC will announce a public tender with public bidding for issuing approvals thereof.

In order to be able to announce the tender, the director of AEK should make a decision in which, among other terms and conditions, the initial amount of the market value of radio frequencies should be determined as a one-time fee for obtaining approval for utilization of radio frequencies and the method of payment. The payment for one-time fee shall be paid to the budget's account.

Pursuant to Article 33 paragraph (3) of the LEC, it is necessary for AEC to obtain an approval from the Government for the minimum amount of the one-time fee, as well as the manner of its payment which can be settled in several monthly or annual installments. A procedure is underway to obtain an approval from the Government for the minimum amount of the one-time fee, as well as the manner of its payment.

In order to determine the amount of the minimum amount of the one-time fee, AEK took into account the previously implemented procedures for implementation of 3G and 4G and made a comparative analysis with other European countries.

AEK proposed to the Government the amount of the one-time fee for a new network operator for approvals of A1 and B1 to be reduced by 50% in view of the one-time fee for existing network operators.

### Fixed Broadband activity development

In April 2021, after conducting an analysis of the data transfer speed for efficient internet access, as part of the services covered by the universal service, AEK has decided to include broadband internet access at a speed of 12 Mbps as part of the services covered by the universal service. With this decision, AEK expects a positive impact on the overall economic development of the country, especially in rural areas where competition between operators that provide Internet access is lower. It will have a positive impact on the development of next generations electronic communications networks, but also on the overall competition in the electronic communications markets in the Republic of North Macedonia."

In May 2021, AEK opened a public debate on the Intention to conduct a public tender procedure for determining an universal service provider for a period of 30 days thereof.

## 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"*.

In order 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. ([www.bco.mioa.gov.mk](http://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 meeting held on 22.06.2020, NBCO adopted amendments to the Template or 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 (consolidated text) ([www.bco.mioa.gov.mk](http://www.bco.mioa.gov.mk)).

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, predominantly,
- State Statistical Office,
- National Bank,
- Information on RNM's Attained Progress for the Needs of the Sub-committee on Innovation, Information Society and Social Policy.

Note:

This Report compares indicators for RNM with the "DESI 2020"<sup>3</sup> Report published by the European Commission (EC) on 11.06.2020, since until the day of preparation and adoption of this NBCO's report, the European Commission has not published the DESI 2021 Report.

## Connectivity – indicators

Indicators for dimension "Connectivity" for RNM are listed in Table 1.

Table 1. Indicators for dimension "Connectivity (September 2021)

Indicators	Description	Unit	Value/ Reference date	Value/ Reference date	Indicators	Description
1a1 Fixed broadband coverage (basic and/or NGA)	% of broadband covered households: xDSL, cable, FTTP WiMax or LTE networks	% households	97.87% (Q1/2019)	97.87% (Q1/2019)	99.08% (Q4/2020)	99.48% (Q2/2021)
1a2 Fixed broadband take-up (basic and/or NGA)	% of households subscribed to broadband: xDSL, cable, FTTP, WiMax or LTE networks	% households	70.91% (Q3/2019)	72.95% (Q1/2020)	73.58% (Q3/2020)	75.79% (Q1/2021)
1b1 4G coverage	% of settlements with 4G coverage: measured as medium coverage of telecommunication operators in every country	% households	99.365% (Q4/2019)	99.38% (Q2/2020)	99.395% (Q4/2020)	99.395% (Q2/2021)

1b2 Mobile broadband take-up	Number of mobile internet subscribers per 100 inhabitants	Subscriptions per 100 people	70.06% (Q3/2019)	64.83% (Q1/2020)	64.95% (Q3/2020)	66.78% (Q1/2021)
1b3 5G readiness	Portion of the spectrum intended and awarded for 5G utilization by the end of 2020 in so-called 5G 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	% of harmonized spectrum	0%	22.2% (14.07.2020)	22.2%	22.2%
1c1 Fast broadband (NGA) coverage	% of households covered with broadband with at least 30 Mbps download speed. Affected technologies include FTTH, FTTB, cable Docsis 3.0 and VDSL	% households	78% (Q1/2019)	78% (Q1/2019)	82.84% (Q4/2020)	82.84% (Q4/2020)
1c2 Fast broadband take-up	% of households subscribed to broadband with at least 30 Mbps	% households	21.03% (Q3/2019)	27.43% (Q1/2020)	28.27% (Q3/2020)	29.89% (Q1/2021)
1d1 Ultra fast broadband coverage (NGA)	% of households subscribed to broadband with at least 100 Mbps download speed. Affected technologies include FTTH, FTTB and cable Docsis 3.0	% households	43.8% (Q1/2019)	43.8% (Q1/2019)	63.10% (Q4/2020)	63.10% (Q4/2020)
1d2 Ultra-fast broadband take-up	% of households subscribed to broadband with at least 100 Mbps	% households	0.98% (Q3/2019)	1.74% (Q1/2020)	1.81% (Q3/2020)	1.97% (Q1/2021)
1e1 Broadband price index	Broadband price index	Score (0-100)				

## Comparison with indicators of EU member states

### • Total revenues of telecom operators (in denars without VAT)

The data on the total revenues of the operators refer to 2020 and are shown in Chart 2.

Chart 2. Revenues from telecommunication services

Service	Revenues in 2018 (mkd)	Revenues in 2019 (mkd)	Revenues in 2020 (mkd)
Fixed telephony	2.131.578.000.00	2.026.590.000.00	2.004.000.000.00
Fixed internet access	3.990.676.000.00	4.126.204.000.00	4.145.699.000.00
Mobile telephony	6.823.893.000.00	7.076.195.000.00	7.007.180.000.00
Mobile internet access	1.468.488.000.00	1.628.726.000.00	1.622.939.000.00
Business Internet users	555.277.292.00	489.512.212.00	507.696.976.00

Source: Agency for Electronic Communications

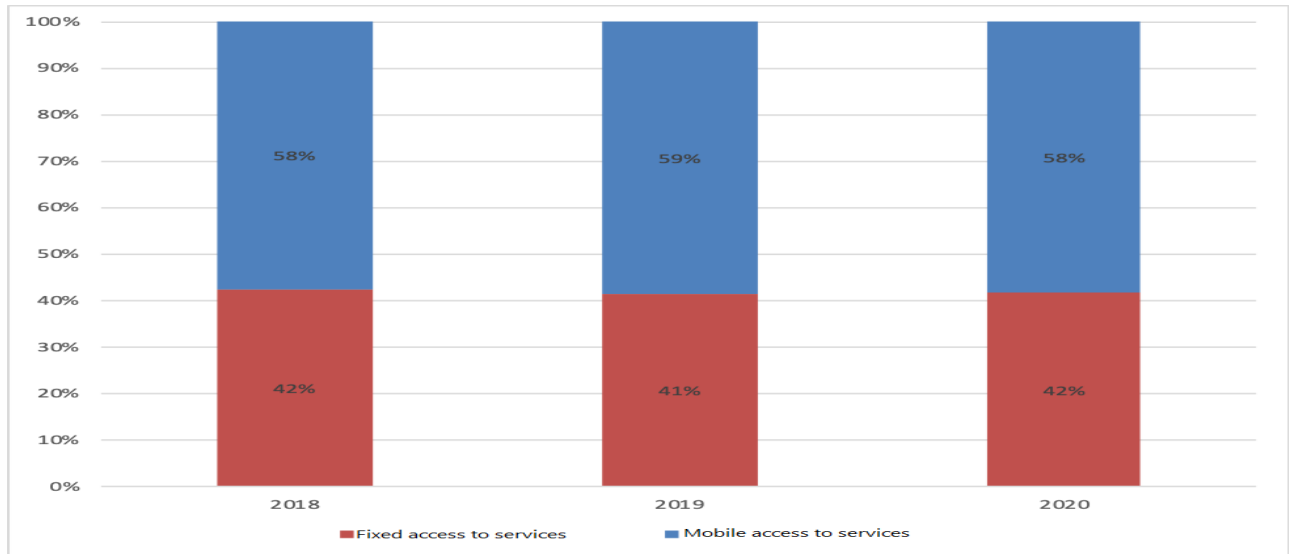


Figure 1: Share of revenues from telecommunication services (Source: AEC))

### • Broadband coverage

Broadband infrastructure coverage data were obtained from the NOBP Implementation Support System launched by the Agency for Electronic Communications in December 2020. In the System for Support of the Implementation of the NOBP starting from September 2021, the categorization of all settlements in RNM (total 1.783) was performed according to the nomenclature of the State Statistical Agency.

#### A. Fixed broadband coverage

##### Indicator 1a1

561.372 households have fixed broadband coverage or 99.48% of the total number of households in RNM have the opportunity to use fixed broadband (basic and / or NGA). 99.395% of households located in rural areas have access to fixed broadband (basic and / or NGA).

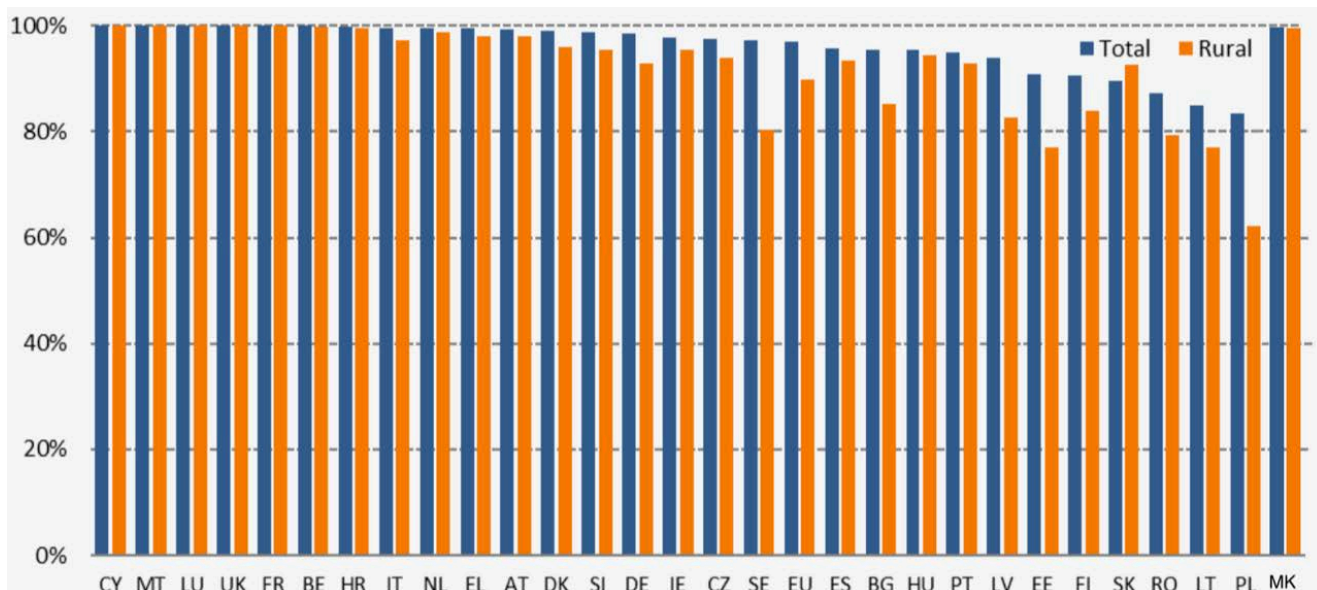


Figure 2: Fixed broadband coverage (% of households) (Source: EC (mid-2019), AEC (Q2 / 2021))

Indicator 1s1

Fixed fast broadband coverage (download with a speed of at least 30 Mbps and not more than 100 Mbps) has 467.599 households or 82.84% of the total number of households in RNM. Of these, 131.627 households or 23.32% of the total number of households in RNM are in rural settlements.

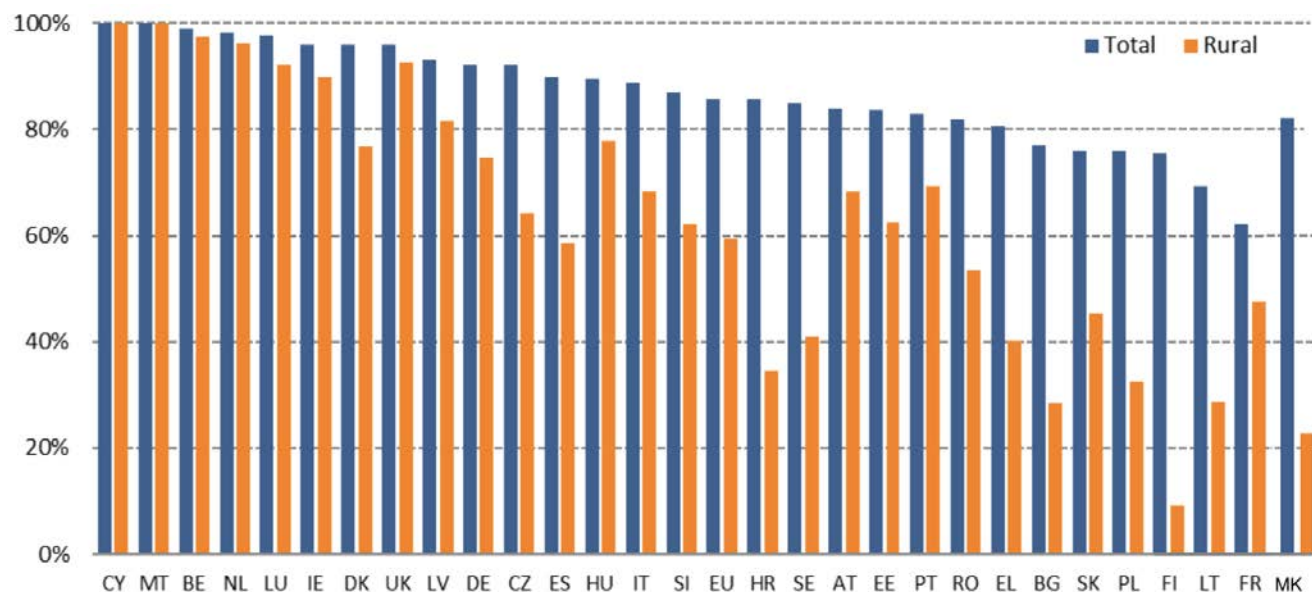


Figure 3: Coverage with fast broadband networks (% of households) (Source: EC (mid-2019), AEC (Q4 / 2020))

Indicator 1d1

Fixed ultra-fast broadband coverage (download with a speed of at least 100 Mbps) has 356.212 households or 63.10% of the total number of households in RNM. Of these, 65.974 households or 11.69% of the total number of households in RNM are in rural settlements.

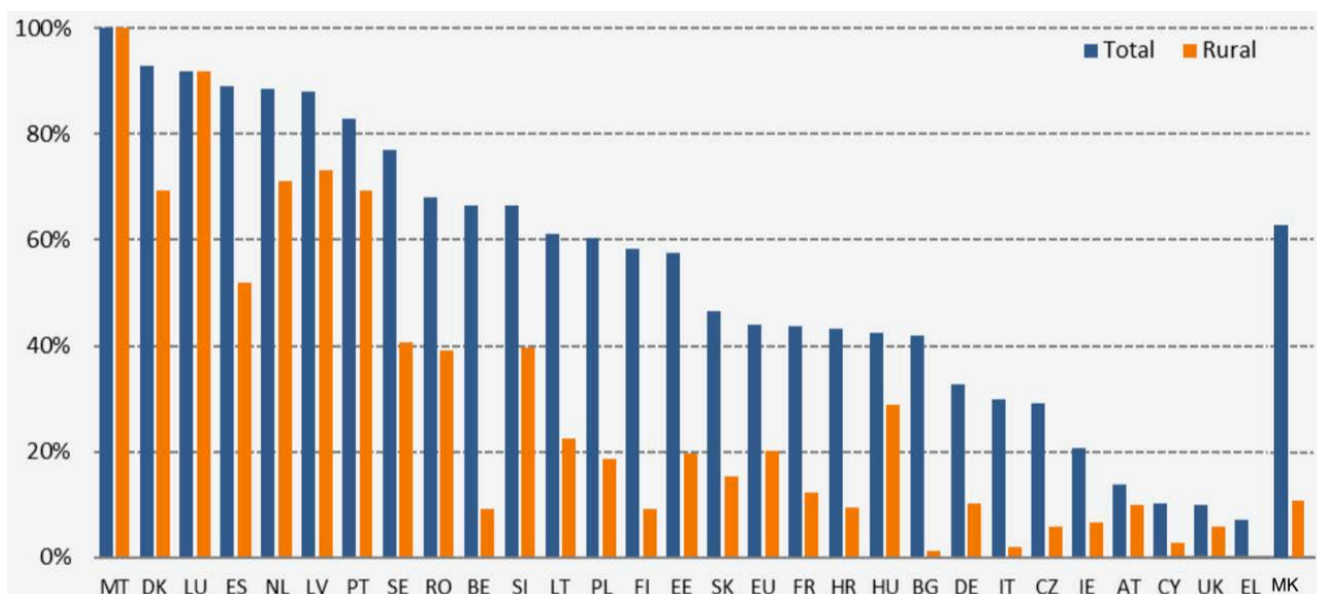


Figure 4: Coverage with ultra-fast broadband networks (% of households)

(Source: EC (mid-2019), AEC (Q4 / 2020))

## B. Mobile Broadband Coverage

### Indicator 1b1

In RNM, 99.58% of the population is covered by 4G (LTE) network (by at least one mobile operator).

The average availability of 4G (as an average value of the coverage of the two mobile operators) is 99.395% of the population in RNM..

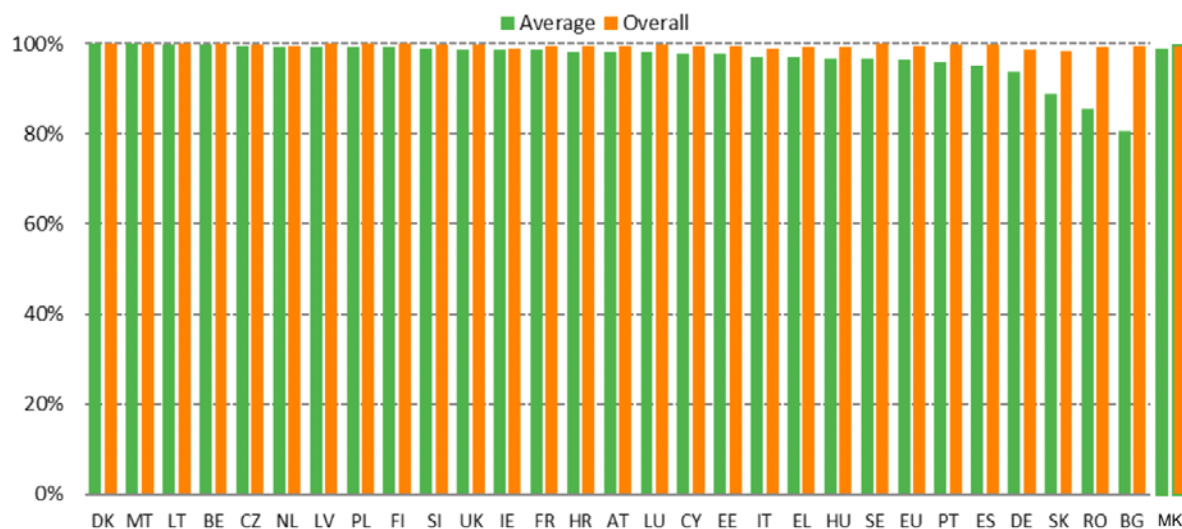


Figure 5: 4G coverage, in percentage of population (Source: EC (mid-2019), AEC (Q2 / 2021))

- Fixed broadband take-up prevalence (fixed broadband take-up) (% of households)

Indicator 1a2



The prevalence of fixed broadband for Q1 / 2021 is 75.79%, ie 427.687 households in RNM have a subscriber agreement for fixed broadband (basic and / or NGA). (Source: AEK (Q1 / 2021))

Figure 6: Households of fixed broadband subscribers (Source: Eurostat (2019), AEK (Q1 / 2021))

The prevalence of fixed broadband in the period from the first NCBC report from March / 2020 to this NBCO report, September / 2021 marks the following increase, as shown in Figure 7.

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

- Prevalence of fast broadband take-up (% of households)

#### Indicator 1c2

The prevalence of fast broadband for Q1 / 2021 is 29.89%, ie 168.686 households have a subscriber agreement for fixed broadband with a download speed of at least 30 Mbps and less than 100Mbps. (Source: Agency for Electronic Communications)

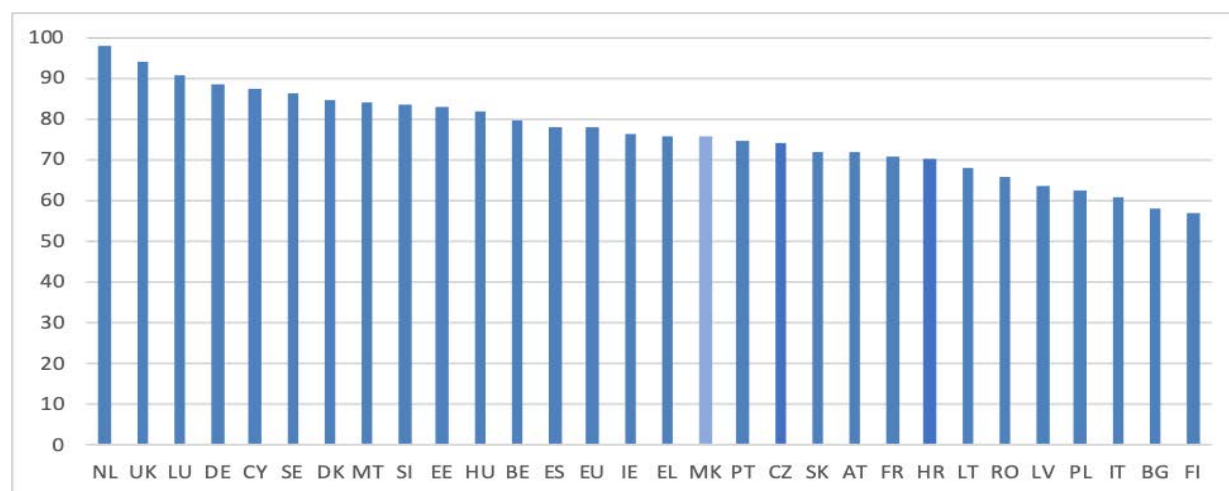
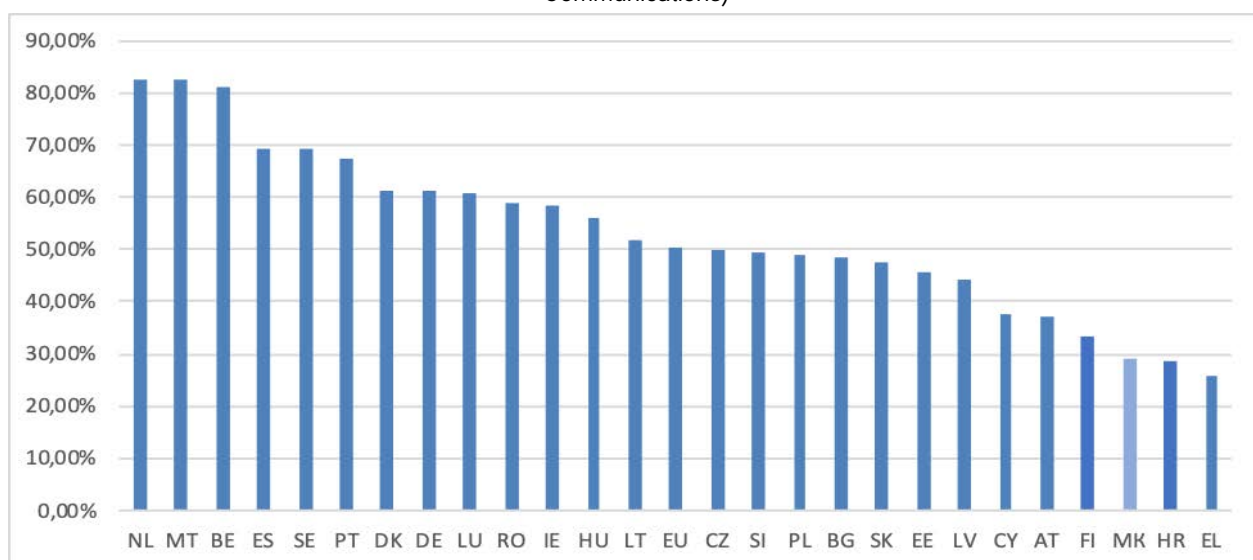


Figure 8: Households subscribers of fixed fast broadband  
(Sources: Digital Agenda for Europe (2019), AEC (Q1 / 2021))

The prevalence of fixed fast broadband in the period from the first NCBO report from March / 2020 to this NCBO report, September / 2021 marks the following increase, as shown in Figure 9.

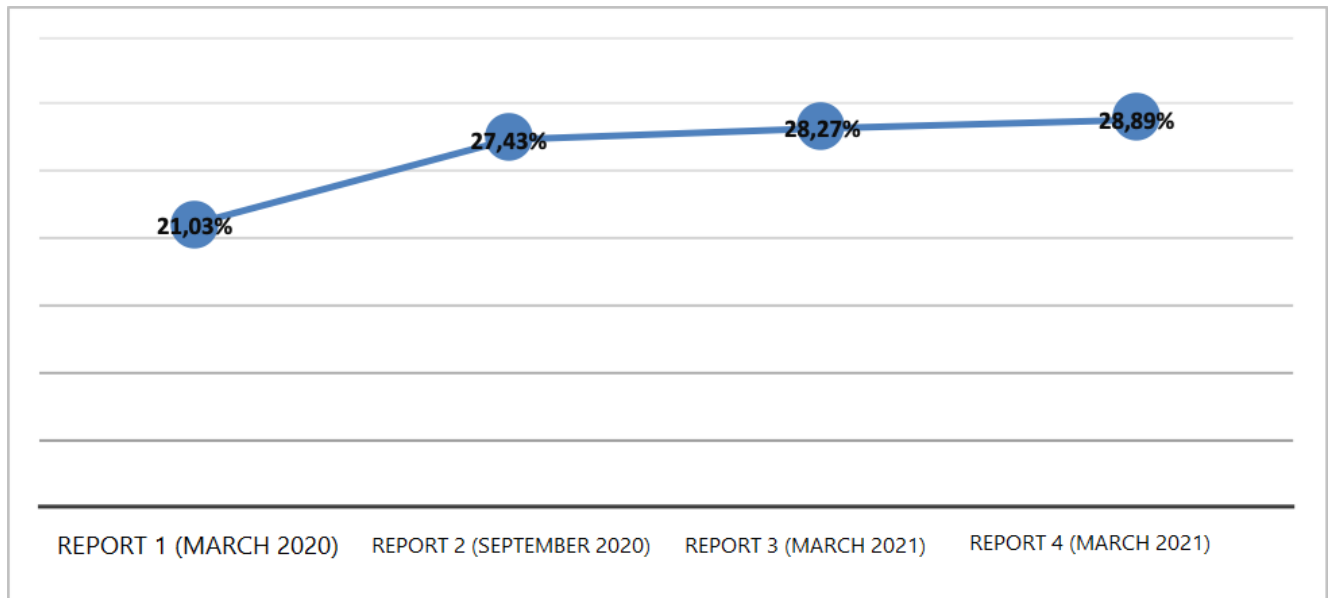


Figure 9: Change in the number of households subscribers of fixed fast broadband in RNM (Source: AEC)

### Prevalence of ultrafast broadband take-up (% of households)

#### Indicator 1d2

The prevalence of ultrafast broadband for Q1 / 2021 is 1.97%, ie 11.122 households have a subscriber agreement for fixed broadband with a download speed of at least 100 Mbps. (Source: Agency for Electronic Communications)

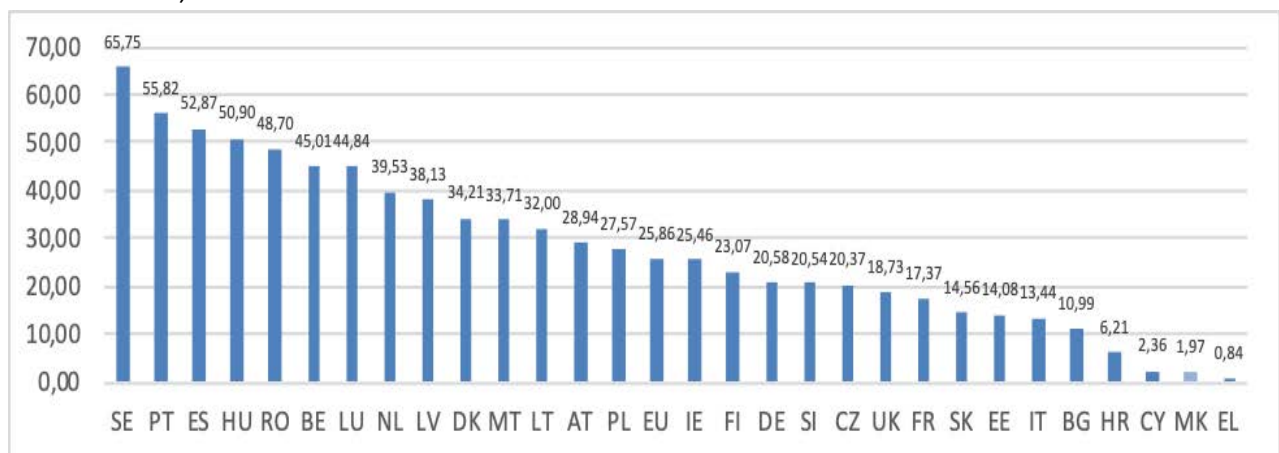


Figure 10: Households subscribers of fixed ultrafast broadband (Source: EK (2019), AEC (Q1 / 2021))

The prevalence of fixed ultrafast broadband in the period from the first NCBO report from March / 2020 to this NCBO report, March / 2021 marks the following increase, as shown in Figure 11.

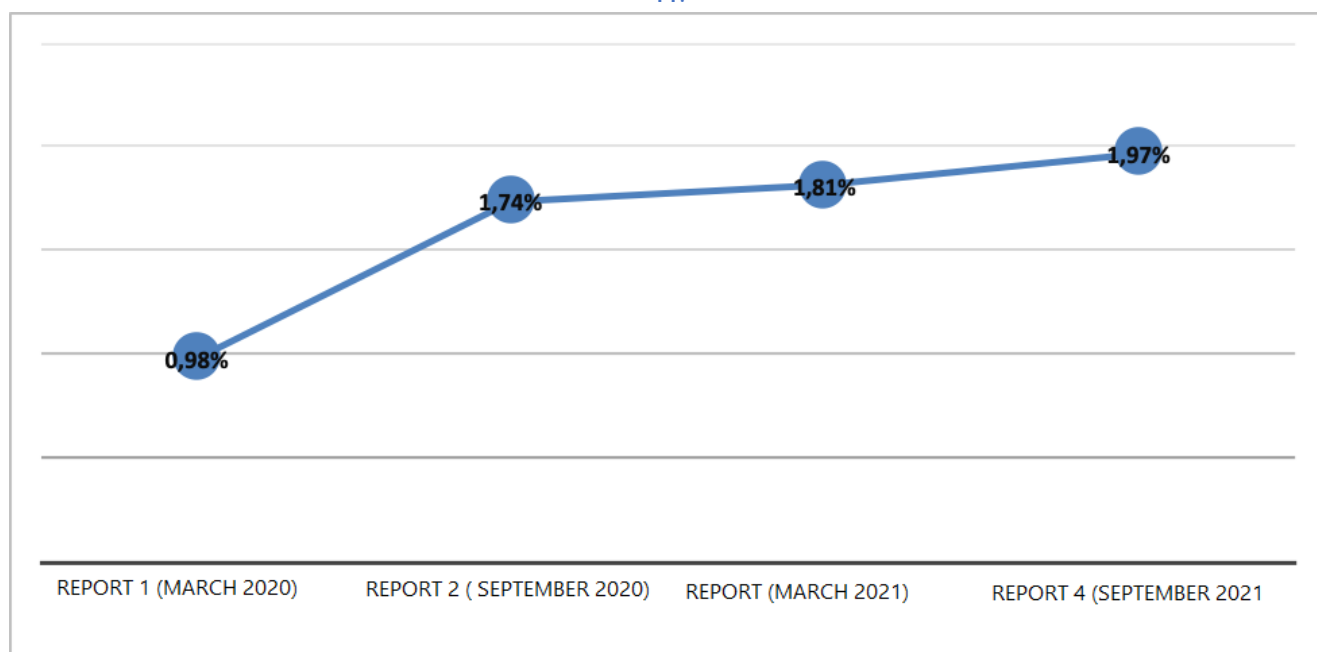


Figure 11: Change in the number of households subscribers of fixed ultrafast broadband in RNM (Source: AEC)

#### • Fixed broadband distribution, market share based on technology

Chart 3 shows the percentage of fixed broadband technology used:

Chart 3. Market share of fixed broadband based on technology

Technology	Market share (%) (March / 2020)	Market share (%) (September / 2020)	Market share (%) (March / 2021)	Market share (%) (September / 2021)
DSL (VDSL included)	30.75	29.14	28.22	26.75
Cable (with Docsis 3.0 included)	34.29	33.29	31.99	30.37
FTTH + B	13.87	15.45	17.04	19.66
Other (LL-Leased Lines, LAN, Fix LTE)	21.09	22.12	22.75	23.22

Source: Agency for Electronic Communications

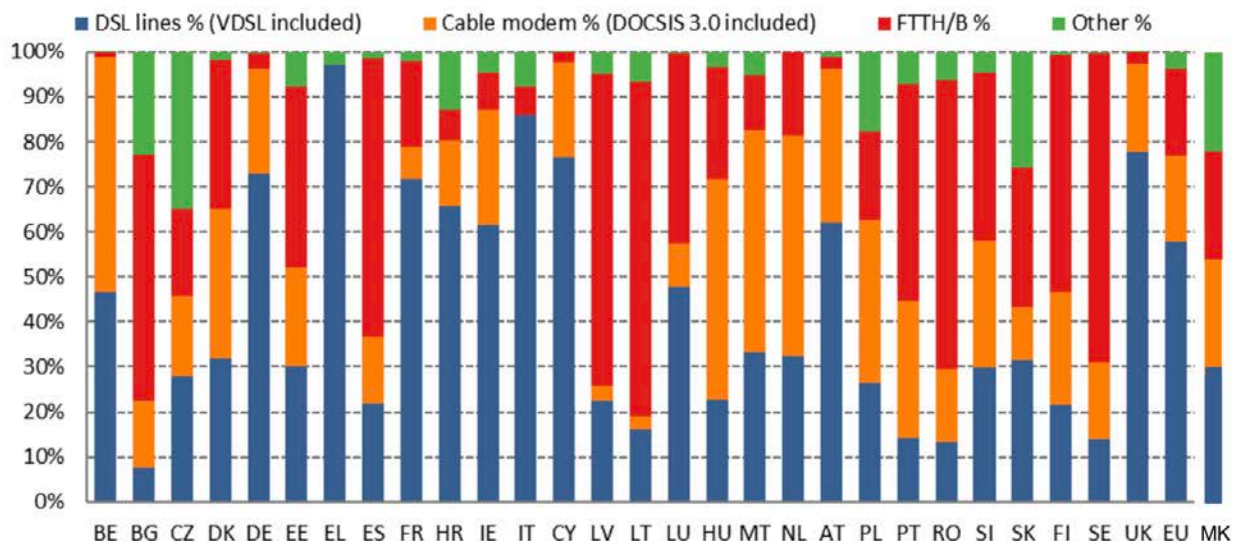


Figure 12: Technologies used to provide fixed broadband  
Sources: Eurostat (July / 2019), AEC (Q1 / 2021))

The share of optical access (FTTH + B) in the total number of fixed broadband subscribers in RNM with 19.66% is at a comparable level of the average value of the share of optical access in the 28 EU member states which is 19% ( according to the EC Report "DESI 2020" from 2020).

Although at the EU average level the dominant technology is xDSL where the main competing technology is cable with Docsis 3.0 (according to the EC Report "DESI 2020" from 2020), in RNM the cable technology Docsis 3.0 has surpassed xDSL technology.

In RNM, the percentage of NGA subscriber agreements (download speed of at least 30 Mbps) in relation to the total number of subscriber agreements for fixed broadband in the country is 43.14% and the same in the period from the first report of NBCO, March / 2020 to this report of NBCO, September / 2021 records a continuous increase.

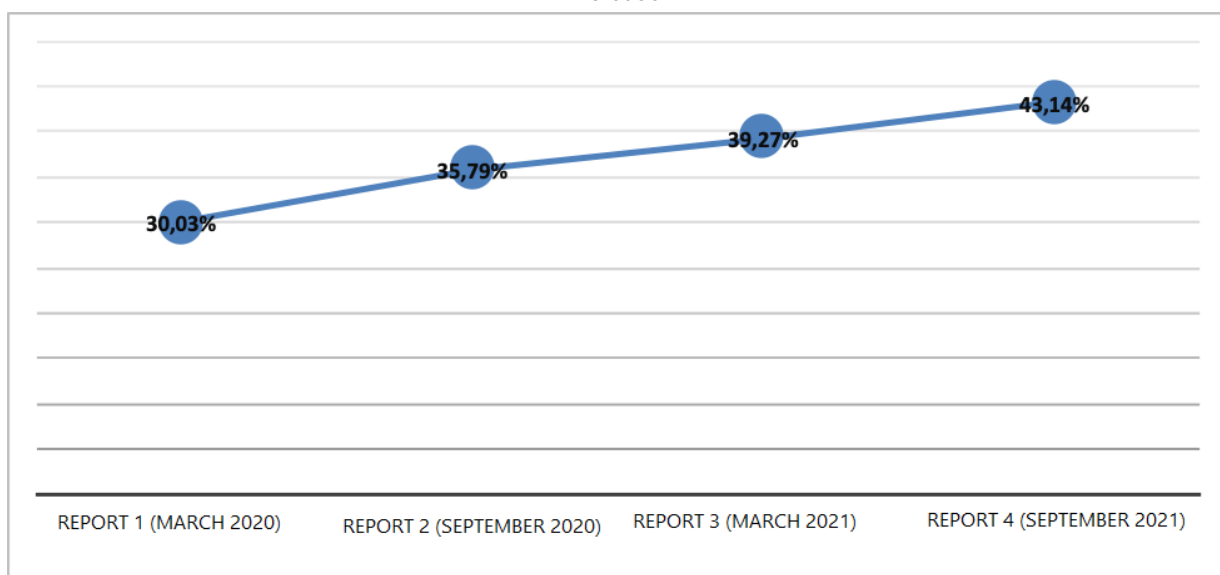


Figure 13: Change of the share of NGA subscriber agreements in RNM (Source: AEC)

## • Competition in the fixed broadband market

In RNM, the share of the traditional (incumbent) operator "Makedonski Telekom" on the fixed broadband market in Q1 / 2021 according to the total number of subscribers (residential and business) according to all technologies for fixed broadband access is 40.59%, while the share of new The emerging operators on the fixed broadband market is 59.41%. (Source: Agency for Electronic Communications)

This ratio in terms of market share between traditional and emerging operators in RNM is according to the average of the 28 EU member states (according to the EC Report "DESI 2020" from 2020), where traditional telecom operators still control 40% of subscribers

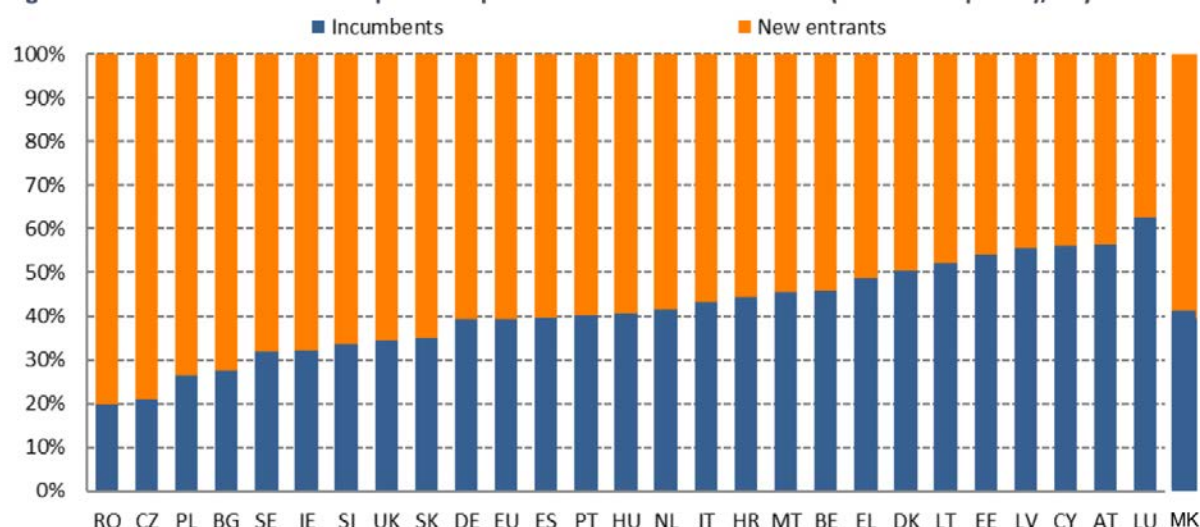


Figure 14: Fixed broadband market share by number of subscribers(Sources: EC (July / 2019), AEC (Q1 / 2021))

## Mobile broadband distribution (subscribers per 100 inhabitants)

### Indicator 1b2

The prevalence of mobile broadband for Q1 / 2021 is 66.78%, ie the total number of subscribers who use mobile broadband is 1.381.645 Source: Agency for Electronic Communications

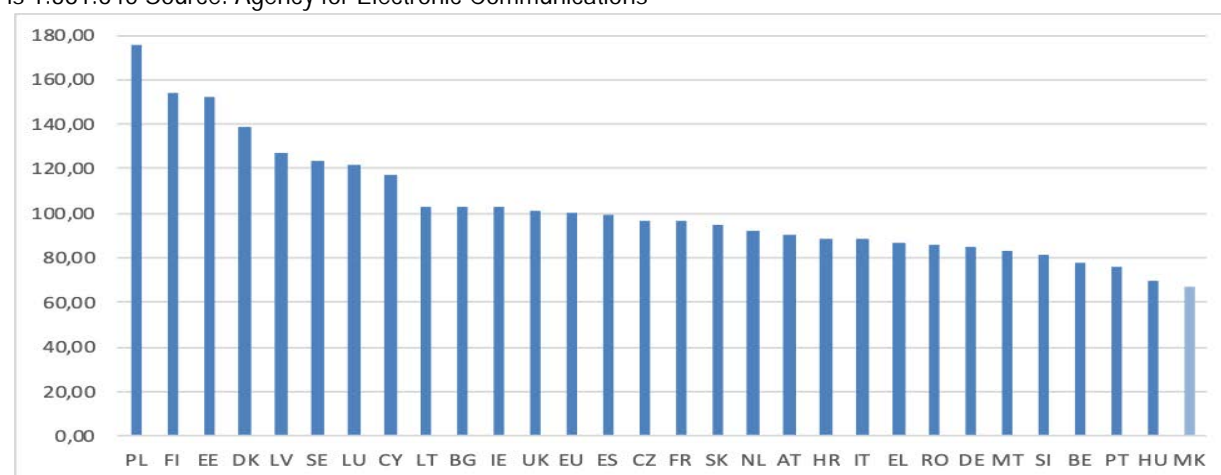


Figure 15: Mobile Broadband Distribution (Sources: EC (July / 2019), AEC (Q1 / 2021))

## 5G readiness

### Indicator 1b3

The "5G Readiness" indicator shows the portion of the spectrum allocated for 5G targets in the country in terms of 5G pioneer range .

- The Agency for Electronic Communications on 01.06.2021 announced its intention to conduct a public tender procedure with public bidding for the issuance of a limited number of approvals for the use of radio frequencies. The intention states that the subject of the public tender are:
- 2x30 MHz in the frequency range 694-790 MHz,
- 300 MHz in the frequency range 3400-3800 MHz and
- 800 MHz in the frequency range 24.25-27.5 GHz.

The Agency planned to grant three approvals for the use of radio frequencies in the range 700 MHz, three approvals for the use of radio frequencies in the range 3.x GHz and four approvals for the use of radio frequencies in the range 26 GHz, as follows:

700 MHz		
Approval	Frequency range	Radiocommunication service
A1	703-713/758-768 MHz	Land mobile
A2	713-723/768-778 MHz	Land mobile
A3	723-733/778-788 MHz	Land mobile
3.x GHz		
Approval	Frequency range	Radiocommunication service
B1	3.5-3.6 GHz	Land mobile
B2	3.6-3.7 GHz	Land mobile
B3	3.7-3.8 GHz	Land mobile
26 GHz		
Approval	Frequency range	Radiocommunication service
C1	24.3-24.5 GHz	Land mobile
C2	24.5-24.7 GHz	Land mobile
C3	24.7-24.9 GHz	Land mobile
C4	24.9-25.1 GHz	Radiocommunication service

During the public hearing that lasted until 05.07.2021, three letters of interest were received from interested parties, as follows:

- "Bitstream Mobile" - for Approvals A1 and B1
- "A1 Macedonia" - for Approvals: A2, A3, B2 and B3 and
- Makedonski Telekom - for Approvals: B2, A2 and / or A3

AEC published the received comments in the letters of interest from the interested parties and the response to the comments on the website on 08.07.2021.

As the received number of letters for expression of interest for approvals is higher than the published number of approvals for use of radio frequencies for the range 700 MHz and 3.x GHz, in accordance with Article 134 paragraph 6 line 1 of the LEC, AEC will announce a public tender with public bidding. for issuing approvals.

In order to be able to announce the tender, the director of AEC should make a decision in which, among other conditions, the initial amount of the market value of radio frequencies should be determined as a one-time fee for obtaining approval for use of radio frequencies and the method of payment. The one-time fee is paid to the budget.

Pursuant to Article 33 paragraph (3) of the LEC, it is necessary for the AEC to obtain the consent of the Government for the minimum amount of the one-time fee, as well as the manner of its payment which can be done in several monthly or annual installments. A procedure is underway to obtain consent from the Government for the minimum amount of the one-time fee, as well as the manner of its payment.

In order to determine the amount of the minimum amount of the one-time fee, AEC was based on the previously implemented procedures for implementation of 3G and 4G and comparative analysis with other European countries.

AEC proposed to the Government the amount of the one-time fee for a new network operator for approvals A1 and B1 to be reduced by 50% compared to the one-time fee for existing network operators.

#### • Internet (IP) traffic per resident

A. Fixed broadband internet traffic per household during one month is 164.22 GB. (Source: Agency for Electronic Communications)

The average fixed broadband internet traffic per household during one month in the period from the first NBCO report from March / 2020 to this NBCO report, September / 2021 records the following increase, as shown in Figure

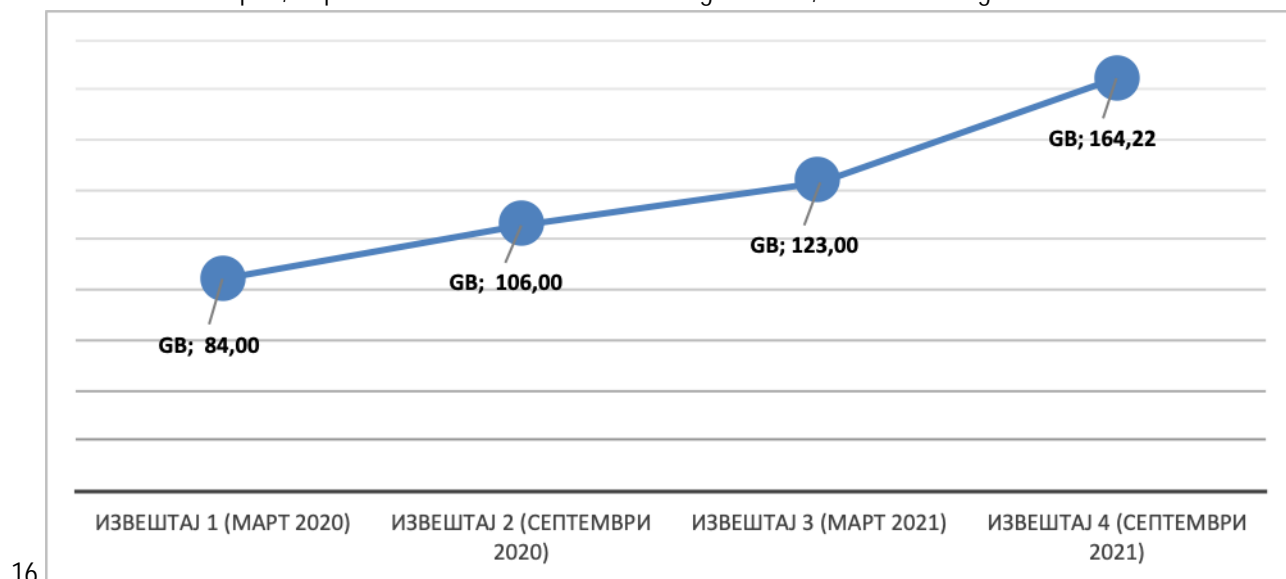


Figure 16: Change of fixed broadband internet traffic per household in RNM (Source: AEC)

B. Mobile broadband internet traffic per subscriber who uses mobile internet during a month is 4.5 GB. (Source: Agency for Electronic Communications)

The average mobile broadband internet traffic per subscriber during one month in the period from the first report of the NBCO from March / 2020 to this report of the NBCO, September / 2021 records the following increase, as shown in Figure

17.

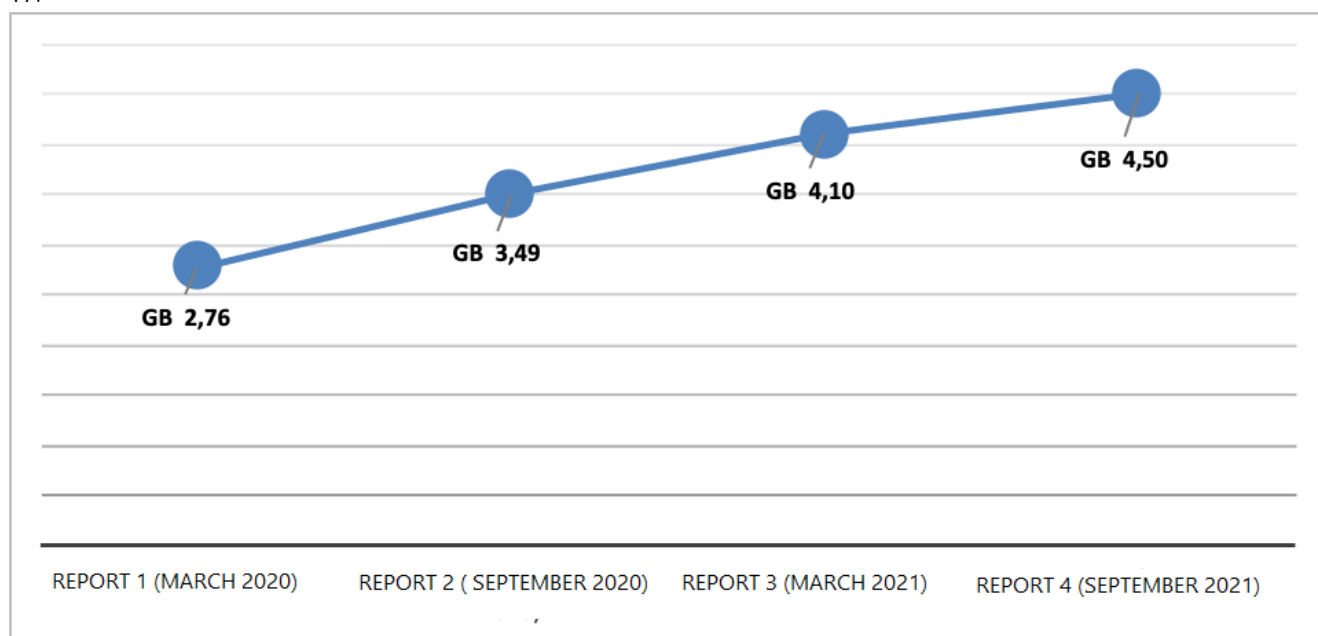


Figure 17: Change of mobile broadband internet traffic per subscriber in RNM (Source: AEC)

## • Broadband price index

### Indicator 1e1

In the analysis of the retail prices offered on the market of fixed broadband services in RNM, the OECD methodology "Revised OECD telecommunication price baskets" from December 2017 was used, according to which the retail offers of the three first ranked operators are analyzed according to the market share by number of users. , whose common total market share is at least 70%.

The analysis of the retail prices on the market of fixed broadband services in this report included the retail offers of the operators "Makedonski Telekom", "A1 Macedonia" and "TRD ROBI - Telekabel", which together in Q1 / 2021 have an 87.37% share of fixed broadband market according to the number of subscribers.

The lowest offers for three categories of speeds (12-30 Mbps, 30-100 Mbps and at least 1000 Mbps) and three types of products in the carts (standalone internet, internet + fixed telephony and internet + TV + fixed telephony), adjusted according to the parity of Purchasing Power Parity (PPP) is shown in Chart 4.

Note: The total market share of fixed broadband according to the number of subscribers of the three first ranked operators "Makedonski Telekom", "A1 Makedonija" and "TRD ROBI - Telekabel", compared to the first report of NBCO from March / 2020 (86.5%) does not show a big change (+/- 1%).

The value of 1 Euro = 61.5337 MKD (Source: National Bank)

The value of the purchasing power parity for RNM is calculated according to the data of the International Monetary Fund at 2.653297281.



Chart 4. Broadband price index

Category	Internet		Internet and fixed telephony		Internet + TV + f.telephony	
	Offer	The lowest price	Offer	The lowest price	Offer	The lowest price
12-30 Mbps	Cable internet Lightspeed 30/1	500 Mkd 8.1 Eur 21.56 (PPP)	A1 Net Neon 15/1	599 Mkd 9.70 Eur 25.83 (PPP)	A1 Combo Neon до 15/1 Mbps	799 Mkd 13.00 Eur 35.74 (PPP)
30-100 Mbps	Optical, Optic 100/100 package	1399 Mkd 22.7 Eur 60.32 (PPP)	A1 Net Neo S до 50/3 Mbps	799 Mkd 13.00 Eur 34.45 (PPP)	A1 Combo Neo 4M 50/3 Mbps	1199 Mkd 19.43 Eur 53.63 (PPP)
>100 Mbps	Optical, Optic package 150/150	1000 Mkd 16.3 Eur 43.12 (PPP)	Optical, Optic 150/150 package	1150 Mkd 18.7 Eur 49.59 (PPP)	Optical, Optic 150/150 package	1600 Mkd 26.0 Eur 68.99 (PPP)

## Number of active subscribers to fixed broadband - at affordable speed

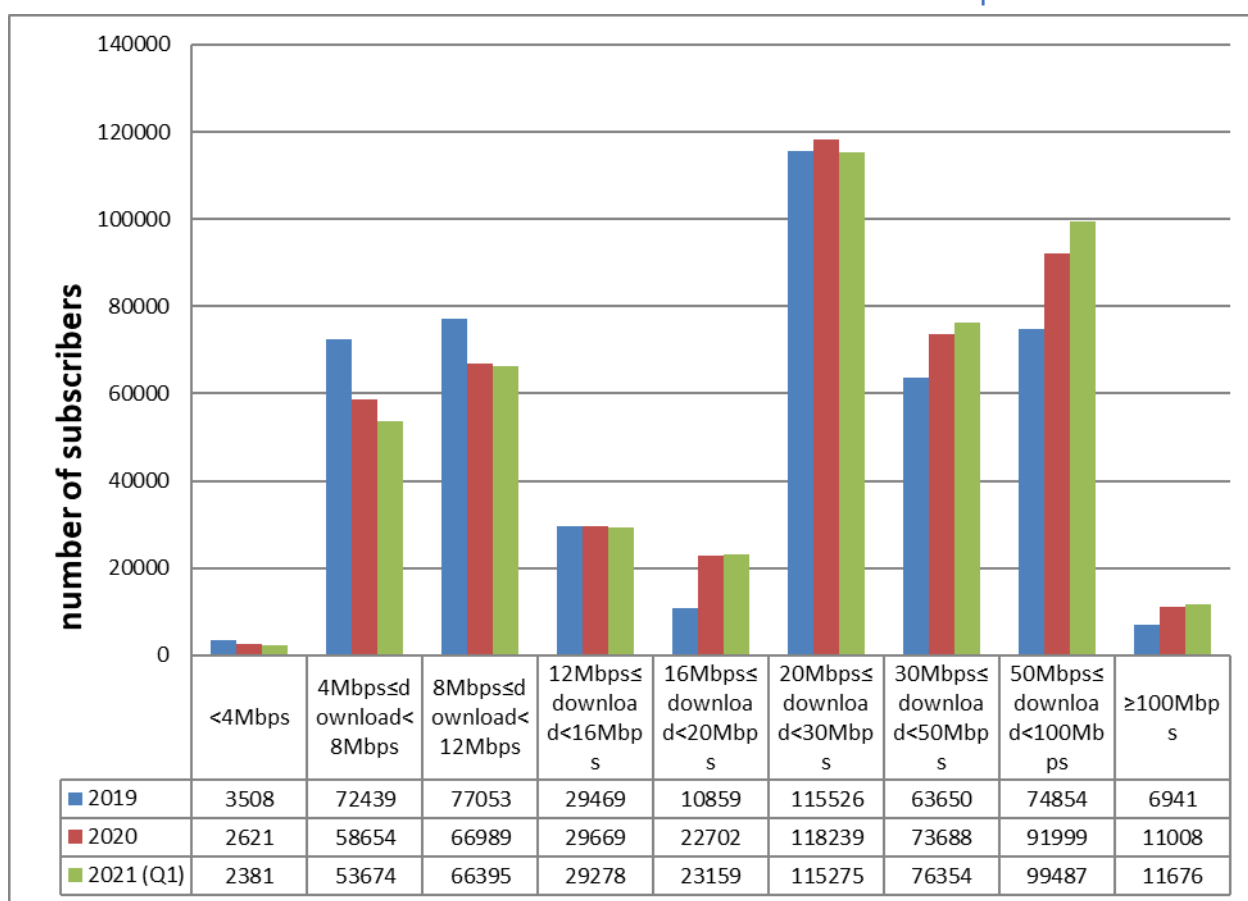


Figure 18: Number of active fixed broadband subscribers by access speed (Source: AEC (Q1 / 2021))

From the graph of Figure 18 it can be concluded that in the period 2019 - first quarter 2021 the number of subscriber agreements with access to basic broadband (download <30 Mbps) significantly decreases, while there is a noticeable increase in the number of subscriber agreements with access to fast broadband (30 Mbps < download < 100 Mbps).

There is also a slight increase in the number of subscriber contracts with access to ultrafast broadband (download > 30Mbps).

Having in mind that in the period when this report refers to one operator for the same value of the monthly subscription significantly increased the transmission speeds (Chart4.), in the following period can be expected even more noticeable increase in the number of subscriber agreements with access to fast broadband as well as ultra-fast broadband.

## Reducing the broadband gap in the country - number of households in white, gray and black zones in 2021

Of particular interest is the coverage with fixed NGA networks that have the capacity for households to provide:

- fast broadband / internet access (download speed between 30 and 100 Mbps) and
- access to ultrafast broadband / internet (download speed greater than 100 Mbps).

Based on EU recommendations:

- **White zone** is an area in the country, ie a settlement in which there is no fixed NGA network and there is no plan for an operator to build / develop such a network in the next 3 years.

This means that households in these settlements currently do not have, and in the future period of 3 years will not be able to access fixed internet with a download speed greater than 30 Mbps (or greater than 100 Mbps).

- **Gray zone** is an area in the country, ie a settlement where there is only one fixed NGA network or there is an investment plan of an operator in the next 3 years to build / develop such an NGA network, but there are no plans from other operators to develop such NGA networks in that settlement.

- **Black zone** is an area in the country, ie a settlement in which there are at least two fixed NGA networks of different operators, or such networks will be set up in the next 3 years.

According to the data received from the NBCO Implementation Support System of the Agency for Electronic Communications:

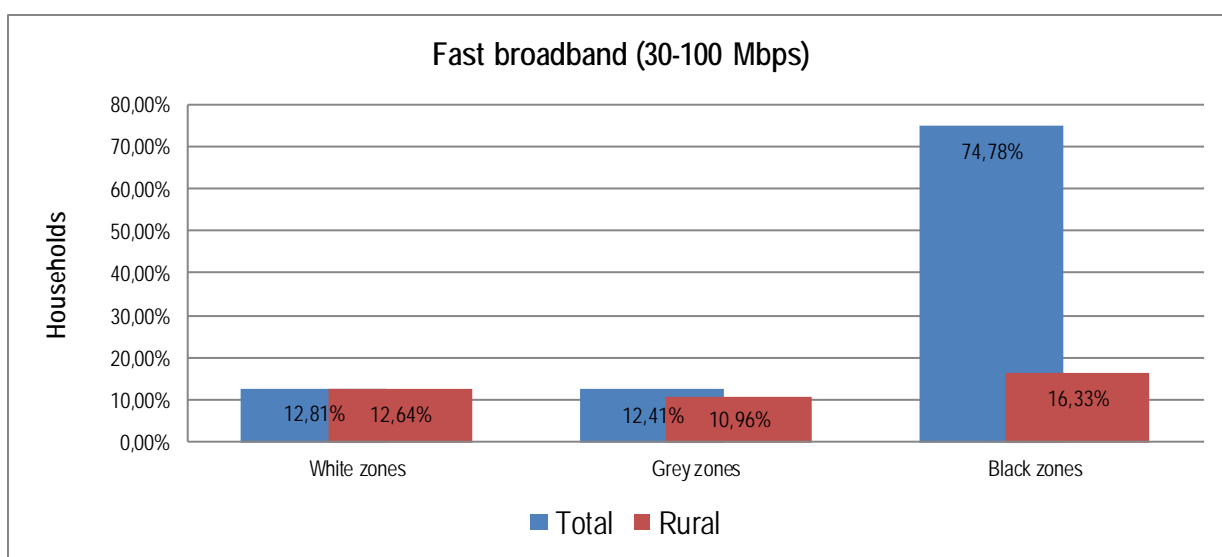


Figure 19: Households in white, gray and black zones (for fixed fast broadband networks) (Source: AEC 2021)

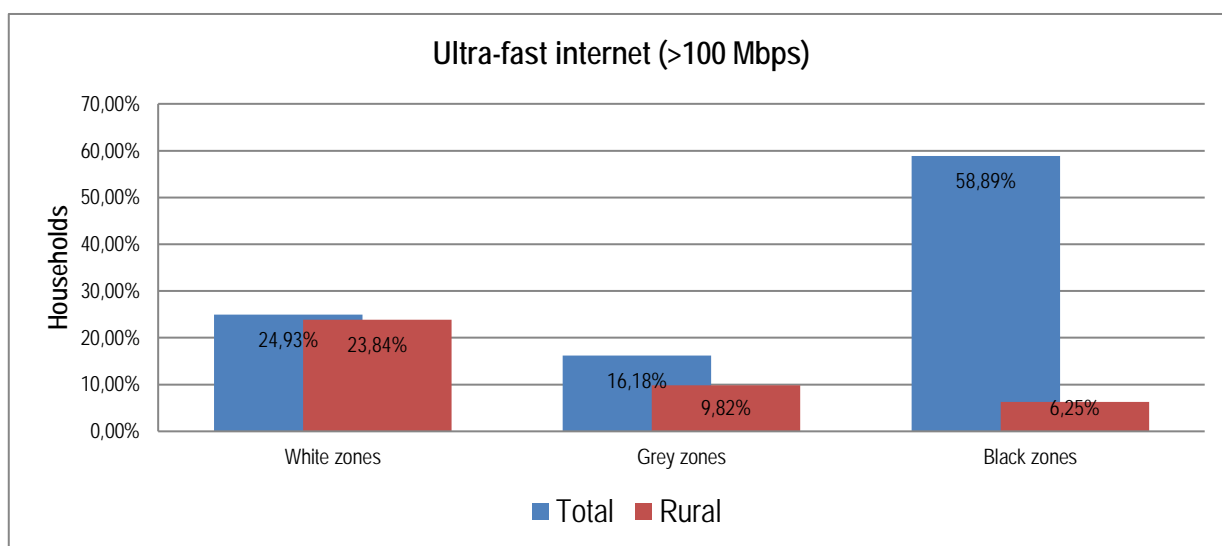


Figure 20: Households in white, gray and black zones (for fixed ultra-fast broadband networks) (Source: AEC 2021)

The following can be concluded from the graphs in Figure 19 and Figure 20:

- Settlements without any NGA networks for fast broadband or ultrafast broadband (white zones) are located in rural areas of the country.
- Most of the settlements where there is only one NGA network for fast broadband (gray zones) are located in rural areas, while there is a significant number of settlements in urban areas that have only one NGA network for ultrafast broadband.
- Settlements with at least two NGA high-speed broadband and ultra-fast broadband networks (black zones) are mainly located in urban areas.