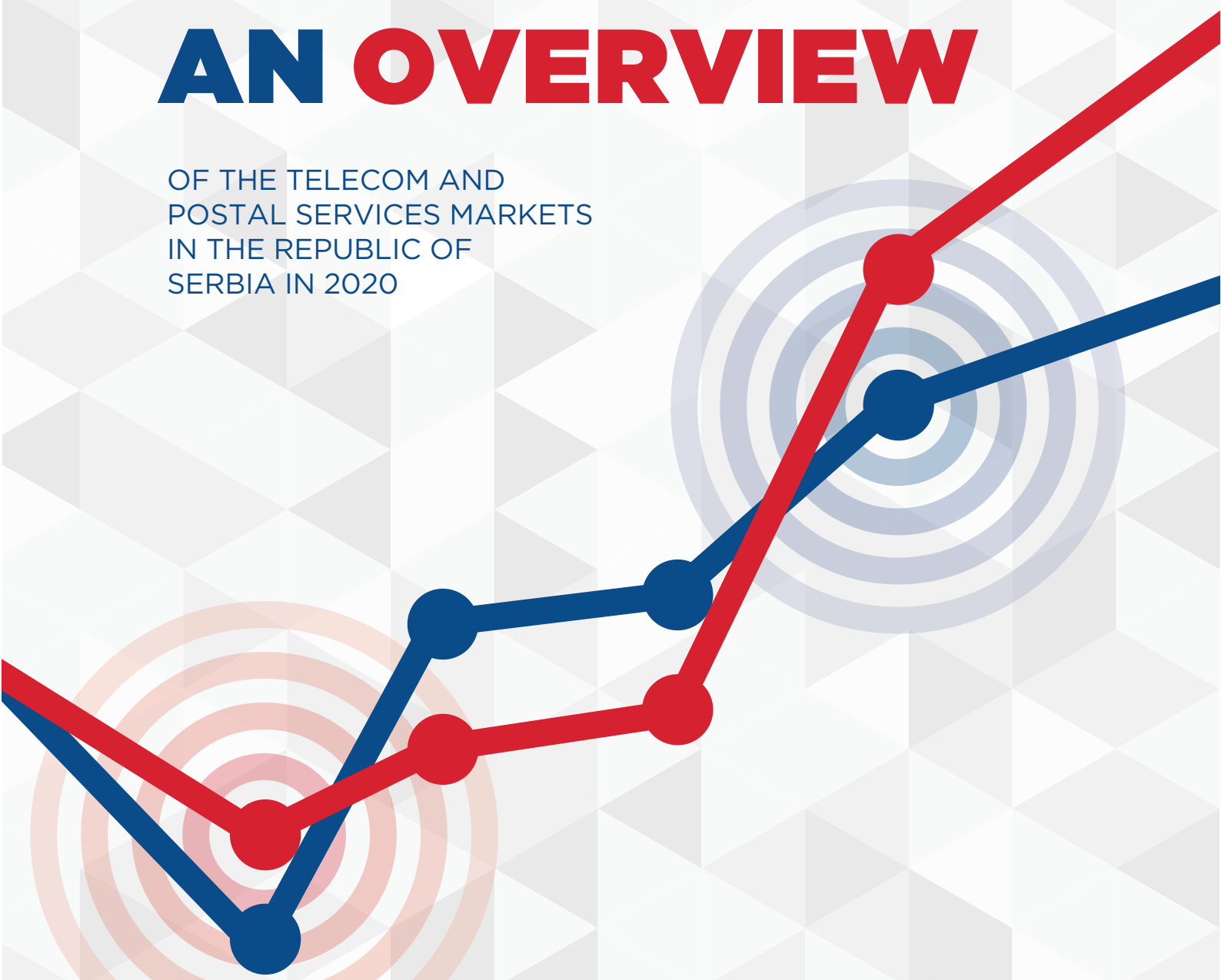
REPUBLIC OF SERBIA
RATEL
REGULATORY AGENCY FOR ELECTRONIC COMMUNICATIONS AND POSTAL SERVICES

AN OVERVIEW

OF THE TELECOM AND POSTAL SERVICES MARKETS IN THE REPUBLIC OF SERBIA IN 2020



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Belgrade, 2021

Title:
An Overview of the Telecom and Postal Services Markets
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Publisher:
Regulatory Agency for Electronic Communications
and Postal Services - RATEL
Palmotićeva 2, Belgrade
www.ratel.rs

Design and production:
Dina Dizajn
Kneza od Semberije 5a
Belgrade

Printed by:
Donat Graf d.o.o.
Vučka Milićevića 20
Grocka, Belgrade

Circulation:
200 copies

RATEL does not assume any liability for the accuracy of data provided by operators via annual questionnaires.

SUMMARY

A WORD OF INTRODUCTION

Reflecting about the last year and the results achieved in the field of telecommunications and postal services, we can conclude that the pandemic pushed the industry to invest in the existing infrastructure and technology and the development of innovative solutions to enhance the performances and to ensure connectivity and secure and stable communication for both private and business users.

The total revenues made in electronic communications market in the Republic of Serbia in 2020 amount to approximately 212.4 billion dinars, which is by 2.7% more compared to the previous year. The share of revenues made from electronic communications in the Serbian GDP was 3.9%. Mobile service provision accounts for the largest share of total revenues made from electronic communications, which equals 59%.

The investments in the electronic communications sector were by 42.6% lower, amounting to 48.7 billion dinars (cf. 84.2 billion in 2019). Investments in media content distribution take up the biggest share of 44.8% (21 billion dinars), while mobile telephony accounts for 25.8% (12.5 billion dinars) of total investments made in 2020.

Dragan Pejović

The number of mobile users continued to decrease, amounting to 2.41 million at the end of 2020. Regardless of gradual drop in the number of active mobile telephony users over the past years, the total mobile network users still outnumber the total number of inhabitants, with the penetration rate of 119.26%. The volume of the outgoing voice traffic is still growing in terms of minutes, with a year-on-year increase of 15.4%. During

2020, each mobile telephony user daily spent on average 6 minutes and 54 seconds talking on the phone. On the other hand, the number of sent text messages continues to drop, with approximately 1.8 messages a day per user.

The total number of active mobile broadband users in 2020 was 6.6 million, including the subscribers of mobile broadband data and voice service, data service only and subscribers using USB wireless modem for the Internet access, which is a 4.8% increase compared to the previous year. Data show that the number of subscribers who purchased mobile broadband Internet services independently of voice services increased by 18.4% compared to the previous year. The traffic volume increased 1.5 times compared with the previous year, amounting to almost 486 million GB on an annual level for entire UMTS and LTE traffic.

In 2020, 69.6% households had fixed broadband Internet access. The total number of fixed broadband subscribers in 2020 was 1.73 million, which is a 6.8% increase compared with the previous year. The increase in the number of users is reflected in the increase in the revenues from fixed broadband Internet, which rose by 10%. The high rate of increase is partly owed to the rise in the number of users, but it is also a result of a considerably bigger volume of the Internet technology usage during the pandemic. There was a rather high demand for fast Internet packages and 27% of fixed broadband subscribers used packages of at least 100 Mbps but less than 1 Gbps.

The availability of high-speed Internet is important to ensure a high-quality access to Internet content. The Internet was most used for online messaging via Skype, Messenger, WhatsApp and Viber (84%), VoIP calls (80.5%) and reading online newspapers and magazines (73.6%). Online purchase of goods and/or services has been growing over the past years. This was particularly characteristic for 2020, due to limited social contacts during the pandemic.

The total number of media content distribution service subscribers was 2.1 million, which is a 5.1% increase year on year, as a result of the rise in the number of CATV and DTH subscribers.

User right protection in the field of electronic communications and postal services remains RATEL's priority. The percentage of user complaints related to the quality of service (QoS) was by 11% less for all types of services. Majority (11%) of complaints concern the quality of services of broadband access. RATEL NetTest application, enabling measurement of the Internet QoS was upgraded in and all the measurement results are transparent and publicly available to users. The advantage of this functionality is that the end user can find the information on the operators' networks at a specific location, by observing the measurement results of a large number of samples in that specific area. The instruction for users on measuring the Internet data throughput by using RATEL Net Test has been added to the application, for the purpose of using the measurement result when filing a complaint on the quality of Internet service.

The new Law on Postal Services envisaged a new competence for RATEL to serve as a mediator in out-of-court dispute resolution between a postal operator and user who filed a complaint. In the new capacity, RATEL processed 96 complaints, the majority of which were related to damaged items, delays in delivery and non-delivery of items.

Revenues from the postal service market, which have been rising for four years in a

row, increased by 10% in 2020. On average, 124 postal items were delivered per household, which equals 43 postal items per inhabitant. Postal services in the Republic of Serbia generated an income of approximately 23.4 billion dinars, representing 0.43% of the projected GDP. Universal postal service remains dominant, with a share of over 85% in the total volume of postal services. However, its share in the total revenues is 39%, with 9.1 billion dinars income, while other postal services made an income of 14.3 billion dinars. The revenue from UPS grew by 2.2% whereas its share in volume dropped by 3%, year on year, which increased by 16.6% in 2020, as a result of an increase in volume of 18%. The remote commerce volume share in the total express volumes continued to grow in 2020. In 2018, the share of remote commerce volumes in national traffic was 27% of the total express volumes, in 2019 it was slightly over 31% and in 2020 it grew to more than 38%. More than 94% of the remote commerce items contain goods, while the rest of them contain documents.

The Law on Information Security stipulates the requirement for the operators of critical ICT systems to inform the responsible authority of any incidents in the system that may significantly impact information security. There were 276 such incidents reported to the National CERT in 2020, including the incidents reported by international CERTs. The incidents which present a risk to the security of ICT systems, suspected to present a felony, have been reported according to the law or forwarded to the Special Prosecution Office for High-Tech Crime.

The annual overview of telecommunications and postal services market in the Republic of Serbia, prepared and published by RATEL each year, is intended to help market stakeholders to anticipate future development trends and to contribute to a successful business and a better quality of services available in our market.

Director

Dragan Pejović

1. BASIC FEATURES OF TELECOMMUNICATIONS MARKET IN THE REPUBLIC OF SERBIA

Figure 1.1. Republic of Serbia – Basic Facts

Name	Republic of Serbia
Capital	Belgrade
Area	88 499 km²
Population (without AP Kosovo and Metohija), estimated by the Statistics Office[1]	6 926 705
Country code:	+381
Internet domain:	.rs
GDP in 2020[2]	5 463.54 billion dinars (46.47 billion euro)
Average net income in 2020[3]	60 073 dinars (510.92 euros)

The data used for the overview of telecom market in the Republic of Serbia have been obtained based on the questionnaires provided by the telecom market participants, and they mainly refer to the territory of the Republic of Serbia without Kosovo and Metohija since this area is under the control of the United Nations, pursuant to the Security Council Resolution 1244, temporary regulating, inter alia, the authority of the international civilian mission in the territory of AP Kosovo and Metohija.

1 Statistics Office estimation for 1.1.2020.

2 Statistics Office estimation – as the sum of four quarters. Data taken from the publication Statistical Calendar of the Republic of Serbia, 2020, issued by the Statistics Office (the average RDS/EUR exchange rate for 2020 was 117.5777), p. 35.

3 Ibidem, p. 41.

The total revenues made in the electronic communications market of the Republic of Serbia in 2020 amounted to approximately 212.4 billion dinars which is by 2.7% more compared with the previous year. The total revenues amounted to 1.8 billion euros, which is a slight growth compared to 1.75 billion euro in 2019. The share of revenues from electronic communications in the Serbian GDP in 2020 was around 3.9%.

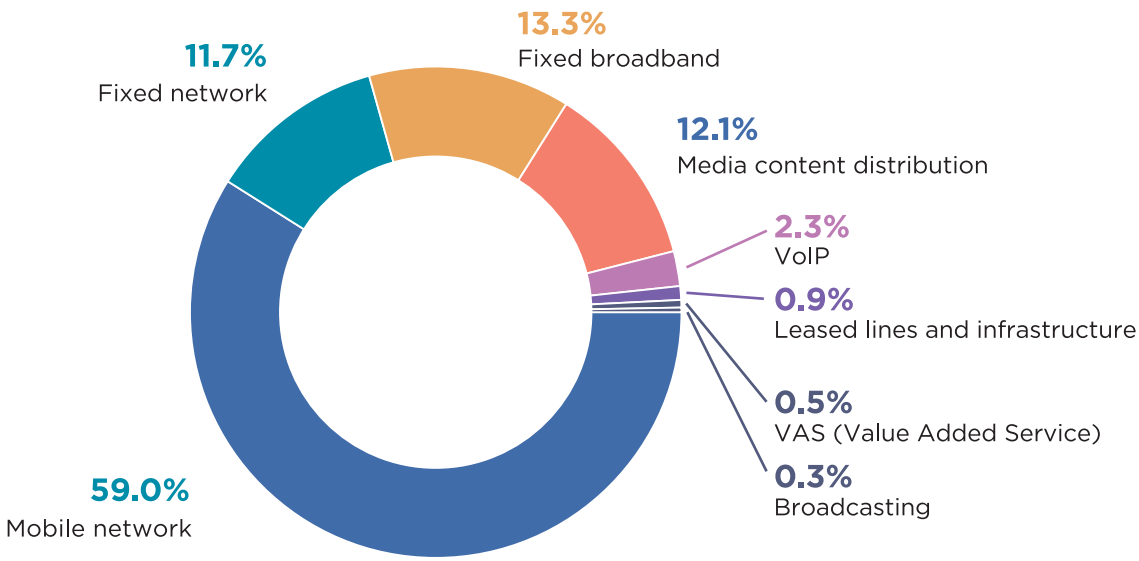
In terms of market share accounted for by different services in the Serbian electronic communication market in 2020, the same as in the previous years, the largest share went to mobile service provision, accounting for 59% of the total revenues.

The total investments made in the electronic communications sector in 2020 amounted to 48.3 billion dinars (410.5 million euros), which is less than in the previous year when they amounted to 84.2 billion dinars. Considered in euros, the investments decreased from 714.3 to 410.5 million euros, which is a drop by 42.5%. Investments made in media content distribution have the largest share, with more than 21 billion dinars (184 million euros) and account for nearly 44.8% of the total investments in 2020, while investments in mobile networks which amounted to 12.5 billion dinars (106 million euros) account for 25.8% of the total investments made in 2020.

A comparative overview of the number of users and penetration rate of public fixed communication networks, public mobile communications networks, broadband Internet, media content distribution systems and bundle services for the period 2016-2020 is given in Table 1.1.

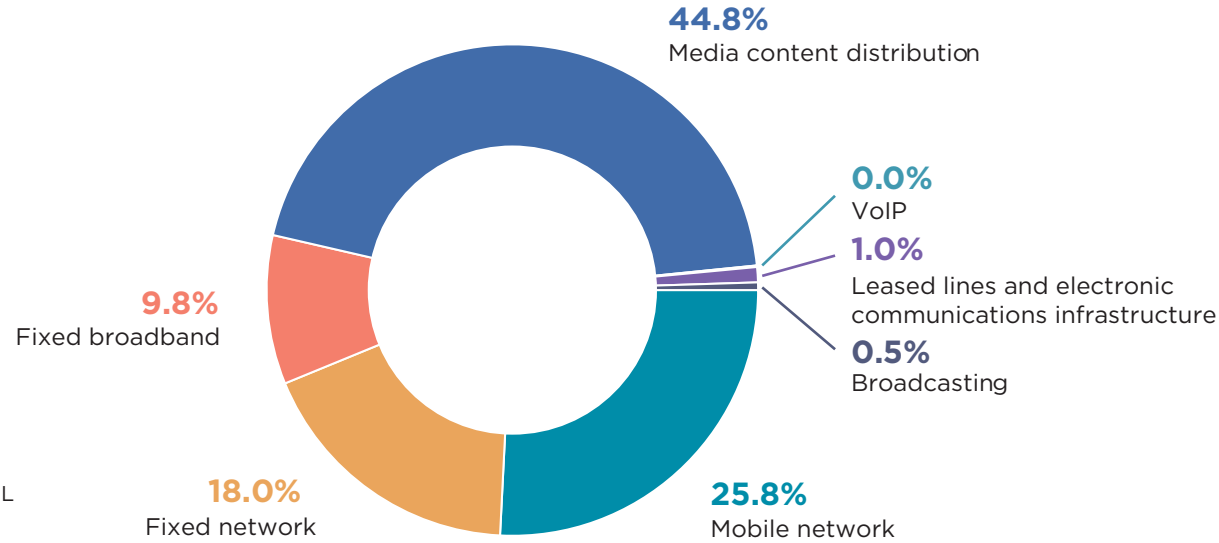
Low usage basket of electronic communications services shows average monthly expenses of a subscriber/inhabitant for telecommunications services. Tables 1.2 and 1.3 illustrate low usage and high usage baskets, representing monthly expenditure per subscriber of electronic communication services in Serbia, based on weighted average, with comparative

Figure 1.2. Structure of revenues by services in 2020



Source: RATEL

Figure 1.3. Structure of investments by services in 2020



Source: RATEL

data for 2018, 2019 and 2020. According to the collected data on natural entities and the data received from the Statistics Office on net income, in 2020, the cost of the low basket equalled 2.03% and the cost of the high usage basket equalled 9.18% of the average net salary.

According to available data, the total number of people in the Republic of Serbia employed in the telecommunications sector in 2020 amounted to 13.6 thousand.

Table 1.1. A comparative overview of the number of users of basic electronic communications services in the Republic of Serbia (2016-2020)

Year		2016.	2017.	2018.	2019.	2020.
Service	**Indicator**					
Fixed telephone - subscribers	Million	2.55	2.48	2.43	2.42	2.41
	Per 100 households	102.63	99.74	97.87	97.34	97.01
Mobile telephone - users	Million	9.09	8.62	8.43	8.45	8.26
	Per 100 inhabitants	128.52	122.46	120.42	121.40	119.25
Fixed broadband - subscribers	Million	1.45	1.48	1.55	1.62	1.73
	Per 100 households	58.30	59.52	62.39	65.27	69.56
Media content distribution - subscribers	Million	1.66	1.70	1.88	2.00	2.10
	Per 100 households	66.87	68.28	75.55	80.42	84.51
Bundle services - subscribers	Million	1.03	1.17	1.27	1.42	1.56
	Per 100 households	41.36	46.95	51.23	56.90	62.54

Table 1.2. Low usage basket of electronic communications services

LOW USAGE BASKET	2018.		2019.		2020.	
	Average bill (dinars)	% of the average salary	Average bill (dinars)	% of the average salary	Average bill (dinars)	% of the average salary
Fixed phone	695.87	1.40%	647.06	1.18%	653.50	1.09%
Mobile phone (prepaid)	293.45	0.59%	323.00	0.59%	310.70	0.52%
TV (public broadcasting service tax) *	150.00	0.30%	220.00	0.40%	255.00	0.42%
Total	**1139.32**	**2.29%**	**1190.06**	**2.17%**	**1219.20**	**2.03%**
Average net salary (RSD)**		49650		54926		60073

Source: RATEL

Table1.3. High usage basket of electronic communications services

HIGH USAGE BASKET	2018.		2019.		2020.	
	Average bill (dinars)	% of the average salary	Average bill(dinars)	% of the average salary	Average bill (dinars)	% of the average salary
Fixed phone	695.87	1.40%	647.06	1.18%	653.50	1.09%
Mobile phone (postpaid)	1481.73	2.98%	1783.88	3.25%	1754.67	2.92%
TV (public broadcasting service tax) *	150.00	0.30%	220.00	0.40%	255.00	0.42%
Internet **	1448.96	2.92%	1435.86	2.61%	1548.78	2.57%
Media content distribution	1404.47	2.83%	1339.44	2.44%	1305.76	2.17%
Total	**5181.03**	**10.44%**	**5426.24**	**9.88%**	**5515.67**	**9.18%**
Average net salary (RSD)		49650		54926		60073

Source: RATEL

Notes:

* Since January 2016, pursuant to the Law on Temporary Regulation of Public Media Service Tax Collection (Official Gazette of RS, no. 112/15), a monthly public broadcasting service tax is collected.

** www.stat.gov.rs – As of 2018, average salary is calculated based on the data obtained through Withholding Tax Return Form, according to new methodology.

*** Fixed broadband (excluding the mobile Internet package)

Relevant electronic communications product and service markets susceptible to ex ante regulation

Pursuant to the Law on Electronic Communications, RATEL has the competence to: identify relevant markets subject to ex-ante regulation, by implementing appropriate recommendations of the EU. Aiming to harmonize with the EU regulations, when conducting the analysis of relevant markets, RATEL applies 2014/710/EU Commission Recommendation of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation. The analysis of relevant markets and, were necessary, additional markets, is conducted to determine whether there is an efficient competition in the markets or one or more operators with significant market power.

Under Decision on identifying relevant markets subject to ex-ante regulation ("Official Gazette of RS", No.78/18), RATEL identified the following markets susceptible to ex-ante regulation in the Republic of Serbia:

1. Wholesale market of call termination on individual public telephone networks provided at a fixed location,
2. Wholesale market of voice call termination on individual mobile networks,
3. a) Wholesale market of the local access provided at a fixed location,

   b) Wholesale market of the central access provided at a fixed location for mass-market products.

The geographic dimension of market susceptible to ex ante regulation is the territory of the Republic of Serbia.

Market analysis conducted by RATEL, involves all necessary steps, including market definition, identifying SMP operators: and defining necessary regulatory obligations to be imposed on the SPM operator.

Pursuant to the Law on Electronic Communications, the decision on designating the operator with SMP on the relevant market, should lay down at least one of the following legally prescribed obligations:

1. obligation of publishing specific data,
2. obligation of non-discriminatory behaviour,
3. obligation of accounting separation,
4. obligation of access to and use of the network elements and associated facilities,
5. obligation of price control and cost-based accounting,
6. obligation of providing the basic set of leased lines,
7. obligation of ensuring carrier selection and pre-selection and
8. obligation of providing retail services under specific conditions.

In the second half of 2020, in view of the results of the market analysis completed in 2018 and the need for changes in the current LRIC model, RATEL began amending LRIC model for designating regulated wholesale services of SMP operators in relevant markets.

The optimization of the current LRIC model and further implementation will enable RATEL to implement regulation in line with the European practice in a way that fully considers all peculiarities of the electronic communications market of the Republic of Serbia, including the current and planned future level of development.

Pursuant to the provisions of Art. 62, para. 4 and Art. 68, para. 1 of LEC, RATEL continually monitors the fulfilment of price control and cost-based accounting obligation, imposed on SMP operators who, in addition, submit reports in line with the Rulebook on the application of the cost-accounting principle, separate accounts and reporting by an operator with significant market power in the electronic communications sector. Pursuant to the provisions of Art. 68, para. 7 of LEC, RATEL hired an independent auditor to verify the compliance of the 2019 regulatory reports submitted by SMP operators with the prescribed cost accounting application. The reports of the independent auditor on the regulatory reports are available at https://www.ratel.rs/cyr/page/cyr-izvestaji-revizora. RATEL monitored the regulated service pricing of SMP operators and consistent implementation of the relevant rulebook.

2. EU TELECOM MARKET STATE OF PLAY

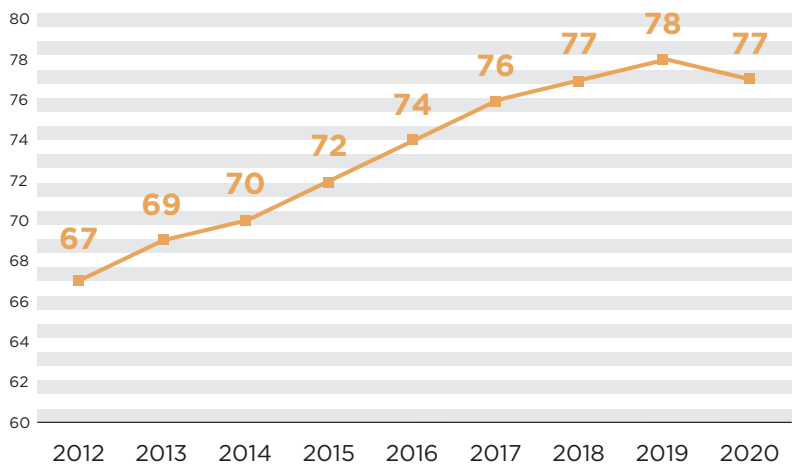
Fixed broadband access

The number of fixed broadband subscribers in the EU Member Countries, households-wise, decreased by 1% in 2020.

In the EU Member States, the number of fixed broadband subscribers ranges from 57% to 92%. Germany, Cyprus and the Netherlands have the highest rate of fixed broadband subscribers per 100 households (over 90%). On the other hand, Finland, Bulgaria, Italy and Latvia have the lowest rates of around 60%. According to some assessments, this may in part be a result of the fixed-mobile substitution. At the end of 2020, the number of fixed broadband subscribers per 100 households in Serbia was 70.

DSL still has the largest share in fixed broadband structure, with 50% of total fixed broadband subscribers in the EU. The same as last

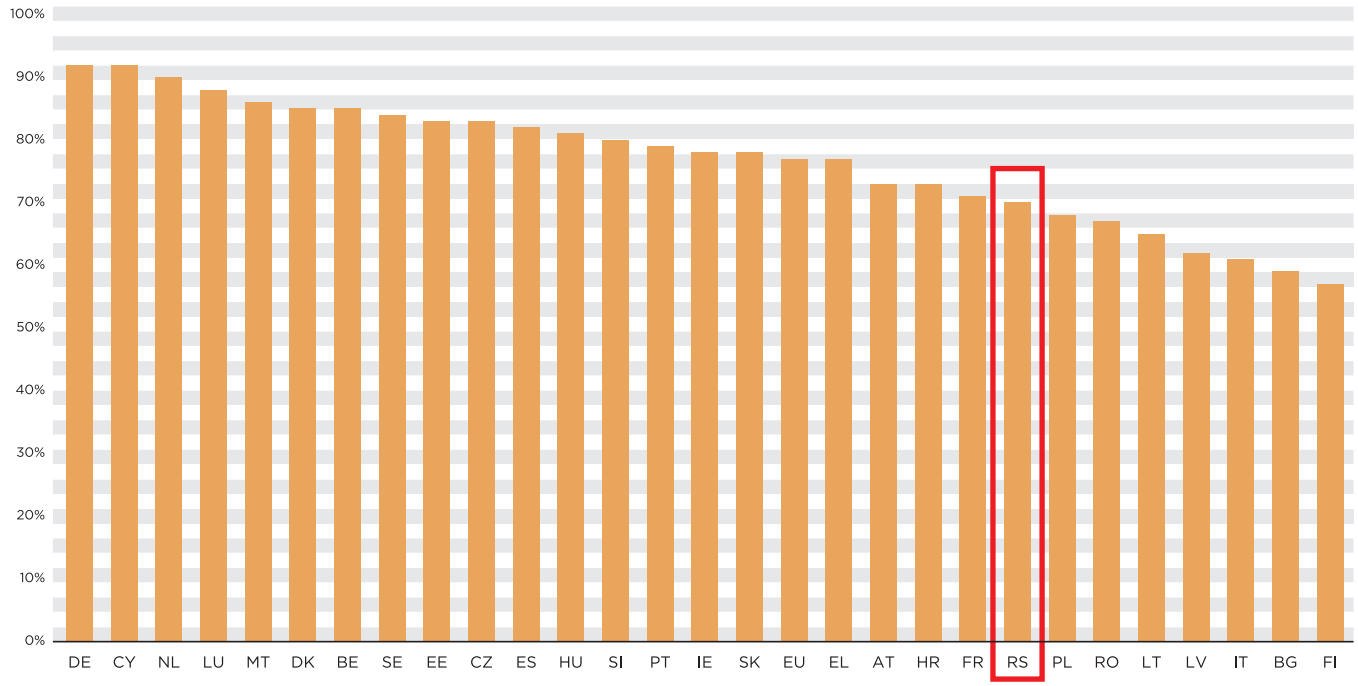
Figure 2.1. Average number of fixed broadband subscribers per 100 households - EU



Source for the EU: EC - Communications Committee – COCOM, https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity, as on 15 November 2021

Source for Serbia: RATEL

Figure 2.2. Fixed broadband penetration rate (per 100 households) – EU by Member States



Source: EC - Communications Committee – COCOM, https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity, as on 11 November 2021

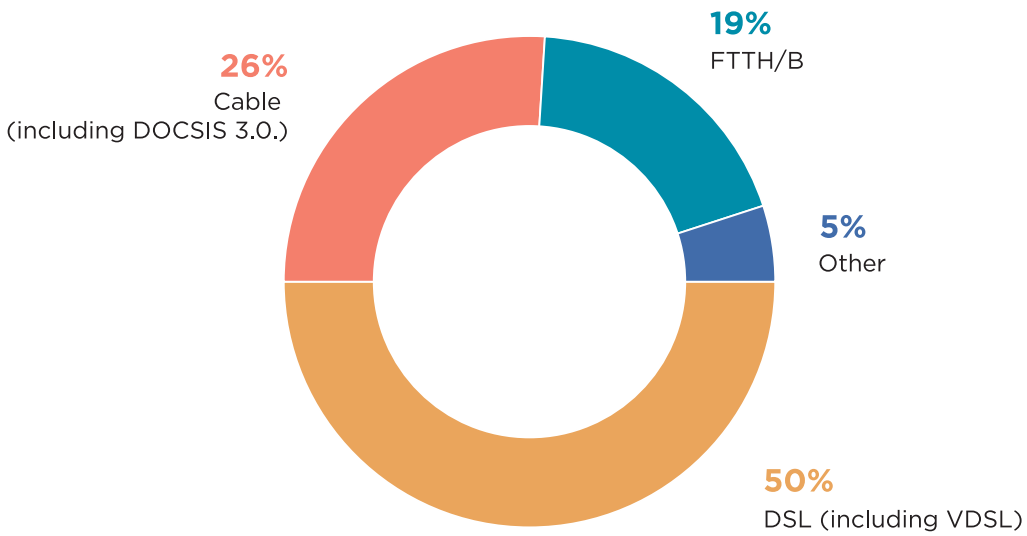
Source for Serbia: RATEL

year, approximately 19% of the total number of subscribers are now using FTTH/B, while cable access increased from 19% to 26% year on year. Cable access is by far more present in the Serbian market, with 46% of the total fixed broadband subscribers, whereas DSL take-up was 34% at the end of 2020.

Figure 2.4. shows the usage of different broadband technologies in the EU Member States and the Republic of Serbia. DSL market share ranges from 8% to 97% and it generally has a lower rate in the East Europe where FTTH/B is widely used. Cable access is present in all countries except for Greece and Italy where DSL is dominant. On the other hand, DSL holds a small share in Bulgaria, Romania, Portugal and Sweden. Cable access has large share in Belgium, Hungary, Malta and the Netherlands. FTTH/B is the most used technology in Lithuania, Latvia, Sweden, Romania, Spain, Bulgaria and Finland. In Serbia in 2020, cable access was dominantly used, outnumbering the subscribers using DSL technology, whereas FTTH/B was used by 14% of the total fixed broadband subscribers.

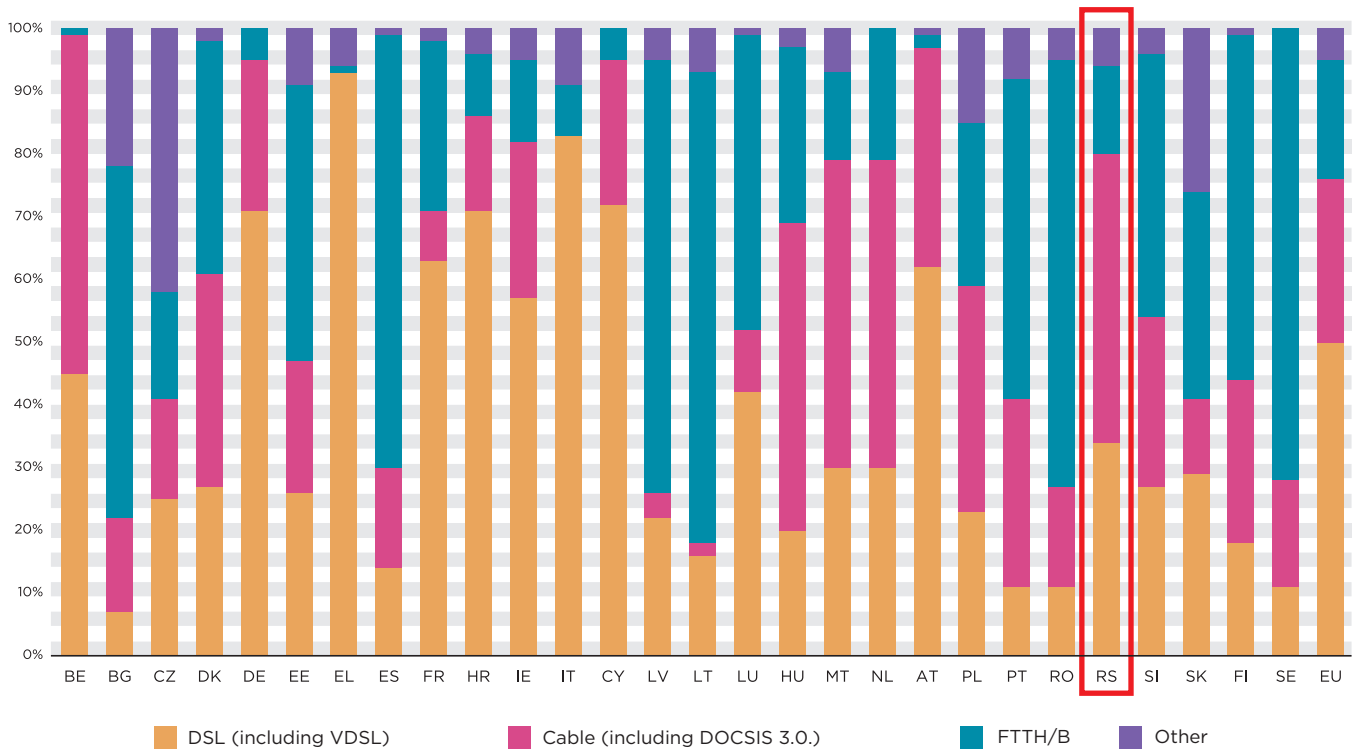
The market share of the incumbent operators in the total number of fixed broadband subscribers remains high in the EU, the average being approximately 39%, the same as last year. Luxemburg has the incumbent with the largest market share of 63%, whereas in Croatia, Austria, Cyprus, Latvia, Estonia, Lithuania and Denmark, the incumbent operators

Figure 2.3. Fixed broadband user distribution in terms of technologies in the EU



Source: EC - Communications Committee – COCOM, https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity, as on 11 November 2021

Figure 2.4. Fixed broadband user distribution in terms of technologies



Source for the EU: EC - Communications Committee – COCOM, https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity, as on 15 November 2021

Source for Serbia: RATEL

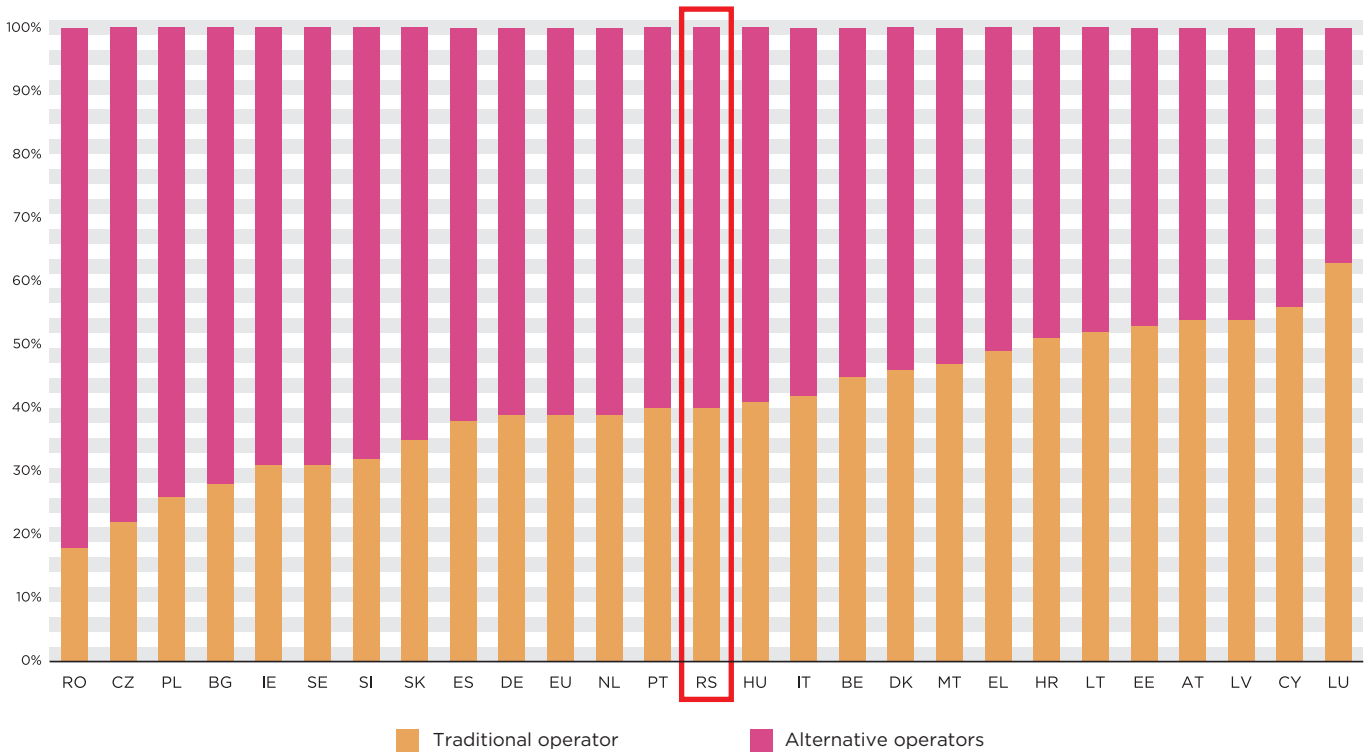
have a share of over 50%. The share of the incumbent is below 30% in the Czech Republic, Romania Bulgaria and Poland. The share of the incumbent in the total number of fixed broadband subscribers in Serbia is slightly above the EU average, with 40% (Figure 2.5).

NGA network coverage continues to grow in the EU. Around 87.2% of the total number of households in the EU have NGA network coverage, compared with 46% eight years ago, noting that NGA includes FTTH, FTTB, VDSL and Cable DOCSIS3.0. By mid-2020, VDSL had the largest coverage among NGA technologies of 55%, followed by cable access (45%) and FTTP (42%). NGA coverage has largely increased in rural areas where it grew by 50% in the past eight years, now reaching 60%.

Cyprus, Malta, Luxemburg and Belgium are leaders in NGA coverage. In 12 Member States NGA is available in at least 90% of households, whereas in France and Lithuania the take up is around 70%. In Serbia the access is available in 77% of households.

In the EU, 34% of the subscribers used Internet packages of at least 100 Mbps, whereas 1% of the subscribers had access to connections of 1 Gbps and higher. The leading countries in terms of ultra-high-speed Internet subscribers (100 Mb/s and higher) are Sweden, Spa-

Figure 2.5. The shares of the incumbent and alternative operators in the total number of fixed broadband subscribers



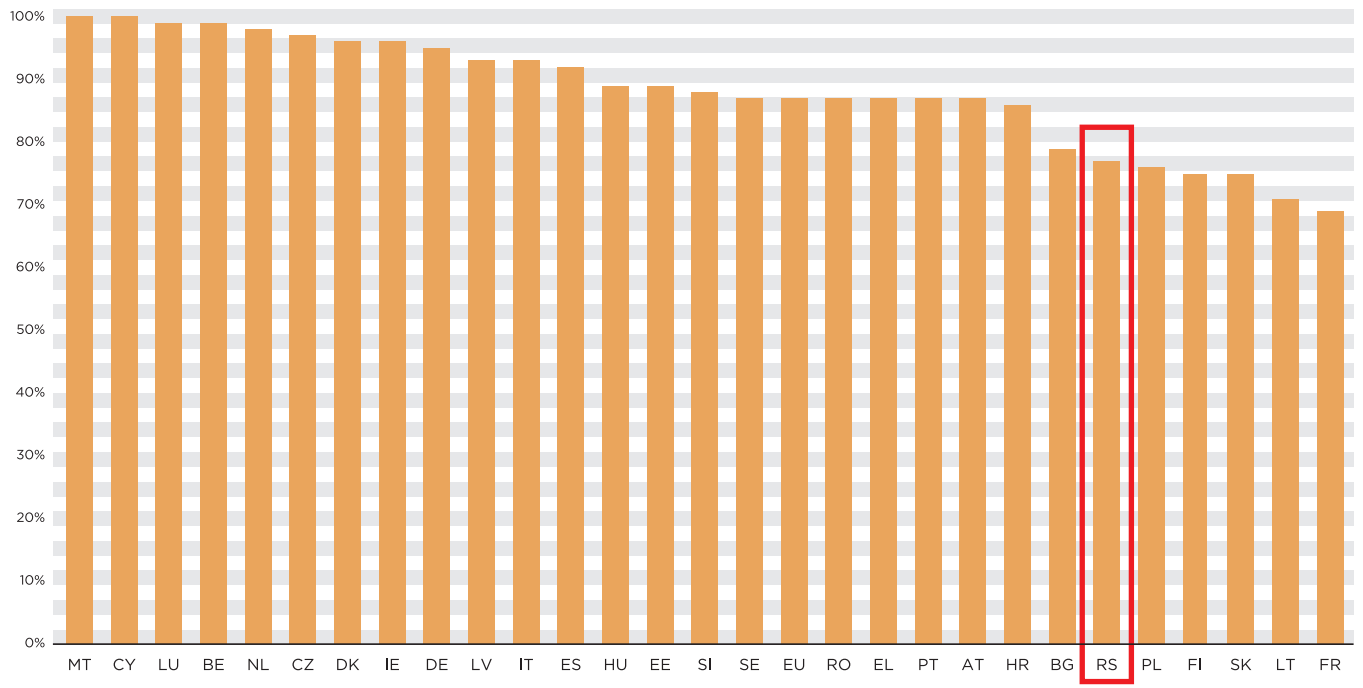
Source for the EU: EC - Communications Committee – COCOM, https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity, as on 15 November 2021

Source for Serbia: RATEL

in, Portugal, Hungary, Belgium, Luxemburg and Romania, where more than 50 % of users have access to such speeds, whereas the least connections at these speeds are available in Croatia (9%), Cyprus (3%) and Greece (3%). In Serbia, 27% of the subscribers used Internet packages of at least 100 Mbps, whereas the number of subscribers with access to connection of over 1 Gbps is insignificant.

Mobile broadband is largely used along fixed broadband in the EU. In Sweden, the Netherlands, Denmark, Spain, Luxemburg and Ireland the mobile broadband penetration rate is above 80%. Italy has the lowest mobile penetration rate of 49%. In Serbia, at the end of 2020, the number of active mobile broadband users per 100 inhabitants was 62, which is still below the EU average (71). It should be noted that the indicator has been changed now involving only the individuals who used the mobile phone to access the Internet, instead of the previous indicator which referred to the very possibility of the cell phone to access the Internet therefore resulting in higher reference values.

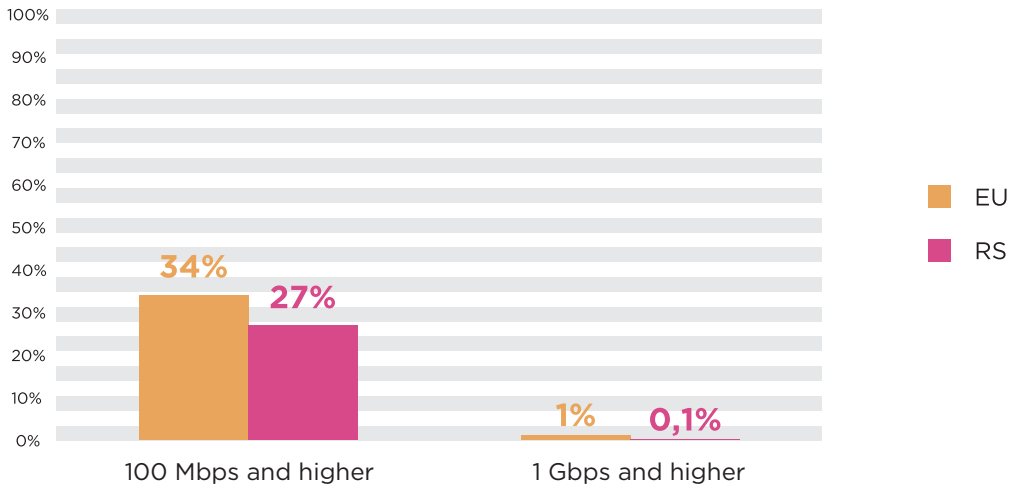
Figure 2.6. NGA coverage in the total number of households



Source for the EU: EC - Communications Committee – COCOM, https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity, as on 15 November 2021

Source for Serbia: RATEL

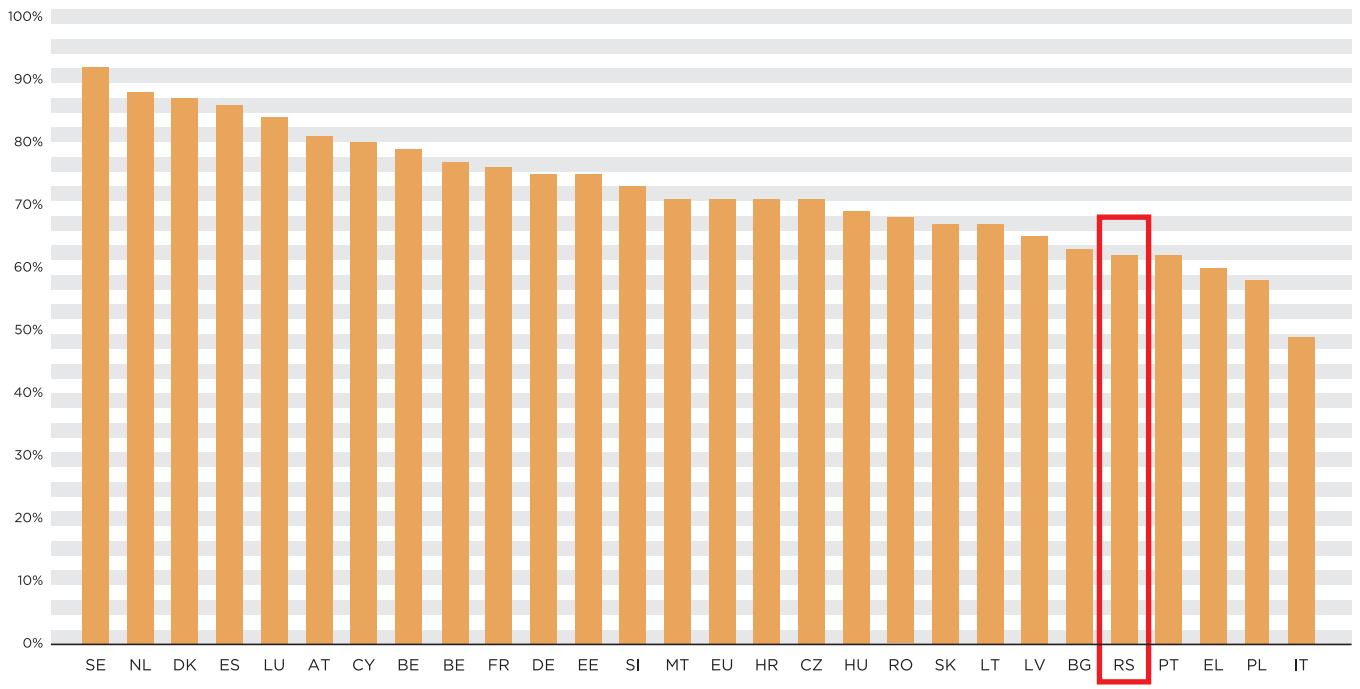
Figure 2.7. Fixed broadband users share, according to connection speed



Source for the EU: EC - Communications Committee – COCOM, https://ec.europa.eu/digital-single-market/en/news/2020-desi-report-electronic-communications-markets-overview-member-state-telecom-chapters, as on 15 November 2021

Source for Serbia: RATEL

Figure 2.8. Mobile broadband penetration rate



Source for the EU: EC - Communications Committee – COCOM, https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity, as on 15 November 2021

Source for Serbia: RATEL

3. THE DIGITAL ECONOMY AND SOCIETY INDEX (DESI)

The Digital Economy and Society Index (DESI) is a composite index that summarises relevant indicators on digital performance and tracks the evolution of EU member states in digital competitiveness. DESI provides an insight in country's general performance and offers a simple way to identify areas with room for improvement. DESI consists of 5 components: Connectivity, Human capital, Use of Internet servives, Integration of digital technology and Digital public services (Figure 3.1).

DESI is calculated for EU member states since 2014 and for Serbia since 2017, thus enabling Serbia to be positioned on the European digital performance map. DESI for Serbia in 2020 has been calculated according to the EC methodology of June 2020.

Figure 3.1. DESI components

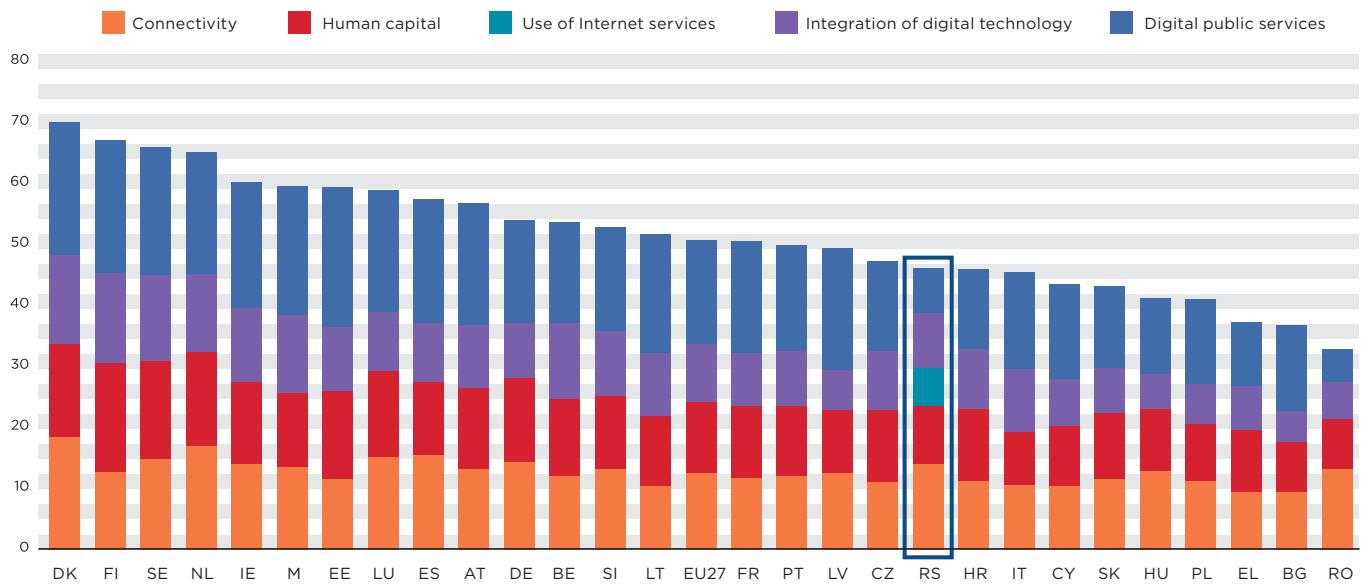
The changes in the methodology in respect to the previous year mainly concern indicators for: Connectivity (2 indicators less), Use of Internet services (2 indicators less) and Digital Public Services (3 eHealth indicators have been excluded).

DESI by dimensions for all EU countries and Serbia is given in Figure 3.2. Values for Serbia and the EU Member States aren't fully comparable because the values for the European countries have been aligned with the latest methodology, which had been published in November 2021 and significantly modified compared to the previous one in terms of used indicators, their sources and weighted values applied in calculation.

Denmark, Finland and Sweden were the most advanced digital economies in the EU in 2020, whereas Romania, Bulgaria and Greece are lagging behind.

Serbia is ranked 19th on the list of the European countries, compared to the 22nd place the previous year. It owes its better ranking to the results in the Human Capital and Connectivity categories. These results still place it in

Figure 3.2. DESI scores of the EU countries and Serbia in 2020*

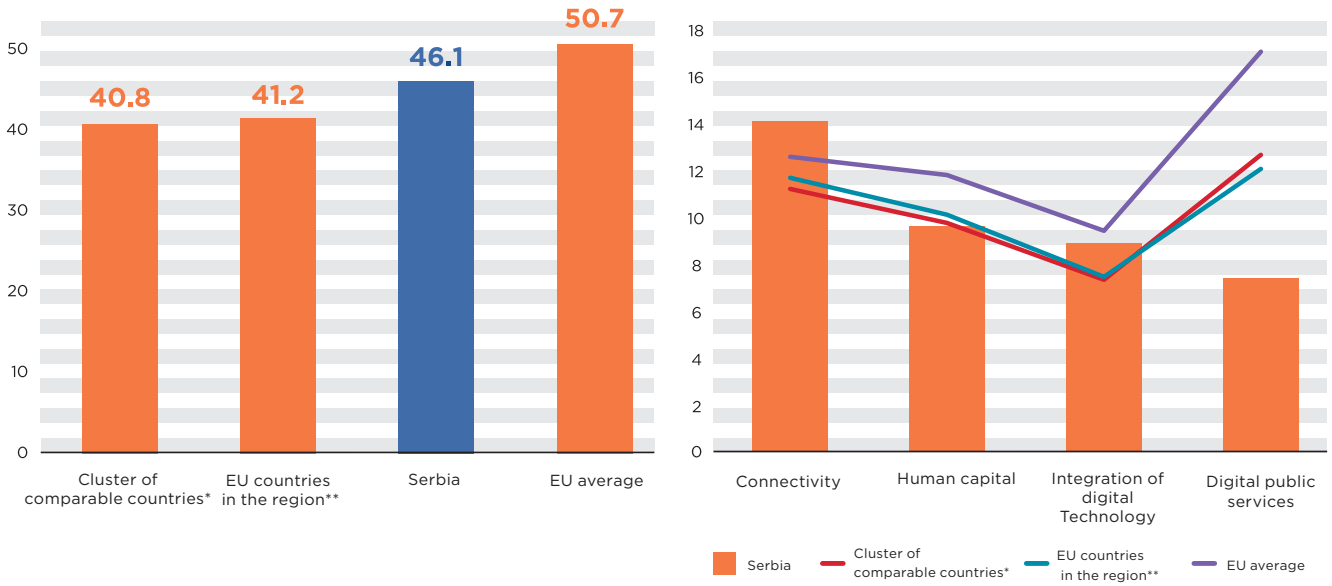


Source for EU countries https://digital-agenda-data.eu/charts/desi-components, as on 15 November 2021

Source for Serbia: RATEL

* DESI for the EU countries does not include Use of Internet services, as this category has been excluded from the 2021 methodology used to calculate values in the EU values.

Figure 3.3. Comparative DESI overview



* Cluster of comparable countries includes countries at a similar level of digital development: Romania, Greece, Bulgaria, Italy, Poland, Hungary, Croatia, Cyprus and Slovak Republic.

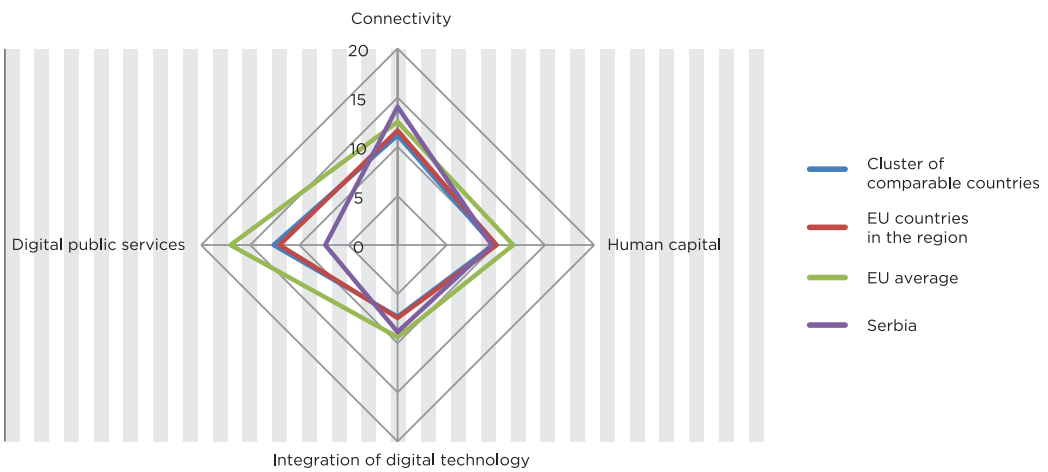
** EU countries in the region: Slovenia, Hungary, Romania, Bulgaria, Croatia and Greece.

the cluster of the countries with a relatively low performance, such as: Romania, Greece, Bulgaria, Italy, Poland, Hungary, Croatia, Cyprus and Slovakia. Average DESI values and values for each category are shown in Figure 3.3.

Average DESI values by dimensions are given in Figure 3.4.

Each dimension includes several sub-dimensions and the values of their indictors are calculation components of DESI. The index is a

Figure 3.4. Average DESI values by dimensions



sum of weighted values for five main dimensions. Sub-dimensions also have weighted values, whereas individual indicators within sub-dimensions have equal value, i.e. the same weight. Biggest changes are evident in the dimensions Connectivity and Digital public services. Weights attributed to the DESI dimensions and sub-dimensions are given below.

Connectivity Dimension

Connectivity is a necessary infrastructure of the digital economy and society, hence this dimension provides information on the types and quality of the Internet access and availability. The sub-dimensions and their indicators are given in Figure 3.5.

DESI Dimensions / Sub-dimensions	Weight
1 Connectivity	**25%**
1a. Fixed broadband take-up	25%
1b. Fixed broadband coverage	25%
1c. Mobile broadband	35%
1e. Broadband price index	15%
2 Human capital	**25%**
2a. Internet user skills	50%
2b. Advanced skills and development	50%
3 Use of Internet services	**15%**
3a. Internet use	25%
3b. Activities online	50%
3c. Transactions	25%
4 Integration of digital technology	**20%**
4a. Business digitalization	60%
4b. e-Commerce	40%
5 Digital public services	**15%**
5a. e-Government	100%

The leading countries in this area are Denmark, the Netherlands and Spain, whereas the countries with the lowest score in the EU are Greece, Bulgaria and Lithuania. The values for Connectivity dimension for the EU countries and Serbia are given in Figure 3.6, while the comparison between Serbia and the cluster of comparable countries and countries in the region is given in Figure 3.7.

Serbia made a slight progress in respect to the last year's s core, which resulted in the rise on the list of European countries for this dimension. However, methodological diffe-

Figure 3.5. Connectivity: Sub-dimensions and their indicators

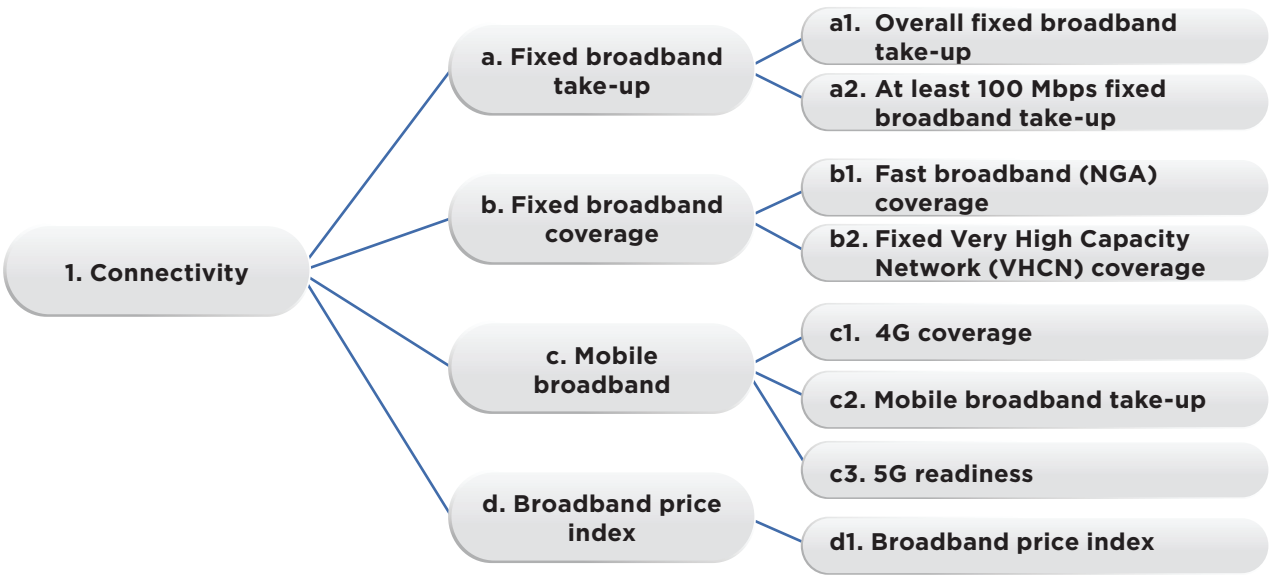


Figure 3.6. 2020 Values for Connectivity dimension for the EU countries and Serbia

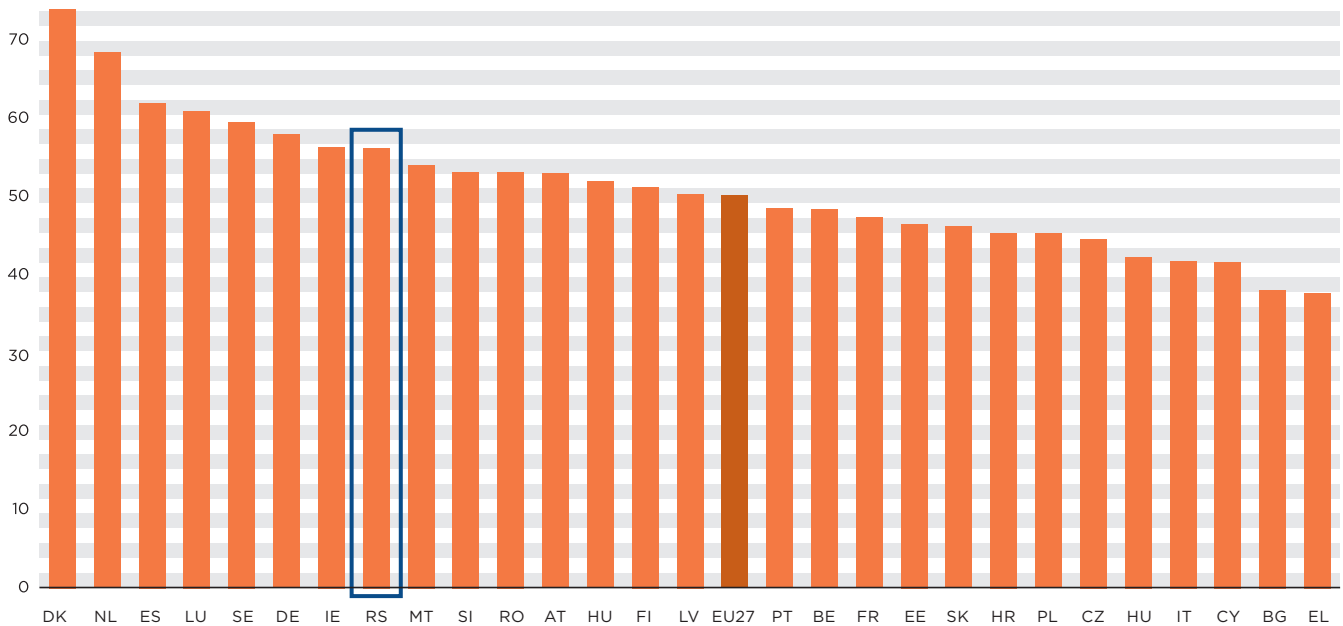
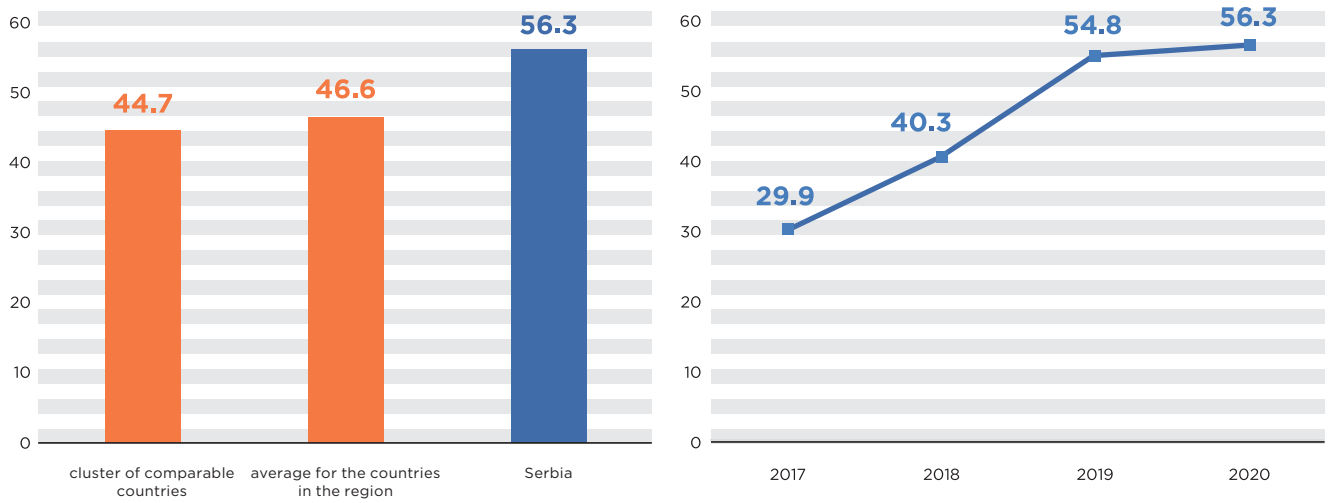


Figure 3.7. Comparative overview of values for Connectivity dimension



rences in the calculation of values for Serbia and for the EU countries also had a significant impact on Serbia's position on the list. All indicators in this category that are comparable with the previous year are higher in 2020. The values for each indicator of the Connectivity dimension for Serbia are given below.

Human Capital Dimension

The Human Capital dimension measures digital skills, basic and advanced, needed to take active part in the digital society and to use digital products and services. Hence, digital skills together with the Internet access, analysed under the previous

Connectivity Indicators		Serbia	Min*	Max*
1a1	Overall fixed broadband take-up	69.6%	50%	100%
1a2	At least 100 Mbps fixed broadband take-up	18.8%	0%	100%
1b1	Fast broadband (NGA) coverage	76.7%	0%	100%
1b2	Fixed Very High Capacity Network (VHCN) coverage	49.2%	0%	100%
1c1	4G coverage	96.7%	0%	100%
1c2	Mobile broadband take-up	95.0%	25	200
1c3	5G readiness**	n/a	0%	100%
1d1	Broadband price index	70.6	0	100

* Minimum and maximum value is predefined and used to normalize different units of indicators, converting them into values on scale from 0 to 10.

** Decision on 5G spectrum auction has not been reached in 2020.

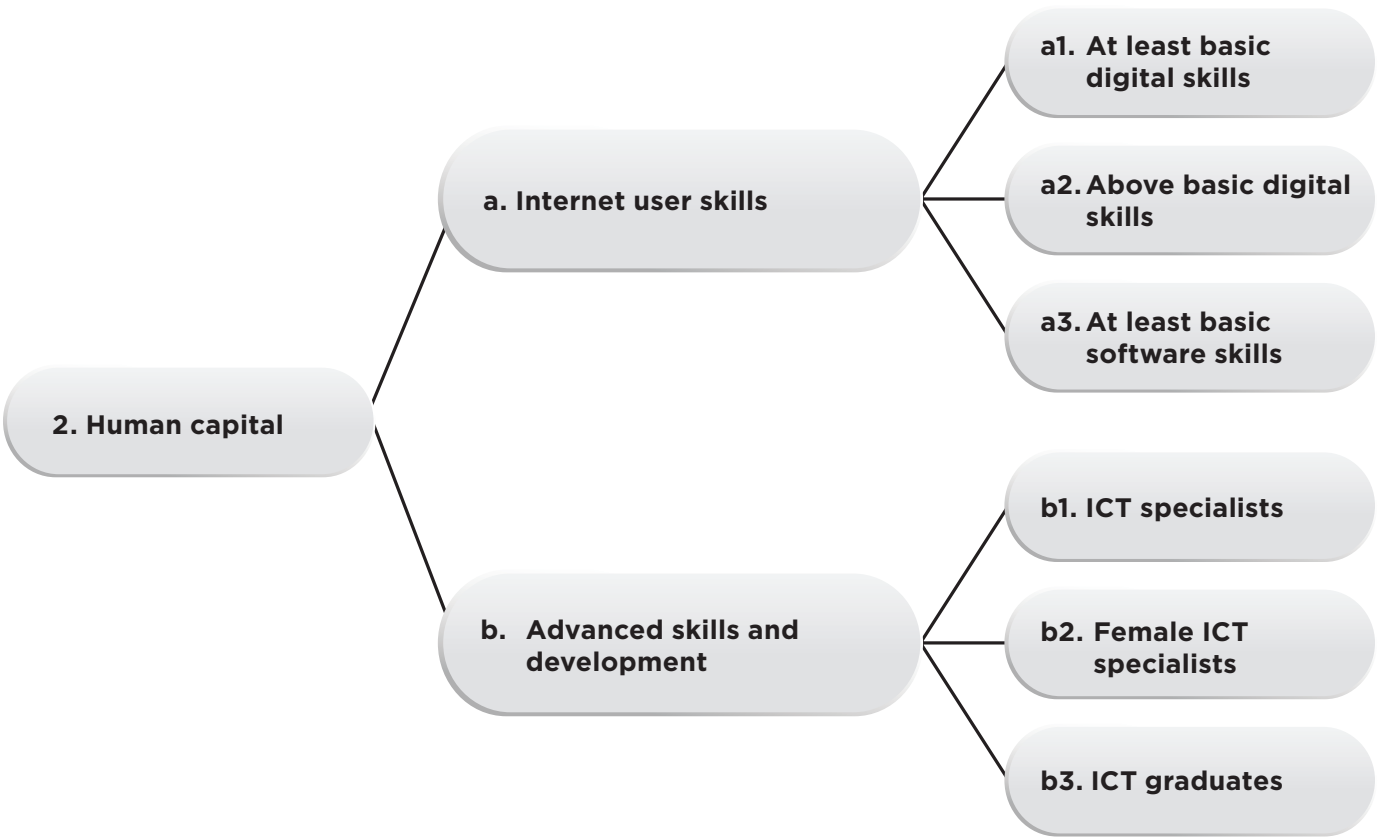
Source: RATEL

dimension, are considered to be necessary infrastructure for the digital economy and society.

Sub-dimensions and indicators under Human Capital dimension are given in Figure 3.8.

The leading countries in this dimension are Finland, Sweden and the Netherlands, whereas the countries with the lowest score in the EU are Bulgaria, Romania and Italy. The values for Human Capital dimension in the EU and Serbia are given in Figure 3.9, whereas the comparison with the compara-

Figure 3.8. Human Capital – sub-dimensions and indicators



ble countries cluster and countries in the region is shown in Figure 3.10.

Compared with the European countries, Serbia is among the least successful in this dimension. Despite the progress made in several areas comparable with the previous year (with rise of "At least Basic Skills" and the number of ICT Specialists), the modifications made to the methodology, which in-

Figure 3.9. The values for Human Capital dimension in the EU and Serbia in 2020

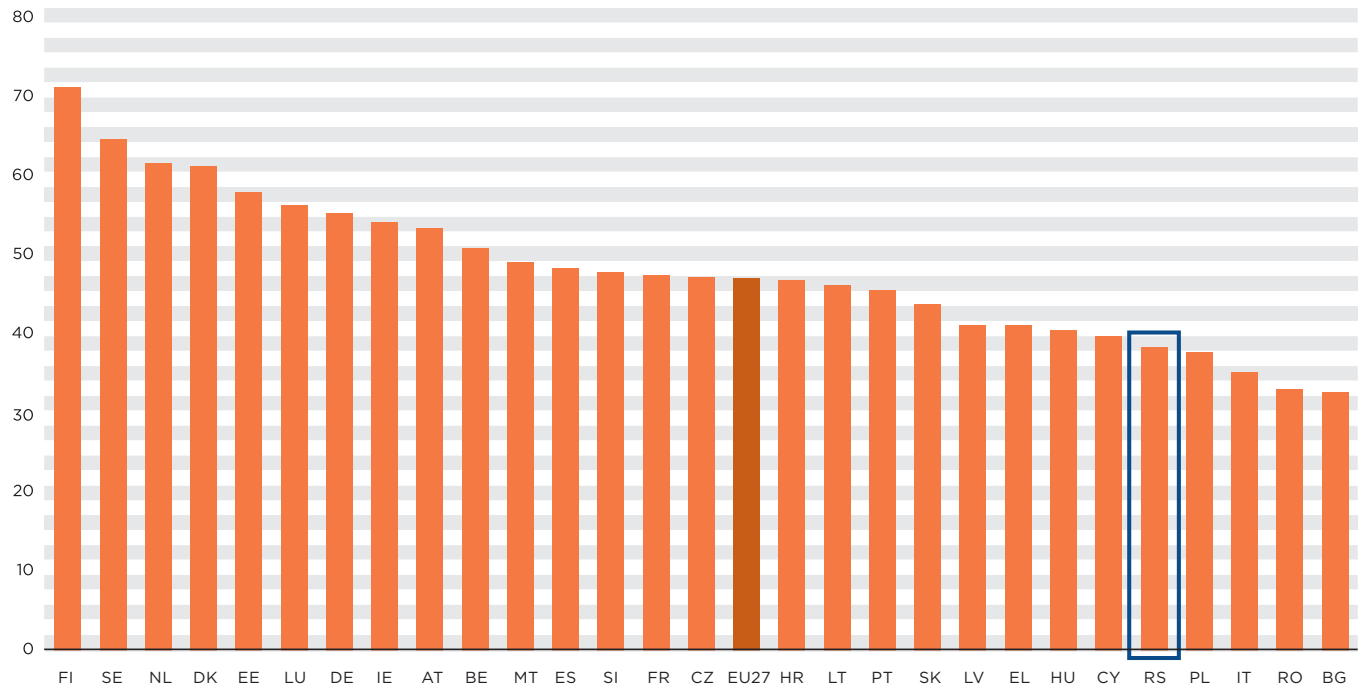
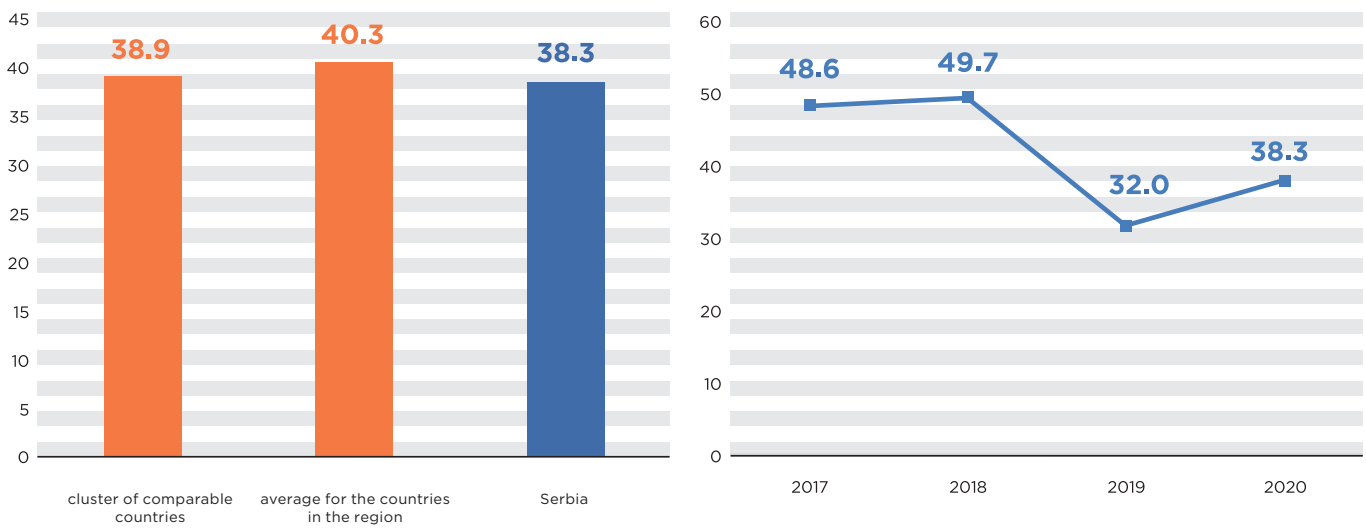


Figure 3.10. Overview of compared values for the Human Capital dimension



volved excluding two earlier and including four new indicators, led to significantly lower results compared with the previous year. The values of individual indicators under Human Capital dimension for Serbia are given below.

Use of Internet Services Dimension

This dimension measures the usage of online content (music, films, video games, social networks) modern communications (video calls) and e-commerce. These activities are key drivers of broadband networks and services development. Sub-dimensions and indicators under Use of Internet Services dimension are given in Figure 3.11.

The value for Use of Internet Services dimension in Serbia for 2020 is slightly lower than that for the previous year. Comparison with an EU country is not possible, since Use of Internet Services dimension has been excluded from the 2021 DESI calculation methodology used to calculate the values in the EU. The omission of this dimension is the result of aligning DESI with the Europe's digital transformation targets by 2030 set by the European Commission. The targets are evolved around four cardinal points: digital skills, digital infrastructure, digital transformation of businesses and digitalization of public services. Progress will be monitored through DESI, which will in turn be structured to follow the four areas in the focus of the digital transformation.

Human Capital Indicators		Serbia	Min	Max
2a1	At least basic digital skills	47.1%	0%	100%
2a2	Above basic digital skills	20.3%	0%	66%
2a3	At least basic software skills	4.3%	0%	100%
2b1	ICT specialists	2.7%	0%	7%
2b2	Female ICT specialists	1.5%	0%	4%
2b3	ICT graduates	7.4%	0%	10%

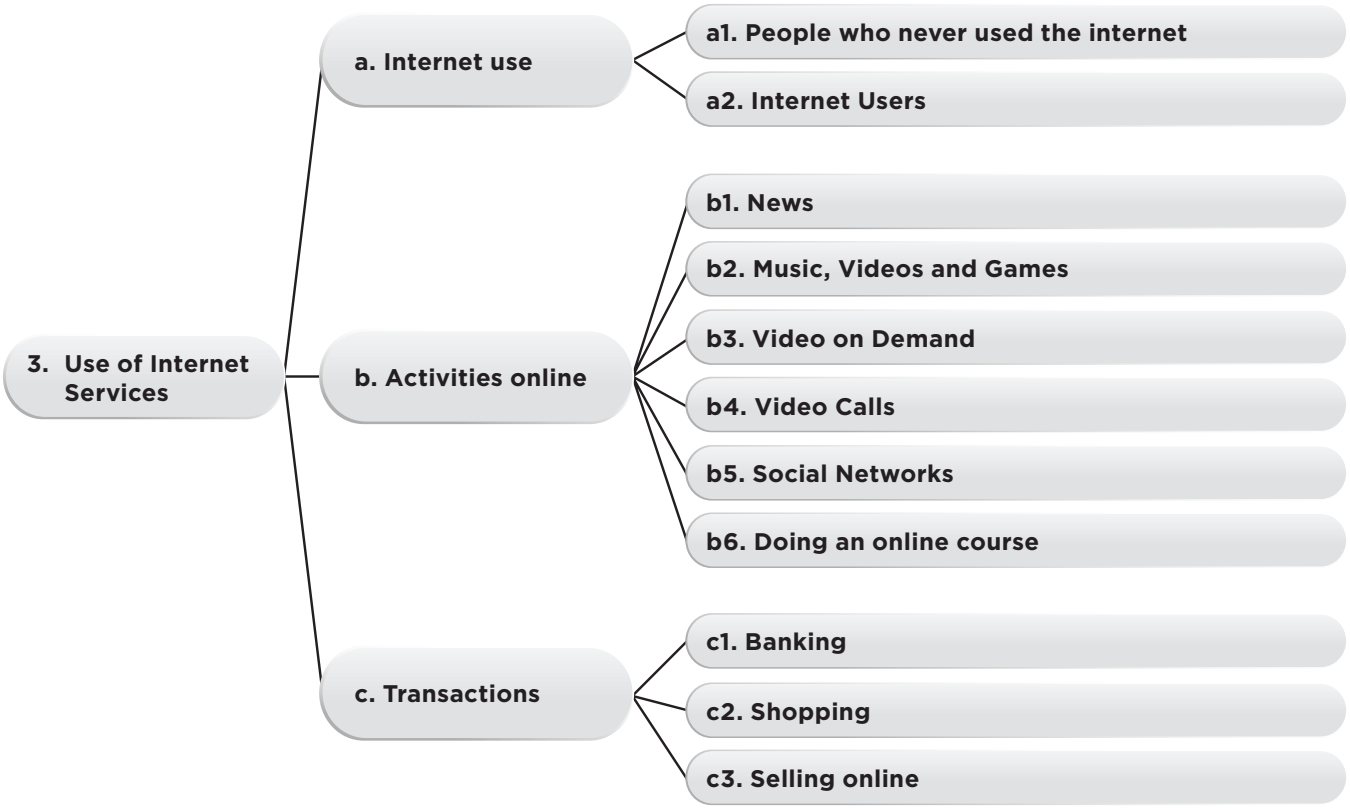
Source: Statistics Office

The values of individual indicators for Serbia for 2020 are given below.

Integration of Digital Technology Dimension

The Integration of Digital Technology dimension reflects the fact that in the digitisation is one of the main drivers of economic growth. By adopting digital technologies (cloud, Big data, IoT, etc.) businesses can enhance efficiency, reduce costs and better engage customers and business partners, therefore it is

Figure 3.11. Use of Internet Services: Sub-dimensions and indicators



Use of Internet service Indicators		Serbia	Min	Max
3a1	People who have never used the Internet	17.4%	0%	45%
3a2	People who have used the Internet at least once a week	76.7%	40%	100%
3b1	Newspapers and magazines	73.6%	33%	100%
3b2	Music, Videos and Games	76.2%	50%	100%
3b3	Video on Demand	13.1%	0%	75%
3b4	Video Calls (e.g. Skype)	80.5%	20%	100%
3b5	Social Networks	71.2%	40%	100%
3b6	Doing an online course	6.7%	0%	30%
3c1	Banking	20.0%	0%	100%
3c2	Shopping	47.9%	0%	100%
3c3	Selling online	8.1%	0%	60%

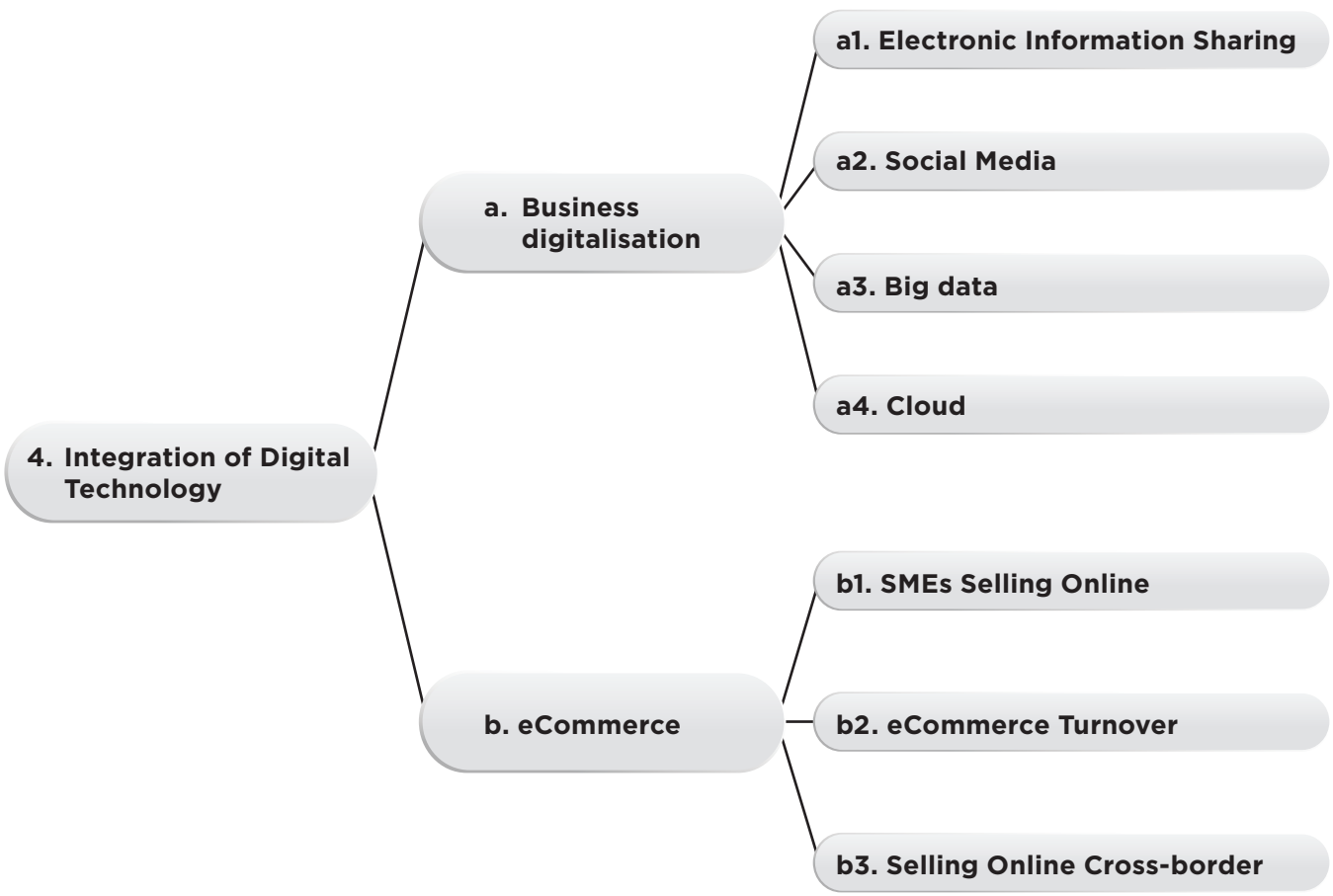
Source: Statistics Office

crucial for competitiveness. Sub-dimensions and indicators under the Integration of Digital Technology Dimension are given in Figure 3.12.

The leading countries in this dimension are Finland, Denmark and Sweden, whereas the countries with the lowest score in the EU are Bulgaria, Hungary and Romania. The values for Integration of Digital Technology dimension in the EU and Serbia are given in Figure 3.13, whereas the comparison with the comparable countries cluster and countries in the region is shown in Figure 3.14.

Serbia's score in Integration of Digital Technology dimension is lower than the previous year, yet it is above average mainly due to high indicators for businesses selling online. It should be noted that comparability with the EU countries is limited due to differences in methodology used for Serbia on the one

Figure 3.12. Integration of Digital Technology - sub-dimensions and indicators



hand and the EU countries on the other. The values of individual indicators under Digital Technology dimension for Serbia for 2020 are given below.

Digital Public Services Dimension

Digital Public Services dimension measures digital technologies which serve to enhance the interaction of citizens and business-

Figure 3.13. The values for the Integration of Digital Technology dimension in the EU and Serbia for 2020

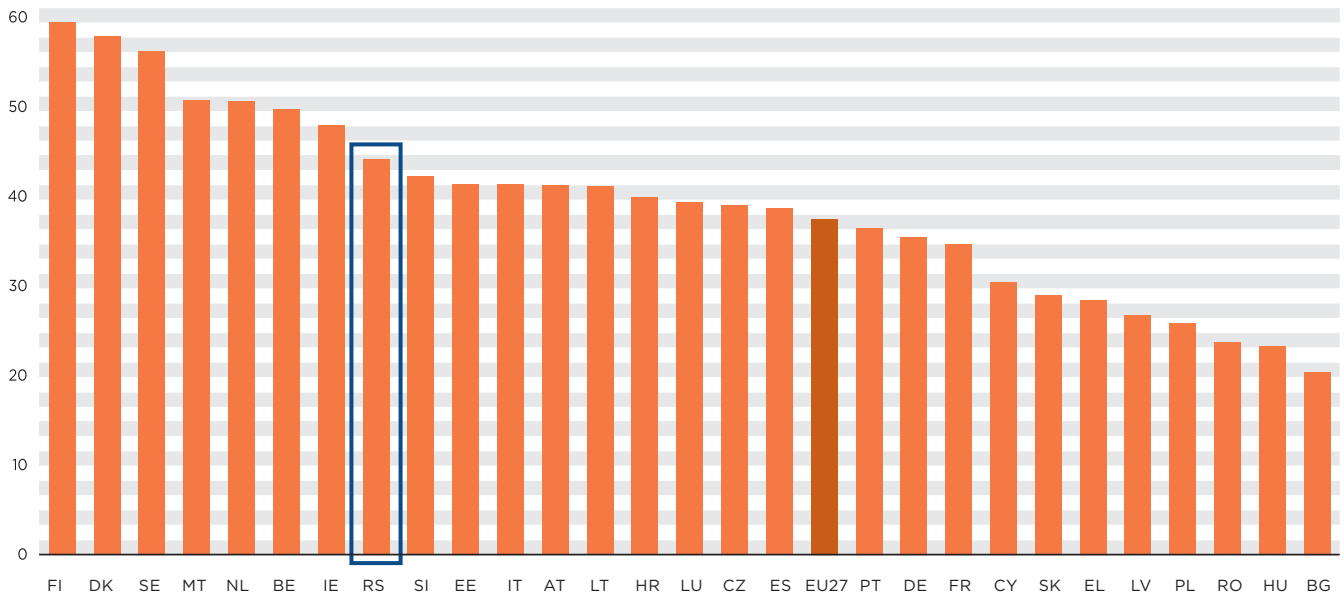
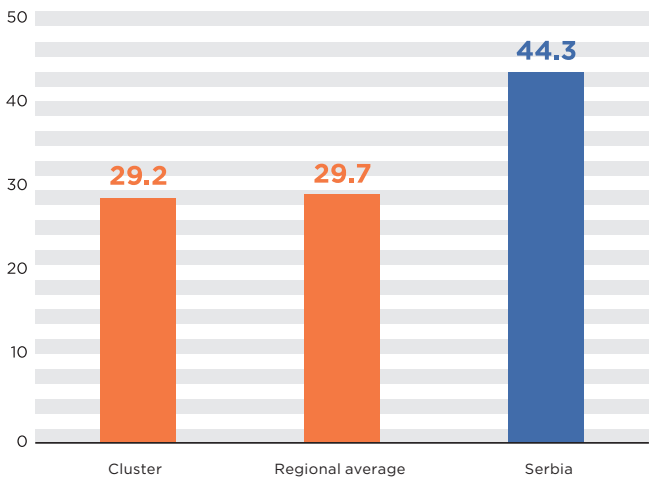
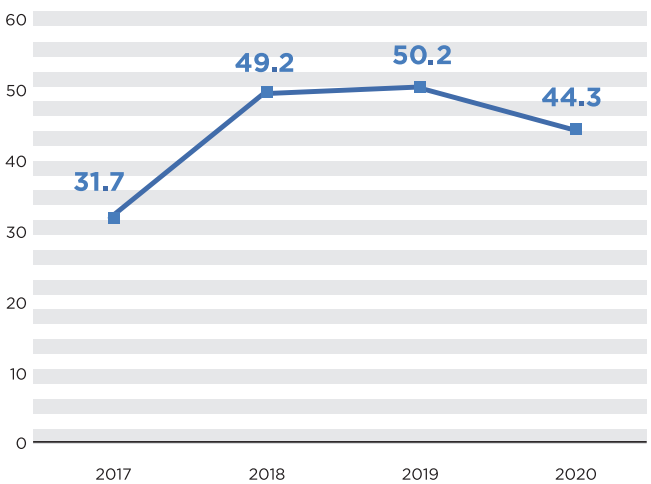


Figure 3.14. Overview of compared values for the Integration of Digital Technology dimension





Digital Technology dimension – indicators		Serbia	Min	Max
4a1	Electronic Information Sharing (ERP)	32.5%	0%	60%
4a2	Social Media	19.8%	0%	50%
4a3	*Big data*	2.0%	0%	33%
4a4	*Cloud*	18.6%	0%	50%
4b1	SMEs Selling Online (min 1% turnover)	26.1%	0%	33%
4b2	eCommerce Turnover	23.6%	0%	33%
4b3	Selling Online Cross-border	7.3%	0%	25%

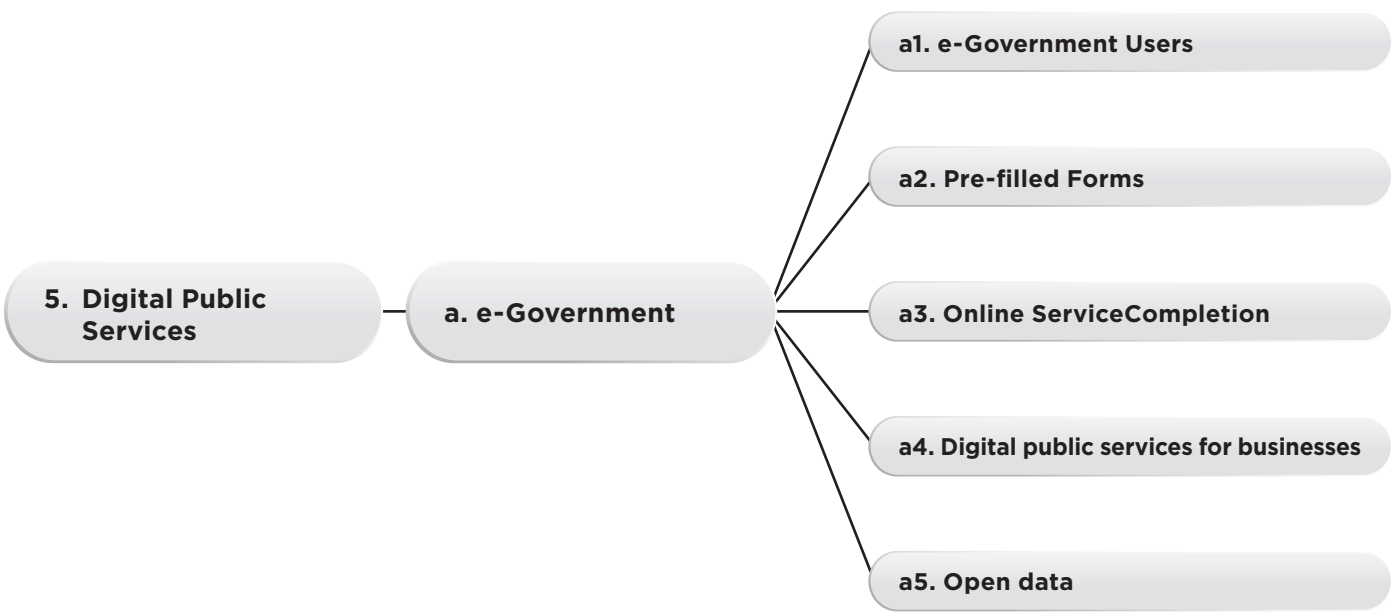
Source: Statistics Office

es with public administration, focusing on e-Government, as shown in Figure 3.15.

The leading countries in this dimension are Estonia, Denmark and Finland, whereas the countries with the lowest score in the EU are Romania, Greece and Hungary. The values for Digital Public Services dimension in the EU and Serbia are given in Figure 3.16, whereas the comparison with the comparable countries cluster and countries in the region is shown in Figure 3.17.

Despite slightly improved results in Digital Public Services dimension, Serbia remains among the least successful countries in this dimension in Europe. This is mainly due to low values of e-Government-related indica-

Figure 3.15. Digital Public Services dimension



tors, specifying the level of sophistication of public administration services available online.

Serbia is below EU average for most indicators in this dimension, except for the Open data indicator where it scored high. Open data indicator is a composite indicator, indicating the degree to which a country applies open data policy, including political, social and economic impact of open data, along with the characteristics of the national

Figure 3.16. The values for the Digital Public Services dimension in the EU and Serbia for 2020

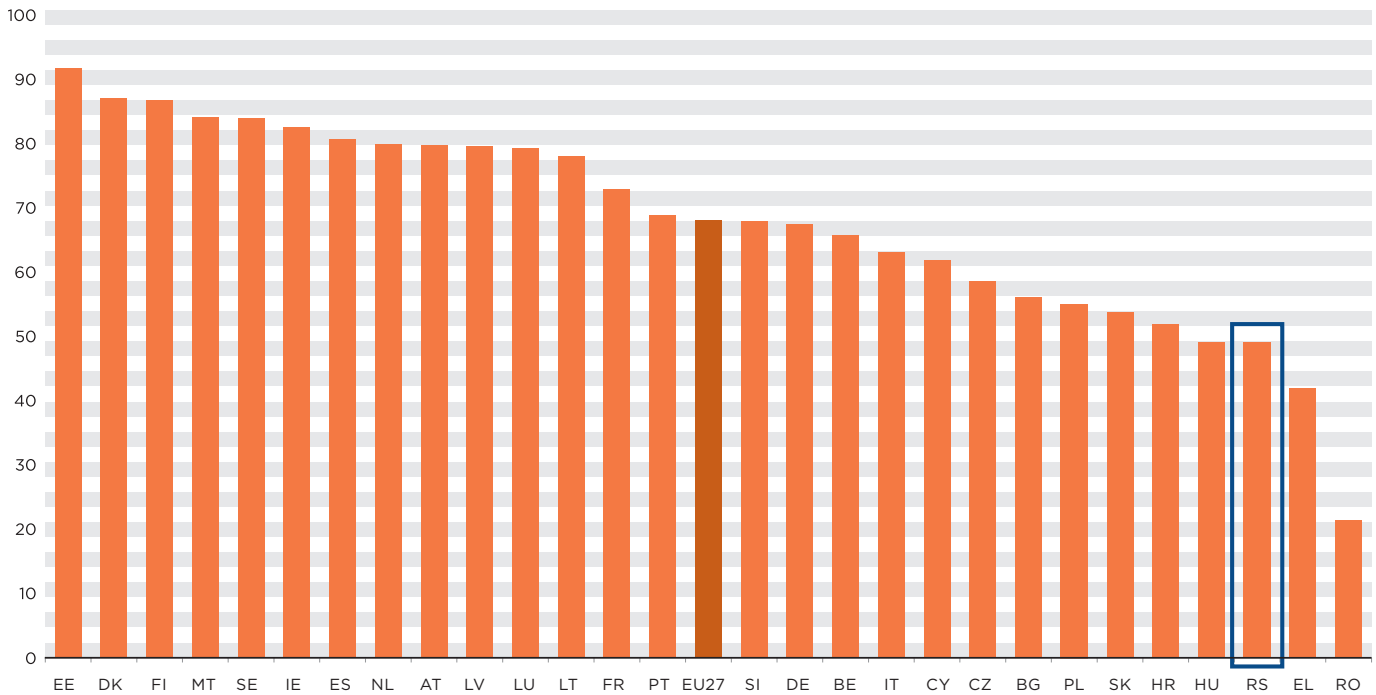
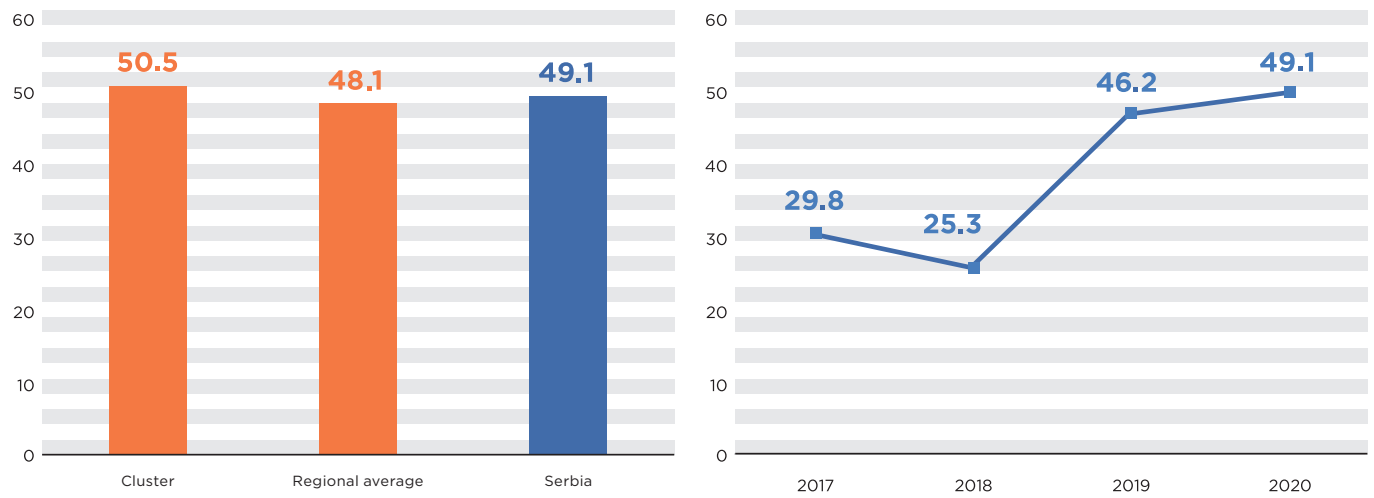


Figure 3.17. Overview of compared values for the Digital Public Services dimension



data portals (functionality, availability and usage). The values of individual indicators under Digital Public Services dimension for Serbia are given below.

Digital Public Services Indicators		Serbia	Min	Max
5a1	e-Government Users (submitting filled out forms via Internet)	23.9%	0%	100%
5a2	Pre-filled Forms	37	0	100
5a3	Online Service Completion	75	40	100
5a4	Digital public services for businesses	68	20	100
5a5	Open data	66.2%	0%	100%

Source: Statistics Office

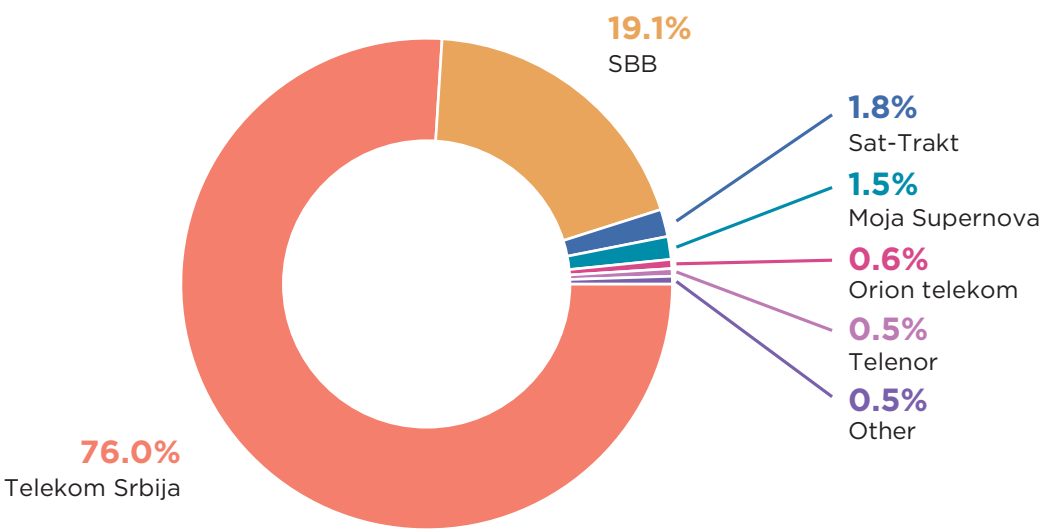
4. PUBLIC FIXED TELECOMMUNICATIONS NETWORKS AND SERVICES

At the end of 2020, there were 28 operators registered for the public telephone service provision over fixed-line network.

In 2020, Telekom Srbija had approximately 4% of subscribers less than in the previous year, but it remained the biggest public fixed telecom network operator and its business activities had the largest impact on the fixed telephony market in 2020. In the region, Telekom Srbija is present in the markets of Republika Srpska and Montenegro. The operator SBB is the second largest fixed-line operator according to the number of subscribers, with an increase of 9% in respect to the previous year.

Market shares of pubic fixed telecom service operators via fixed network in terms of the number of telephone lines is given in figure 4.1.

Figure 4.1. Market shares of pubic fixed telecom service operators via fixed network

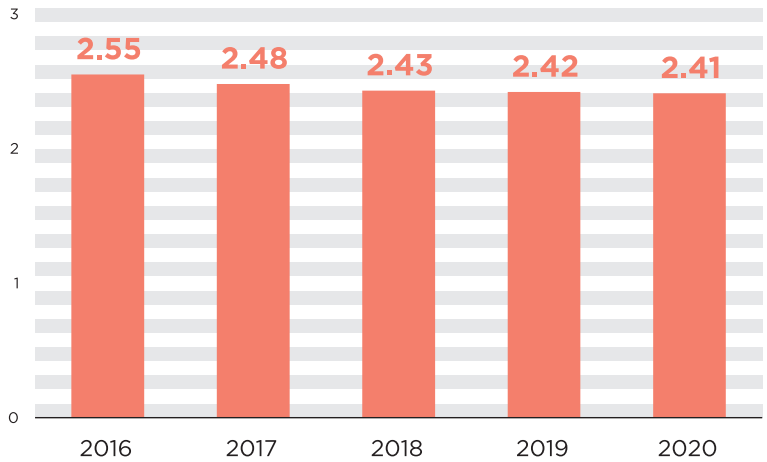


Source: RATEL

The number of fixed line subscribers continued to sightly decrease, amounting to 2.41 million at the end of 2020. The number of subscribers includes users of electronic communications services provided at a fixed location via public mobile networks (Cellular Local Loop–CLL) by Telekom Srbija and Vip mobile, which take up 0.5% of the total number of subscribers in 2020. Residential users are still dominant, with a 88% share in the total number of users. In 2020, the digitalization rate was 99.98% in Telekom Serbia's network, whereas all other operators have a 100% digitalization rate. The number of payphones continued to decrease, amounting to 2099 in 2020.

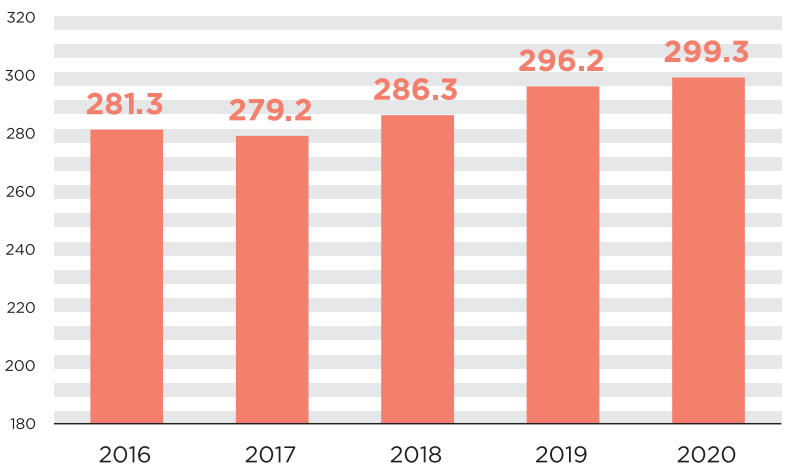
The share of business subscribers in 2020 was approximately 12%. The trend over the past years is shown in Figure 4.3.

Figure 4.2. Number of fixed network subscribers (million)



Source: RATEL

Figure 4.3. Number of business subscribers (in thousands)



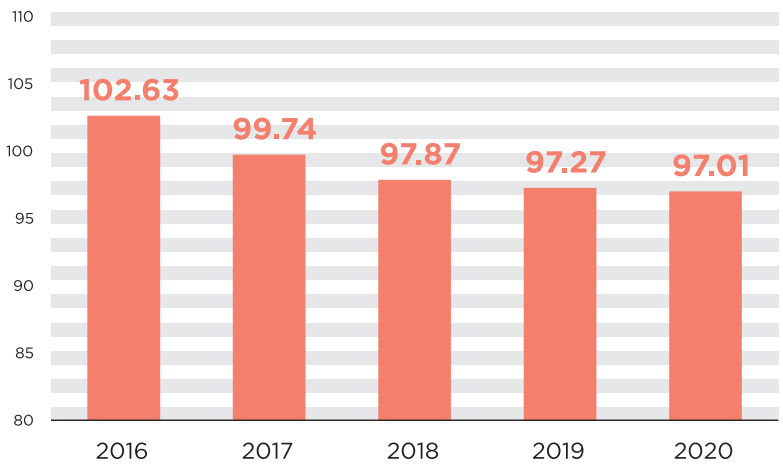
Source: RATEL

Fixed telephony penetration rate, in terms of households, was 97% in 2020, as given in Figure 4.4.

The number of ISDN subscribers in 2020 was approximately 20.5 thousand, which is by 11% less year on year. 7% of ISDN subscribers have primary rate access, whereas other users have a basic rate access. As expected, ISDN connections are following a downtrend, due to technological migration of users to advanced IP-based technologies.

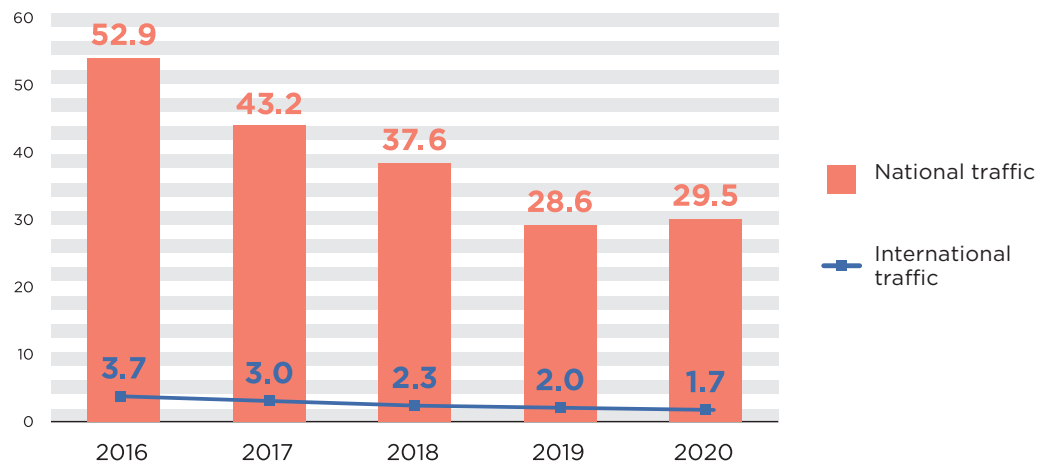
The total traffic over fixed network in 2020 increased by approximately 2% year on year, the national traffic being estimated to 2.95 billion of minutes and the international traffic to 173 million of minutes. The increase seen in the total national traffic is mainly due to increase in traffic toward other fixed networks,

Figure 4.4. Fixed line penetration rate – households



Source: RATEL

Figure 4.5. Total traffic (in hundreds million minutes)



Source: RATEL

whereas international traffic, with 13% of minutes less than in the previous year, continues to drop due to the increasing trend of using VoIP applications.

Despite a slight decrease over the years, the biggest share in the total traffic still goes to the traffic made within the same network (66%), whereas the smallest share goes to the traffic made to non-geographic numbers and short codes (1%). Fixed network traffic distribution in 2020 is given in figure 4.6. The traffic made to non-geographic numbers and short codes includes both minutes made within the same network and to other networks, whereas international traffic includes outgoing international traffic from fixed network to other fixed and mobile networks and incoming international traffic made to fixed network.

The average call duration was 4.30 minutes for a call made within the same network, 1.87 minutes for a call made to mobile network and 4.81 minutes for an international call.

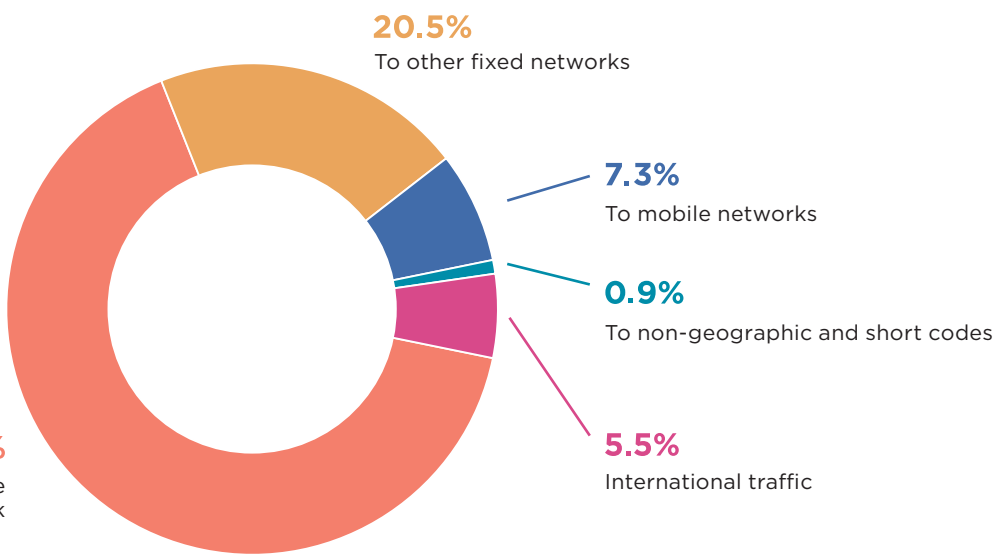
The total number of VoIP operators at the end of 2020 was approximately 30.9 thousand, which is a 25% decrease year on year. There were 3 million of minutes of traffic and there were 157 million minutes of international transit.

Per-minute rates for the local and national calls and for calls to mobile networks of the operators with the biggest number of subscribers are given in Figure 4.7. The rates ranged between 1 and 1.2 dinars per minute for fixed-line calls, and between 8 and 10 dinars per minute for the calls made to mobile networks.

The rates for the international calls have not been significantly modified compared with the previous year. The information on the rates is available on the official websites of the operators.

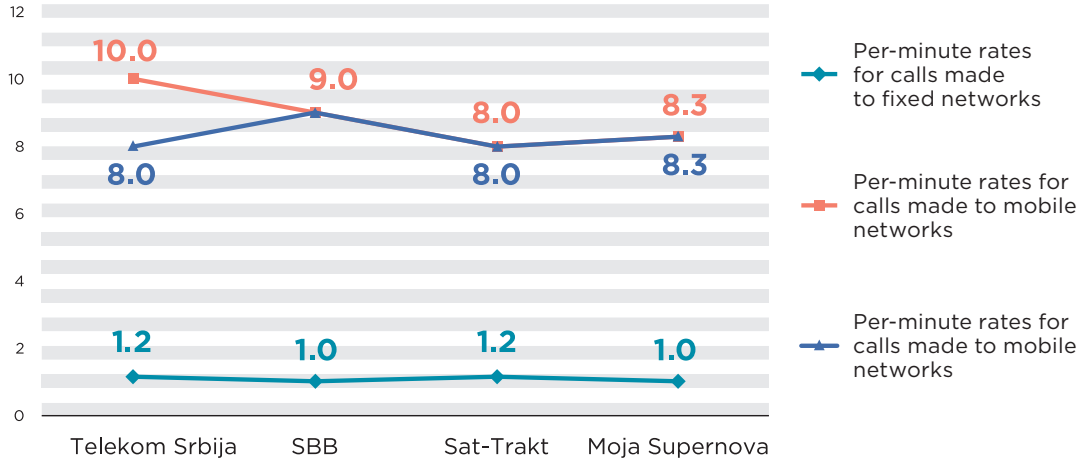
The total revenues from fixed telephone services provided by all operators registered for this service in the territory of the Republic of

Figure 4.6. Fixed network traffic distribution in 2020



Source: RATEL

Figure 4.7. Fixed-line calls and fixed-to-mobile telephone service rates in 2020 VAT included (RSD)

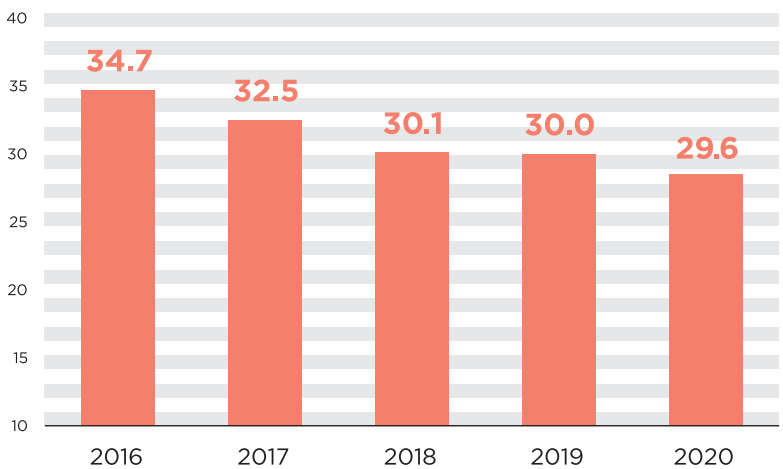


Source: RATEL

Serbia in 2020 were somewhat lower compared to the previous year, amounting to 29.6 billion dinars, including the revenues made from VoIP services in the amount of 4.8 billion dinars. The investments made in the fixed telephony services in 2020 amounted to approximately 8.7 billion dinars, which is slightly lower than in the previous year.

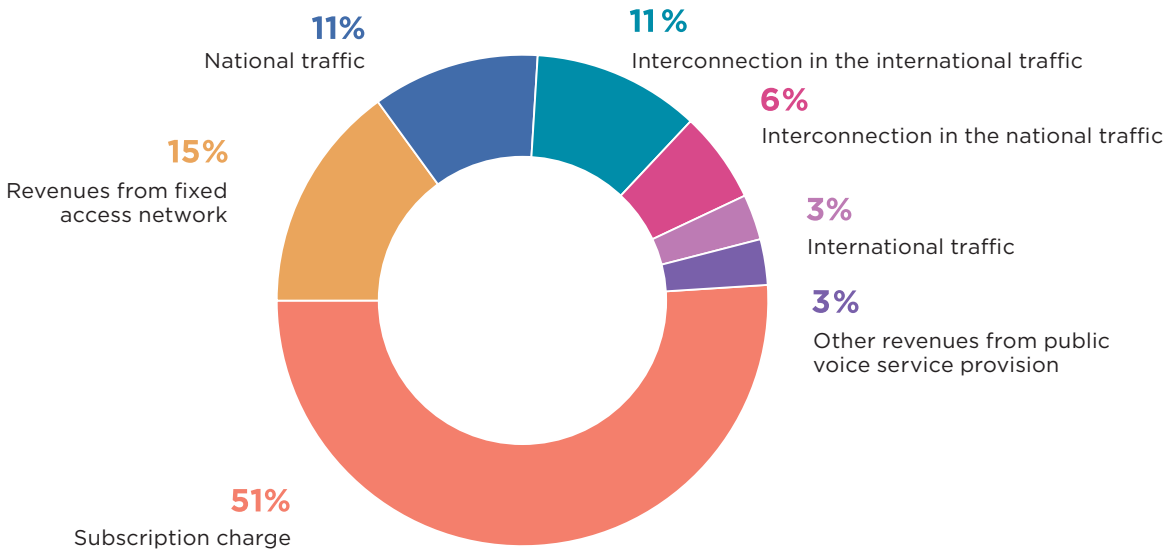
Despite being lower that in the previous year, the subscription charges, in the amount of 12.7 billion dinars, still have the largest share in the total revenues, accounting for almost one half of total fixed network service revenues in 2020, without revenues from VoIP. The revenues made from the national traffic, in the amount of 2.7 billion remained the same, while the revenues made from the international traffic, in the amount of 0.7 billion, are lower compared with those in the previous year following the decrease in the number of minutes of international traffic made in 2020. The revenues from

Figure 4.8. Revenues from fixed telecom networks and services (billion dinars)



Source: RATEL

Figure 4.9. Structure of revenues from fixed telecom network in 2020



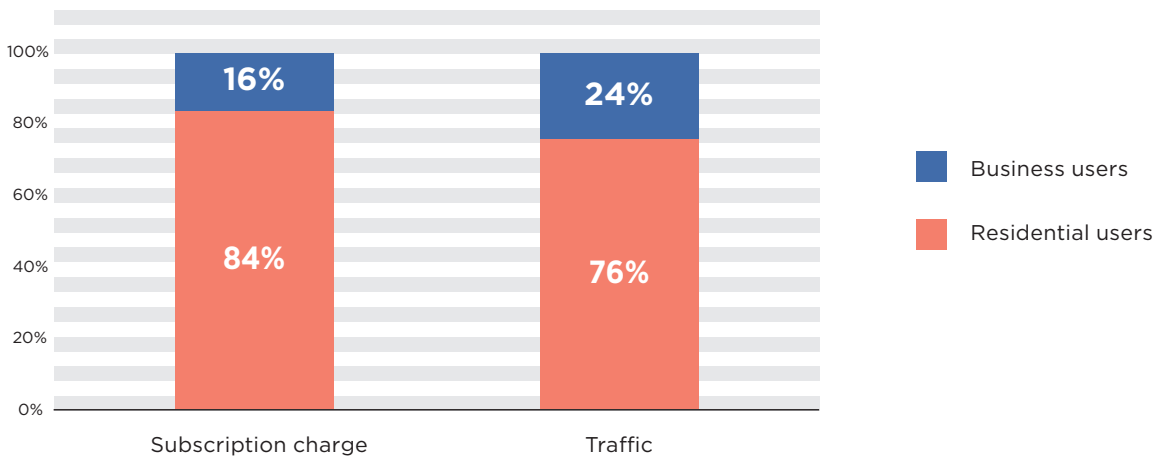
Source: RATEL

interconnection in the national and international traffic also dropped slightly.

Other revenues from public voice service provision include revenues from special services on fixed network (call identification, call on hold, call diverting, etc), revenues from connection fees, value added services - VAS, public payphones, etc. Revenues from fixed access network include revenues from data transmission, leased capacities on national market, international data transmission and leased capacities, LLU (full or shared), co-location, leased cable ducts, etc.

There are no significant changes in the share of residential and business users in the revenues from subscription charge and traffic made, as shown in Figure 4.10.

Figure 4.10. Share of residential and business users in the revenues made from subscription charge and traffic made



Source: RATEL

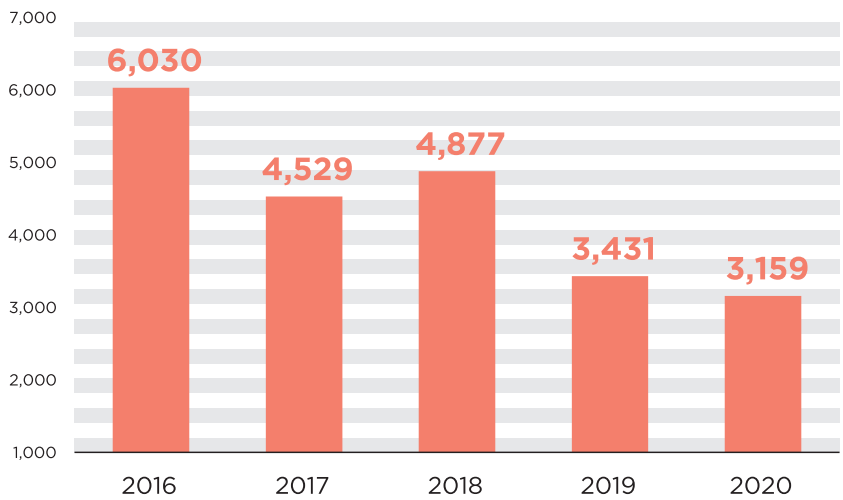
The interest for the number portability service on public fixed telephone networks showed a slight decrease. In 2020, the monthly average of ported numbers was 3,159.

During 2020 there were 37,909 fixed line subscribers who changed the operator while keeping the same number, so that the total of ported numbers amounted to 375,644 at the end of 2020 (Figure 4.12).

Leased Lines

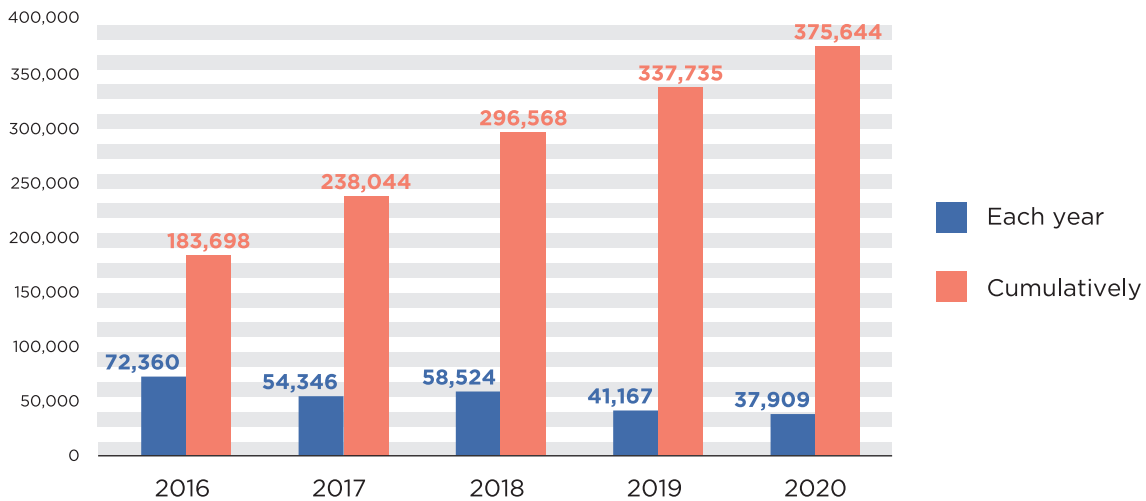
Leased lines are a significant part of the market of electronic communications, being the essential means for service provision for some operators, such as transport infrastructure. Also, big business users (as end-users) use leased lines to connect remote branches and to enable various data transmission.

Figure 4.11. Monthly average of ported numbers each year



Source: RATEL

Figure 4.12. Portings made each year and in total



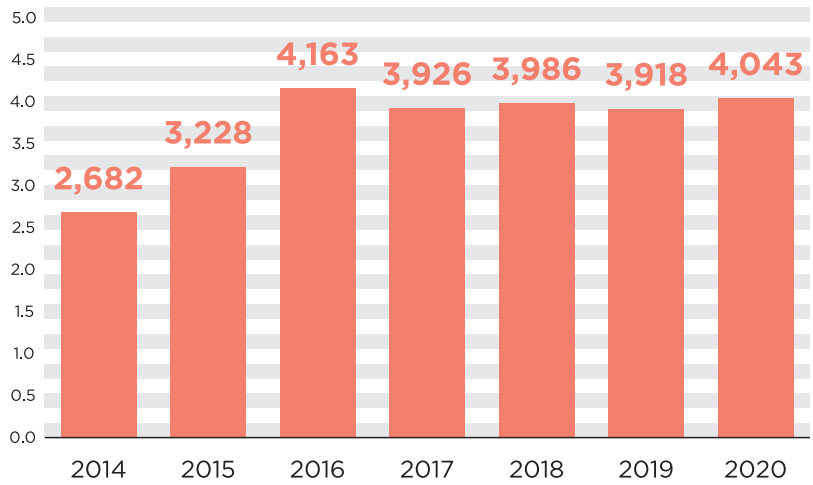
Source: RATEL

Leased lines are a particular type of closely defined and transparent transmission capacities, which should not require any additional synchronisation to be made by the users (operators) when leasing lines. Leased line may be defined as a fixed "reserved" line, implying a constant guaranteed symmetrical transmission i.e. equal download/upload speeds, regardless of the type of user (operator or end user).

international leased lines was 4,043, while national lines accounted for 96.2% of the total in 2020.

As for technologies, most national leased lines are Ethernet based (39% in 2020). The share of traditional digital lines is decreasing and the number of xWDM based lines enabling symmetrical high-speed data transmission rates (up to 40 Gbps) remained unchanged. Since

Figure 4.13. Total number of leased lines over years



Source: RATEL

Leased lines can be provided by using different technologies and transmission media, such as: fiber-optic cables, radio links, copper pairs, etc. and can be both analogue and digital. The service satisfies user needs for a reliable high-quality transmission capacity with symmetrical and stable guaranteed speed rates and it is often offered, especially to business users, together with services such as VPN, direct high-speed Internet access, VoIP, connections with data centres and customer support centres, etc.

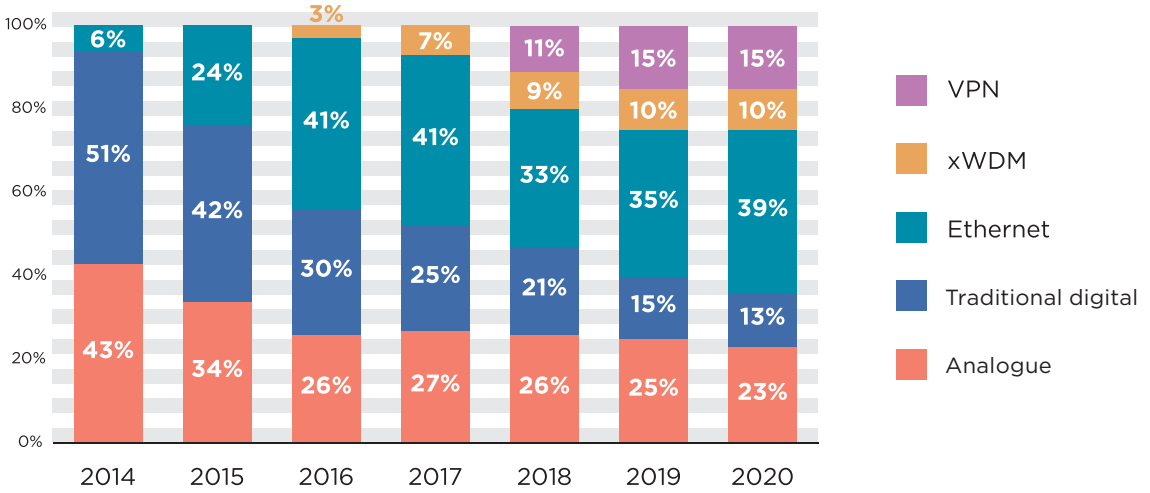
According to available data, leased lines service was provided by 33 operators in Serbia in 2020 and the total number of national and

2018, data on VPN end-user service are being collected, presenting, in terms of high-quality access provision, an equivalent to the traditional leased lines service, with a 15% share in the total number of lines.

Analogue leased lines account for one quarter of leased national lines. This service is no longer available to new users and its presence is a result of valid contracts on lease closed for a period of 5 to 10 years. Therefore, a continued drop may be expected as the contracts come to expire.

In terms of speed, the most common national line transmission technologies in 2020 are

Figure 4.14. Distribution of national leased lines according to access type

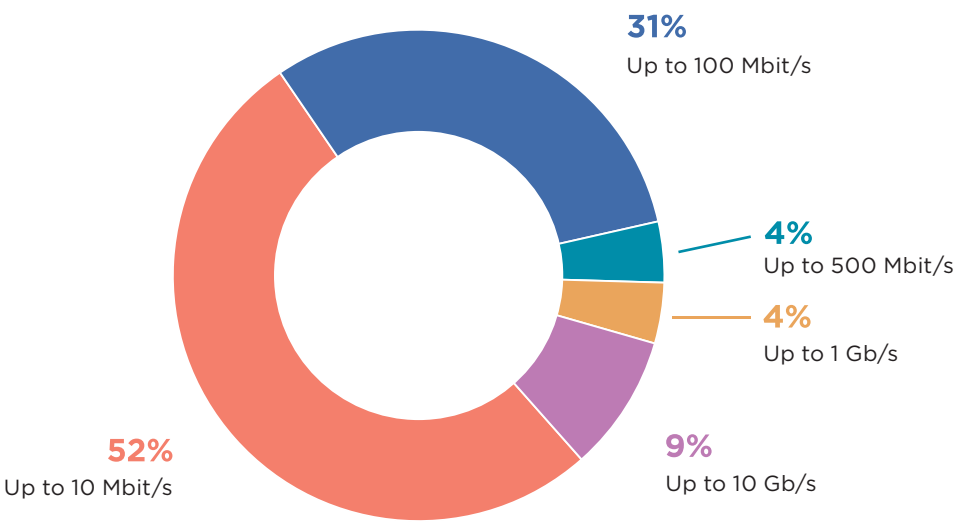


Source: RATEL

Ethernet 10 Mbit/s lines with 52% share, followed by Ethernet 100 Mbit/s lines with 31% share (cf. 25% in 2019). The least common are Ethernet 500 Mbit/s to 10 Gb/s lines with 4% share, while 1Gb/s lines have a 9% share which is an increase with respect to 6% year on year.

Leased lines is a service used by business users (companies, organizations, institutions and public authorities) that need to connect several units at different locations, in order to ensure an uninterrupted data transmission. The service is also used by operator users to

Figure 4.15. Distribution of Ethernet national leased lines according to speed in 2020

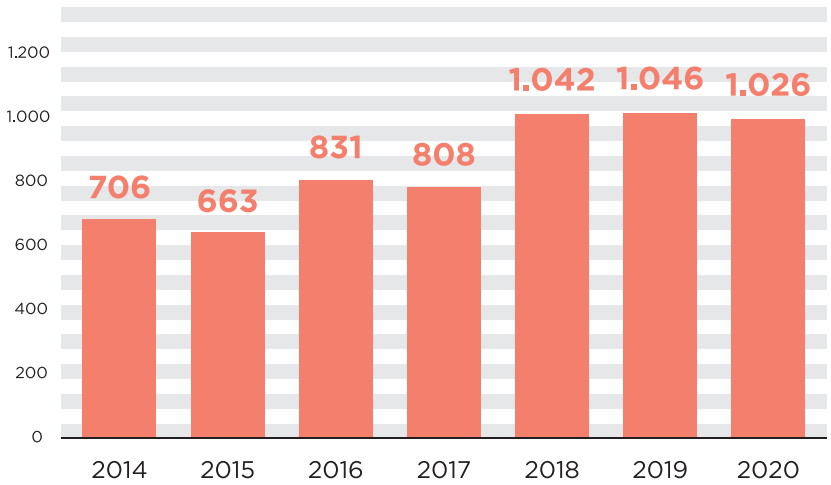


Source: RATEL

build and to connect their own network, to connect it to the networks of other operators and to provide retail service to their own end users.

The total revenues made from national and international leased lines in 2020 were over a billion dinars, only slightly lower than the previous year. The share of revenues made from international lines in the total revenues is 15%.

Figure 4.16. Revenues made from leased lines in 2020 (million dinars)



Source: RATEL

5. PUBLIC MOBILE TELECOMMUNICATIONS NETWORKS AND SERVICES

Mobile telephony services in the Republic of Serbia were provided by the following three operators in 2020:

- **Telecommunications Company Telekom Srbija Joint Stock Co. - Mobilna telefonija Srbije MTS**, 58.11% owned by the Republic of Serbia – the Government of the Republic of Serbia, 20% owned by Telekom Srbija, 14.95% owned by the citizens of the Republic of Serbia and 6.94% owned by the current and former employees of Telekom Srbija and its predecessor [4]

- **Telenor Ltd., Belgrade**, 100% owned by PPF TMT Bidco 1 B.V., the Netherlands

- **Vip mobile Ltd**., 100% in the ownership of Mobilkom CEE Beteiligungsverwaltung GmbH, Austria.

Based on the individual licences for RF usage issued upon public bidding procedure, all three operators are using the following RF bands on technologically neutral basis:

- 791-821/832-862 MHz;
- 890-915/935-960 MHz;
- 1710-1780/1805-1875 MHz;
- 1900-1915 MHz (this band remains unused by the operators);
- 1920-1965/2110-2165 MHz.

Operators are using GSM (2G), UMTS (3G) and LTE (4G) technology.

The licences were issued in 2006 for the territory of the Republic of Serbia, for a period of 10 years, and in 2016 they were duly amended and extended for another 10 years.

In addition to network operators, two virtual mobile operators were also registered, **Mundio Mobile d.o.o.**[5] and **Globaltel d.o.o.**

4G network was launched in 2015 in the Republic of Serbia. In the beginning of 2015, the public bidding procedure for the issuance of individual licences for the usage of radio frequencies in the 1710-1785/1805-1880 MHz frequency bands, in which all three mobile operators had participated, was completed. In March 2015, individual decisions were awarded to all three operators, granting the usage of two 5 MHz-radio frequency blocks, each. The requirements were thus met for the 4G

4 Source: www.mts.rs

5 **Mundio Mobile d.o.o.** did not provide services in 2020.

mobile technology to be launched, enabling better coverage and faster Internet on the territory of the Republic of Serbia. In the second half of 2015, public bidding procedure for the issuance of individual licences for the usage of radio frequencies in the 791-821/832-862 MHz frequency bands in the territory of the Republic of Serbia, in which all three mobile operators had participated, was successfully carried out. Upon the completed procedure, in January 2016 individual decisions were awarded to all three operators, granting the usage of two 10 MHz-radio frequency blocks, each, in the 791-821/832-862 MHz frequency bands.

Telekom Srbija Joint Stock Co. has been providing mobile telephony services since 1998. In addition to the Serbian market, Telekom Srbija is also present as a mobile operator in the region, in Bosnia and Herzegovina and Montenegro through associated companies.

Telenor Ltd. has been in the Serbian telecoms market since 2006, when it purchased the company Mobi63 (ex Mobitel) established in 1994. In 2018 the ownership structured changed, since Telenor Group sold to PPF Group its business in Central and Eastern Europe, consisting of subsidiaries in Bulgaria, Hungary, Serbia and Montenegro and Telenor Common Operation Serbia. As part of the regional transaction, PPF Group purchased 100% of shares in Telenor Ltd.

Vip mobile Ltd. is a member of the Telekom Austria Group, present in 7 European countries, including the following countries in the region: Croatia, Bulgaria and Macedonia. Vip mobile has been present in the Serbian market since 2006.

Based on the set of entry data on active base stations within the network received from operators Telekom Srbija Joint Stock Co., Telenor Ltd. and Vip mobile Ltd., by applying RATEL's prediction model, the following data are presented for each operator:

- Qualitative overview of active base radio stations/repeaters/WiFi AP (Table 5.1.);
- Comparative overview of territory and population coverage by technologies, in percentage (Table 5.2.);
- Graphic presentation of mobile telephony signal coverage for GSM technology (Fig. 5.1.);
- Graphic presentation of mobile telephony signal coverage for UMTS technology (Fig. 5.2.);
- Graphic presentation of mobile telephony signal coverage for LTE technology (Fig. 5.3.).

Table 5.1. Qualitative overview of active base radio stations/repeaters/WiFi AP as on 31.12.2020.

		Telekom Srbija	Telenor	Vip mobile
I				
1.	Total number of active sites with mobile telephony base stations	2780	2213	2160
2.	Raw land sites (RL) (freestanding land polls) with base stations	1631	1260	1264
3.	Rooftop sites (RT) (antenna systems on buildings and masts on building) with base stations	1094	896	854
4.	Indoor sites with base stations	45	36	28
5.	RT + indoor sites	10	21	14
II				
6.	ADAS indoor	4	4	4
7.	DAS indoor	47	52	37
8.	ADAS + DAS indoor	4	1	1
III				
9.	GSM base station sites (all frequency ranges)	2171	2154	2089
10.	GSM1800 network base stations	2	7	356
11.	GSM900 network base stations	2009	2103	1327
12.	GSM900+GSM1800	160	44	406
IV				
13.	UMTS network base stations	2714	2206	2148
14.	UMTS2100 network base stations	2678	62	2142
15.	UMTS900 network base stations	18	365	2
16.	UMTS900 + UMTS2100 network base stations	18	1779	4

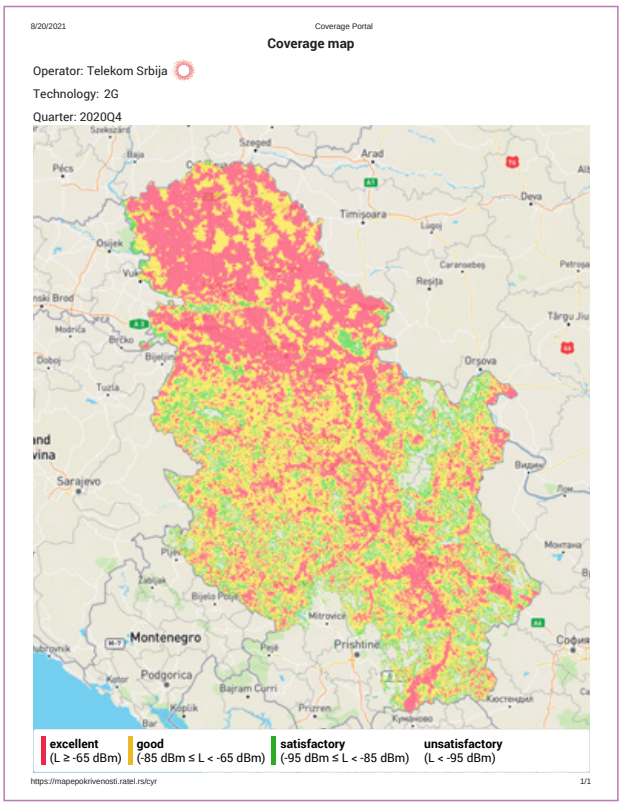
V				
17.	LTE network base stations	2696	2137	2154
18.	LTE800 network base stations	1331	787	691
19.	LTE1800 network base stations	168	46	248
20.	LTE800 + LTE1800 network base stations	1197	633	1199
21.	LTE1800 + LTE2100	0	16	1
22.	LTE800 + LTE1800 + LTE2100	0	655	15
VI				
23.	Indoor repeater sites	593	264	291
24.	Indoor GSM repeater sites	75	4	30
25.	Indoor UMTS repeater sites	275	24	130
26.	Indoor dual repeater sites (GSM + UMTS)	187	209	4
27.	Indoor LTE repeater sites	3	3	0
28.	Indoor dual/triple repeater sites (LTE+GSM/UMTS)	53	24	127
VII				
29.	Outdoor repeater sites (only remote if different from donor)	19	26	0
VIII				
30.	WiFi sites	1253	15	0
31.	Indoor WiFi sites	454	0	0
32.	Outdoor WiFi sites	551	14	0
33.	Indoor + outdoor WiFi sites	248	1	0
IX				
34.	GSM900 base radio stations	2169	2167	1733

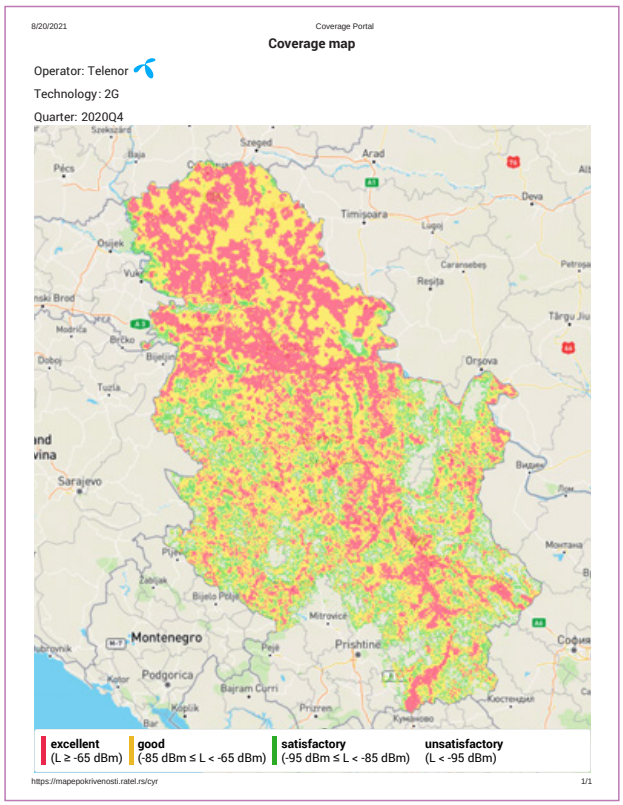
35.	GSM1800 base radio stations	162	51	762
36.	UMTS900 base radio stations	36	2154	6
37.	UMTS2100 base radio stations	2696	1867	2146
38.	LTE800 base radio stations	2528	2080	1905
39.	LTE1800 base radio stations	1365	1370	1436
40.	LTE2100 base radio stations	0	672	16
41.	WiFi AP	2900	15	0
42.	Indoor WiFi AP	1910	1	0
43.	Outdoor WiFi AP	990	14	0
44.	Indoor repeaters	958	383	425
45.	Outdoor repeaters	19	30	0
x				
46.	Optic to the base stations	1507	744	685
47.	Single microwave connection to optical transmission point	877	850	635
48.	Multiple microwave connection to optical transmission point	396	619	840

Table 5.2. Comparative overview of territory and population coverage by GSM/UMTS/ LTE technologies (%)

Name	Telekom Srbija	Telenor	Vip mobile
Percentage of territory covered by GSM network signal	91.37 %	86.91 %	88.85 %
Percentage of population covered by GSM network signal	99.19 %	98.71 %	98.99 %
Percentage of territory covered by UMTS network signal	77.25 %	88.41 %	75.62 %
Percentage of population covered by UMTS network signal	96.76 %	98.94 %	96.71 %
Percentage of territory covered by LTE network signal	84.15 %	74.21 %	73.12 %
Percentage of population covered by LTE network signal	98.10 %	96.25 %	95.63 %

Figure 5.1. Graphic presentation of mobile telephony signal coverage for GSM technology





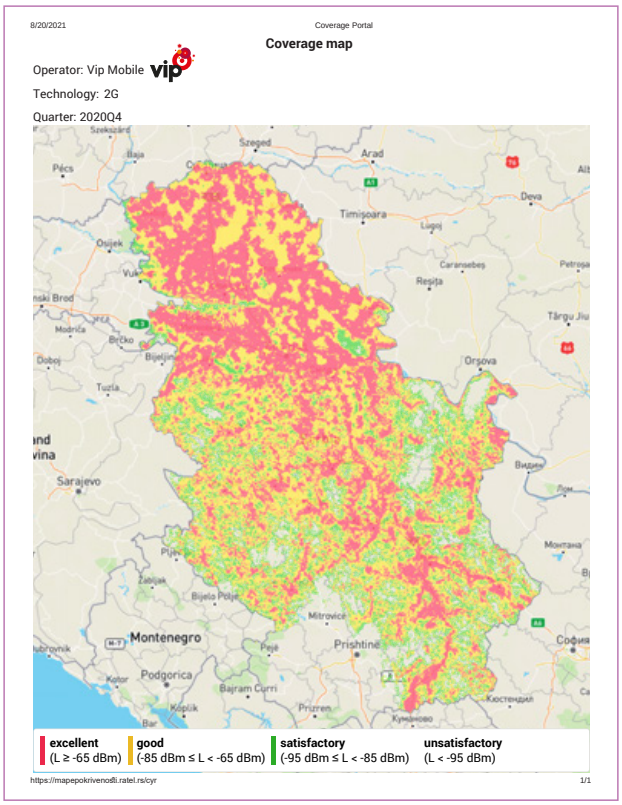
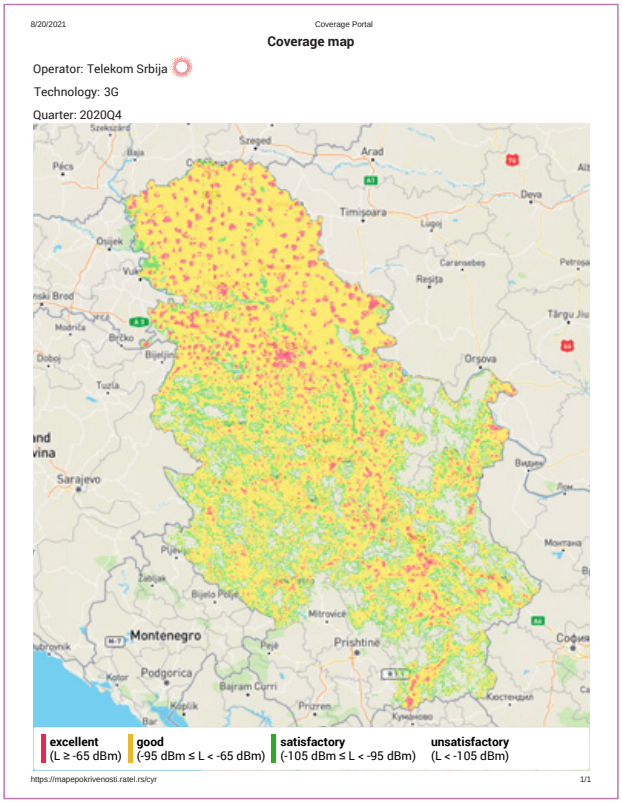
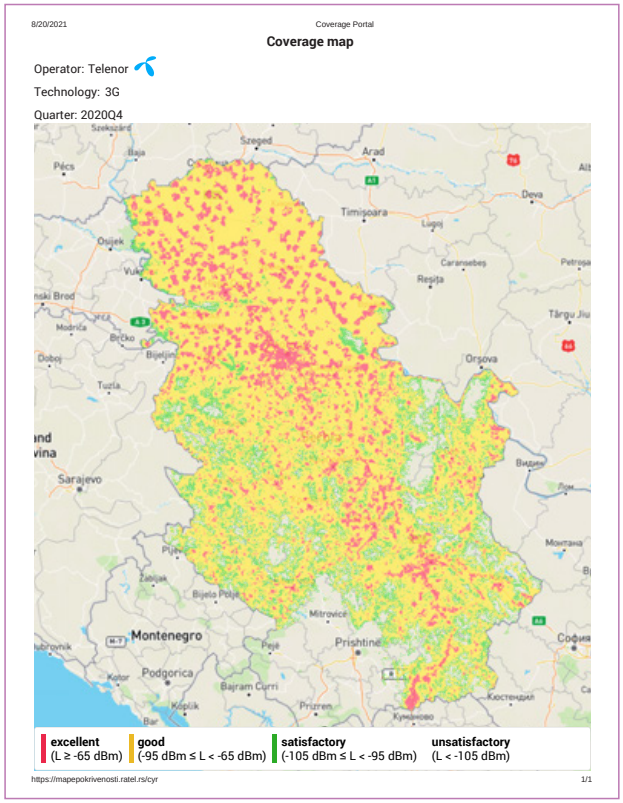


Figure 5.2. Graphic presentation of mobile telephony signal coverage for UMTS technology





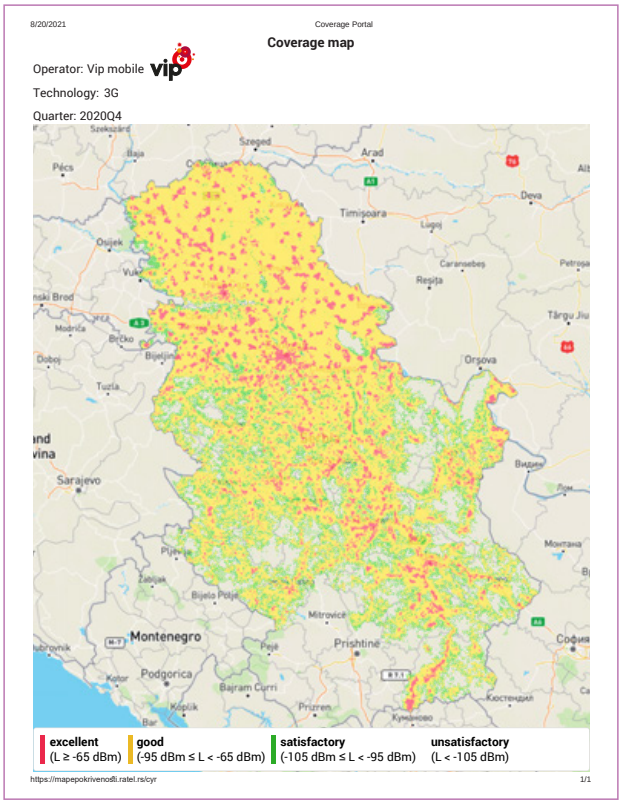
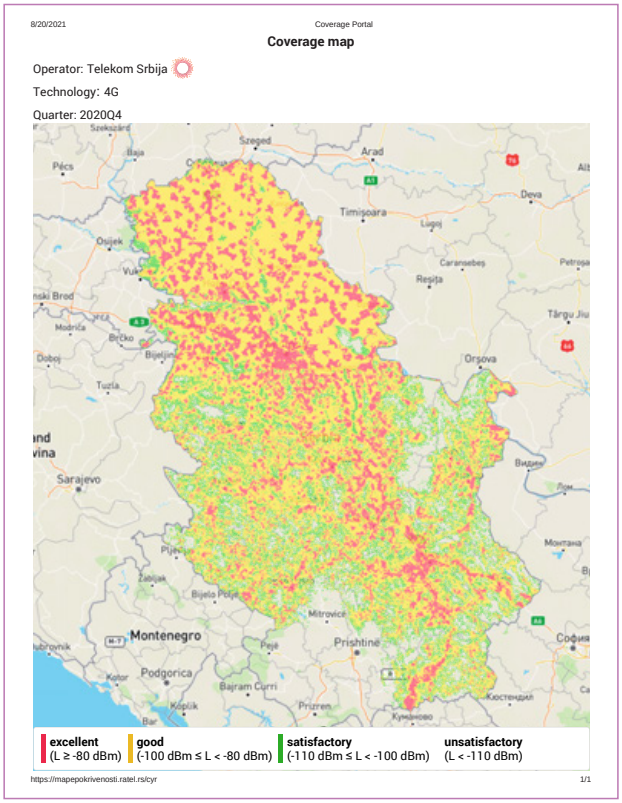
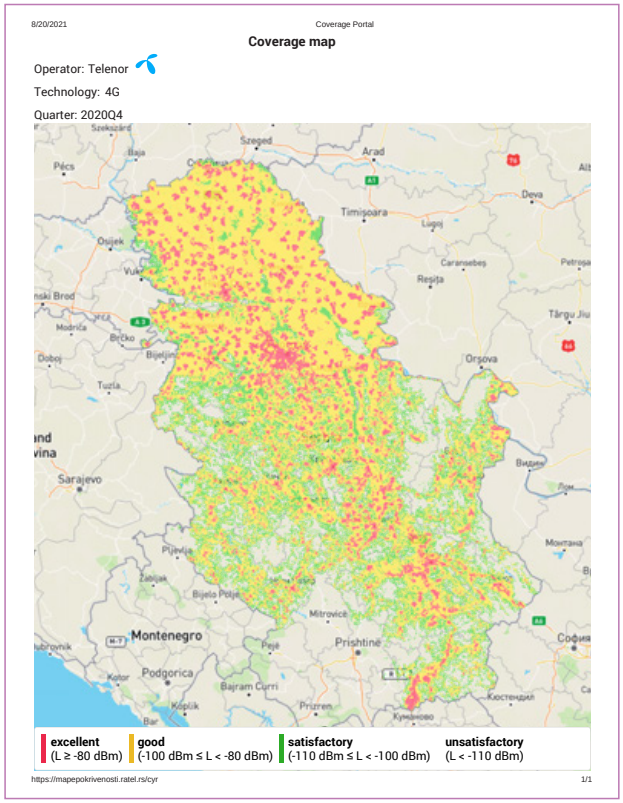
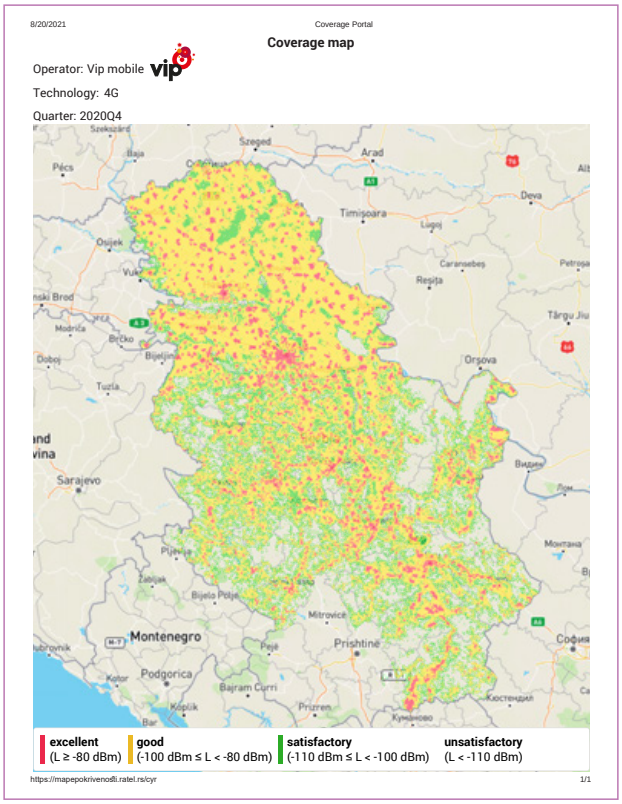


Figure 5.3. Graphic presentation of mobile telephony signal coverage for LTE technology





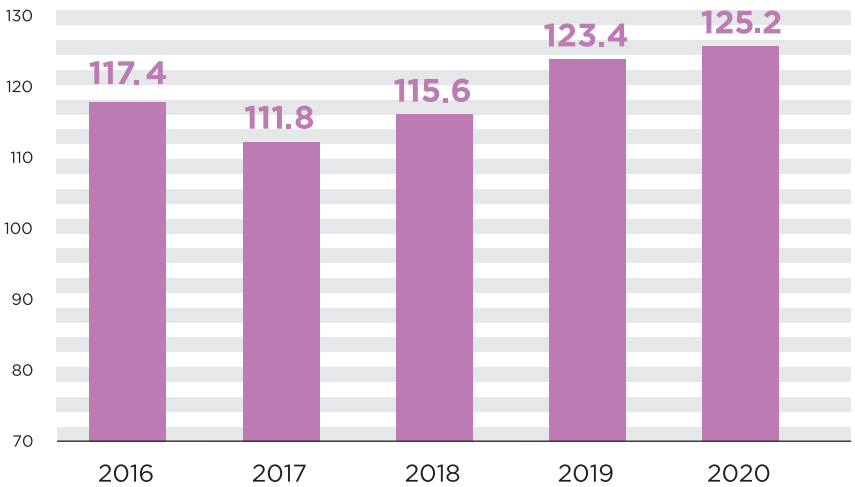


The revenues from mobile networks in 2020 amounted to around 125.2 billion dinars or 1.06 billion euro. Observed in the national currency (RSD) the revenues increased by 1.5% year on year.

Investments in this market segment increased by 51% compared with the previous year, amounting to 12.5 billion dinars.

The total number of mobile users decreased by 2.28% year on year, amounting to 8,260,758 at the end of 2020. A slight increase in the number of postpaid users was not enough to make for the decrease in the number of prepaid users in 2020. Figure 5.5. shows the trend in the total number of users over the previous period.

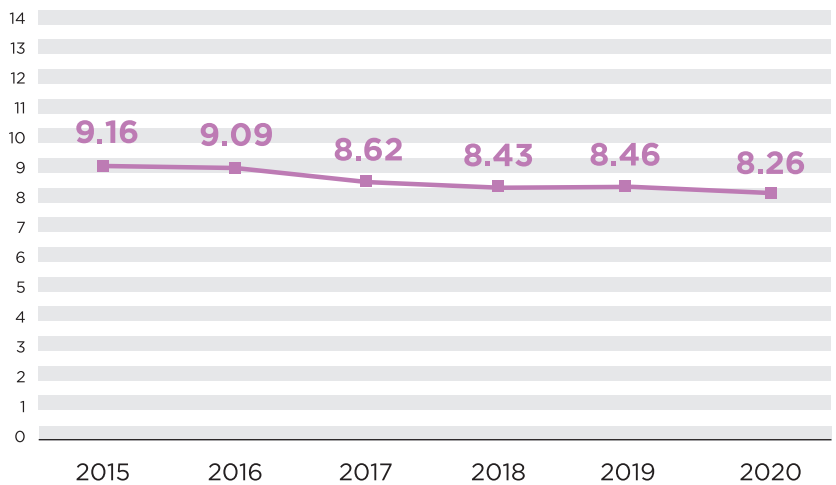
Figure 5.4. The total revenues from the mobile telephony (RSD billion)



Source: RATEL

* includes revenues from mobile data traffic, amounting to 5.6 billion RSD in 2020.

Figure 5.5. Total number of active mobile telephony users (million)



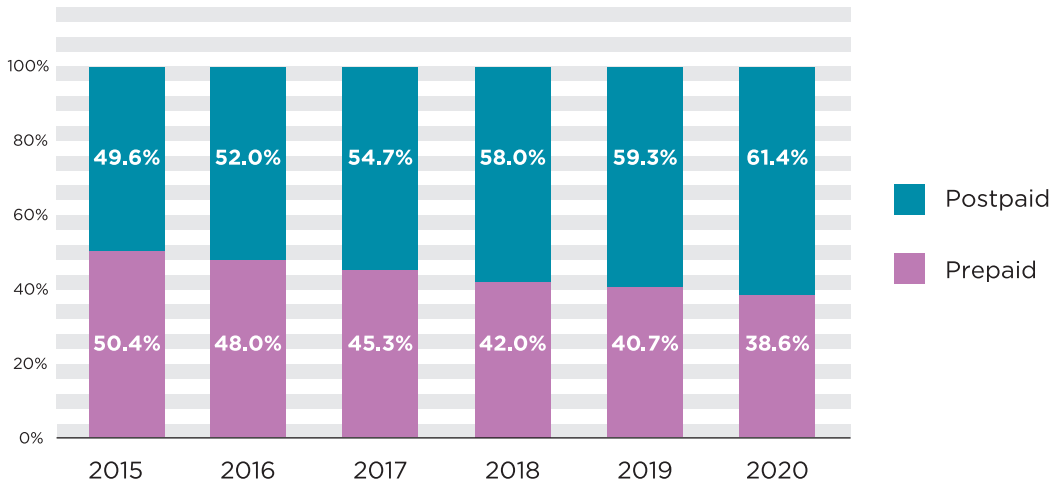
Source: RATEL

The total number of users involves postpaid and prepaid users active in the last three months of particular year. Distribution between prepaid and postpaid users is given in Figure 5.6. In 2016, the number of postpaid users is higher than the number of prepaid users and the trend continued over the analyzed period. The postpaid user take-up reached 61.4% in 2020.

Residential and business ratio is given in Figure 5.7. Residential users are dominant in user structure over the years. In 2020 the share of residential users in the total number of users was 83.8%.

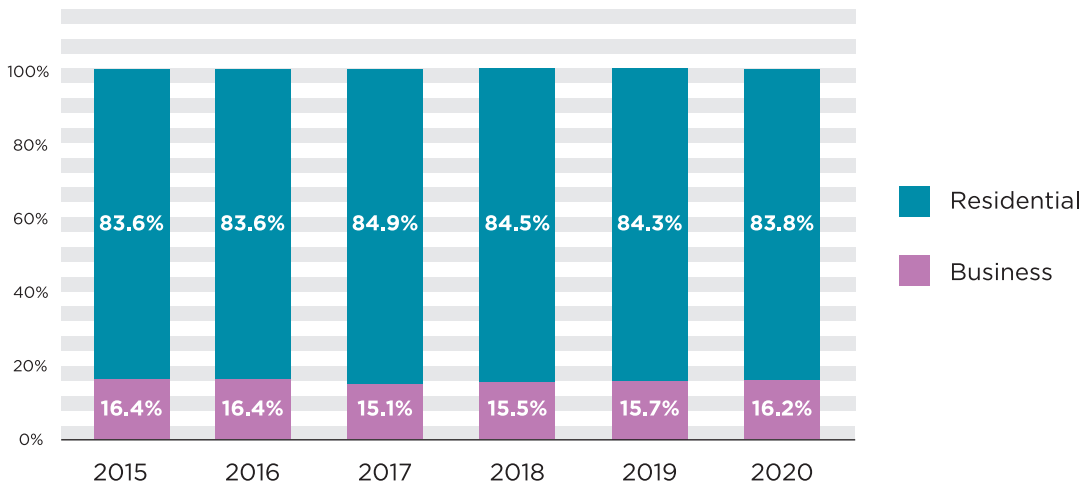
The number of mobile network users is again higher than the number of inhabitants in 2020, the mobile penetration rate being 119.26%,

Figure 5.6. Prepaid/postpaid user ratio



Source: RATEL

Figure 5.7. Residential/business user ratio

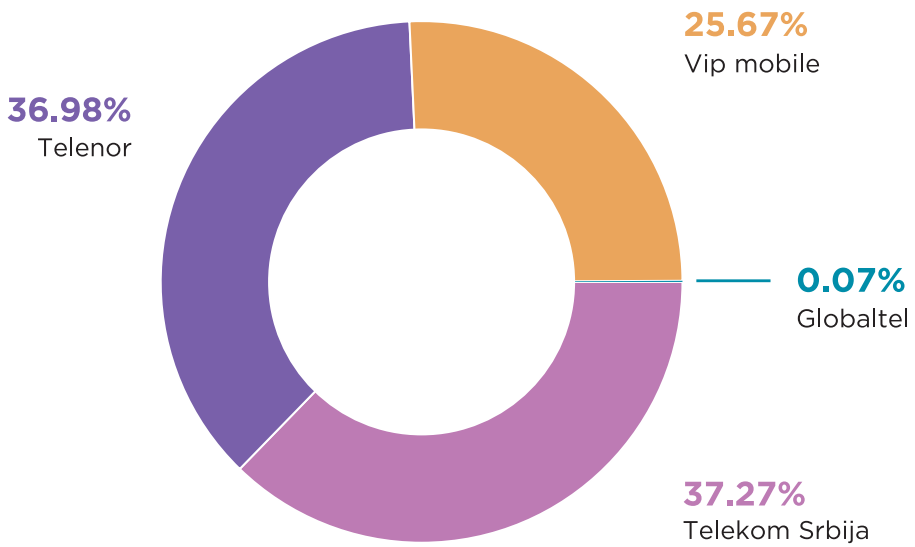


Source: RATEL

which means that some subscribers are using more than one SIM card.

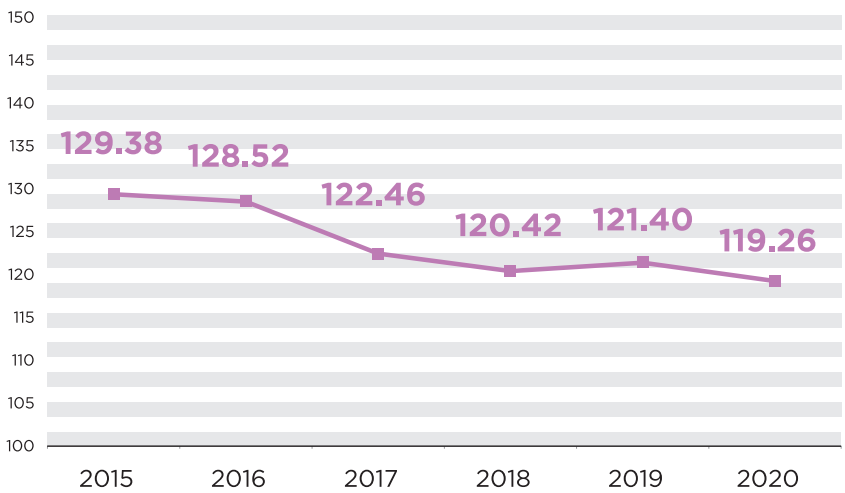
The minutes of calls made from mobile networks have been constantly increasing year after year. In 2020, the total outgoing traffic on the mobile network amounted to 20.65 billion minutes, which is an increase of 15.4% compared with the previous year, when it amounted to 17.90 billion minutes. The annual average of traffic per user in 2020 was 2516 minutes, or approximately 6 minutes and 54 seconds a day.

Figure 5.8. Share of operators in the total revenues made from mobile telephony (%)



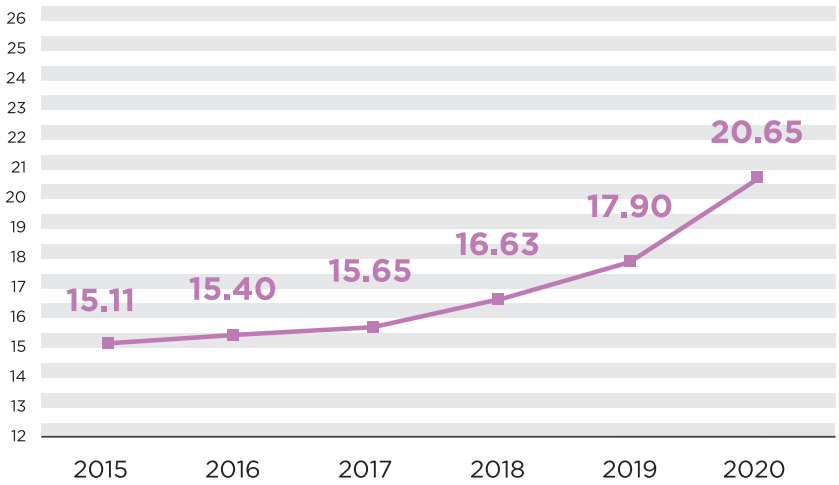
Source: RATEL

Figure 5.9. Mobile penetration rate



Source: RATEL

Figure 5.10. Total outgoing traffic (billion minutes)

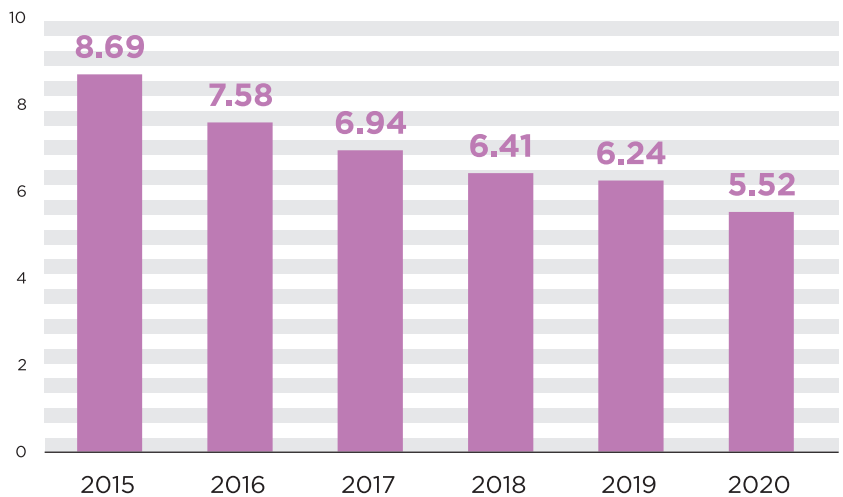


Source: RATEL

The number of sent text messages continued to decrease. In 2020, the total of 5.52 billion SMS messages were sent, which is a decrease by 11.5% compared with 2019 when 6.24 billion SMS messages were sent. The average number of text messages sent in 2020 per user was 668, or 1.8 SMS messages a day. In 2020, residential users accounted for 88.4% of SMS messages.

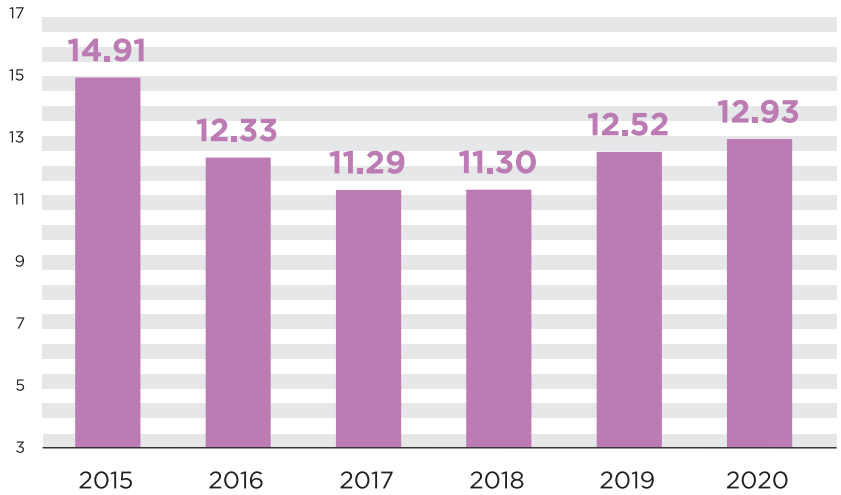
The number of MMS messages showed an increase for a third year in a row. In 2020, 12.93 million MMS messages were sent, which is a 3.3% increase in respect to 2019. In 2020, residential users accounted for 84.8% of MMS messages.

Figure 5.11. Number of sent text (SMS) messages (billion)



Source: RATEL

Figure 5.12. Number of MMS messages sent (million)

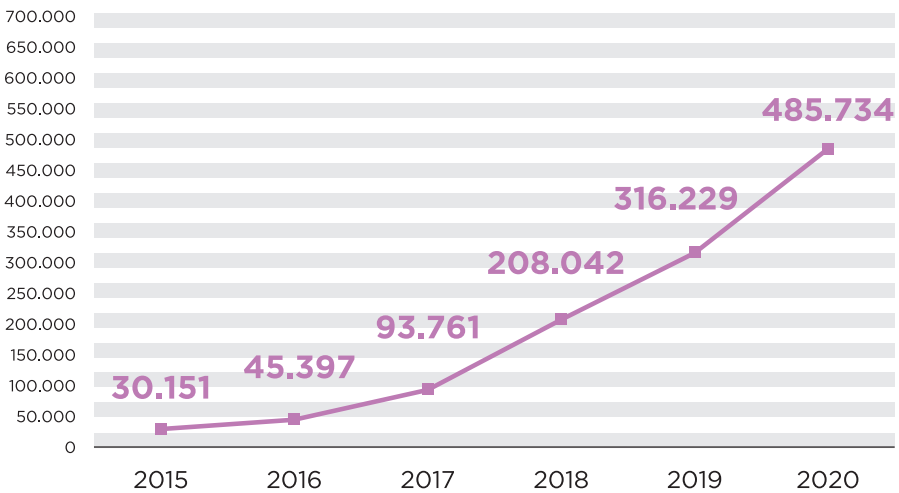


Source: RATEL

Data traffic has been constantly growing during the observed period (Figure 5.13). Over the analysed three-year period, the average annual growth rate of the transmitted data was around 53%.

Figures 5.14–5.18 show market share of the mobile operators and MVOs in terms of total number of users, outgoing traffic, number of text and multimedia messages (SMS and MMS) sent and the volume of data traffic made.

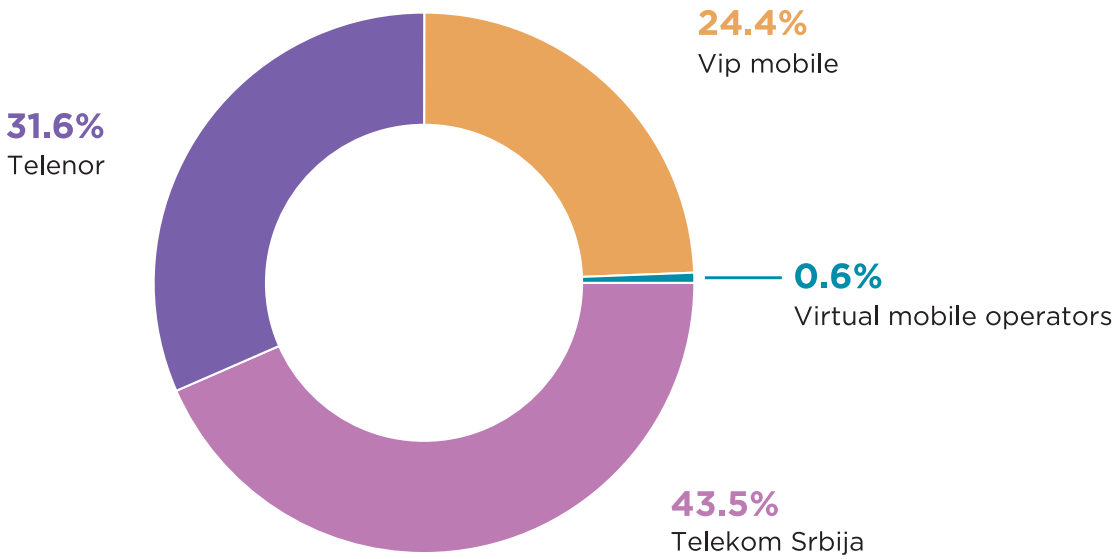
Figure 5.13. Data traffic in TB (GPRS+UMTS+LTE)



Source: RATEL

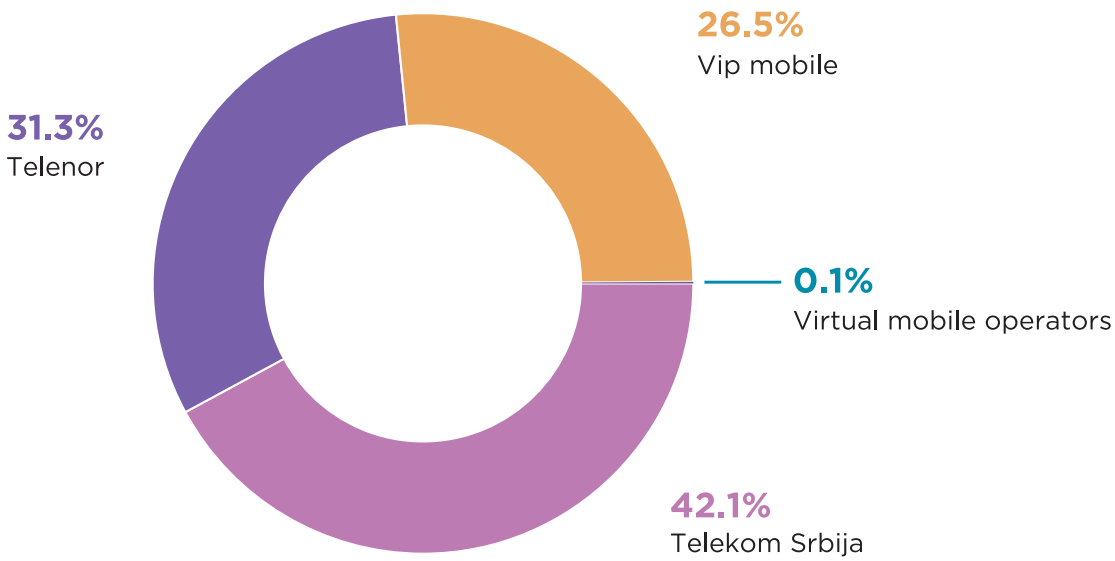
*As of 2016 data traffic over LTE network is also included.

Figure 5.14. Share in terms of the number of users (%)



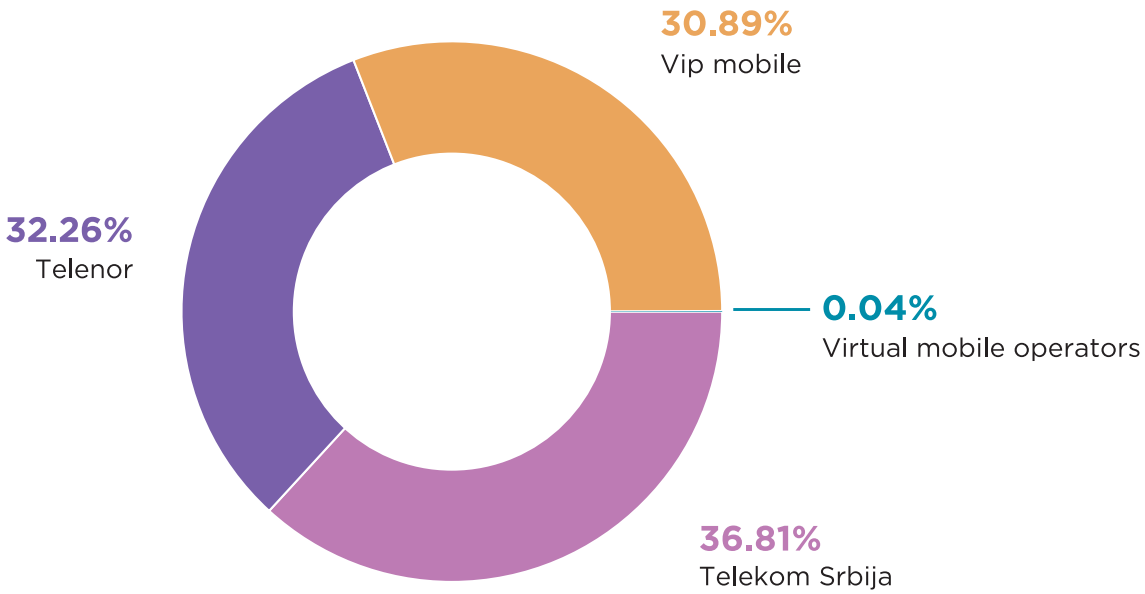
Source: RATEL

Figure 5.15. Share in the total outgoing voice traffic (%)



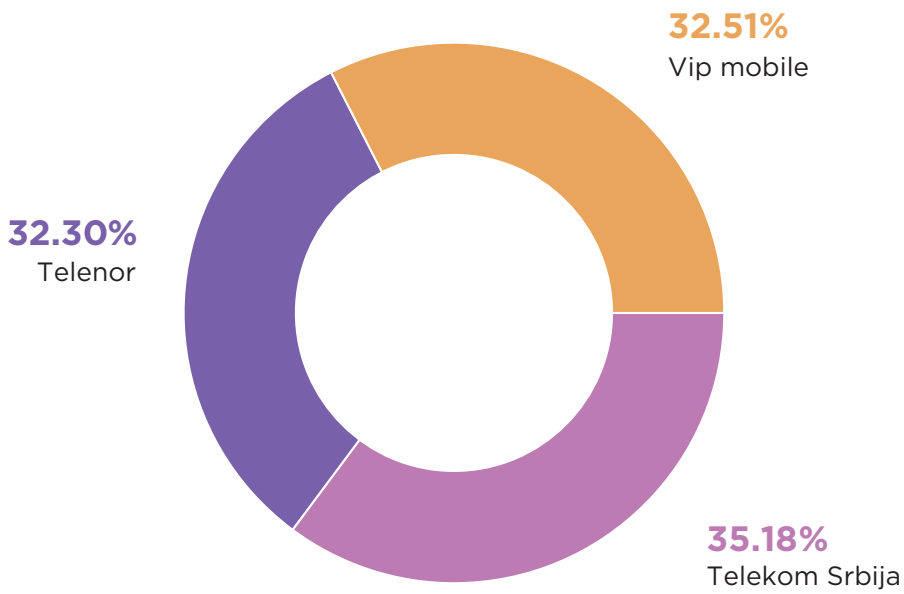
Source: RATEL

Figure 5.16. Share in the total number of sent SMS messages (%)



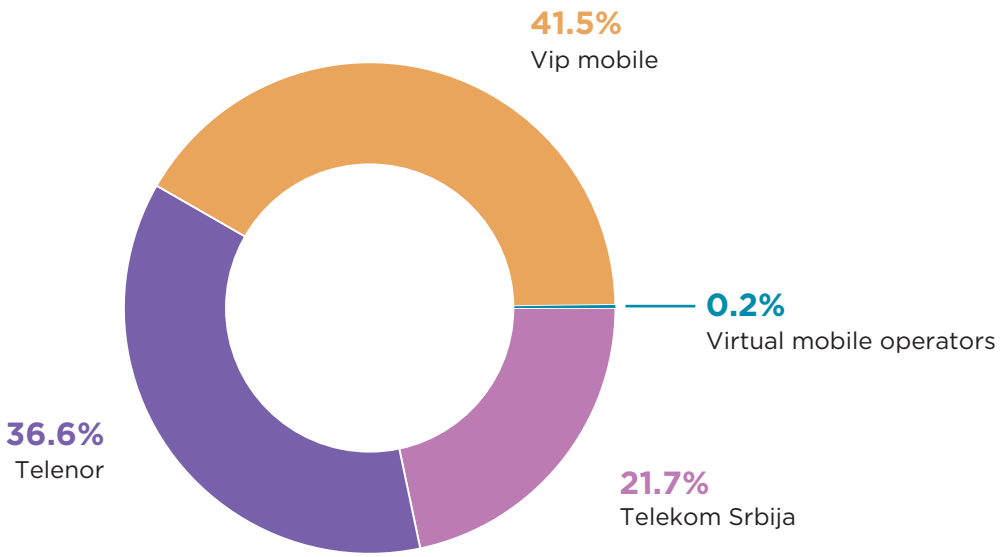
Source: RATEL

Figure 5.17. Share in the total number of sent MMS messages (%)



Source: RATEL

Figure 5.18. Share in data traffic (GPRS+UMTS+LTE) (%)



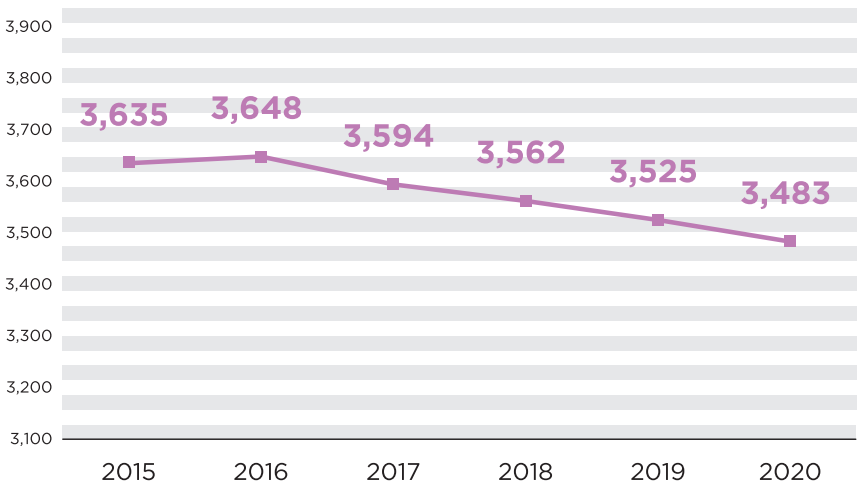
Source: RATEL

The competition in the mobile market can be estimated using the Herfindahl Hirschman Index (HHI). HHI is an indicator used for determining the degree of concentration of a given market and it is defined as the sum of the squares of the market shares of each individual market share. The market share was identified by the number of users.

The value of HHI for 2020 was the lowest in the last six years, indicating a lower market concentration and increase in the level competition.

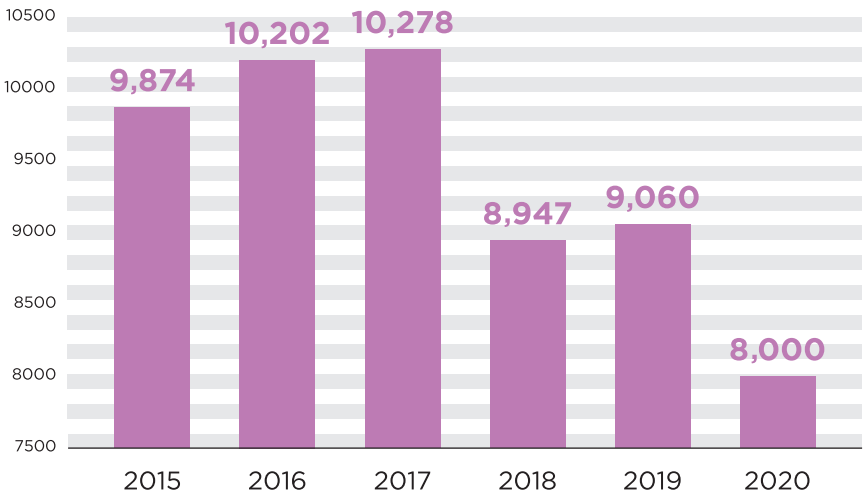
The average number of ported mobile numbers decreased by 11.7% in respect to the pre-

Figure 5.19. HHI values



Source: RATEL

Figure 5.20. Average number of portings on mobile network a month for each year



Source: RATEL

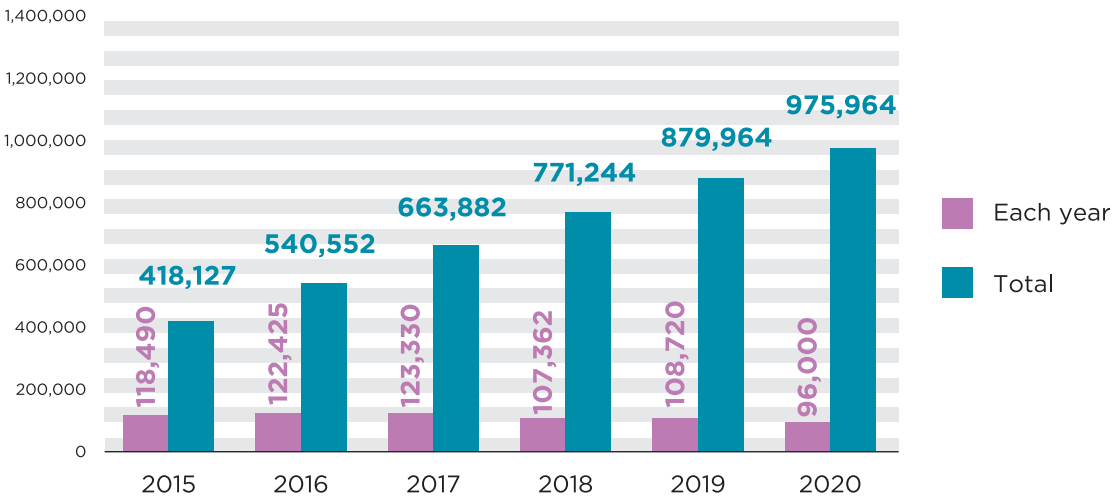
vious year, with an average number of 8000 ported numbers per month in 2020.

In 2020 there were around 96,000 number portings on mobile networks, thus reaching the total of 975,964 portings made since the beginning of number portability service.

In addition to national traffic, the users also use roaming traffic abroad. Voice traffic abroad has been growing until 2016, in the past four years there was a drop, mainly due to the use of VoIP applications. Another reason for the significant drop in 2020 is the COVID-19 pandemic, which lead to a decrease in the volume of roaming service usage.

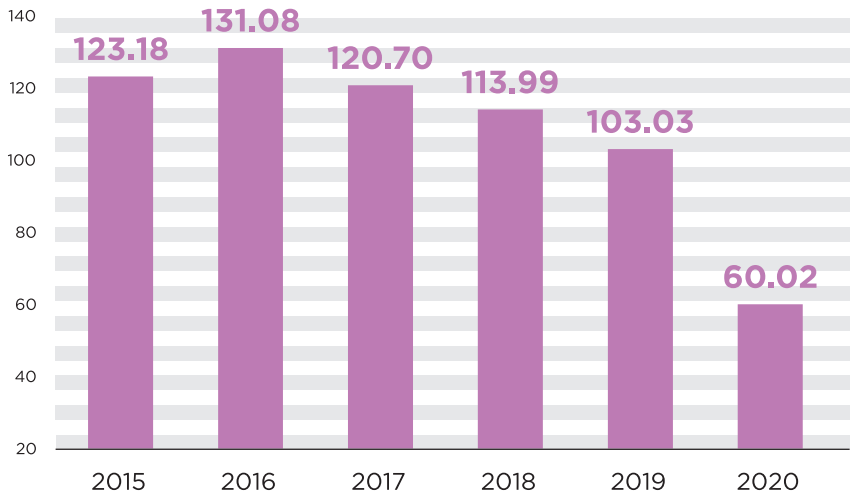
In addition to voice traffic, the subscribers also use mobile Internet abroad and according to the available data for 2020, there were 1,021 TB of roaming mobile internet traffic made. In

Figure 5.21. Number of portings on mobile network each year and in total



Source: RATEL

Figure 5.22. Number of roaming minutes (million)



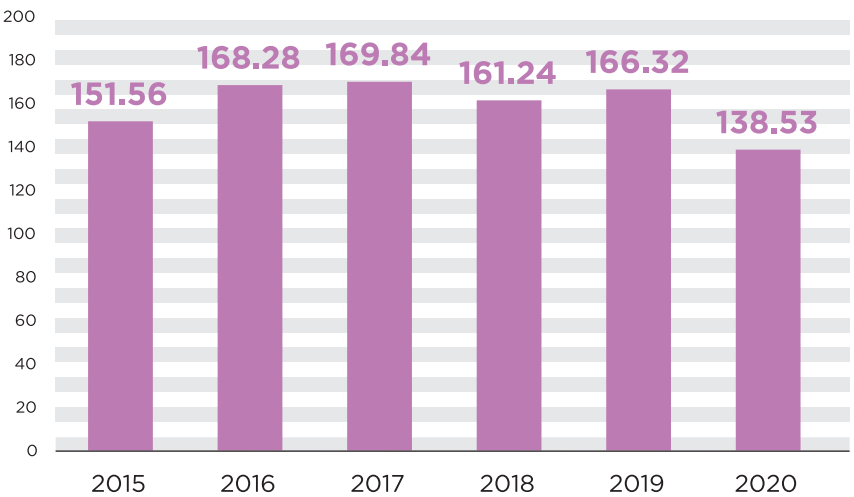
Source: RATEL

addition, 18 million text (SMS) messages were sent.

In addition to the users of the national networks, the traffic in the territory of Serbia generated by foreign network subscribers has been showing an increase in voice service usage over the past years including 2019, while 2020 was marked by a drop.

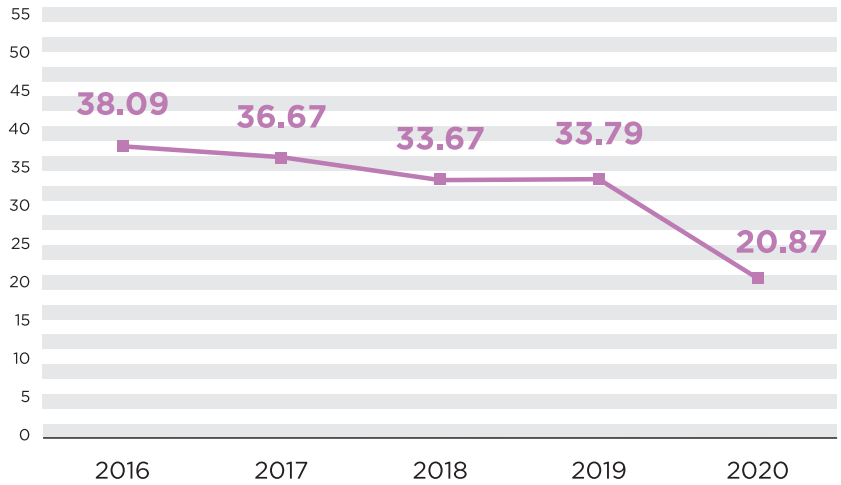
The revenues made from roaming, which include revenues made from outbound roaming and revenues made from inbound roaming, that have followed a slight downward trend for several years. In 2020, there was a significant drop, by 38%.

Figure 5.23. Number of roaming minutes made by foreign subscribers (million)



Source: RATEL

Figure 5.24. Roaming revenues (mil. EUR)



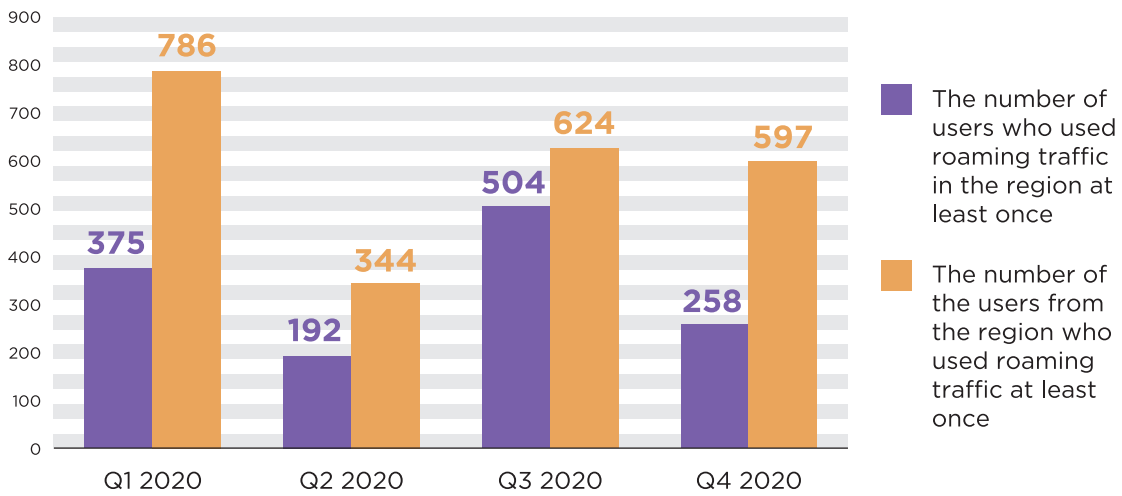
Source: RATEL

6. REGIONAL ROAMING

In April 2019, the Agreement on the price reduction of the roaming services in public mobile communication networks in the Western Balkans region was signed, aiming to achieve a high level of consumer, competition and transparency protection on the electronic communication market. To that end, RATEL carried out a procedure and passed a decision setting the obligations on reduction of rates for regulated roaming services and roaming termination rates in public mobile networks in the Western Balkans region, implemented as of 1 July 2019. Following a transitory period, which is to last until 30 June 2021, as of 1 July 2021 all surcharges will be abolished and regulated calls, SMS and data transfer in roaming will be charged in accordance with the domestic retail pricelists, bringing the roaming prices in the Western Balkans region to the price level in line with the "roam like at home" rule applied in the European Union.

The data on the number of users show a significant increase in the visitors from the region using roaming, which outnumbers the users of national networks using roaming in the re-

Figure 6.1. The number of users using roaming in the region and the number of users from the region that made traffic at least once (thousand)



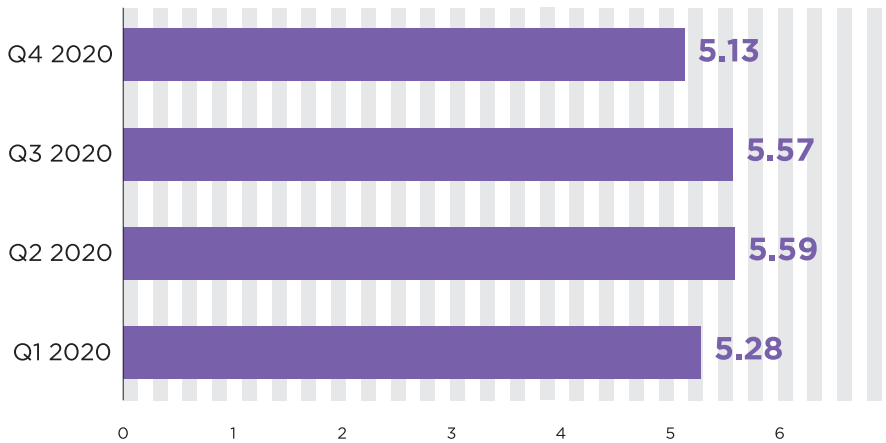
Source: RATEL

gion. It should be noted that the COVID-19 pandemic made impact on the roaming trend indicators in 2020.

Comparative data for all four quarters of 2020 are given below. The overview shows the trend of the traffic made from the regulated retail roaming services by mobile users while travelling to the region. The data include the entire traffic, i.e. the total of the traffic made without any tariff add-ons and the traffic made using tariff add-ons which are available to the end users.

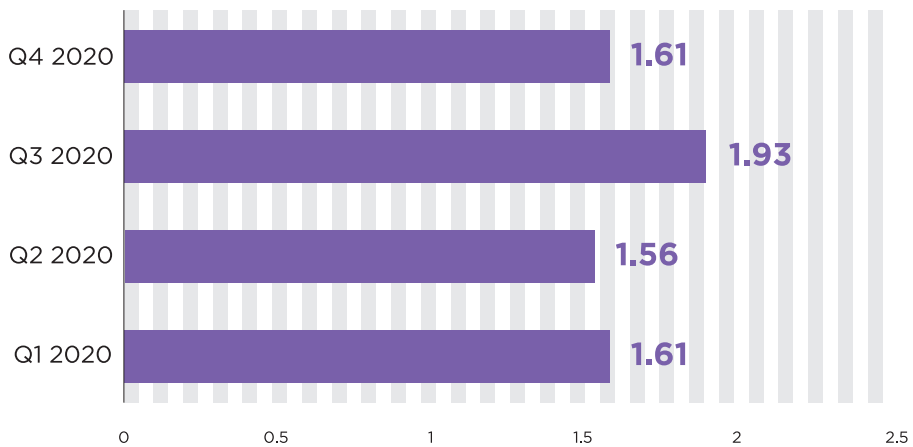
Absolute values of traffic for observed retail services show that the most roaming traffic was made during the third quarter, followed by the second quarter. The data on voice ser-

Figure6.2. Roaming outgoing calls made by prepaid users in the region (million minutes)



Source: RATEL

Figure 6.3. Roaming incoming calls made by prepaid users in the region (million minutes)



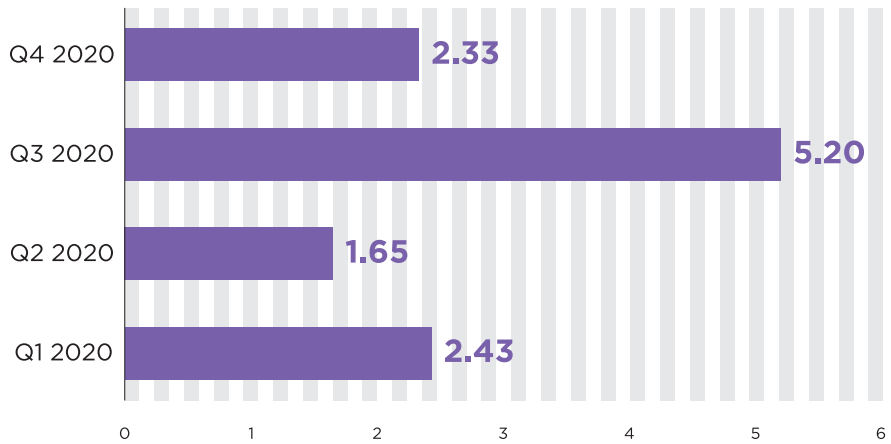
Source: RATEL

vice show that prepaid users generate more outgoing calls minutes compared to incoming calls, which indicates active usage of roaming voice services during all four quarters in 2020 (Figures 6.2 and 6.3)

Comparable quarterly data show that postpaid users are actively using roaming voice services, meaning that they generate more outgoing calls minutes compared to incoming calls during all four quarters of 2020 (Figures 6.4 and 6.5).

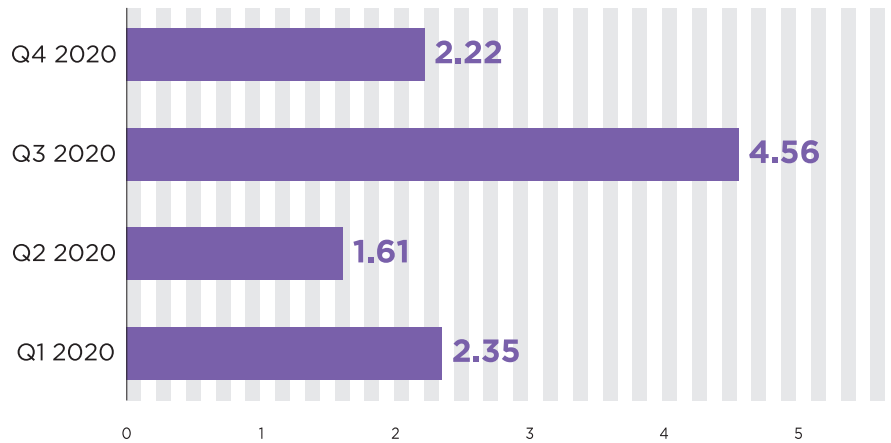
The data show that postpaid users end more text messages (SMS) in roaming than the prepaid users, which is not surprising since there are more postpaid than prepaid subscribers using roaming (Figure 6.6).

Figure6.4. Roaming outgoing calls made by postpaid users in the region (million minutes)



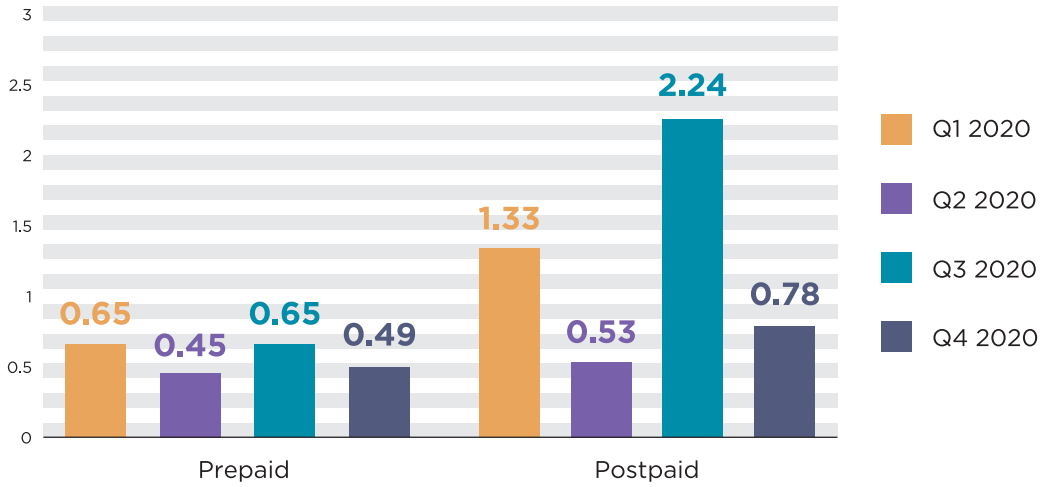
Source: RATEL

Figure 6.5. Roaming incoming calls made by postpaid users in the region (million minutes)



Source: RATEL

Figure 6.6. Number of roaming SMS messages in the region (million)

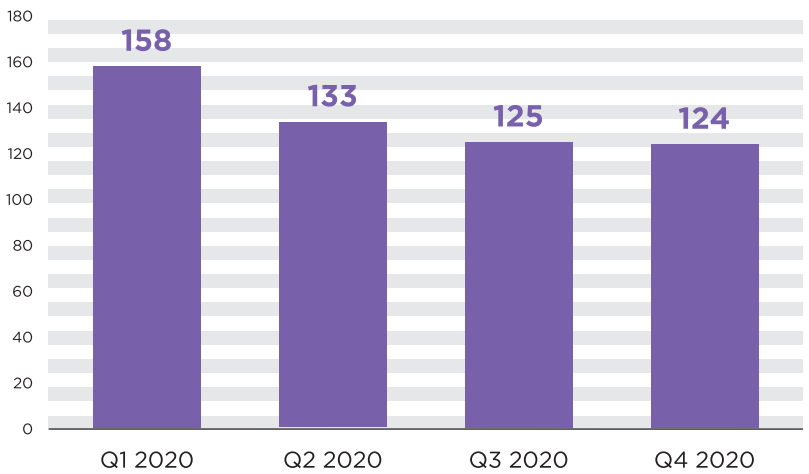


Source: RATEL

Prepaid roaming data transmission was highest during the first quarter, whereas most postpaid users used the service during the third quarter of 2020 (Figures 6.7. and 6.8).

The data illustrating the trend of revenues made from roaming do not include the revenues made from tariff add-ons. The revenues made from outgoing roaming calls provided to prepaid users in the region are higher than

Figure 6.7. Roaming data traffic made in the region - prepaid (TB)

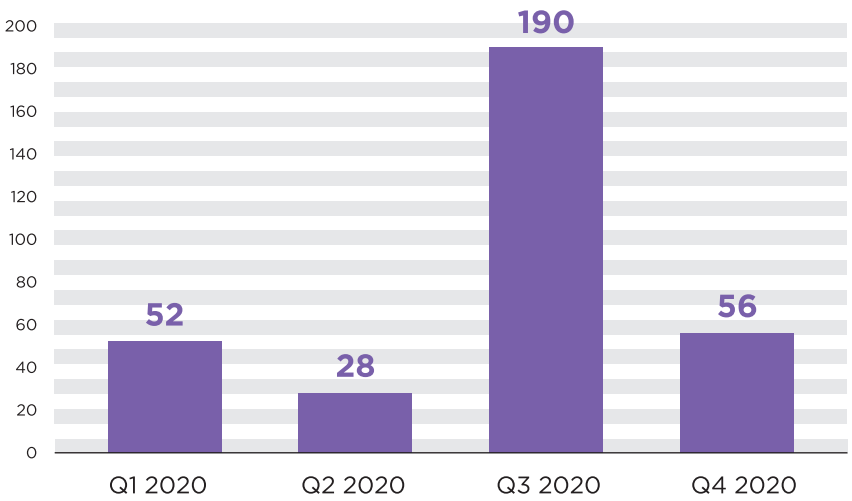


Source: RATEL

the revenues made from incoming roaming calls, as given in Figures 6.9. and 6.10. In Q4 2020, the lowest revenues were made from outgoing and incoming calls.

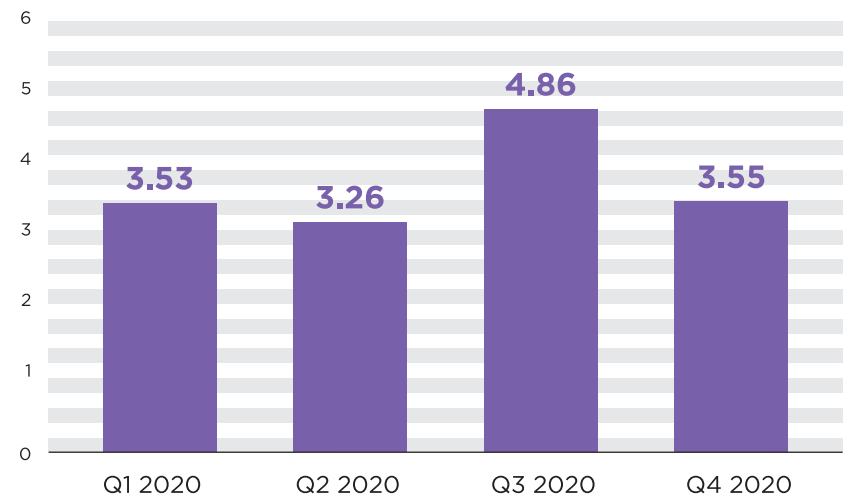
The revenues made from outgoing roaming calls provided to postpaid users in the region are much higher than the revenues made from the incoming roaming calls in all

Figure 6.8. Roaming data traffic made in the region - postpaid (TB)



Source: RATEL

Figure 6.9. Revenues made from outgoing roaming calls provided to prepaid users in the region (mil. RSD)



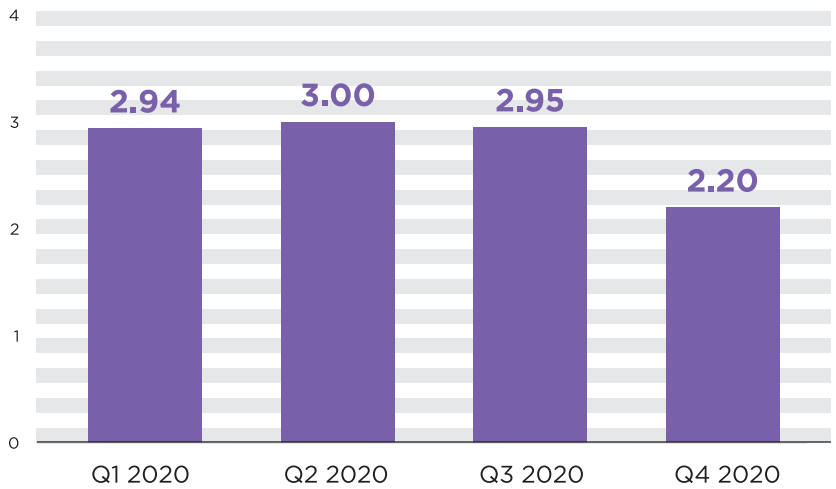
Source: RATEL

four quarters of 2020, as given in Figures 6.11. and 6.12.

Revenues made from SMS roaming were highest in Q3 2020, during the holiday season, when people travel more to the region (Figure 6.13).

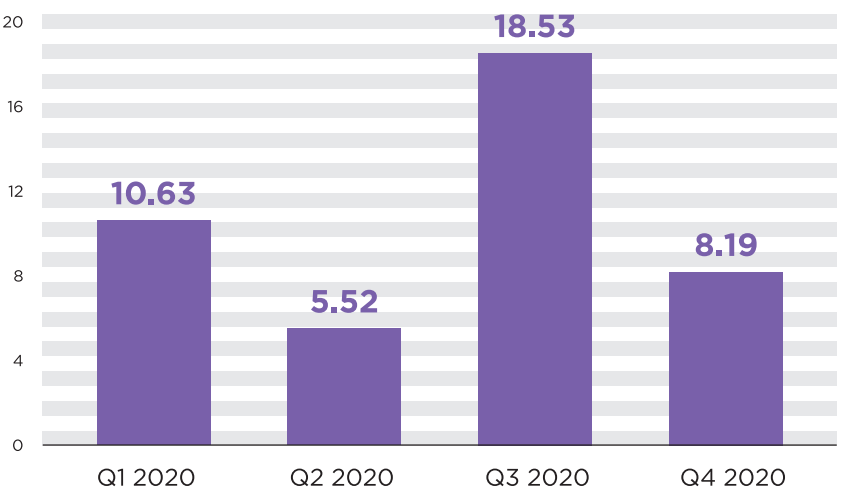
The revenues made from data roaming made by postpaid users in the region are significantly higher in all four quarters of 2020, compared to the revenues made from data roaming provided to prepaid users. Data roaming was most used during Q3 2020 and the revenues made from providing the

Figure 6.10. Revenues made from incoming roaming calls provided to prepaid users in the region (mil. RSD)



Source: RATEL

Figure 6.11. Revenues made from outgoing roaming calls provided to postpaid users in the region (mil. RSD)

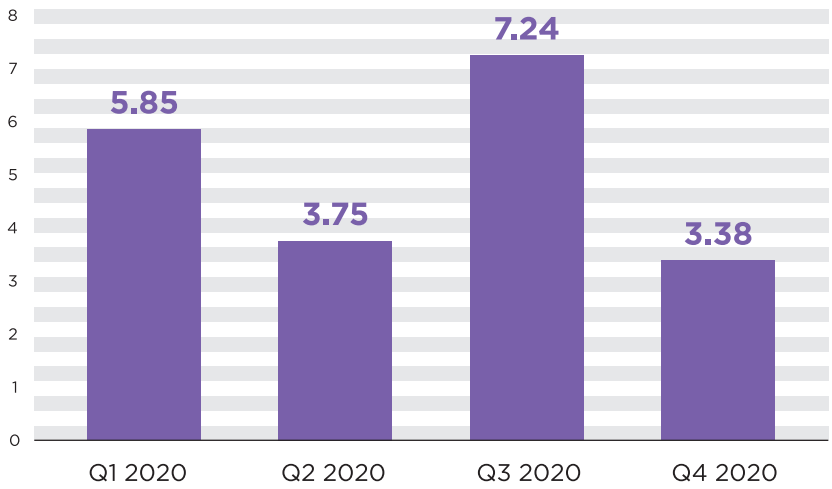


Source: RATEL

service to postpaid users were much higher than the revenues made from prepaid users (Figures 6.14. and 6.15).

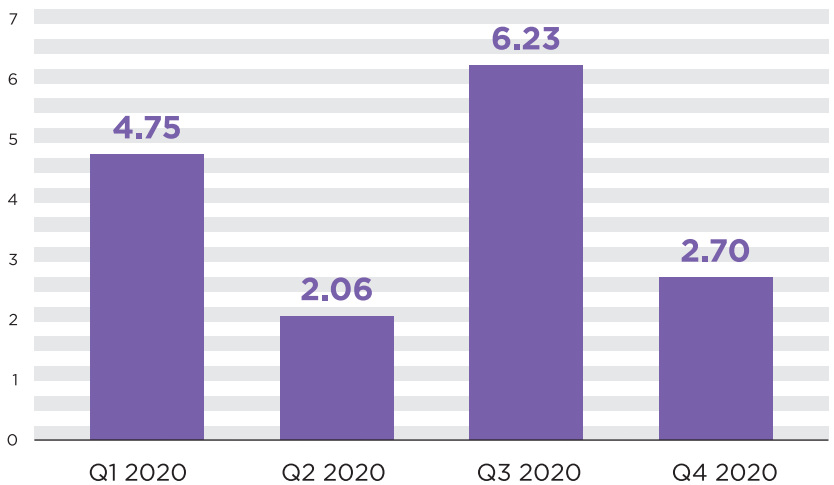
The absolute values concerning the revenues made from the observed retail services show that the biggest revenue was made in the third quarter, during the summer holiday season, when people travel more frequently to the region.

Figure 6.12. Revenues made from incoming roaming calls provided to postpaid users in the region (mil. RSD)



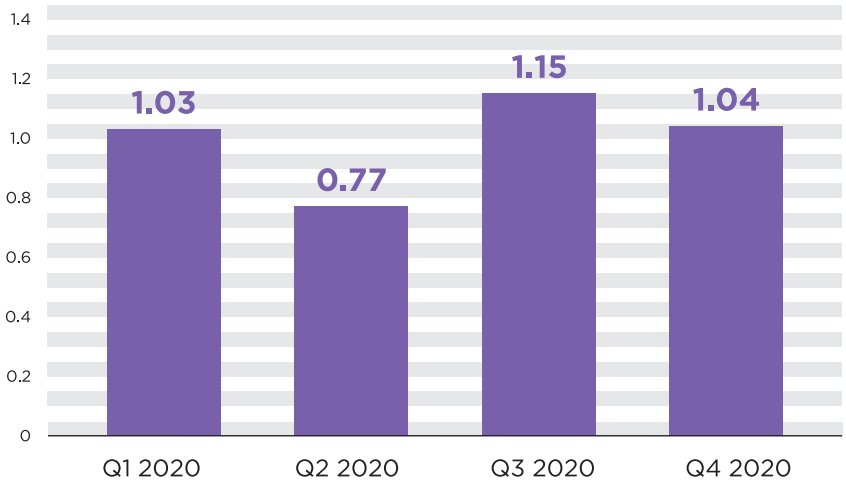
Source: RATEL

Figure 6.13. Revenues made from SMS roaming in the region (mil. RSD)



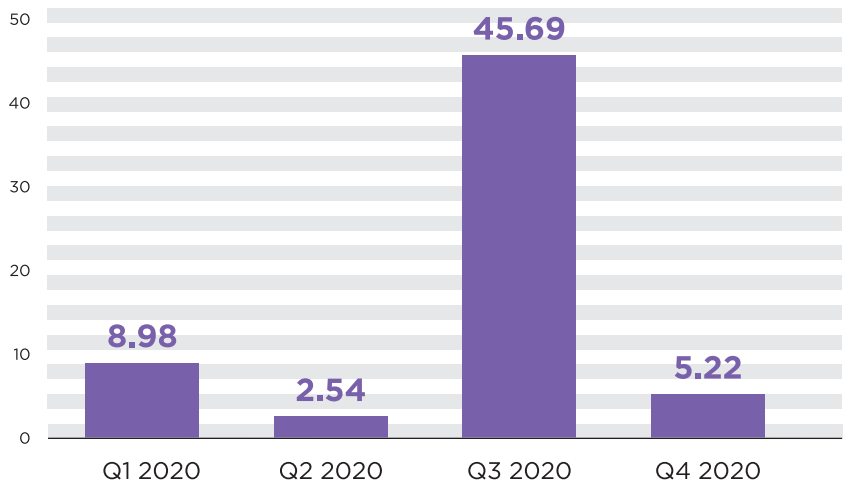
Source: RATEL

Figure 6.14. Revenues made from the roaming data in the region – prepaid (mil. RSD)



Source: RATEL

Figure 6.15. Revenues made from the roaming data in the region - postpaid (mil. RSD)



Source: RATEL

7. BROADBAND INTERNET SERVICES

The broadband market in Serbia has been experiencing a significant growth for years, which continued in 2020. In addition to the rise in the total number of users, a change occurred in the structure of the service packages offered, in terms of increase of the number of high-rate packages. Since the usage of OTT video streaming services is growing and the number of connected devices at home is increasing, the users show a greater demand for higher speed, in order to upgrade their experience with digital service usage. The Internet has become increasingly important as means that provides access to information and serves as an important link in the promotion of development in the area of science, technology and innovation and in the enhancement of regional and international cooperation. The increasing demand for broadband access produces the need for faster and more reliable networks, which results in the changes in infrastructure used to provide services to the users, so that optical infrastructure is increasingly used to provide broadband access to users.

According to the survey on ICT usage by individuals, households and business, carried out in 2020 by the national Statistical Office on the sample of 2,800 households and 2,800 individuals, the number of Internet users increased slightly compared to the previous year by 2%, **eight out of ten persons in Serbia have used the Internet** in first quarter of 2020[6].

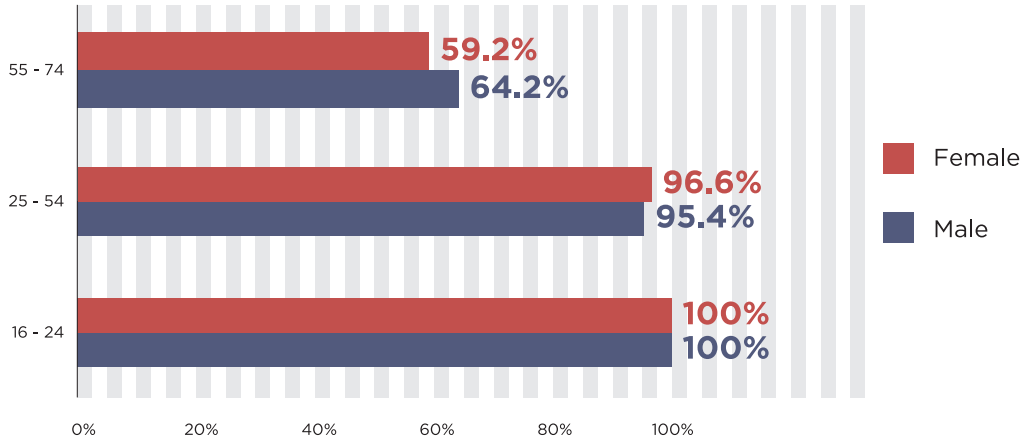
The Internet was used most by the youngest population (16 – 24 years) and it is equally used by male and female population. In 2020, the share of respondents from younger population who have an account on the social networks, such as Facebook and Twitter, was 86.1%.

The survey showed that the older age group (25-54 years) used the Internet less than the youngest population. The smallest share of Internet users is in the oldest group, comprising individuals between the age of 55 and 74 years (Figure 7.1). This group also displays the greatest discrepancy between genders regarding the usage of the Internet.

It would be hard to imagine life without telecom systems and the Internet and it seems that this is just the beginning of the techno-

6 Data taken from the publication "Usage of information and communication technologies in the Republic of Serbia, 2020", Statistical Office of the Republic of Serbia, based on research from February 2020.

Figure 7.1. Internet users by gender and age

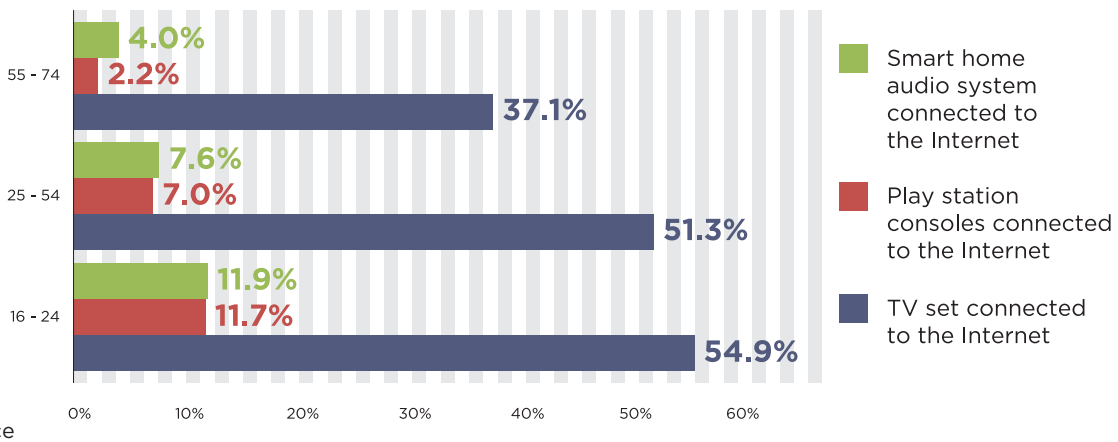


Source: Statistical Office of the Republic of Serbia

logical advantages of modern digital era. Internet access has become a constant in our everyday life, and its importance the development of economy and society in general is immense. Broadband access is necessary everywhere, either for work or for social networking. This is reflected both in the user habits and in the devices used for this purpose.

The Internet of Things, (IoT) is a new field which is developing fast. IoT technology enables connecting large number of users, devices, services and applications to the Internet. End users are able to access data via Internet and mobile apps and to manage device configurations and maintain IoT systems. The analysis showed that a significant number of respondents accesses the Internet via smart TV sets, which is particularly common for the younger population (16-24) where more than 54.9% used this access mode. There is a similar trend among the older group (25-54). However, the survey showed that many respondents (37.1%) from the oldest population (55-74) also used this type of Internet access (Figure 7.2).

Figure 7.2. Mobile devices used for Internet access outside home/work

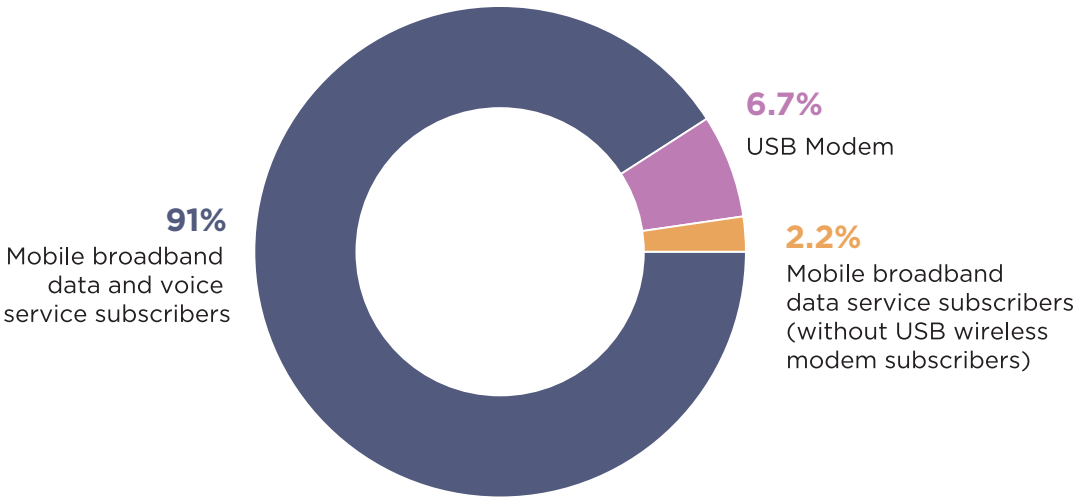


Source: Statistical Office of the Republic of Serbia

The growing usage of mobile phones for the Internet access is reflected in the constant rise in the mobile Internet service users provided in 2020 by three mobile operators: Telekom Srbija, Telenor and Vip mobile and one virtual mobile network operator–Globaltel.

and subscribers using USB wireless modem for the Internet access, which is a significant increase compared to 2019. This is a 4.8% increase compared to 2019, when the number of active broadband users was around 6.3 million. Data show that the number of subscribers who purchased mobile broadband

Figure 7.3. Mobile broadband user structure

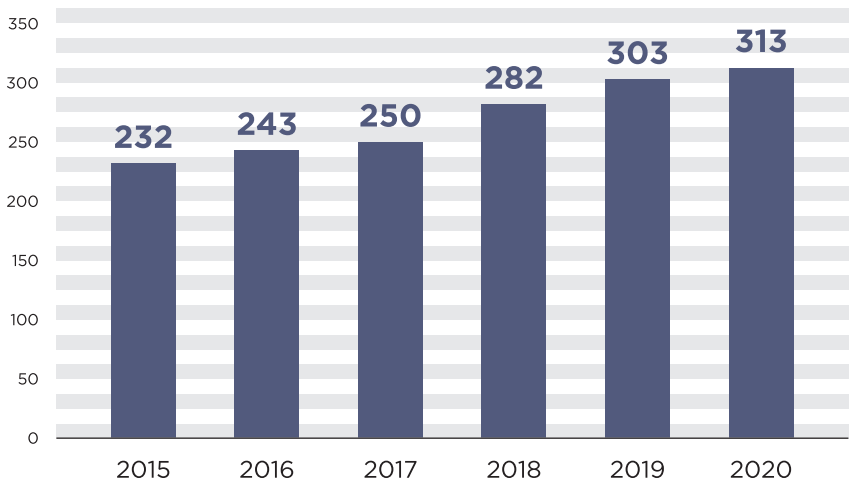


Source: RATEL

The total number of active mobile broadband users in 2020 was 6.6 million, including the subscribers of mobile broadband data and voice service, data service only

Internet services independently of voice services increased by 18.4% compared to the previous year.

Figure 7.4. Number of M2M subscriptions (thousand)



Source: RATEL

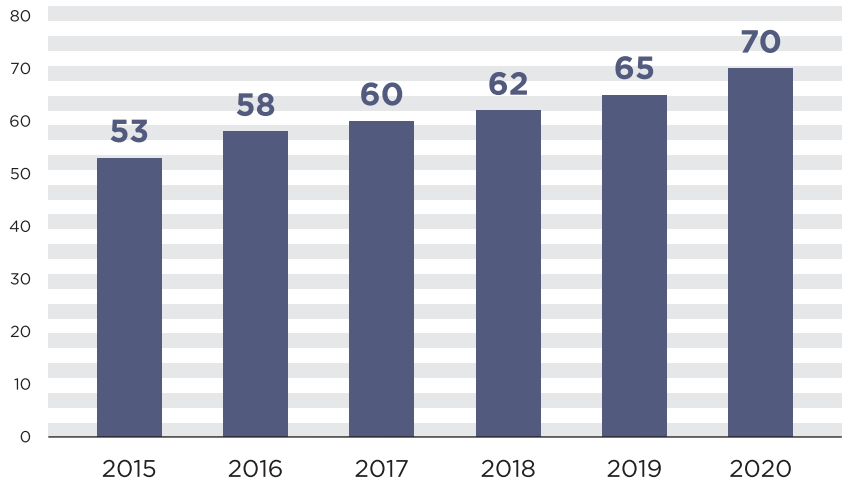
The number of M2M subscriptions increased as well, amounting to 313 thousand in 2020, which is 3.3% more than in the previous year.

The number of users resulted in the increase in the traffic volume by almost 1.5 times compared with the previous year, amounting to almost 486 million GB on an annual level for entire UMTS and LTE traffic (the traffic includes mobile Internet users, via cell phones and modems), where, as expected, the biggest increase is seen in LTE traffic which doubled compared with the previous year.

The bestselling mobile Internet package for private postpaid users offered 150 GB of data transmission at the price of 1,599 dinars.

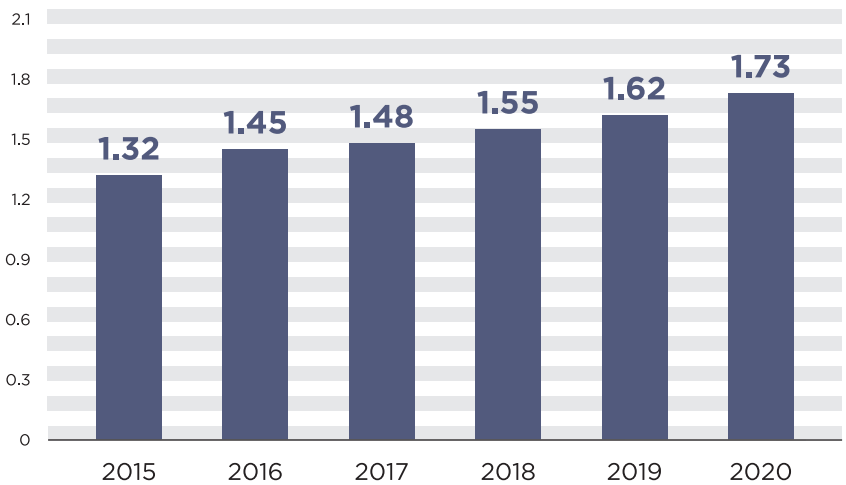
In 2020, seventy out of one hundred households (69.6%) had fixed broadband. The total number of fixed broadband subscribers in 2020 was 1.73 million, which is a 6.8% increase compared with the previous year (Figure 7.6).

Figure 7.5. The number of fixed broadband internet subscribers per 100 households



Source: RATEL

Figure 7.6. The total number of subscribers of fixed broadband Internet access (million)



Source: RATEL

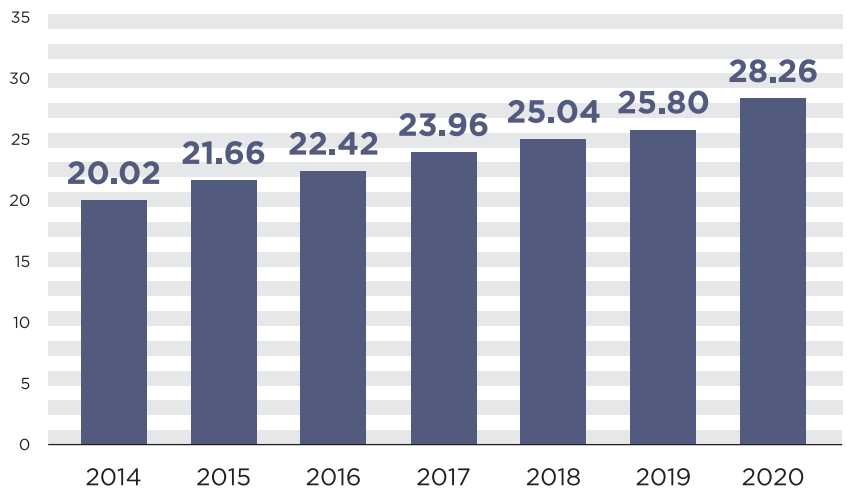
In terms of technology used, based on the available data, the biggest percentage increase of 43% was seen in the number of broadband users with FTTH (Fiber to the Home) or FTTB (Fiber to the Building) fibre-optics Internet access, however this number is still relatively low, corresponding to 14% of the total number of users. Moreover, fast development of cable networks, which are usually composed of both fiber optic and coaxial cables, and upgrade of coaxial cable networks to DOCSIS 3.0 standard leads to high-speed Internet packages being offered to end users. This resulted in a 11% rise in the number of users accessing the Internet over coaxial cable network. The number of users of xDSL decreased by 6%, fourth year in a row. However, xDSL subscriber structure changed significantly with a significant increase of the number of users of VDSL technology that account for 55% of the total number of xDSL users, due to greater demand for packages with bigger throughput.

The increase in the number of users is reflected in the increase in the revenues from fixed broadband Internet, which grew by 10% compared to 2019 (Figure 7.7.) The high rate of increase is partly owed to the rise in the number of users, but it is also a result of a considerably bigger volume of the Internet technology usage during the pandemic.

The coaxial cable infrastructure is, for the third year in a row, the most widely used access technology with 46% of the total number users, followed by xDSL infrastructure with 34% of users (Figure 7.8).

The structure of revenues made from fixed broadband access reflects the subscriber structure, since the revenues from cable services accounted for 45.57% and xDSL for 30.17% of the total revenues. In line with the subscriber structure, where preference is given to technologies enabling higher speeds, revenue structure reveals a growth trend in services provided over coaxial cable and FTTH/B infrastructure, whereas a drop in revenues is seen in services provided via xDSL infrastructure (Figure 7.9).

Figure 7.7. Revenues from fixed broadband (billion)

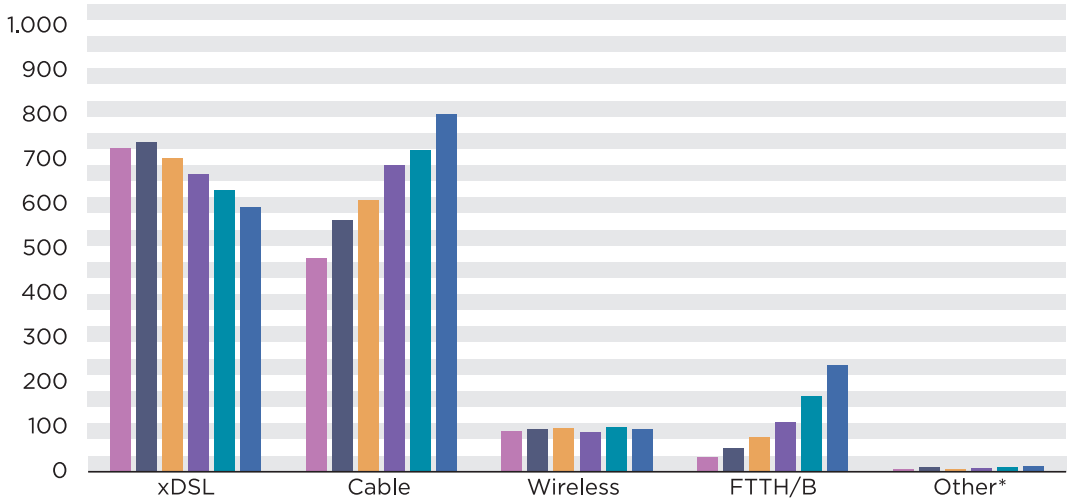


Source: RATEL

The revenues from fixed broadband access provision to business users had a similar distribution as in the previous years, corresponding to 16% in 2020. The share of private and business users in the total revenues made in the past six years is illustrated in Figure 7.10.

The availability of high-speed Internet is important to ensure a high-quality access to Internet content, including the content generated by end users (various services and information). The Internet was most used for online messaging using Skype, Messen-

Figure 7.8. The share of the broadband subscribers by access technology (thousand)

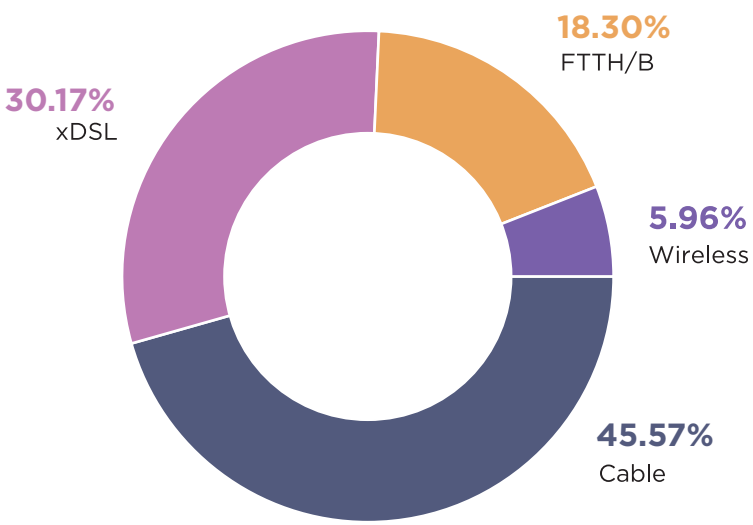


	xDSL	Cable	Wireless	FTTH/B	Other*
2015	724.16	475.97	87.57	30.53	2.29
2016	737.25	561.94	93.14	50.16	7.99
2017	701.00	606.62	94.49	75.15	3.50
2018	664.61	685.48	87.20	109.04	5.83
2019	630.51	719.88	98.01	166.63	8.76
2020	590.80	800.14	92.05	237.61	9.90

* Eternet, LAN

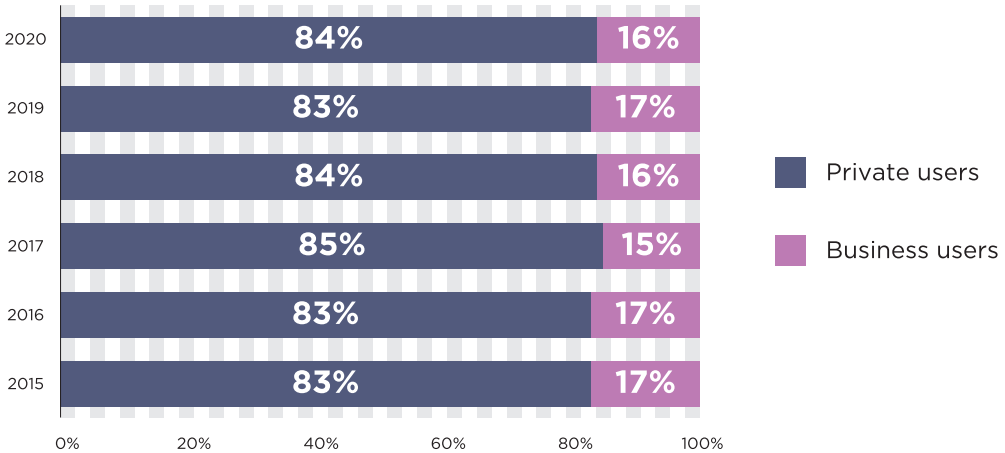
Source: RATEL

Figure 7.9. The structure of revenues made from fixed broadband, by access technologies



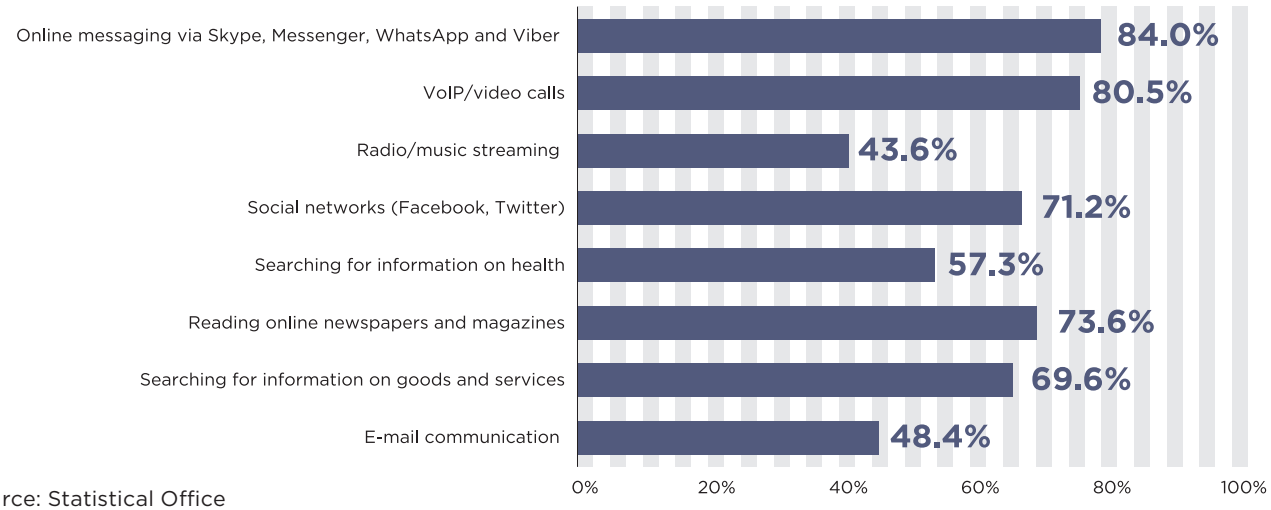
Source: RATEL

Figure 7.10. Share of private and business users in the total revenues made from fixed broadband Internet service



Source: RATEL

Figure 7.11. Types of Internet usage for private purposes



Source: Statistical Office of the Republic of Serbia

ger, WhatsApp and Viber (84%), VoIP calls (80.5%) and reading online newspapers and magazines (73.6%).

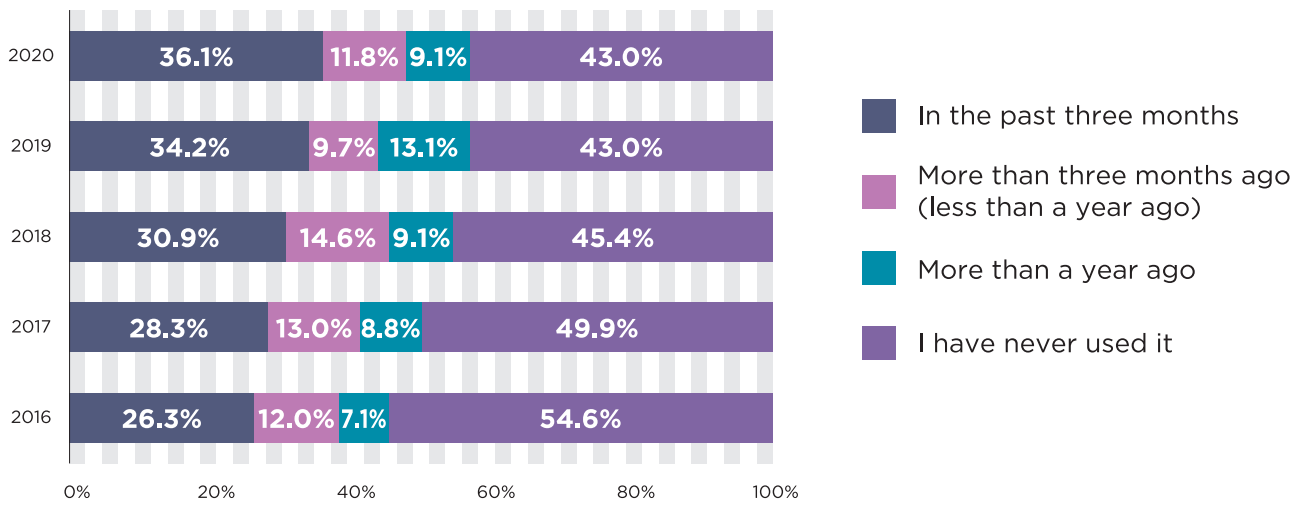
The technological developments are changing user habits. Online purchase of goods and/or services has been growing over the past years. This was particularly characteristic for 2020, when, due to the pandemic, measures were enforced to limit social contacts. Changes in the habits of individuals regarding online purchases over the last 5 years can be seen in Figure 7.12.

Although the number of fixed broadband users has been significantly increasing over the past years, fixed broadband can considerably differ in terms of speed, which affects the quality and the functionality of the Internet access. Changes in user habits, increased number of users accessing video streaming services, along with the increase in the number of devices used to access the Internet at the same time have resulted in the change of the package structure and the increase in the traffic volume.

As for fixed broadband access, the same as the previous year, Internet packages offering 10 Mbps were the most sold, at the price ranging between 900 and 1,900 dinars.

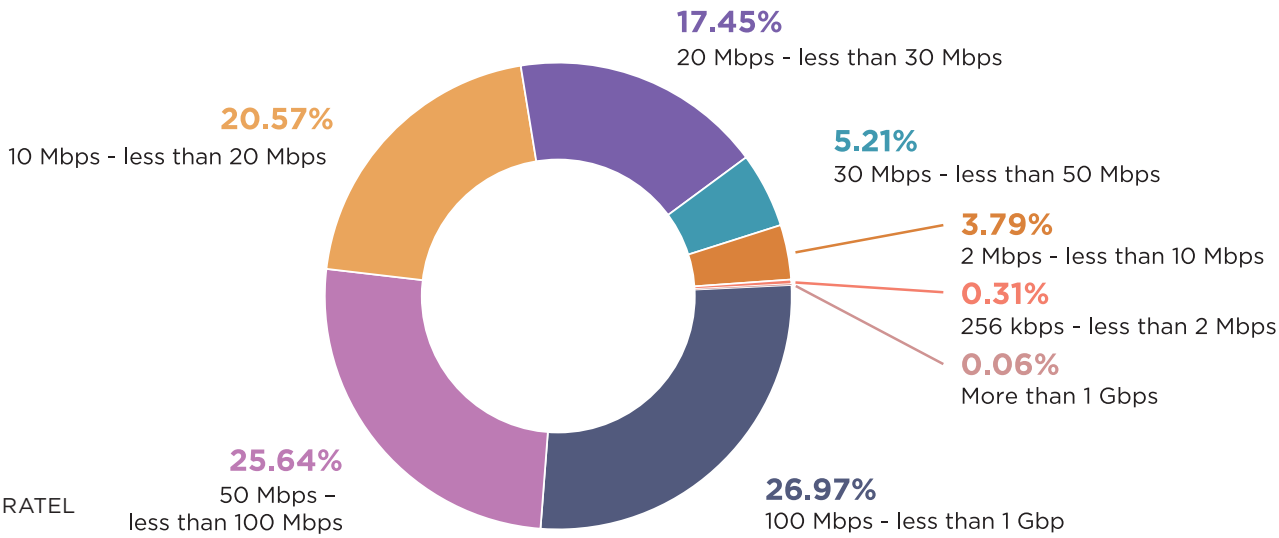
The distinction between broadband speeds offered and the overview of this indicator helps understand the digital divide, and the data on the number of users, depending on the available speed, helps create and introduce regulatory measures targeted at bridging the digital gap. According to the available data, in 2020 there were more than 26% (cf. 22% in 2019) of users who used the packages of at least 50 Mbps but less than 100 Mbps. In addition, 27% of fixed broad-

Figure 7.12. Ordering/purchasing goods or services online



Source: Statistical Office of the Republic of Serbia

Figure 7.13. Share of the fixed broadband subscribers, according to access rate



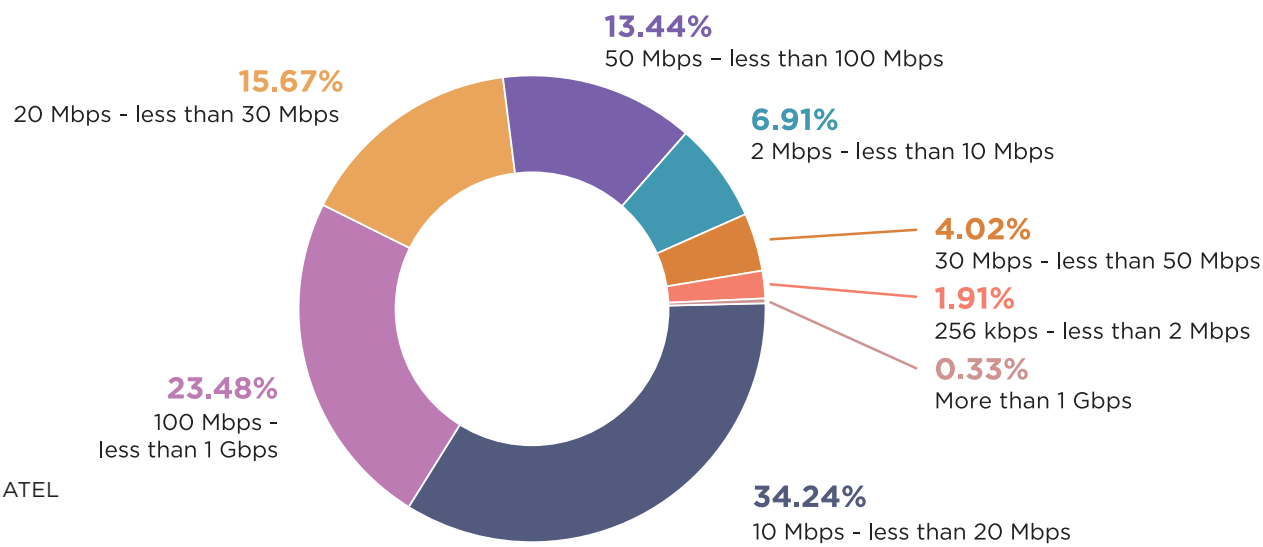
Source: RATEL

band users used packages of at least 100 Mbps but less than 1 Gbps.

The share of the fixed broadband subscribers according to access rate also had impact on the average bill for fixed broadband Internet, which amounted to 1,549 dinars for private users and 4,452 dinars for business users in 2020.

As for business users, the Internet connection speed defined under the contract closed between a company and an ISP is given in Figure 7.14.

Figure 7.14. Share of business fixed broadband subscribers, according to access rate



Source: RATEL

Out of the total number of companies with Internet connection, 84.4% have their own website, mainly with the purpose of providing description of goods and services and price lists (87.6%), giving the possibility to regular customers to view content in customized mode (72.4%) and the possibility for consumers to get acquainted with the products (51.7%).

Social networks are becoming increasingly important for the businesses. During 2020, nearly 44.2% of the companies used social networks, such as Facebook or Twitter.

The percentage of companies paying for cloud service, accessed via Internet for the purpose of software usage and data storage, was 18.6% in 2020. The cloud service, located on the server of the service provider, can be used upon user request and is charged based on used capacity or the way the service is used.

The change in the package structure in favour of higher access rates and the increased number of devices used for the Internet access within the same household, resulted in the increased traffic volume. Based on the available data, the assessed total traffic made by fixed broadband in 2020 was around 2.82 billion GB (2.62 EB). The assessed international link capacity usage was approximately 1.1 million Mb/s and the leased international link capacity (*lit/equipped*) was around 4.9 million Mb/s.

Telecommunications Company "Telekom Srbija" remains to be the largest operator of fixed broadband in the Republic of Serbia in 2020, with a market share of 39.67% in terms of the number of subscribers, showing a decreasing trend in the past two years. Other leading ISPs in the market are: SBB with 32.08% market share, followed by Moja Supernova, Sat-Trakt, Orion telekom, Astra telekom, Jotel and PE "Pošta Srbije", each of them holding a significantly smaller share compared to Telekom Srbija and SBB. Together these 10 operators hold 95.55% of the Serbian ISP market in terms of the number of subscribers.

Figure 7.15. Market share of the leading ISPs in 2019

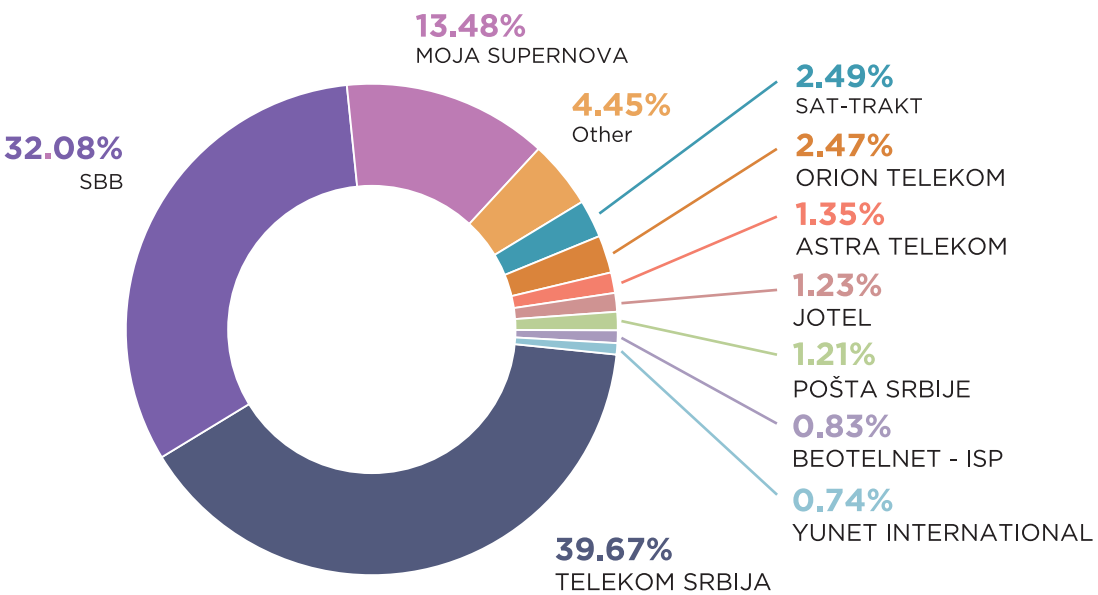


Table 7.1. Internet penetration rate by districts

District	Penetration rate (%)
Belgrade	101.28
Nišava	82.73
South Bačka	82.50
Srem	69.34
South Banat	68.18
Braničevo	65.69
Podunavlje	65.15
Raška	61.97
Pomoravlje	61.70
North Bačka	61.10
Šumadija	60.93
Central Banat	59.66
Morava	59.21
West Bačka	57.00

District	Penetration rate (%)
Rasina	53.50
Zlatibor	52.13
Pirot	51.67
Kolubara	51.27
Pčinja	51.00
Mačva	50.96
Zaječar	48.20
Jablanica	48.03
North Banat	47.82
Bor	43.44
Toplica	42.31

In 2020, there were 205 registered operators providing broadband Internet access. Information on the number of users and penetration rate for the Internet access by districts and the data for 10 municipalities with the highest penetration rates is based on the questionnaires submitted by ISPs.

Data on penetration rates for Kosovo and Metohija and for Preševo have not been presented in the table due to unavailability of information on the number of households.

Table 7.1 shows data on broadband penetration rate for households, by districts, and Figure 7.16. provides a graphic image on the map of Serbia.

The list of 10 municipalities/cities with the biggest number of Internet service subscribers, considering the number of households, is given in Table 7.2 below, while Table 7.3 lists municipalities where the Internet penetration is below 20%.

Figure 7.16. Internet penetration by districts

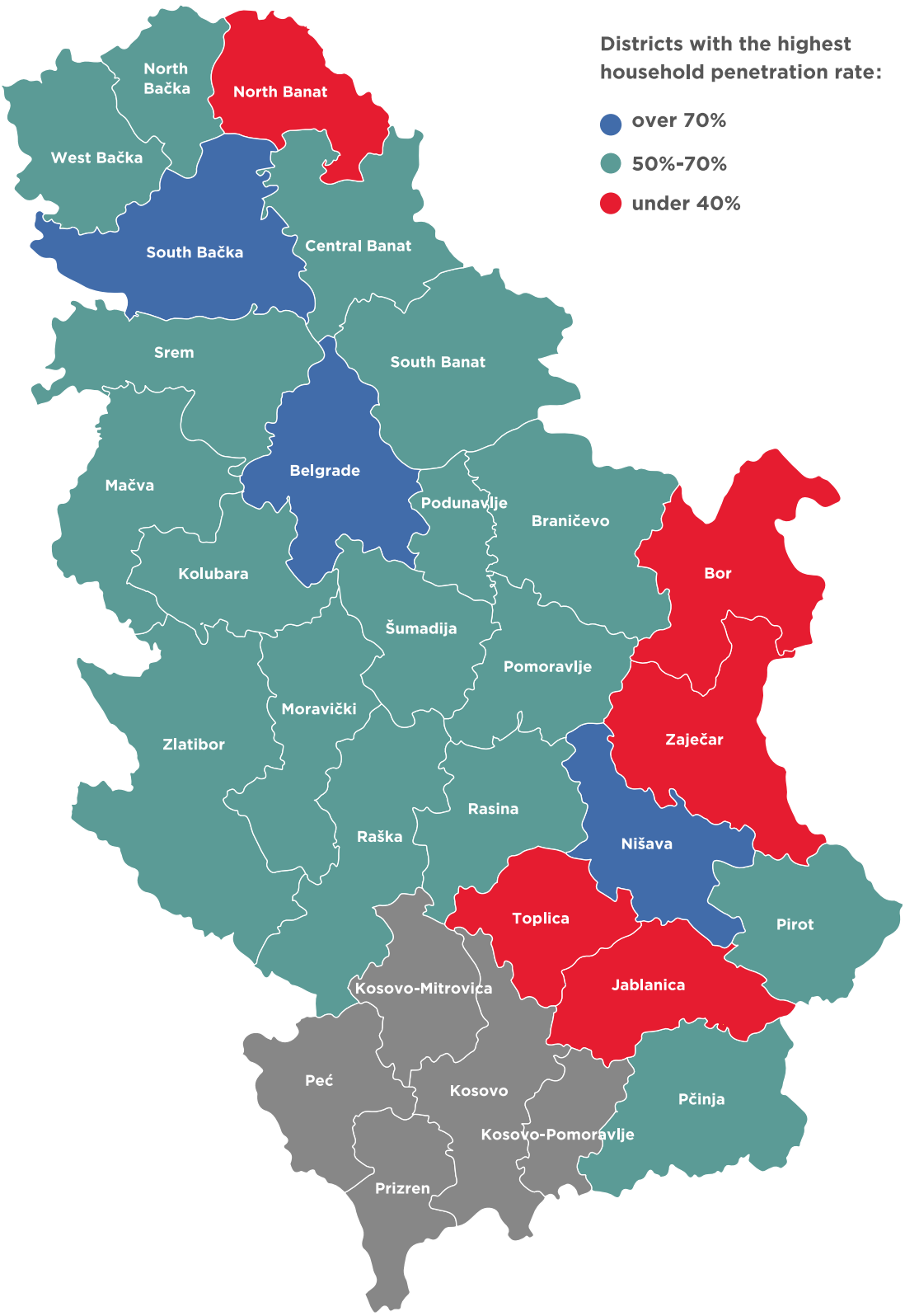


Table 7.2. List of 10 municipalities/cities with the biggest number of subscribers

City/municipality	Penetration (%)
Čajetina	107.63
Novi Sad	102.21
Niš	101.76
Beograd	101.28
Lapovo	94.42
Petrovac	91.24
Inđija	88.84
Veliko Gradište	84.73
Opovo	81.06
Pančevo	79.93

Table 7.3. Municipalities with Internet penetration

City/municipality	Penetration (%)
Gadžin Han	17.68
Trgovište	13.70
Kučevo	13.03
Bosilegrad	10.14
Crna Trava	9.45

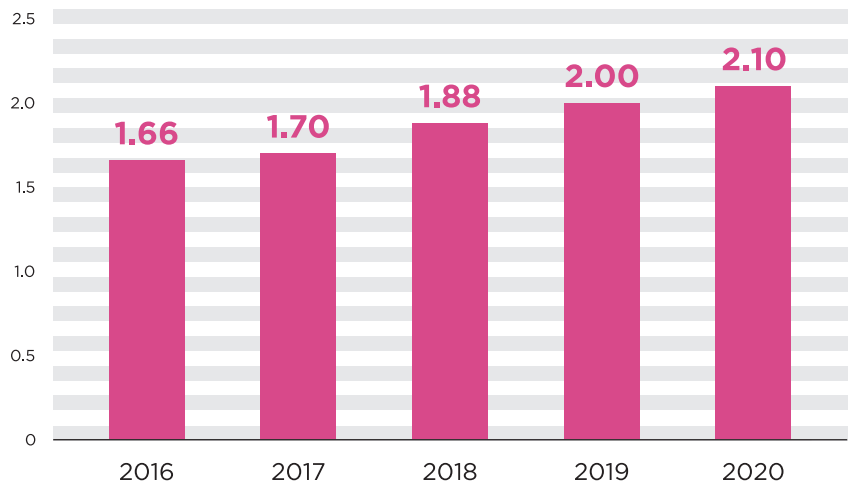
8. MEDIA CONTENT DISTRIBUTION

In 2020, there were 46 registered media content distribution operators providing the service via cable distribution network (coaxial, hybrid and optical), xDSL technologies, satellite distribution network and wireless network. Since 2016, another media content distribution service has been available on the market – paid terrestrial television, broadcast via the network of terrestrial transmitters in the DVB-T2 standard, which requires an indoor antenna and a set-top box. In the Serbian market mts Antena TV Ltd. has been registered since 2016 for the provision of this service.

The total number of subscribers of the media content distribution service in 2020 was 2.1 million, which represents an increase by 5.1% compared to the previous year, mostly due to the increase of cable service and DTH subscribers. Approximately 1.38 million subscribers used the service of media content distribution within service package (bundled service), usually combined with broadband access and/or fixed telephony.

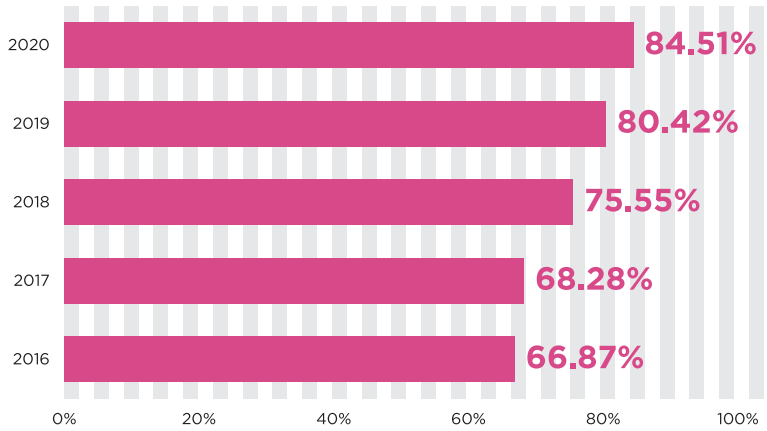
The penetration was 30.35% in terms of population and 84.51% in terms of the total number of households.

Figure 8.1. Total number of subscribers (in million)



Source: RATEL

Figure 8.2. Household penetration (in %)

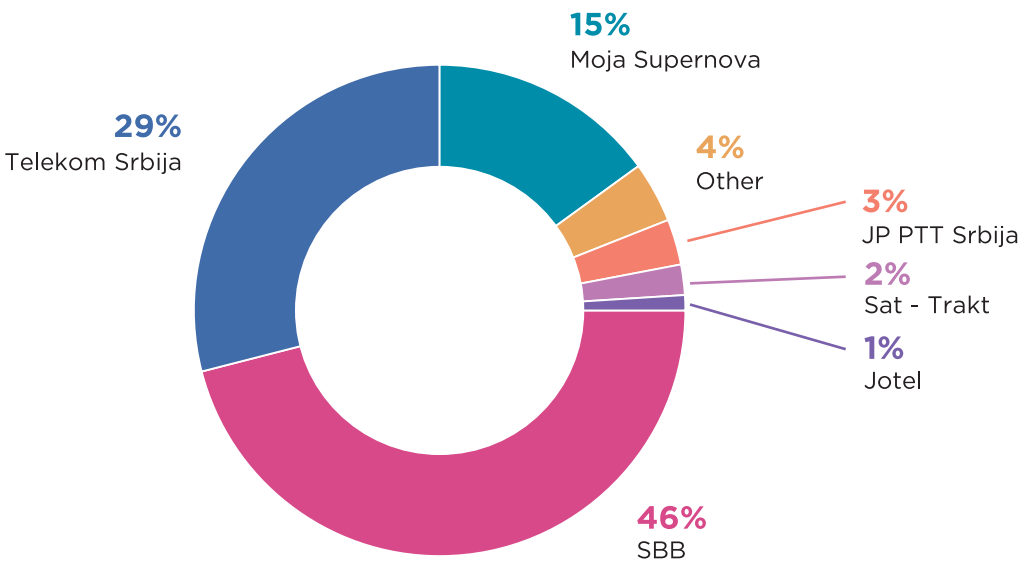


Source: RATEL

The largest media content distribution operator in the Republic of Serbia in 2020 is still Serbia Broadband – Srpske kablovske mreže Ltd. (SBB Ltd.), with a market share of 46%, in terms of number of subscribers. Telekom Srbija, Joint Stock Co. accounts for around 29% of the market share in 2020, whereas Moja Supernova Ltd, the Public Enterprise "Pošta Srbije" and Sat-Trakt Ltd, account for a joint market share of 95% pertaining to media content distribution, in terms of number of subscribers.

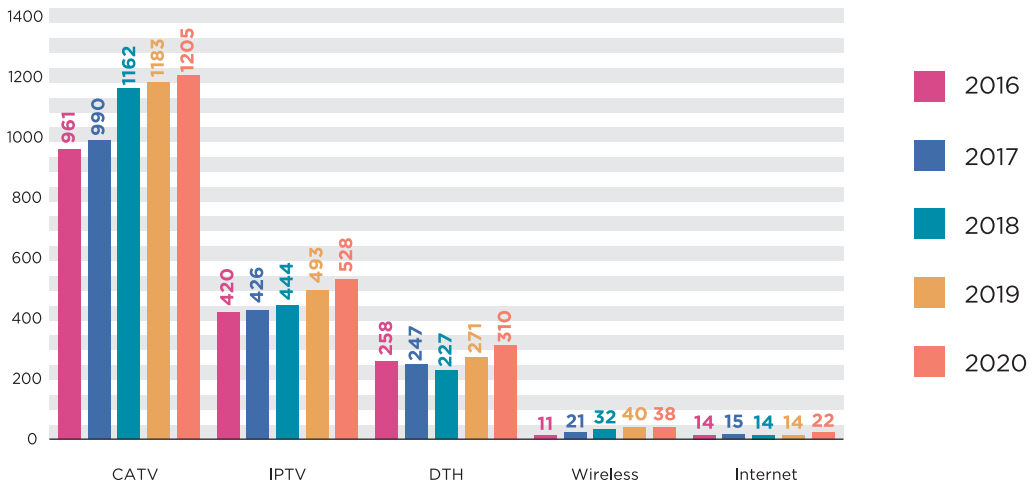
Media content distribution via cable distribution systems (CATV) is still dominant in 2020, with around 1.2 million subscribers, which is an increase by 1.8% compared to the previous year. The number of IPTV subscribers via copper pair network increased as well by approximately 7% compared to the previous year, whereas the number of DTH subscribers via satellite network rose by approximately 14%. The number of media content distribution subscribers via wireless network has equally continued to grow in 2020, amounting to ap-

Figure 8.3. Market share of leading operators in 2020



Source: RATEL

Figure 8.4. Distribution of media content distribution service by type (in thousand)



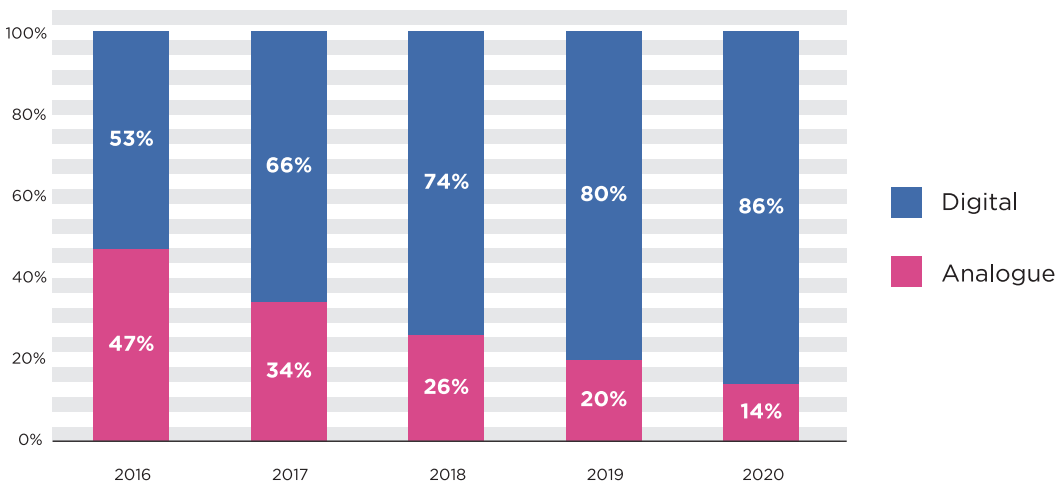
Source: RATEL

proximately 38 thousand, whereas the number of media content distribution subscribers via Internet amounted to approximately 22 thousand.

The share of subscribers by type of distribution has not changed substantively during 2020 for the most widely used technologies, while the shares of other types of distribution increased slightly, from 2.7% to 2.8%. In particular, these are the subscribers using the distribution via Internet which increased from 0.7% to 1%. Pay TV, present on the market since 2016, had around 15 thousand subscribers in 2020.

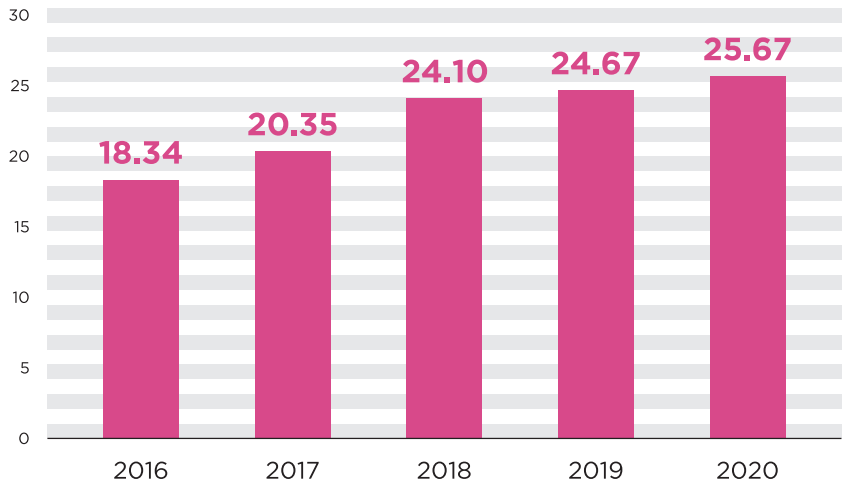
In 2020, as many as 86% of the total number of CATV subscribers have been following the media content in digital format, which means that the users' preferences have changed, and that the digitalization of cable networks is in its full development. Digital cable distribution

Figure 8.5. Distribution of CATV subscribers



Source: RATEL

Figure 8.6. Revenue trends on media content distribution market (in billion dinars)



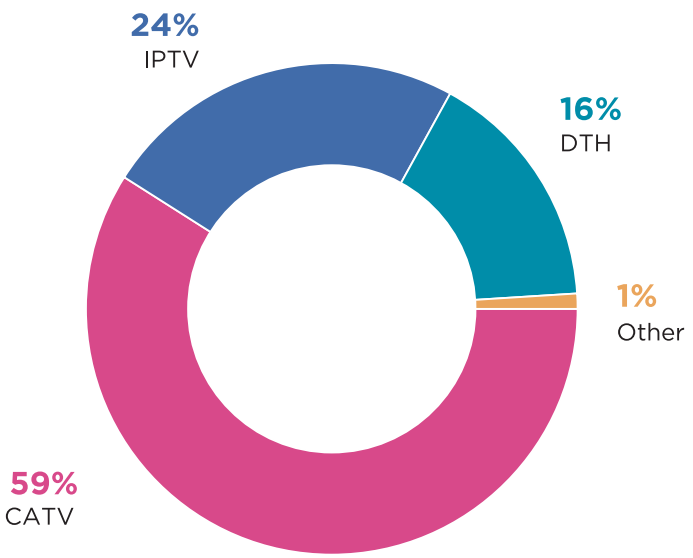
Source: RATEL

enables users to watch the content in high resolution (HD), and to have many additional services available. In addition, analogue to digital distribution switchover is encouraged by diverse promotional activities offered by the operators.

The total income of media content distribution operators in 2020 reached 25.67 billion dinars, which is by almost 4% higher compared to the previous year.

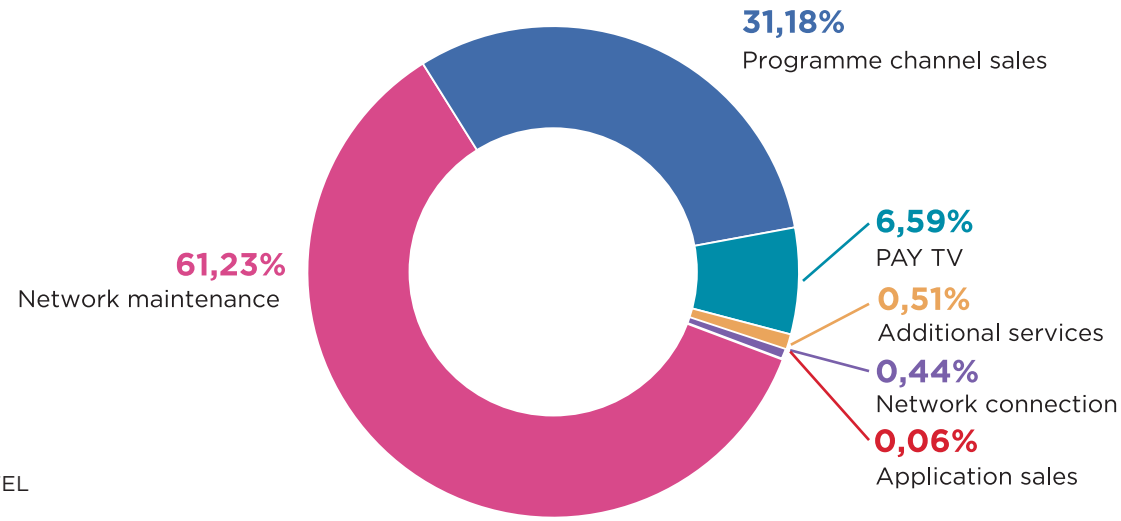
The share of revenues by the type of distribution has not changed in 2020 compared to the previous year. CATV accounts for the biggest share in the revenues from the media content distribution (59%), with IPTV (24%) and DTH (16%) on the same level as in 2019. Other revenues in the observed market (revenues from distribution via Internet and from distribution via wireless network including revenues from paid terrestrial television) participate with approximately 1%.

Figure 8.7. Structure of revenues from media content distribution in 2020



Source: RATEL

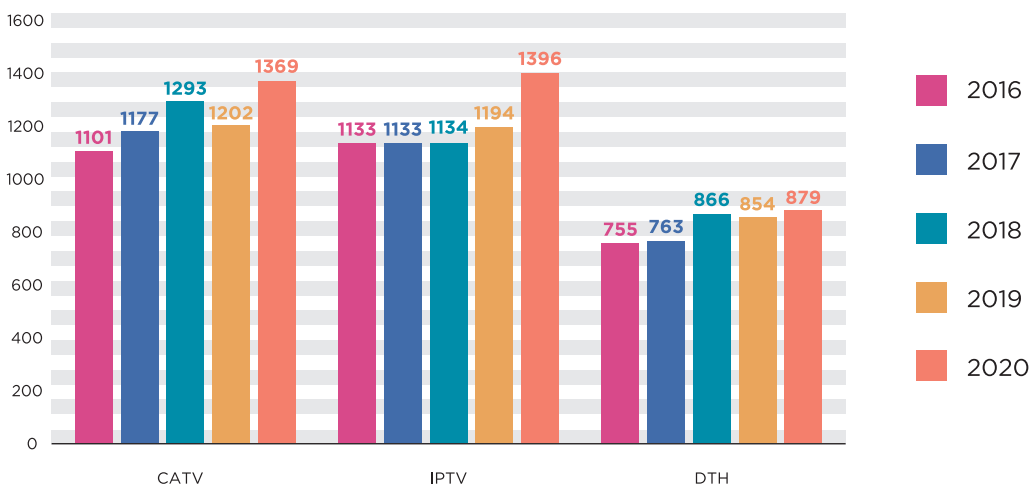
Figure 8.8. Share of revenues from media content distribution in 2020



Source: RATEL

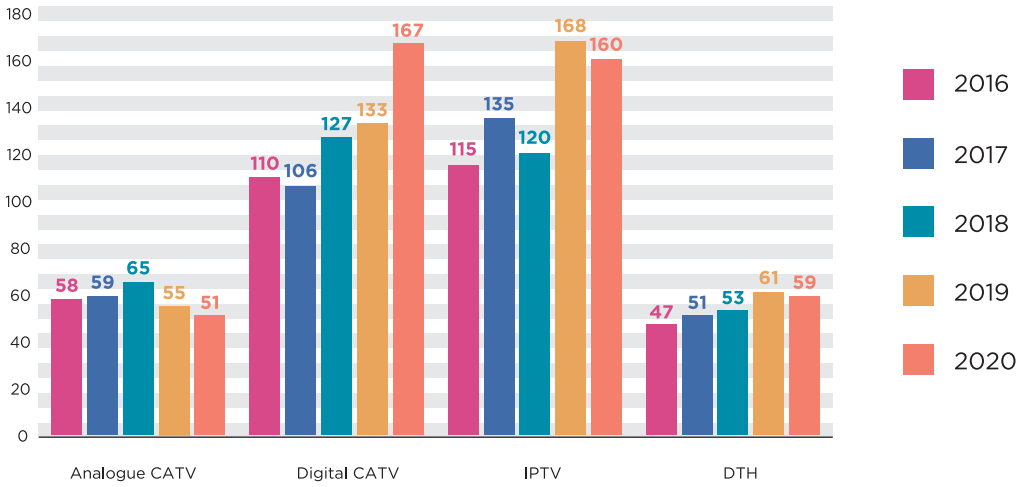
The revenues from the network maintenance and revenues from programme channels sales, which is the income made by selling own programme channels to other operators, account for 92% of the total income, as shown in Figure 8.8. Revenues made from additional PAY TV service make up almost 7% of the total revenues. Network connection charges account for approximately 0.44% of the total revenues in 2020. The reason for such a low share is the fact that most operators do not charge this service to new users during promotional offers or in case of a 12-month/24-month contract. Additional service income includes revenues from services such as video on demand, rewind service, programme recordings service etc, which altogether account for almost 1% of the total revenues in 2020. Revenues pertaining to the sale of TV watching app refer to the application that is sold independently from the distribution service without a user agreement, account for 0.06%, a rather negligible portion of the total income.

Figure 8.9. Average monthly subscription for basic package of the most popular types of distribution (in dinars)



Source: RATEL

Figure 8.10. Average number of TV programs in basic package of the most popular types of distribution



Source: RATEL

In 2020, the average monthly subscription was 997 dinars for basic analogue CATV package, and it 1431 dinars for digital CATV. The average subscription for basic IPTV package has marked a slight rise compared to the previous year, amounting to 1396 dinars, whereas the average monthly subscription for DTH is 879 dinars.

The average number of TV programmes in the basic package in 2020, for different types of distribution, ranged from 51 in case of analogue CATV to 167 in case of digital CATV. There is still a big disproportion between the number of basic package programmes for the analogue and those for the digital CATV, which is one of the means operators use to encourage subscribers to switch to the digital distribution of media content.

In addition to basic package programs included in monthly subscriptions, users can opt for extra, usually thematic, channels subject to additional subscription. These programme packages, in addition to the standard offer programmes included in the subscription, contain additional educational, sports, film and other additional HD programmes. According to the available data, in 2020, these programs were followed by more than 653 thousand subscribers.

Beside the extra channels, additional services available to the subscribers of digital CATV and IPTV include VoD (video on demand), rewind service, recording of the content, interactive TV guide, parental control, watching content on mobile devices and other. According to the available data, in 2020, out of the total number of subscribers, 1.5 million used additional services and realized over 1.6 billion requests for an additional service (more than 1000 requests annually per subscriber), out of which more than 55 million requests involved the VoD service, i.e. 36 requests per subscriber annually.

For the distribution service subscribers to be able to watch media content in digital format (whatever the network they might be connected to – cable, telephony, wireless) on more than one TV device, an additional set-top box is required for each device and charged additionally. During 2020, more than 526 thousand subscribers were renting the additional receiver.

In addition to the distribution service, it is also possible to follow certain TV content on mobile devices, using different applications, without connecting oneself to the distribution network and without entering into subscriber agreement with the operator. The application user is not obliged to pay monthly subscription, while the application itself is usually activated by means of an SMS, charged at a previously set rate. This rate represents, in fact, the fee for the usage of the application during a certain, usually shorter, period.

Table 8.1. shows the data on the penetration of media content distribution service per household on a district level, and Figure 8.11. presents a graphical overview on the map of Serbia. Media content distribution penetration rate per district and per municipality is calculated based on the data provided by operators for inhabited localities. Data for Kosovo and Metohija have not been included in the table, due to lack of data on the number of households.

Table 8.2 lists 10 municipalities with the highest penetration rate, whereas Table 8.3 lists the municipalities where media distribution penetration rate is below 30%.

Table 8.1. Penetration of media content distribution service by districts

Municipality	Penetration (%)	Municipality	Penetration (%)
Belgrade	114.65	Podunavlje	65.50
Pčinja	113.34	Pirot	64.72
Srem	81.07	Zaječar	64.32
Braničevo	80.98	Mačva	63.78
Raška	76.51	North Bačka	61.75
South Banat	73.84	West Bačka	60.93
South Bačka	71.81	Rasina	58.87
Kolubara	70.59	Bor	57.10
Pomoravlje	70.16	Toplica	50.31
Šumadija	69.68	Nišava	50.14
Zlatibor	68.27	North Banat	48.98
Morava	68.17	Jablanica	46.96
Central Banat	66.88		

Figure 8.11. **Media content distribution subscribers by districts**

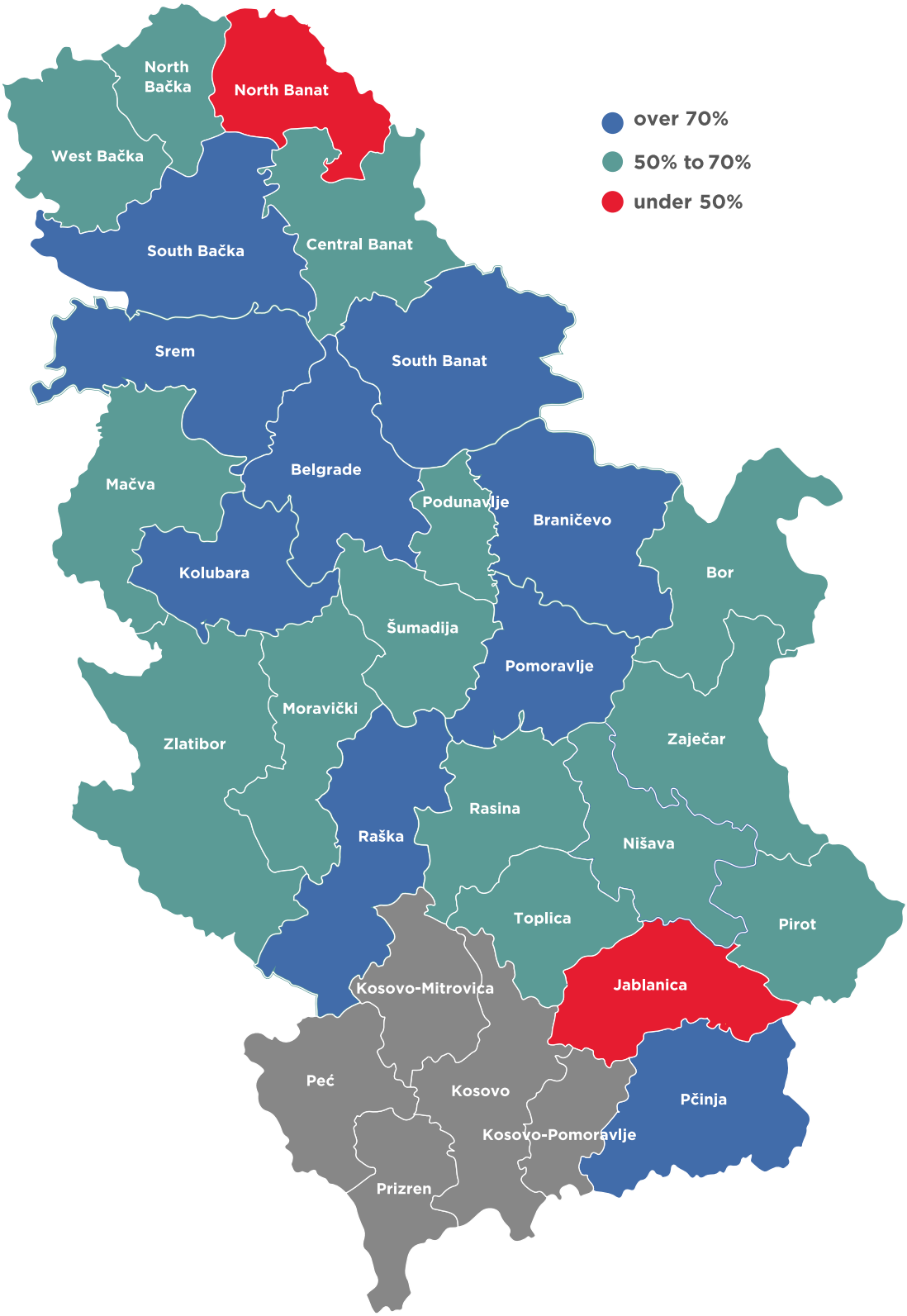


Table 8.2. List of 10 municipalities/cities with the highest media content distribution service penetration rate

Municipality	Subscriber take-up in terms of the number of households per municipality (%)
Čajetina	178.60
Beograd – ukupno sve opštine	114.65
Novi Sad	114.01
Petrovac	108.53
Veliko Gradište	104.34
Raška	99.69
Beočin	95.79
Požarevac	91.55
Stara Pazova	91.11
Irig	91.00

Table 8.3. Municipalities with penetration of media content distribution service per household under 30%

Municipality	Subscriber take-up in terms of the number of households (%)
Crna Trava	26.70
Senta	25.16

9. BUNDLED SERVICES

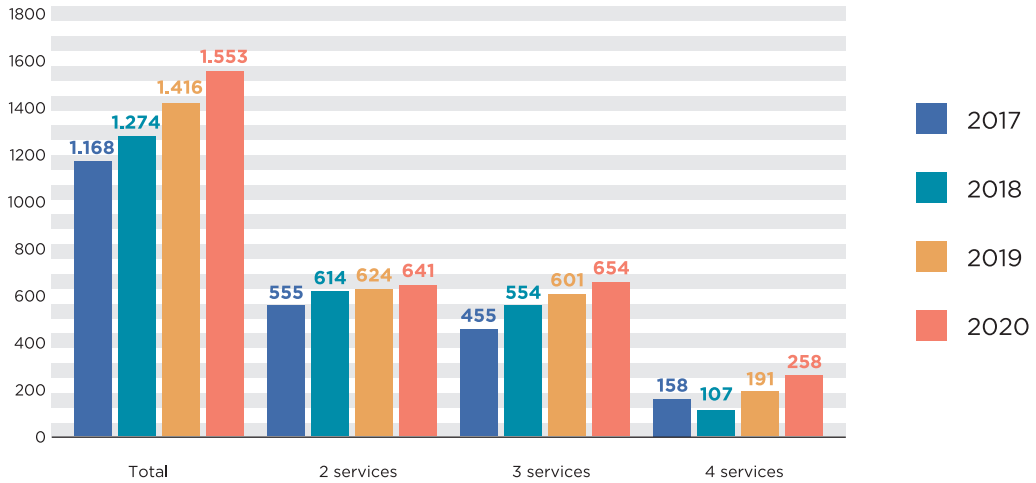
Bundled services are commercial offers of two or more services at a flat rate, which is lower than the sum of individual prices for each of the services. On the electronic communications market, service packages (bundled services) are the result of the horizontal integration, enabling operators to use the same network and thus provide more different services on the retail market (horizontally integrated operators), such as fixed telephony, fixed broadband Internet access, media content distribution, mobile telephony and mobile broadband Internet access. In that way, the operators are able to reduce some costs and attract new subscribers, regardless of if they use their own or another operator's network for the provision of retail services. Bundling services into packages also makes it possible for the operators as independent market players to offer their services together, in a unique package containing services otherwise non-existent individually in their standard offer.

During last several years, the sale of bundled electronic communications services has marked constant growth, due to the benefits they provide to end-users, such as lower prices and simpler purchase and payment procedures for a whole set of services, through one single registration and one single account.

In the Republic of Serbia, beside 2-service (double-play) or 3-service (triple-play) packages made up of different combinations of fixed telephony services, broadband Internet and media content distribution, there are also 4-service (quadruple-play) packages that include mobile telephony service as well, while in the EU there are 5-service packages including mobile broadband Internet, normally offered separately from the voice service via mobile network.

Based on the available data, on the market of the Republic of Serbia, bundled services are offered by 34 operators, out of which 14 operators offer 3-service packages, whereas 4-service packages are offered by one operator. The total number of bundled service subscribers in 2020 was around 1.55 million, marking a growth by 10% compared to the previous year. The triple-play package subscribers account for the growth by 9%, while the number of double-play service packages grew by 3% compared to 2019. The number of 4-service subscribers marked a growth by 35% in 2020.

Figure 9.1. Number of bundled service subscribers (in thousand)



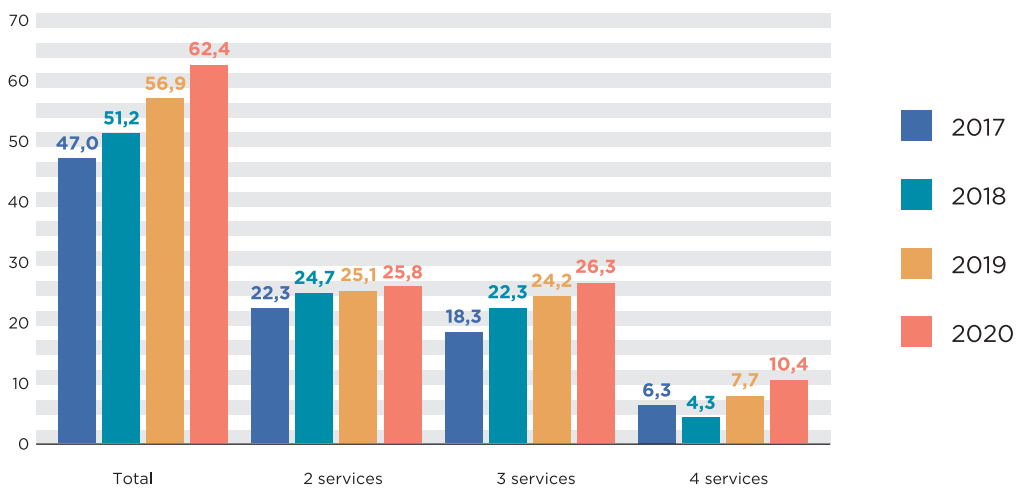
Source: RATEL

In 2020, the penetration of bundled services by the number of households was around 62%.

The majority of 2-service package subscribers used bundled service offering broadband Internet access and media content distribution. Figure 9.3, showing the number of double-play service subscribers by types of included services, indicates that in 2020 the number of subscribers of broadband Internet access and media content distribution increased (by 10%), while the number of subscribers of packages including fixed telephony and media content distribution marked a decrease by 13%, as well as subscribers of the broadband Internet and fixed telephony package (a drop by 12%), while the number of subscribers of packages with mobile telephony remained low.

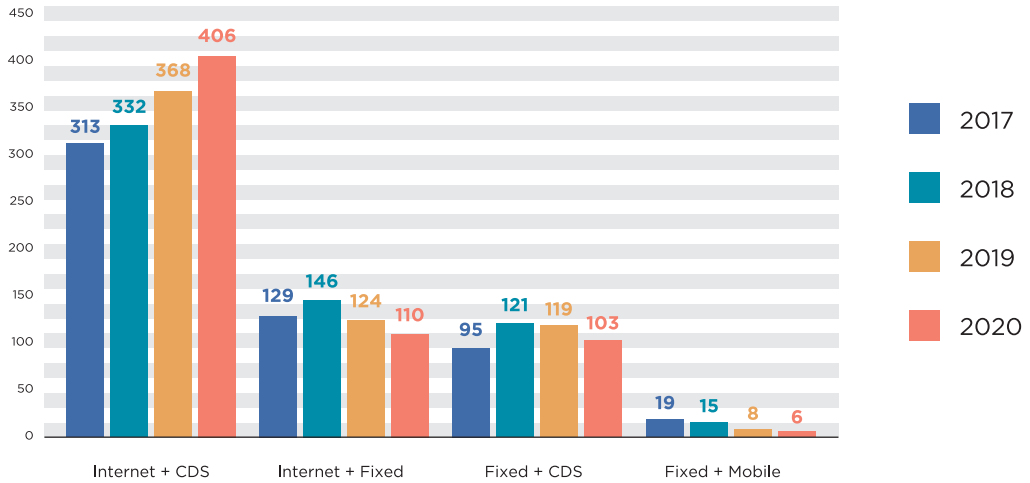
The best-selling 3-service package is bundled service including broadband Internet access, fixed telephony and media content distribution. This package has seen an increase of subscribers by 6%. The rise in the number of

Figure 9.2. Bundled service penetration by the number of households (%)



Source: RATEL

Slika 9.3. Number of 2-service package subscribers (in thousand)

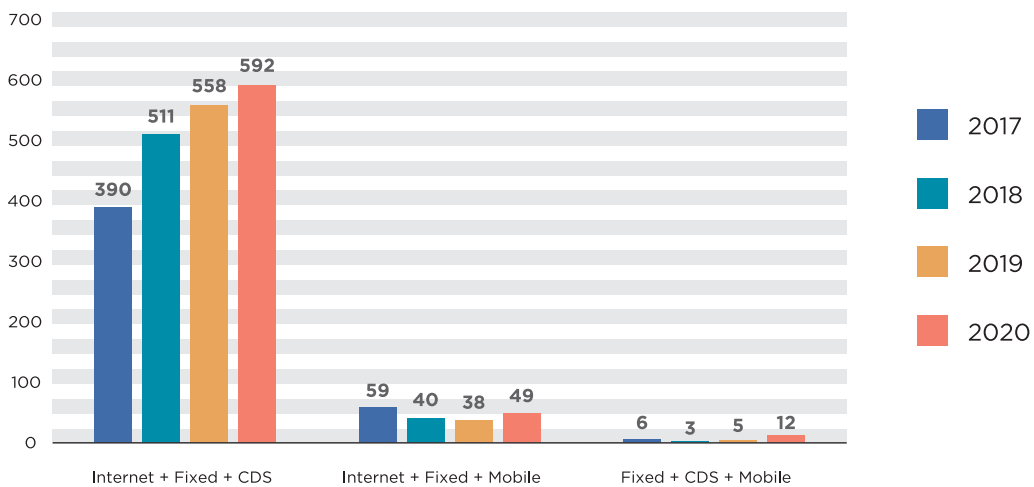


Source: RATEL

subscribers was also present in other two triple-play bundles. Package containing broadband Internet access, fixed telephony and mobile telephony has marked a growth by 29%, whereas the 3-service package offering fixed telephony, media content distribution and mobile telephony and has been on the market since 2016, has also marked a certain growth in the number of subscribers, still not enough to overcome its traditionally low ranking, which is in 2020 around 12 thousand.

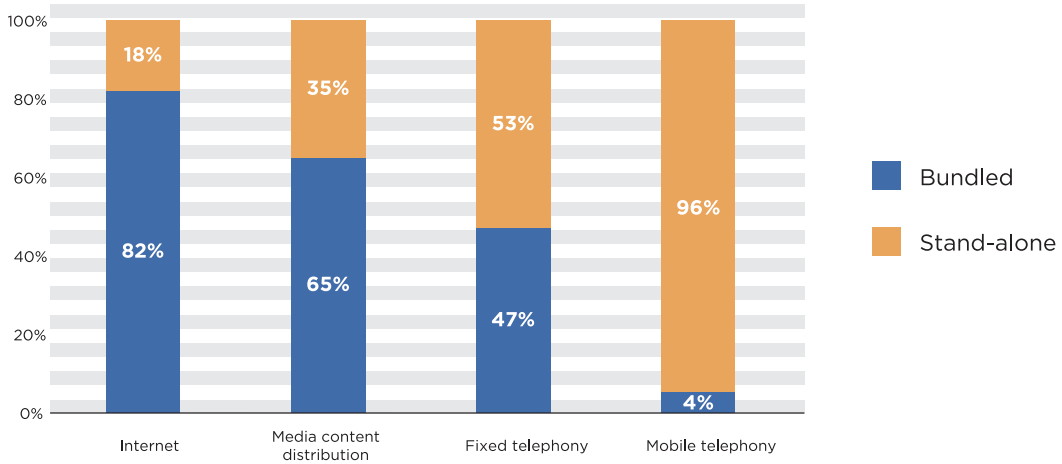
Compared to the previous year, the number of subscribers purchasing broadband Internet access, media content distribution and fixed telephony as bundled service, has marked a remarkable increase, while the situation regarding the mobile telephony service has not changed significantly. The best-selling service within the package is still that of broadband Internet access, used in bundled mode by over 1.4 million subscribers in 2020. It is followed by the service of media content distribution, used

Figure 9.4. Number of 3-service package subscribers (in thousand)



Source: RATEL

Figure 9.5. Share of stand-alone and bundled services purchased by subscribers in 2020



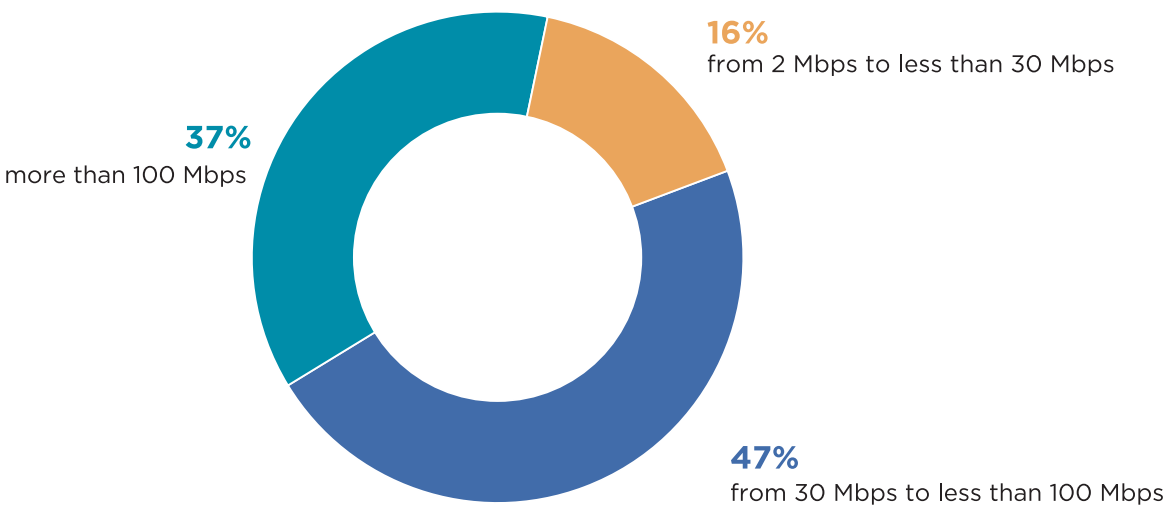
Source: RATEL

in package by more than half of its subscribers (around 1.3 million), while the least popular service is that of mobile telephony.

In most cases, subscribers purchase the service of broadband Internet access from the same operator whose service of media content distribution or service of fixed telephony they are already using. For that reason, the service of broadband Internet access is most usually purchased in package, since thus the subscribers have the opportunity to pay less and have simpler procedures regarding registering and bill payment (for example, instead of several subscriber agreements for each individual service they purchase, only one package contract is signed with the operator; instead of various separate bills for each individual service, only one package bill is received etc).

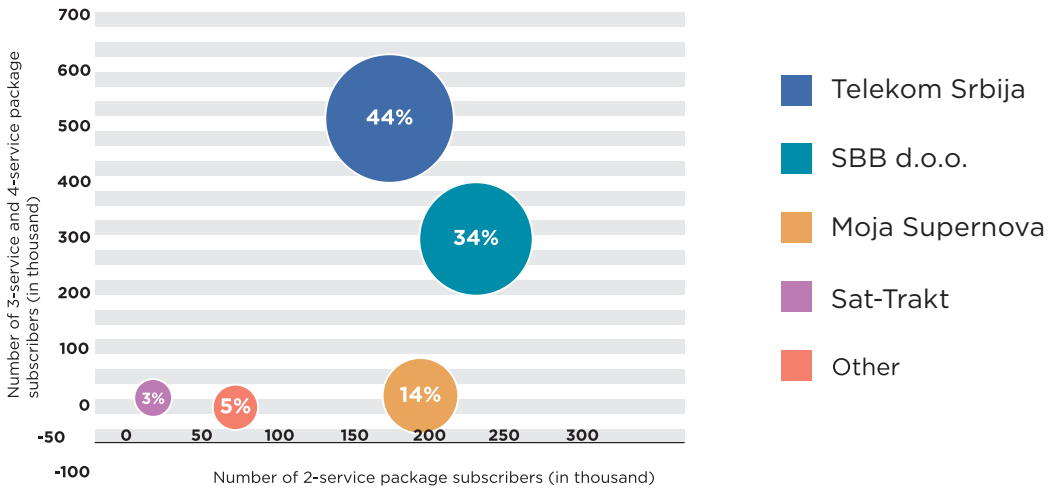
Within the best-selling 2-service and 3-service packages in 2020, containing broadband Internet access service, as much as 47% of the subscribers opted for an Internet speed from 30 Mbps to less than 100 Mbps. Within the

Figure 9.6. Subscribers of the most popular service packages using different Internet speeds in 2020



Source: RATEL

Figure 9.7. Share of operators by the number of bundled service subscribers in 2020

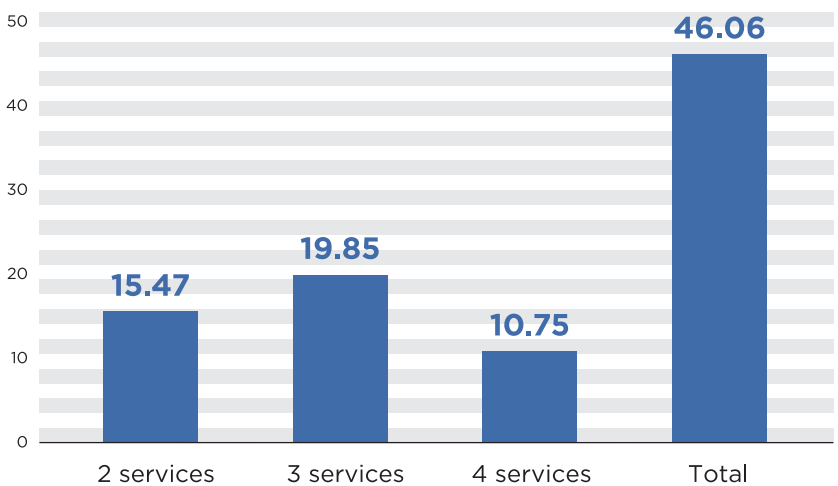


Source: RATEL

package containing broadband Internet access and media content distribution services, 69% of the subscribers opted for the above rate, whereas 51% of the subscribers using package containing broadband Internet access and fixed telephony services opted for a slower Internet rate (from 2 Mbps to less than 30 Mbps). As for the triple-play packages containing broadband Internet access, media content distribution and fixed telephony services, 50% of the subscribers used the fastest Internet rate (more than 100 Mbps).

Most of the operators on the market act individually, offering in their packages the services they already provide to their subscribers. There are certain forms of joint offers on the market of the Republic of Serbia, designed to offer services otherwise absent from regular operators' offers, but those include separate subscriber agreements and separate bills for end-users, so they cannot be considered bundled services. The share of operators measured by the number of bundled service subscribers is shown in Figure 9.7.

Figure 9.8. Earned income from bundled service sales in 2020 (in billion dinars)

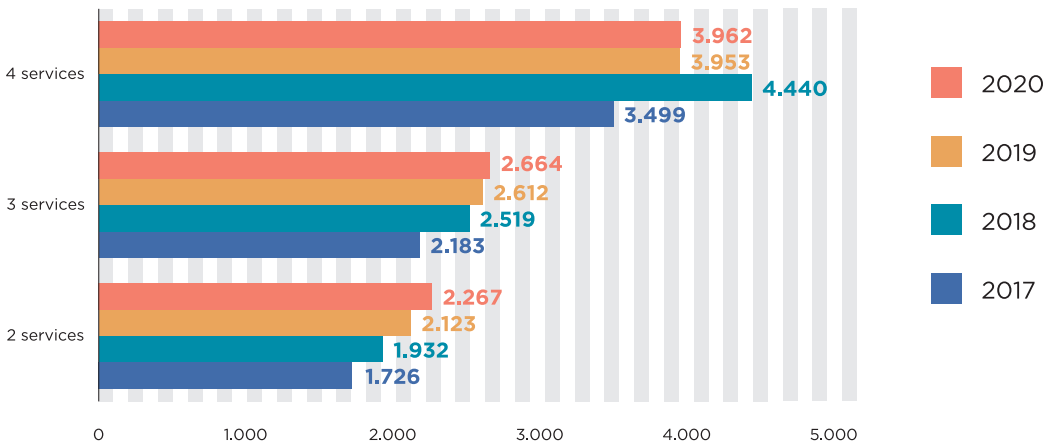


Source: RATEL

From the sale of bundled services in 2020, the operators earned an income of more than 46 billion dinars, the most of which (around 19.8 billion dinars) is generated from the sale of triple-play bundles, while the sale of quad-play packages accounted for the smallest income share (around 10.7 billion dinars).

Monthly subscriptions for the best-selling packages in 2020 ranged between 650 dinars for the cheapest package and 3,999 dinars for the most expensive one, depending on the operator and the package content, and are more or less similar to those in the previous year. Operators often offer bundled services at promotional prices (considerably lower than the regular ones) for a limited time, with a 12 or 24-month contract. Monthly subscriptions differ depending on the program package (basic channel package, additional services, additional media content), Internet speed, free minutes in fixed telephony and mobile telephony package included in the bundled service. The average subscription amounts for the best-selling bundled services in the Republic of Serbia are shown in Figure 9.9.

Figure 9.9. Average amounts of monthly subscription for the best-selling bundled services (in dinars)



Source: RATEL

10. VALUE ADDED SERVICES AND MESSAGING SERVICES

The Law on Electronic Communications and Rulebook on general terms and conditions for electronic communication activity ("Official Gazette of RS", no. 38/11) have created administrative possibility for messaging and value-added service (VAS) providers to be registered in the register of operators managed and updated by RATEL, in line with its legal competences.

In 2020, there were 40 operators in the register of public communication networks and services registered for value added service provision, most of them also being registered for message transmission service. These operators provide services through fixed and mobile network operators, the users of these networks being able to access value added services by means of public numbering (090Xabcdef and 0780abcdef) for value added voice transmission and internal numbering of mobile operators for value added messaging (SMS, MMS).

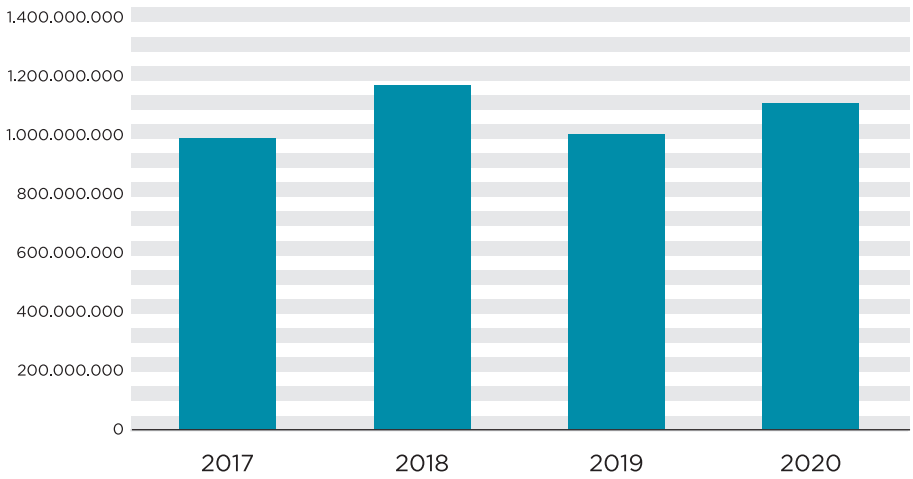
Messaging and value-added service provided by the operators may be divided, according to purpose, into: televoting, advertising, entertainment, children entertainment, humanitarian aid, adult entertainment, lottery, SMS notifications, marketing bulk messages, goods and services payment and other.

Annual revenues for the period 2017-2020 pertaining to the above services are given in Figure 10.1. The service provision accounts for the total income of 990 to 1,174 million dinars annually. In 2020, the revenues in this market, according to the data collected by RATEL, amounted to approximately 747 million dinars, which means that the operators' income has decreased by approximately 26% compared to the previous year. It should be noted that part of the revenues, generated from network usage, traffic billing and collecting, go to network operators, based on commercial contracts between the network operators and messaging and value-added service providers.

According to the available data provided to RATEL by the operators, there were three providers with the largest revenues from the messaging and value-added service provision in 2020: Dimoco, Comtrade and Dopler, taking up in total 43% of the VAS market share.

Value added service market is fully competitive. Figure 10.2 shows market share of VAS

Figure 10.1. Annual revenues 2017-2020

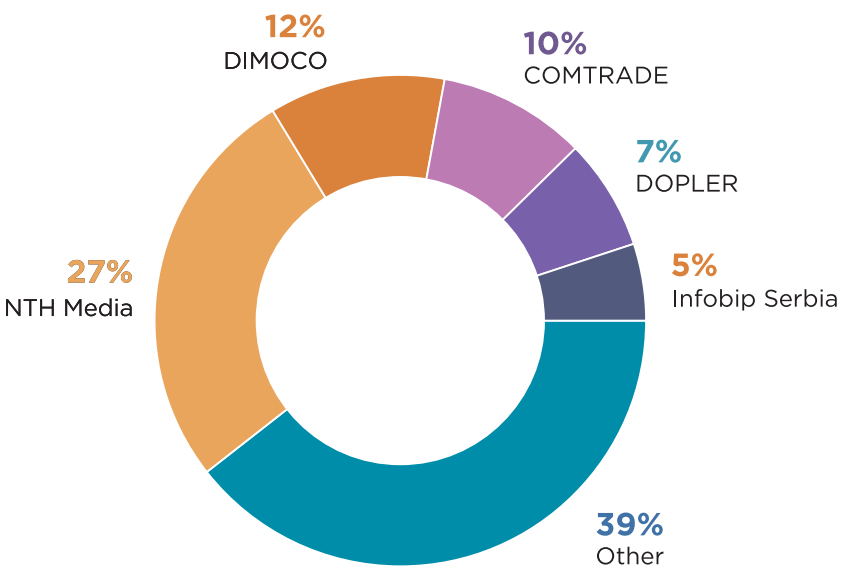


Source: RATEL

providers (VASPs) according to revenues made. However, it should be noted that the revenues are divided between VASPs, network operators and content creators.

Around 93% of the total revenues made by the operators in 2020 are revenues from messaging service (SMS, MMS) and VAS messaging, and the rest of the revenues comes from voice VAS. The technology that enables easier and better data processing for SMS and MMS and the expansion of direct electronic marketing have in the recent period led to a significant increase in the revenues made from messaging and value-added services and to a simultaneous drop in the revenues from VAS voice transmission services, with the income share steadily set in during the recent years. In ad-

Figure 10.2. Market share of messaging and value-added service operators by revenues made from these services



Source: RATEL

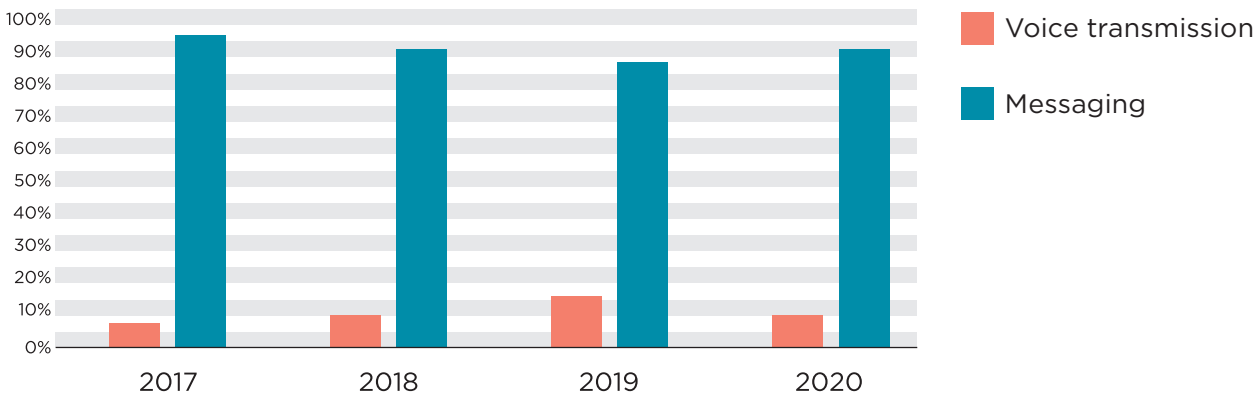
dition, the large-scale usage of smart phone devices made the users lose interest in VAS by voice transmission or SMS messaging, which particularly affects voice VAS.

For the purpose of VAS voice transmission, the operators were assigned 660 numbers, i.e. 80 numbers more than the previous year.

In 2020, the voice value added service provision accounted for approximately 1. 4 million minutes of traffic, and the share by type of voice VAS is given in Figure 10.4.

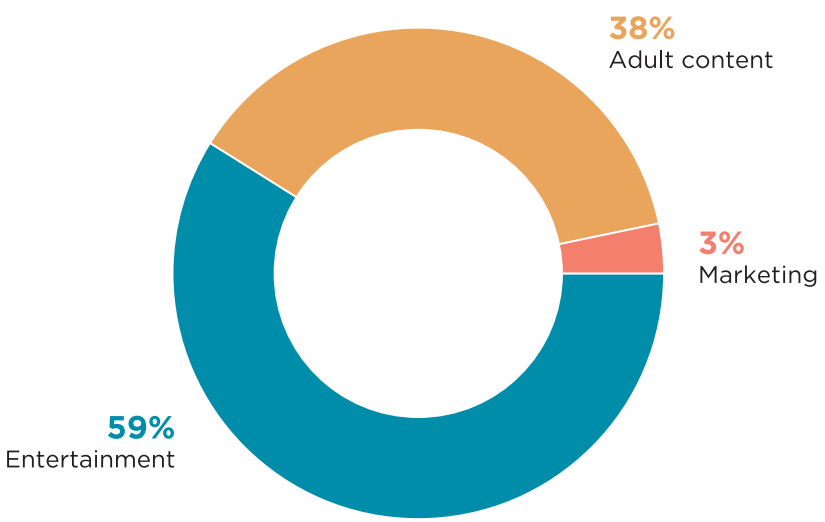
In 2020, the volume of bulk message transmission and VAS message transmission was 465 million messages, the 92% of which ac-

Figure 10.3. Market share by type of VAS and revenues made in 2017, 2018, 2019 and 2020



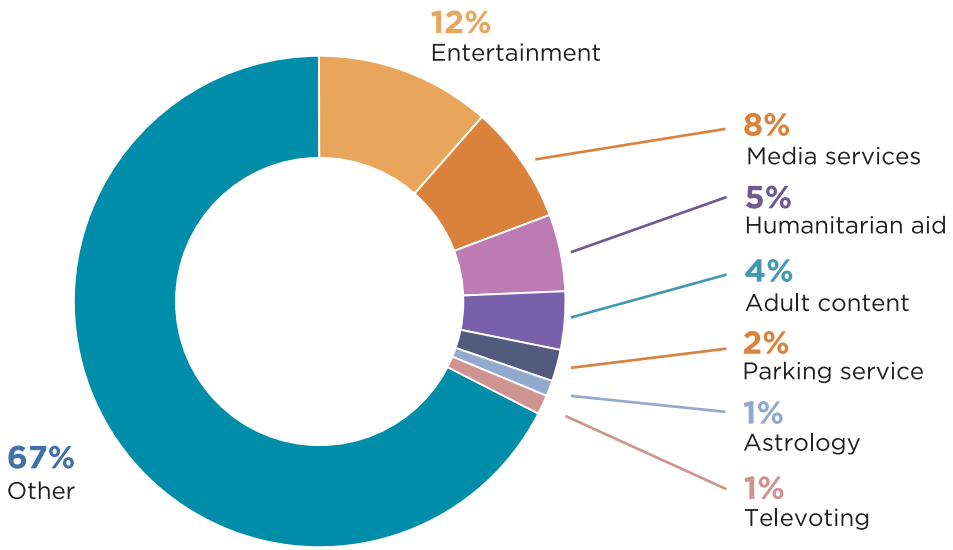
Source: RATEL

Figure 10.4. Share of realized minutes by type of voice VAS in 2020



Source: RATEL

Figure 10.5. Share of realized VAS messages by purpose in 2020



Source: RATEL

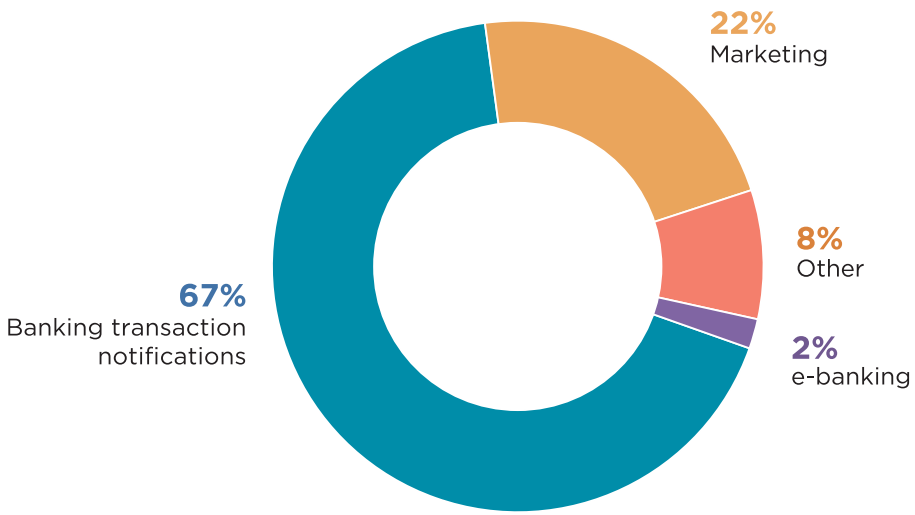
count for bulk messages, and 8% for VAS messages.

The share of realized VAS messages by purpose is shown in Figure 10.5, with 81% of the displayed messages belonging to the category "Other", since these do not relate to the standard set of value-added services, but rather serve to transfer information, notifications, taxi requests, perform search queries (for currency exchange values etc.) and payments for goods and services.

The share of realized bulk messages by purpose is shown in Figure 10.6, where it can be seen that 76% of the messages fall under category "Banking transaction notifications".

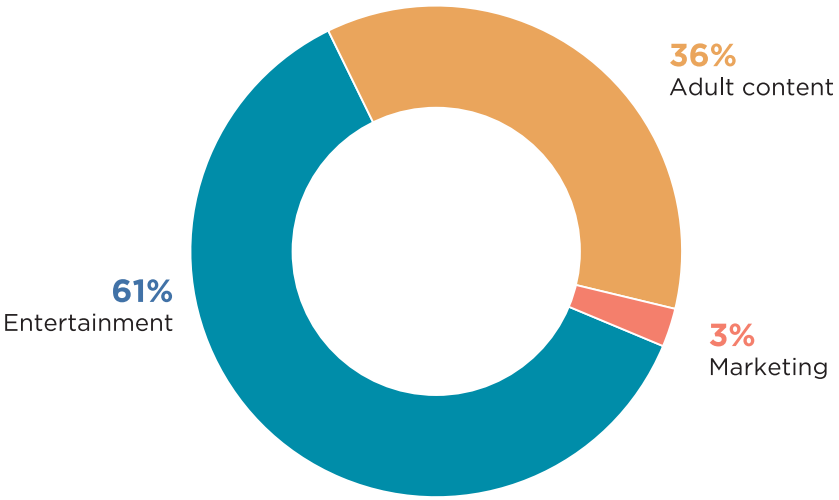
Revenues from voice VAS transmission amount to approximately 50 million dinars,

Figure 10.6. Share of bulk messages by purpose in 2020



Source: RATEL

Figure 10.7. Share of voice VAS revenues by purpose in 2020



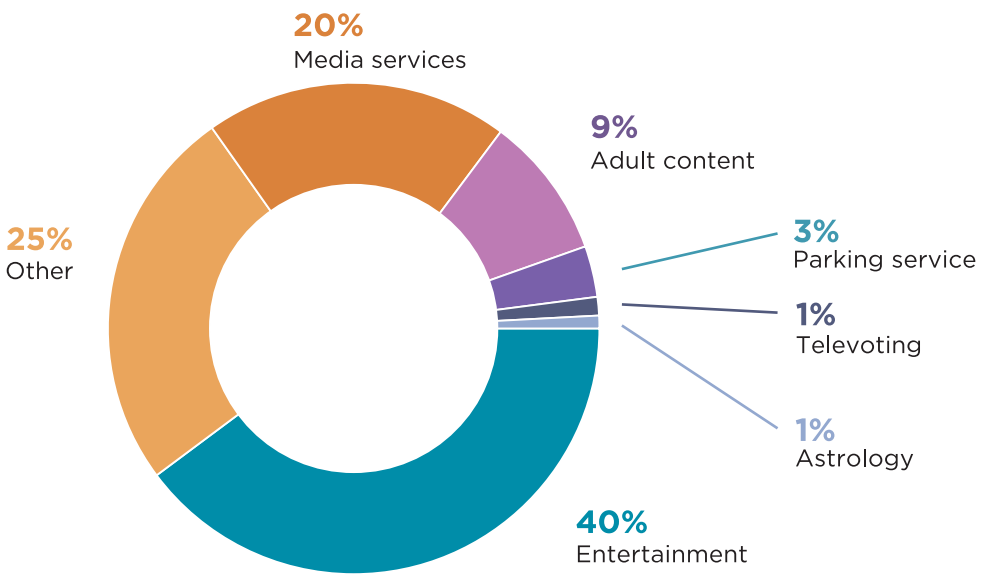
Source: RATEL

with the shares by purpose being shown in Figure 10.7.

Revenues from message service transmission (bulk messages) and VAS messages amount to more than 697 million dinars, 75% of which account for the income generated from VAS message transmission and the rest of the income from bulk transmission. This is an expected ratio of realized revenues, due to the nature of bulk messages, which are charged at a considerably lower average rate than VAS messages.

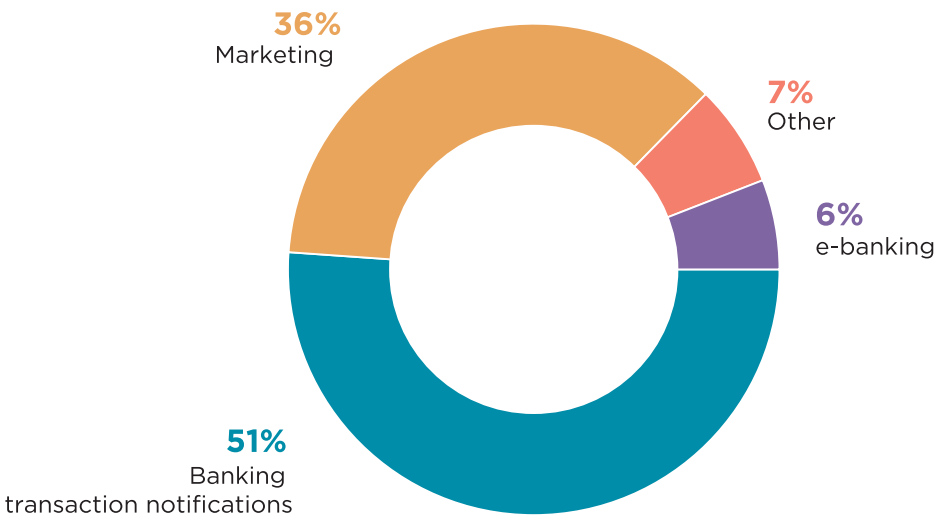
The share of revenues from VAS message transmission by purpose is shown in Figure 10.8, while the share of revenues from message transmission by purpose is shown in Figure 10.9.

Figure 10.8. Share of VAS transmission revenues by purpose in 2020



Source: RATEL

Figure 10.9. Share of message transmission revenues by purpose in 2020



Source: RATEL

11. MONITORING OF ELECTRONIC COMMUNICATIONS NETWORK AND SERVICE QUALITY PARAMETERS

Monitoring of quality parameters for electronic communication services and networks is performed pursuant to the Rulebook on quality parameters for publicly available electronic communication services and monitoring of electronic communication activity ("Official Gazette of RS", Nos. 73/11 and 03/14).

The Rulebook stipulates quality parameters for the following electronic communication services:

- public voice service on the public telephone network at a fixed location,
- public voice service provided via Internet (VoIP),
- public services on the public mobile communications network,
- broadband access,
- media content distribution;

and for the following networks:

- public mobile communications networks.

The electronic communication operators are required to provide, at least once a year, upon RATEL's request, a report on the values of the quality parameters for services and/or networks, on appropriate forms for each service or network. RATEL also performs monitoring of quality parameters for services and networks, compliance with technical and other requirements and performance of the electronic communication activity, in accordance with the Law on Electronic Communications, the aforementioned Rulebook on quality parameters for publicly available electronic communication services and other bylaws and positive regulations.

RATEL maintains an up-to-date database on the quality of the public communication networks and services. In addition, the operators are required, pursuant to Article 106 of the Law on electronic communications, to make their terms and conditions, including the minimum quality of service provision, publicly available in a suitable manner, so as to inform the users on the values of the quality parameters used for measuring the electronic communication QoS.

The reports on the values of quality parameters for electronic communication services and networks for the previous year were submitted to RATEL by the operators within the prescribed delay, till March 15, 2021.

11.1. Average values of quality parameters for electronic communications services and networks for the period 2018–2020

Table 11.1 shows the number of the operators of electronic communications networks and services that submitted their network and service parameters in a report.

Average supply time for electronic communications services

For all electronic communications services, the average time from the instant of a valid service order being received to the instant a working service is made available for use, during last year was less than 3 days. The operators keep fulfilling the demands of users for electronic communications services more swiftly, so that the average supply time becomes shorter each year.

Table 11.1. Number of operators which provided reports

	2018	2019	2020
Voice service on the public telephone network at a fixed location	18	24	**24**
Voice service provided via Internet (VoIP)	20	23	**20**
Services on the public mobile communications network	4	4	**4**
Broadband access service	107	102	**139**
Media content distribution service	60	40	**44**

Table 11.2. Average supply time for service

	Prescribed value	2018	2019	2020
Voice service on the public telephone network at a fixed location	10 days for 50% new connections a year	4.7	3	**3**
Voice service provided via Internet (VoIP)	8 days for more than 95% requests	3	4	**2.2**
Broadband access service	8 days for more than 95% requests	6	3	**2.2**
Media content distribution service	8 days for more than 95% requests	3.2	3.4	**2.2**

Customer complaints about quality of electronic communications services

During 2020, the percentage of user complaints about quality of electronic communications services was in average less than 11% for all types of services. The highest percentage of complaints (11%) concerned broadband access quality, an expected outcome taking into account the increased need for higher Internet output and Internet access quality as a result of the pandemic.

The time needed for user complaint resolution (applicable for 80% of the complaints) was less than 1.65 days for all electronic communications services. For all electronic communications services, the percentage of user complaints about the correctness of bills was less than or equal to 1%, which is the maximum prescribed value.

Table 11.3. User complaints and complaint resolution

		Prescribed value	2018	2019	2020
Voice service on the public telephone network at a fixed location	Percentage of user complaints about quality of service	0.5%	2.9%	2.17%	**3.7%**
	Resolution time for user complaints for 80% of the complaints (days)	10.0	1.2	1.2	**1.4**
	Percentage of user complaints about bill correctness	≤1%	1%	0.54%	**0.61%**
Voice service provided via Internet (VoIP)	Percentage of user complaints about quality of service	-	2.7%	2%	**1.2%**
	Resolution time for user complaints for 80% of the complaints (days)	1.0	0.72	1	**1**
	Percentage of user complaints about bill correctness	≤1%	0.1%	0.1%	**1%**
Services on the public mobile communications network	Percentage of user complaints about quality of service	-	1.9%	2%	**1.33%**
	Percentage of user complaints about bill correctness	≤1%	0.1%	0.1%	**0.12%**
Broadband access service	Percentage of user complaints about quality of service	-	9%	8%	**11%**
	Resolution time for user complaints for 80% of the complaints (days)	1.0	1	1.3	**1.65**
	Percentage of user complaints about bill correctness	≤1%	0.4%	0.6%	**0.5%**
Media content distribution service	Percentage of user complaints about quality of service	-	6%	7%	**6.5%**
	Percentage of user complaints about bill correctness	≤1%	0.7%	0.45%	**0.6%**

Parameters of operator's contact services

The mean value of quality parameter „response time for operator's contact services" has increased over 2020 compared to 2019. A rule has been observed that the „response time for operator's contact services" parameter value increases with the number of users. The operators serving a great number of users should improve this parameter in order to provide a better communication contact to the customers.

Quality parameters for voice service on the public telephone network at a fixed location

The ratio of all unsuccessful calls comprising the percentage of unsuccessful national calls in fixed network within and outside of the local exchange, percentage of unsuccessful national calls from fixed network to mobile operators and other fixed operators, as well as percentage of unsuccessful international calls was 0.7% in 2020, which equals the value from the previous reporting cycle. The supply time for call was shortened.

Table 11.4. Response time for operator's call centre (in seconds)

	2018	2019	2020
Voice service on the public telephone network at a fixed location	30	28	**45**
Voice service provided via Internet (VoIP)	40	25	**58**
Services on the public mobile communications network	29	38	**53.4**
Broadband access service	32	35	**45**
Media content distribution service	30	32	**49**

Table 11.5. Quality parameters for voice service on the public telephone network at a fixed location

	Parameter definition	Prescribed value	2018	2019	2020
Unsuccessful call ratio (all calls)	Percentage of call attempts to an existing user, which failed due to system failure or no capacities available. The case where the called party (B-Number) is busy or not responding is not regarded as a failed call.	≤1%	0.83%	0.79%	**0.70%**
Supply time for call (average time for national calls)	Time between selecting the two last digits of the subscriber's number and call verification signal.	< 3s	3.4	2.7	**2.32**

Quality parameters for services on the public mobile communications network

Four operators provide reports including quality parameters for public services on the public mobile communications network:

- Telekom Srbija,
- Telenor,
- Vip mobile,
- Globaltel,

since, in 2016, Globaltel was registered as a virtual mobile operator.

The measurement of quality parameters for services on the public mobile telecommunications network, which are supposed to correspond to average values measured for the peak traffic hour in a 7-day week, was carried out in the 50th week of 2020, between the 7th and 13th of December 2020.

PIt is observable that the call setup time in 2G and 3G mobile communications networks has become shorter, with public communication service Voice over LTE (VoLTE) network also being established. This service contributes to the improvement of the „call setup“parameter.

DL throughput for packet interactive toward users in GSM and UMTS mobile networks has decreased, but also significantly increased for packet interactive toward users in LTE mobile network.

Table 11.6. Quality parameters for public mobile services

	Parameter definition	Prescribed value	2018	2019	2020
Call Setup Success Rate for GSM mobile network (Call Setup Success Rate)	CSSR=(successful call attempts/all call attempts)*100	> 98% at GSM network level	99.5%	99.39%	**99.55%**
Call Setup Success Rate for UMTS mobile network (Call Setup Success Rate)	CSSR=(successful call attempts/all call attempts)*100	> 98% at UMTS network level	99.88%	99.25%	**99.90%**
VoLTE Call Setup Success Rate (Call Setup Success Rate)	CSSR=(successful call attempts/all call attempts)*100	-	-	-	**99.80%**
Telephony Setup Time for GSM network	Time for connection setup from the moment user activates sending function.	-	4.6s	4.5s	**4.61s**
Telephony Setup Time for UMTS network	Time for connection setup from the moment user activates sending function.	-	3.3s	2.7s	**2.78s**
DL Throughput for Packet Interactive in GSM and UMTS mobile networks	Average throughput toward user (DL) for packet interactive.	> 128 Kb/s	5.6Mb/s	5.3Mb/s	**2.8Mb/s**
DL Throughput for Packet Interactive in LTE mobile network	Average throughput toward user (DL) for packet interactive.	-	29.5Mb/s	54.4Mb/s	**43.7Mb/s**

Network load for GMS and UMTS network voice traffic

The measurement of quality parameters for mobile communications networks, which should correspond to average values measured for the peak traffic hour in a 7-day week, was carried out in the 50th week of 2020, between the 7th and 13th of December 2020.

During 2020, an increased volume of voice traffic in operators' mobile communication networks was observed, compared to previous years.

The mean value of LTE traffic volumes in the week of measurement in 2020 has amounted to 3,306,948.00 GB.

lowing operators: Telekom Srbija, Telenor and Vip mobile.

The purpose of mobile network benchmarking is an objective parallel testing of QoS in mobile networks, from users' point of view, by measuring KPI quality parameters (Key Performance Indicators). Benchmarking measurements were realized during October and November 2020 and represent an integral part of RATEL's regular activities.

The benchmarking measurements were carried out in a drive test form, using two vehicles moving on the pre-defined routes, and in a walk test form, at four hot-spot locations in Belgrade.

Table 11.7. Network load for GMS and UMTS network voice traffic

		2018	2019	2020
GSM voice traffic	mean value of network load for GSM network voice trafic, Erlang/TRX	1.52	1.22	**1.92**
UMTS voice traffic	mean value of network load for UMTS network voice trafic, Erlang/TRX	2.1	2.59	**3.35**

11.2 Benchmarking of mobile communications networks

RATEL's strategy aims to encourage additional investments and further development of telecommunications market by fostering competition, cost-effectiveness and efficiency of mobile communications, and to inform users in a reliable and neutral way on the quality of mobile networks in Serbia. For that very reason, for four years RATEL has undertaken comprehensive benchmarking of mobile communications networks belonging to the following operators: Telekom Srbija, Telenor and Vip mobile.

Benchmarking measurements were carried out in 50 cities and along 10,000 km of roads in the Republic of Serbia. During the campaign, more than 6,000 calls and 7,000 sessions for each of data transfer services on all mobile networks and using all available technologies (2G, 3G, 4G) were performed. The measurements included:

- radio parameter measurements for 2G/3G/4G technologies,
- measurement of KPIs for voice service and data transfer service.

Since the benchmarking of mobile networks was carried out in October and November 2020, the measured and calculated values of quality parameters, including final results, refer only to that period.

Radio parameters for 2G/3G/4G technologies

Radio frequency bands (2G, 3G, 4G) used by operators during the benchmarking campaign:

with Telenor and Vip mobile also using 2100 MHz band for selected areas. Telekom Srbija used both bands in all categories, with Telenor and Vip mobile additionally using the 2100 MHz band.

The use of Carrier Aggregation (CA) depends on network configuration and on the quantity of sent data during the test. In big cities, Telenor used LTE carrier aggregation for around 90% of data transfer tests, Telekom Srbija for approximately 85% and Vip mobile

Figure 11.1. Radio frequency bands used by operators during benchmarking campaign

Frequency band usage	Telekom	Telenor	Vip Mobile	Total
2G/GSM 900 MHz	4.2	3.6	3.2	**4.2**
2G/GSM 1800 MHz		0.6	4.4	**4.4**
3G/UMTS 900 MHz	5	5	5	**5**
3G/UMTS 2100 MHz	15	15	15	**15**
4G/LTE 1800 MHz	20	20	20	**20**
4G/LTE 800 MHz	10	10	10	**10**
4G/LTE 2100 MHz		10	10	**10**
Total	**20**	**20**	**20**	**20**

2G/GSM: All three operators used radio frequency band 900 MHz. Radio frequency band 1800 MHz was used by Vip mobile, with Telenor using it to a slightly lesser extent.

3G/UMTS: All three operators used radio frequency band 2100 MHz and, to a lesser extent, band 900 MHz.

4G/LTE: Radio frequency bands 800 MHz and 1800 MHz were used by all three operators,

for around 70%. In smaller cities, carrier aggregation was used to a lesser extent – by Vip mobile for around 83%, by Telenor for approximately 64% and by Telekom Srbija for around 68% of data transfer tests. Along the roads, CA sample was much lower – Vip mobile with approximately 54%, followed by Telenor and Telekom Srbija, with 37% and 29% respectively.

KPI benchmarking for voice and data transmission services in 2018, 2019 and 2020

In the 2020 Benchmarking campaign, Telekom Srbija had the best total score, thanks to an outstanding improvement of the quality of all services in all categories. It is followed by Telenor, which improved its performances by implementing VoLTE service (voice transmission through 4G, Voice over LTE), prior to the start of the 2020 campaign. Vip mobile had worse results than the competitors, due to the DNS server problems.

All three mobile operators upgraded their voice transmission service quality, compared to the previous years. The VoLTE service implementation (voice transmission through 4G, Voice over LTE) helped Telenor make the biggest progress.

All KPI values for voice service tests were on the expected levels:

- *Call Success Rate:* Telekom Srbija and Telenor increased their rate of successfully realized calls in big cities, while Vip mobile remained at the same level as before. In small cities, Telekom Srbija and Telenor had better results compared to the previous year, with Vip mobile showing a slight degradation. All three operators improved their performances along the roads, in comparison to 2019.
- *Call Setup Time:* The most striking difference in results, compared to the previous benchmarking campaigns, concerns Telenor, who significantly improved its average call setup time by implementing VoLTE service. Telekom Srbija and Vip mobile made some progress in comparison to the previous campaigns.
- *Average value of MOS parameter:* Average MOS results have been upgraded by 1 point with Telenor, due to VoLTE services implementation. Telekom Srbija and Vip mobile, on the other hand, showed a slight degradation.
- *High percentage of samples with unsatisfactory MOS parameter values (MOS<2.3 voice signal quality considered unacceptable by users):* Telenor and Vip mobile networks displayed significantly reduced number of low-quality samples with MOS values under 2.3 in all categories. Telekom Srbija made a very good result, however with a slight degradation, compared to the previous year.

All three mobile operators reached satisfactory KPI values (KPI – Key Performance Indicator) for voice service tests in big and small cities. Along the roads, the Vip mobile and Telenor networks both saw CSR (Call Success Rate) that could be improved.

All three operators demonstrated similar voice service performance. Telenor made the greatest progress, due to the VoLTE service implementation.

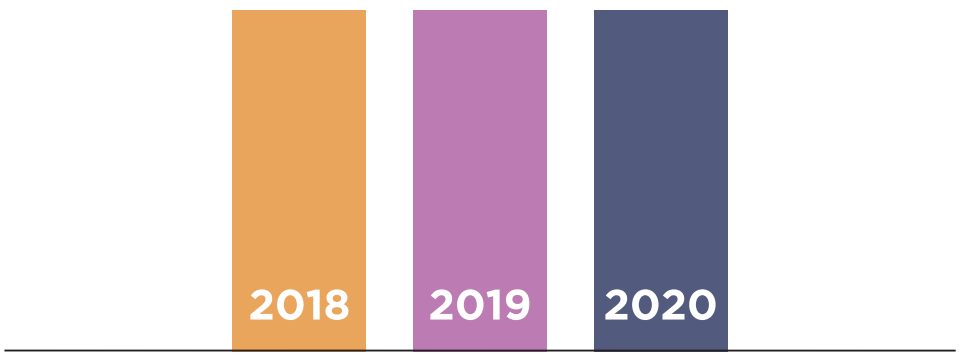
The complete analysis and comparison of KPI parameters for voice service is shown in Figure 11.2.

Note: Different colour shades are used to make distinction between benchmarking campaign results in 2018, 2019 and 2020. Lighter shades represent benchmarking campaign results of 2018, whereas darker and the darkest refer to the benchmarking campaign results of 2019 and 2020 respectively. The example is demonstrated in figure 11.3.

As for the parameters pertaining to the data transfer service, Telekom Srbija and Telenor improved their quality of service compared

Figure 11.2. Voice service testing results – (KPI)

Figure 11.3. Yearly comparison



to the previous years. Due to the DNS server problem, Vip mobile came out with lower results compared to 2019.

Comparative overview of the FDTT HTTP data transmission results is given in Figure 11.4.

ter compared to 2019, but worse compared to 2018.

The average data transmission rate was improved for all three operators, compared to 2019. The biggest improvement was made

Figure 11.4. FDTT HTTP data transmission service testing results (DL 400MB)

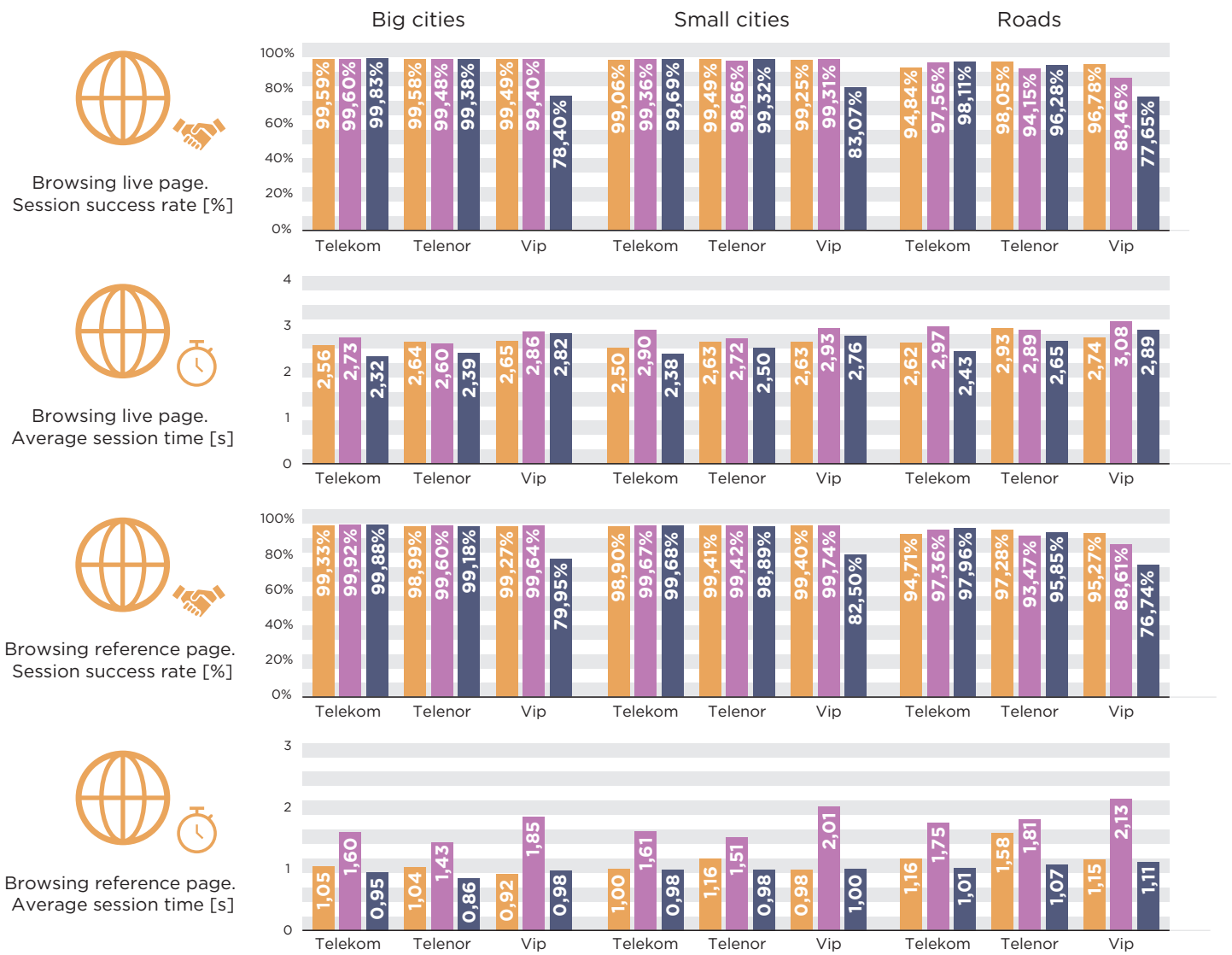
The session success rate reflects the level of reliability of the Internet connection provided by the mobile operator to users. During the benchmarking campaign of 2020, all three operators achieved excellent results (>99%), both in big and small cities. Compared to the previous campaigns, the quality of service in big and small cities was maintained at the same level. The QoS along the roads was better by Telenor (better results by 10 Mb/s in small cities and by 30 Mb/s in big cities), while Vip mobile had better results by 10 Mb/s in small cities. Telekom Srbija achieved same results in cities as in the previous year. Along the roads, all operators made progress.

The percentage of samples with an average data transmission rate below 4Mb/s is a

metrics quantifying the rate of measurement samples not fulfilling the minimum criteria of customer satisfaction. If the average data transmission rate falls below 4 Mb/s, subscribers may encounter problems when using more demanding services, such as video streaming or when downloading greater amounts of data. Telekom Srbija and Telenor achieved similar results in cities as in 2019. Vip mobile recorded a slight degradation in small cities. Along the roads, all three operators scored better results.

The comparative overview of the browsing service testing results can bee seen in Figure 11.5.

Figure 11.5. Browsing service testing results



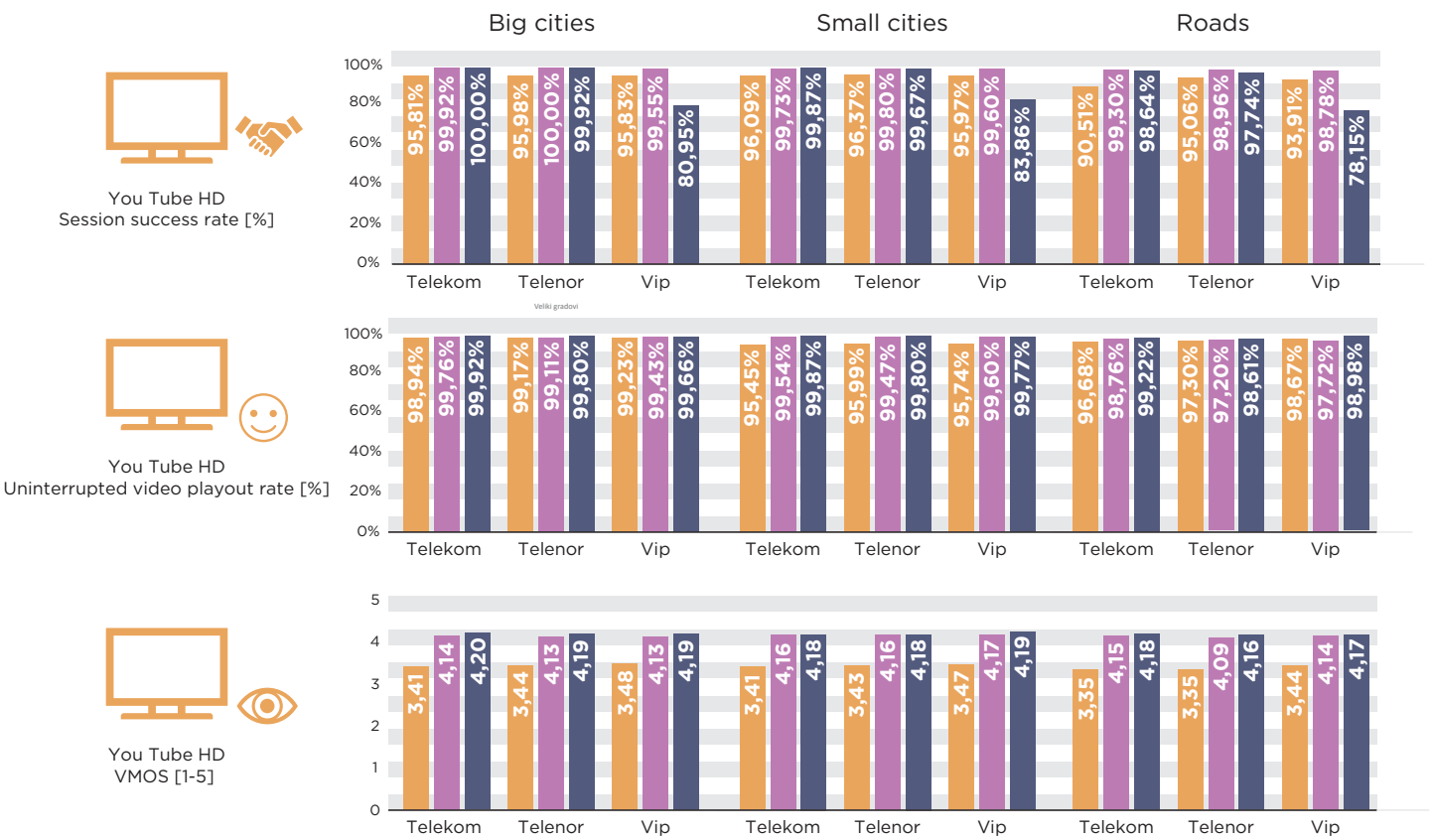
The rate of successfully realized browsing live page sessions reflects most precisely web browsing service subscribers' quality perception. During the 2020 benchmarking campaign, Telekom Srbija and Telenor had almost identical performance in big and small cities, with differences unnoticeable for a user. The best results along the roads achieved Telekom Srbija. Vip mobile scored weaker results than the previous year, due to the problem with DNS server. Result differences are due not only to the operators' network performance, but also to the changes in live pages' content and structure.

The average session time differs during the campaigns, due to the network improvements and changes in live pages' content and structure. All three operators improved their performance in all categories.

The rate of successfully realized browsing reference page sessions in this year's benchmarking campaign in the cities remained on the same level for Telekom Srbija and Telenor, with these two simultaneously making progress along the roads. Vip mobile displayed weaker results than the previous year, due to the problem with DNS server.

The average reference page browsing session time remained on the same level for Telekom Srbija and Telenor in the cities, while along the roads performance was improved. Vip mobile

Figure 11.6. YouTube video service testing results



showed weaker results than 2019, due to the problem with DNS server.

Parameters referring to YouTube and comparative results overview in 2020 are shown in Figure 11.6.

The rate of successfully realized sessions was, like in the previous year, excellent for the networks of Telekom Srbija and Telenor. Differences between the operators are indiscernible by users. Vip mobile showed significantly weaker results than 2019, due to a problem with DNS server.

The uninterrupted video playout rate has been improved for all operators during this year›s benchmarking campaign in all categories. All three operators scored excellent results in these categories, with negligible differences indiscernible by the user.

YouTube VMOS is a complex metrics reflecting all aspects of video signal quality (resolution, interruption, blurriness, blockage etc.). All three operators reached similar results in all categories. Scarce small differences are hardly discernible by the end user.

The analysis of the above and scoring of all parameters according to the scoring matrix have resulted in the final measurement results performed in 2020, as shown in Figure 11.7.

Upon the completion of the benchmarking, followed by data processing and analysis of the measurement results regarding mobile operators› network quality in the Republic of Serbia, an update was added to the interactive portal for comparative mobile network quality referring to the 2020 results and the analysis of result trends. The portal is available in Serbian and English, at the following address: http://benchmark.ratel.rs/en.

Figure 11.7. Comparison of results

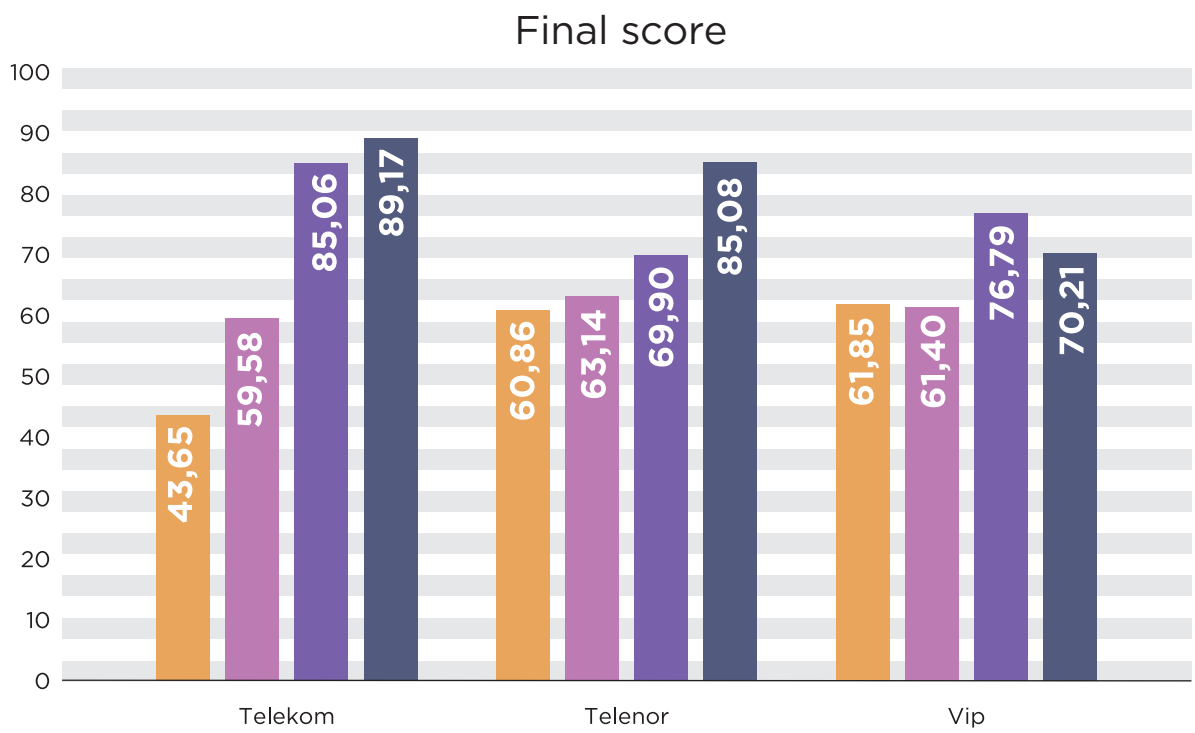
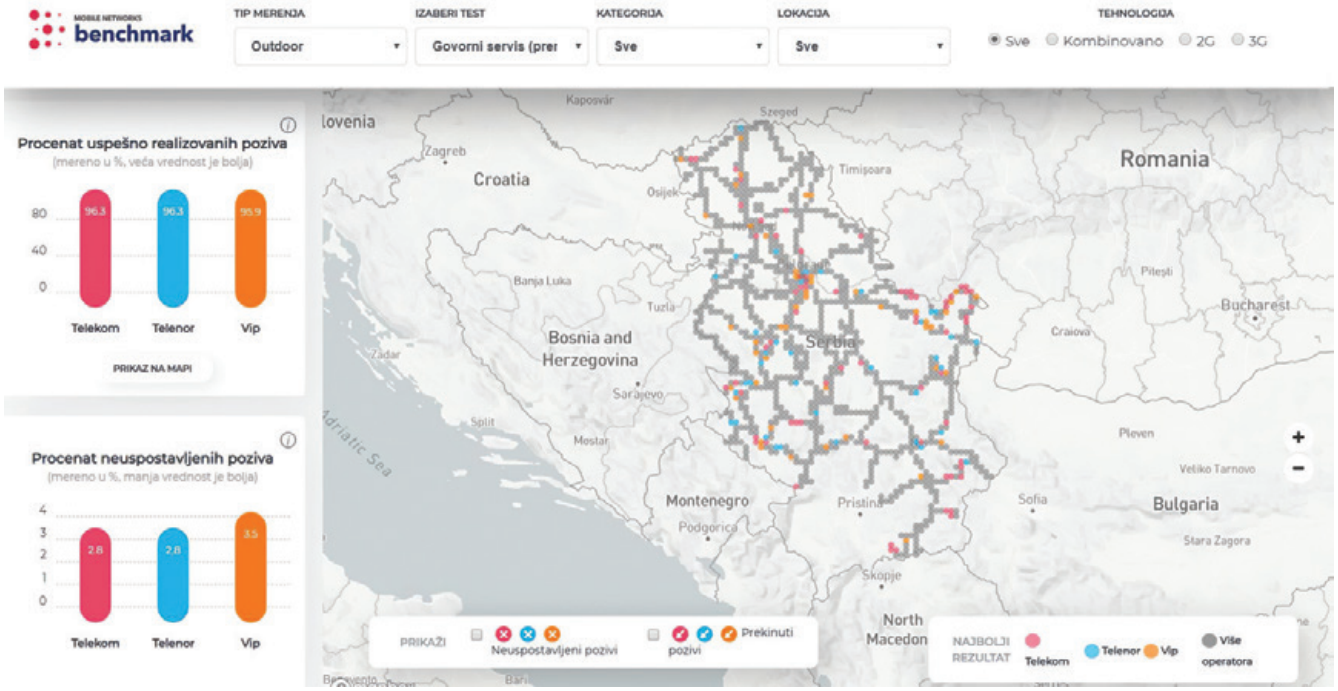


Figure 11.8. Benchmarking interactive portal



11.3 RATEL NetTest: testing of Internet connection quality

As of May 2016, RATEL enabled the users of Internet access services in public fixed and public mobile communications networks to measure QoS of broadband Internet access, by means of RATEL's application *NetTest*. In the meantime, the app has been upgraded with several new functions.

The testing of Internet connection in public fixed communications networks can be done using the RATEL's application available on its website: https://www.nettest.ratel.rs/en/map

The testing of Internet connection in public mobile communications networks can be performed by means of an application for Android i iOS mobile devices downloaded from *Google Play Store* and *Apple App Store.*

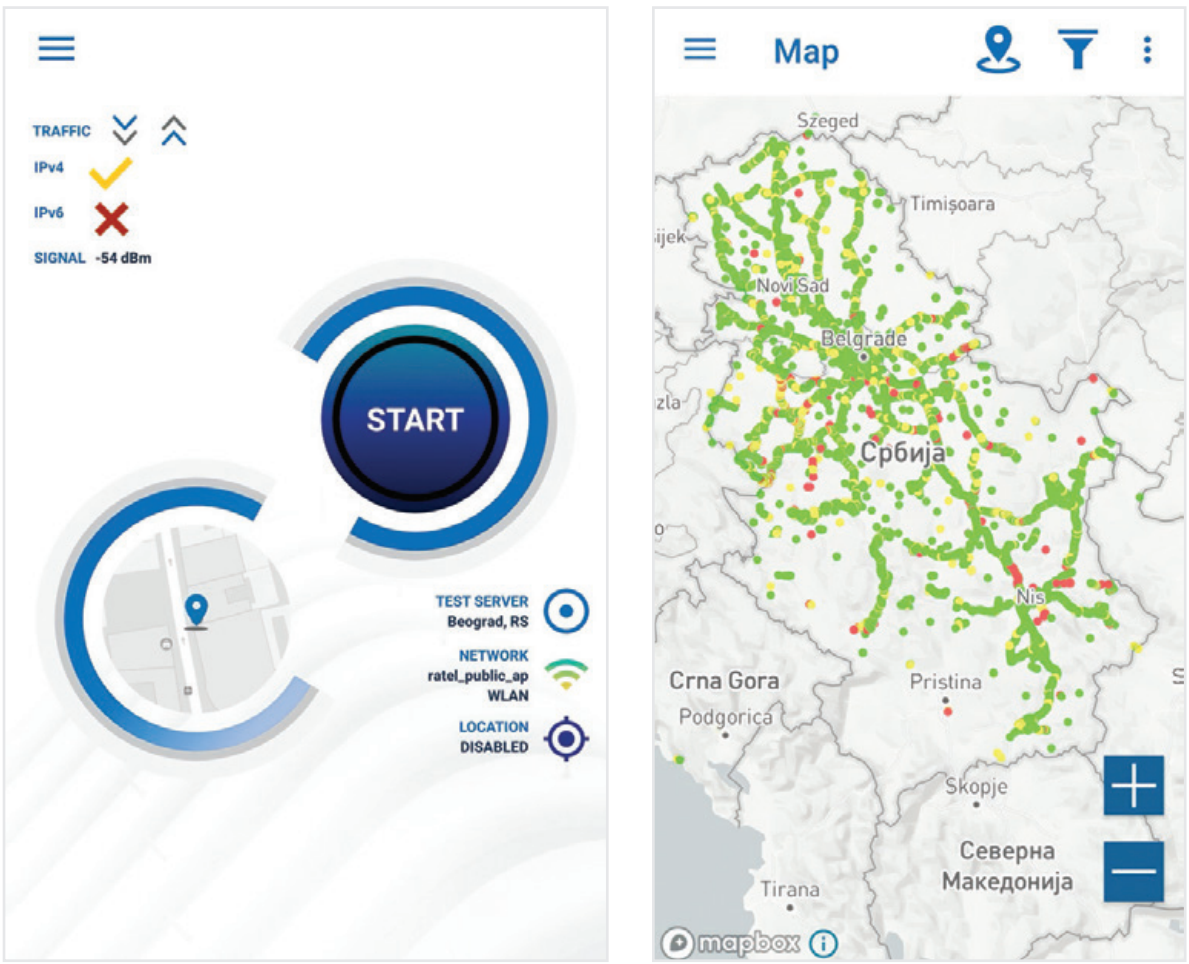
The purpose of RATEL NetTest application is to provide transparent and comprehensive information regarding the users' Internet connection quality. It measures connection from the user's device (PC, tablet, mobile terminal) to a measuring server. The measuring server is situated in the immediate proximity of the Internet exchange point (IXP) connected to major service operators, representing an independent and optimal location not favouring any of the connections.

RATEL NetTest application offers to its users the possibility to test the quality and speed of current Internet connection. At the same time, the results of other users who performed the testing can be compared on the interactive map of Serbia. This feature enables comparative analysis of Internet service providers, depending on the location or type of Internet access (fixed/mobile). Colour scale red/yellow/green serves as a visual indicator of the connection quality level for the majority

Table 11.8. Application logo and number of downloads from Google Play Store and Apple App Store in 2020

App	Number of app downloads
RATEL NetTest	
ANDROID APP ON Google play	577
	574

Figure 11.9. Mobile application home page and map view of performed tests



of Internet services. This scale does not refer to the technology used, however extremely high speeds in mobile networks can only be achieved by means of certain technologies, such as LTE.

By means of RATEL NetTest application, the following quality parameters of Internet connection can be tested:

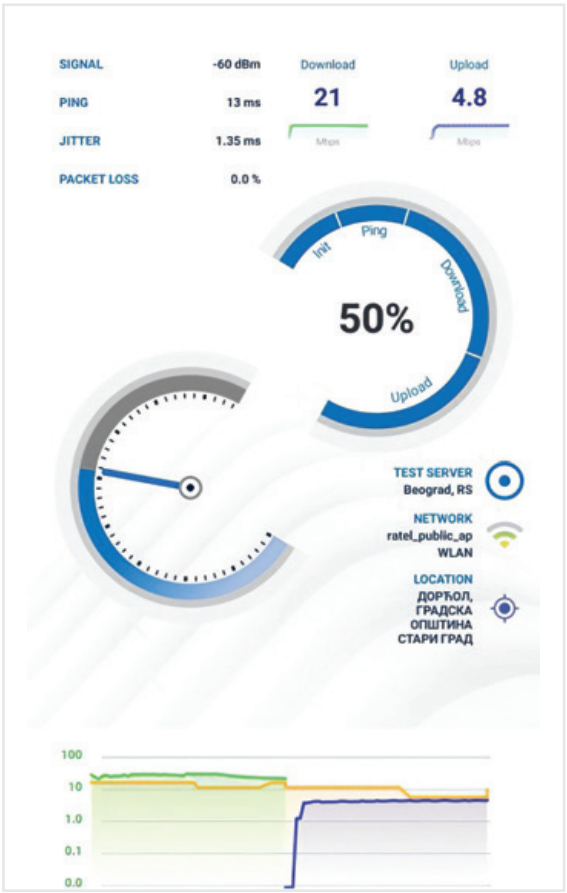
- data download speed: measurement from measuring server to user (download),
- data upload speed: measurement from user to measuring server (upload),
- ping (latency),
- packet loss,
- signal quality (RxQual, Ec/Io, RSRQ) and signal strength (RSSI, RSCP, RSRP), if a mobile terminal is used.
- Zero measurements – measurements in locations with no signal coverage, suggesting that service is not available, therefore tested parameters equal zero value. These spots on the map are marked in black.

RATEL NetTest application has been improved so that all measurement results are now visible and publicly available to end users. The benefit of this functionality is that, by having at their disposal a number of measurement results in the selected area, the end users can get information about the operator's network QoS locally.

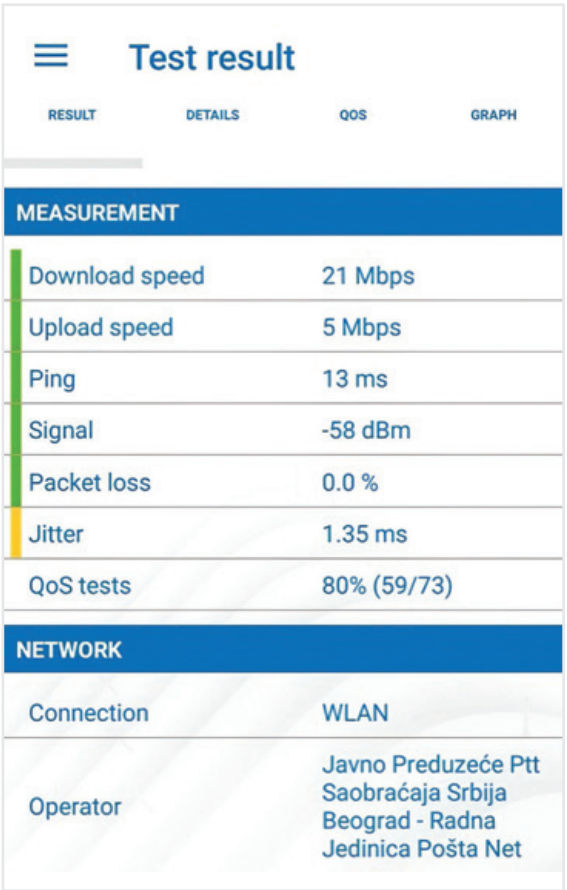
An Instruction for the measurement of Internet data throughput for RATEL NetTest app users was added to the application, now enabling the use of measurement results as the grounds for complaints pertaining to the quality of service of Internet data throughput. During the filing of complaint regarding the above service, it is necessary to perform several measurements during different parts of the day, so as to provide necessary measurement statistics, for the sake of proper assessment of the performed throughput.

8317 users measured their Internet connection quality using RATEL NetTest application in 2020. 52.2% of subscribers used web application, 46.5% mobile phone, and 1.3% measured the above parameters by means of a tablet. The majority of measurements were performed for the Telekom Srbija telecommunications network.

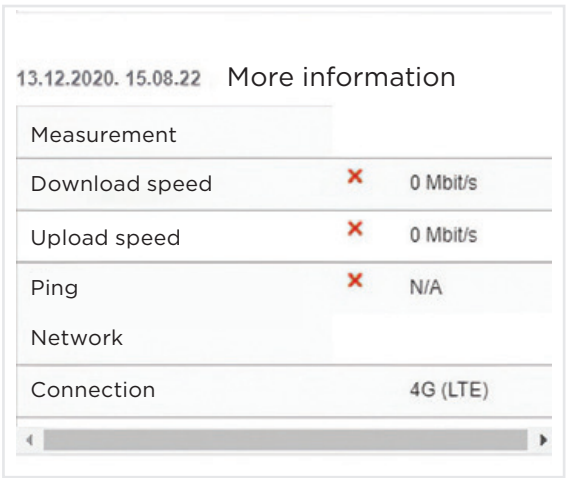
Figure 11.10. a) Testing of Internet connection, b) Testing results c) Zero measurements



a



b



c

12. ELECTRONIC COMMUNICATIONS INFRASTRUCTURE INTENDED FOR SHARED USE

The Agency maintains an updated database on type, availability and geographic location of capacities that may be subject to demand for common use and access. Operators of public electronic communications networks are entitled to require shared usage of another operator's or third person's electronic communications infrastructure, when needed for the purpose of a competitive, cost-effective and efficient performance of electronic communications activities

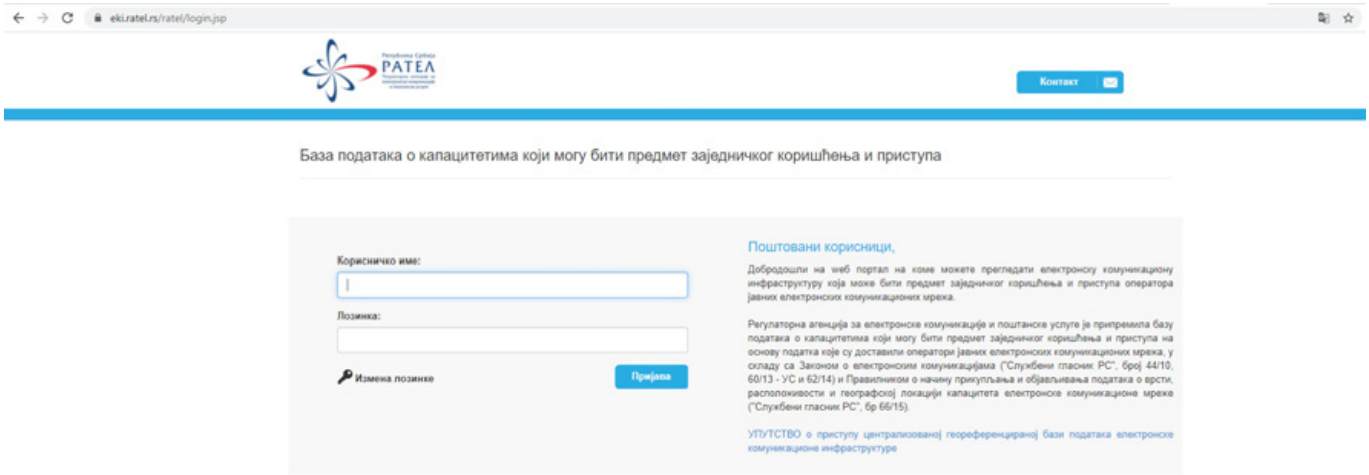
The shared use of infrastructure in the Republic of Serbia is defined in the Law on Electronic Communications („Official Gazette of RS'', nos. 44/10, 60/13 – CC and 62/14, hereinafter: the Law) and Rulebook on the manner of collection and publication of the data on type, availability and geographic location of the electronic communications network's capacities („Official Gazette of RS'', no. 66/15, hereinafter: the Rulebook).

Pursuant to Article 52 od the Law, the Agency keeps an updated database on the type, availability and geographic location of capacities which may be subject to shared use and access (hereinafter: the Capacity database). The Agency adopted the Rulebook in July 2015. It prescribes creation of the records of the electronic communications network capacities which may be subject to shared use, in the form of an aggregated database. Pursuant to Article 5 of the Rulebook, the Agency is responsible for creation, maintenance and funding of the Capacity database, including definition of the manner of data provision (access, interfaces and protocols).

The Capacity database was created in June 2016. Coordination with operators was established and data input into the database was enabled, by web access or through automatic data exchange systems. There is a choice between read access and read/record access. The read access is available to all registered electronic communications operators, whereas the read/record access is reserved only to electronic communications operators with recorded infrastructure lease service. Users can access the application by means of a user name/password combination (Figure 12.1).

In case of the building of a new infrastructure subject to shared use and access, the operators are obliged to submit all required data within 15 days from the beginning of the use of infrastructure and to update their

Figure 12.1. Access to Capacity database web – GIS application

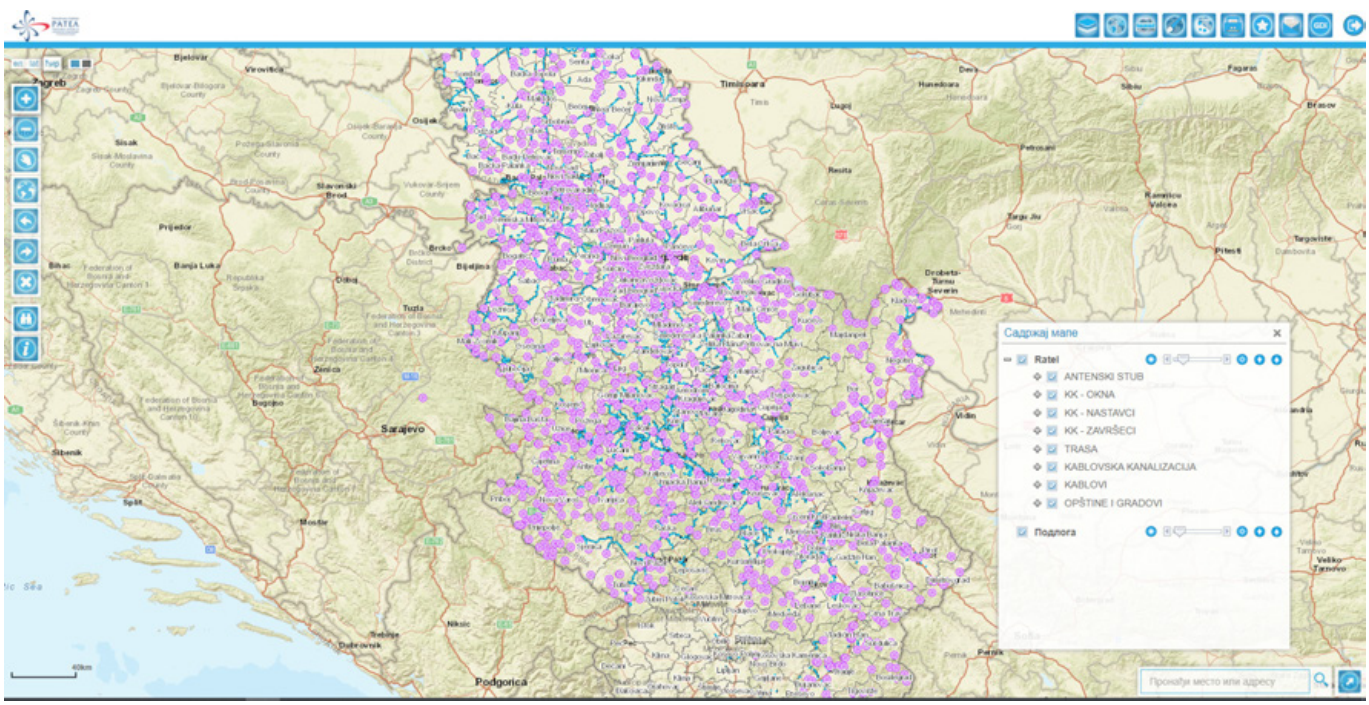


data at least once in 3 months, should any changes in infrastructure occur.

The data on electronic communications network refer to electronic communications network cable ducts and antenna masts (Figures 12.2. and 12.3)

As of 31.12.2020, this database includes data for 1739 antenna masts, 1500 optic cables and around 200.000 cable canalization elements. The Capacity database is available on the Agency's website to all interested operators of electronic communication networks in a web – GIS application form. There are 27

Figure 12.2. Capacity database web – GIS app – Home page



operators with read access right and 16 operators with read/record access right.

The Web – GIS application includes standard tools for map operation, such as (Figures 12.4 - 12.7):

- Switching on/ switching off of layers;
- Zooming;
- Definition of coordinates in different coordinate systems;
- Measurement of distance/ surface;
- Selection of data using spatial inquiries/ selection of areas by hand;
- Selection of surface (satellite footages, topographic maps, street networks etc.)

Figure 12.3. Capacity database web – GIS app – Enlarged view

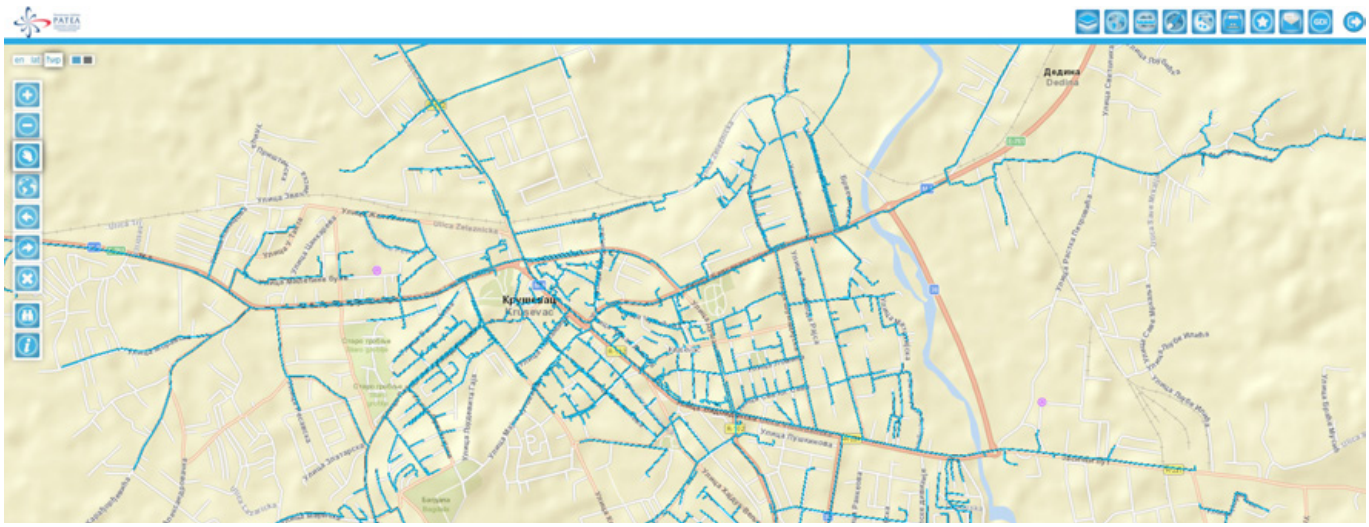


Figure 12.4. Use of standard tools – various surface types – street network

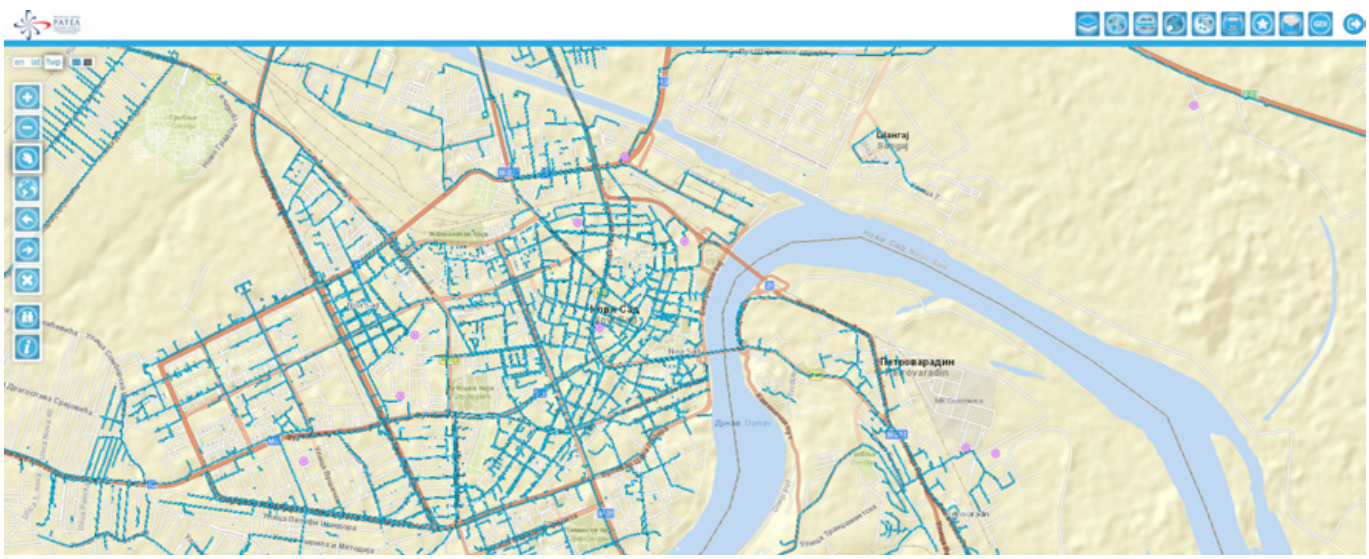


Figure 12.5. **Use of standard tools – various surface types – satellite footage**

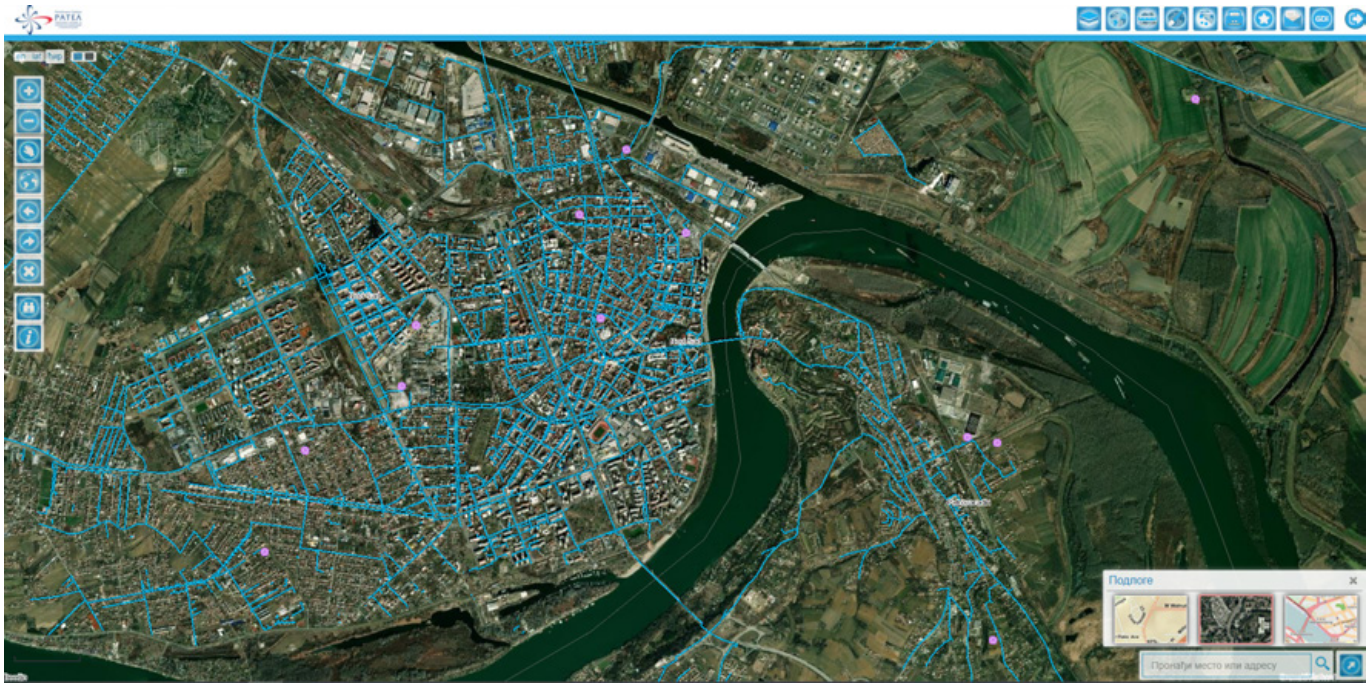


Figure 12.6. **Use of standard tools – various surface types – topographic map**

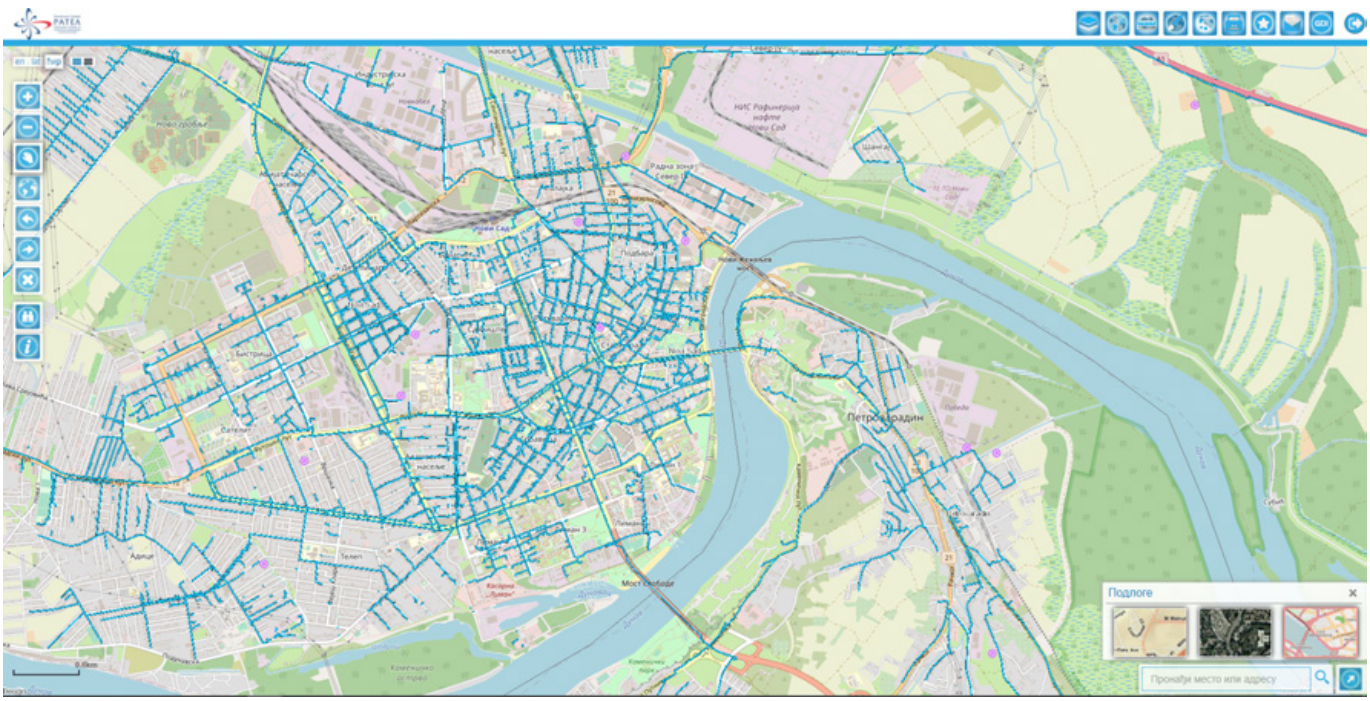
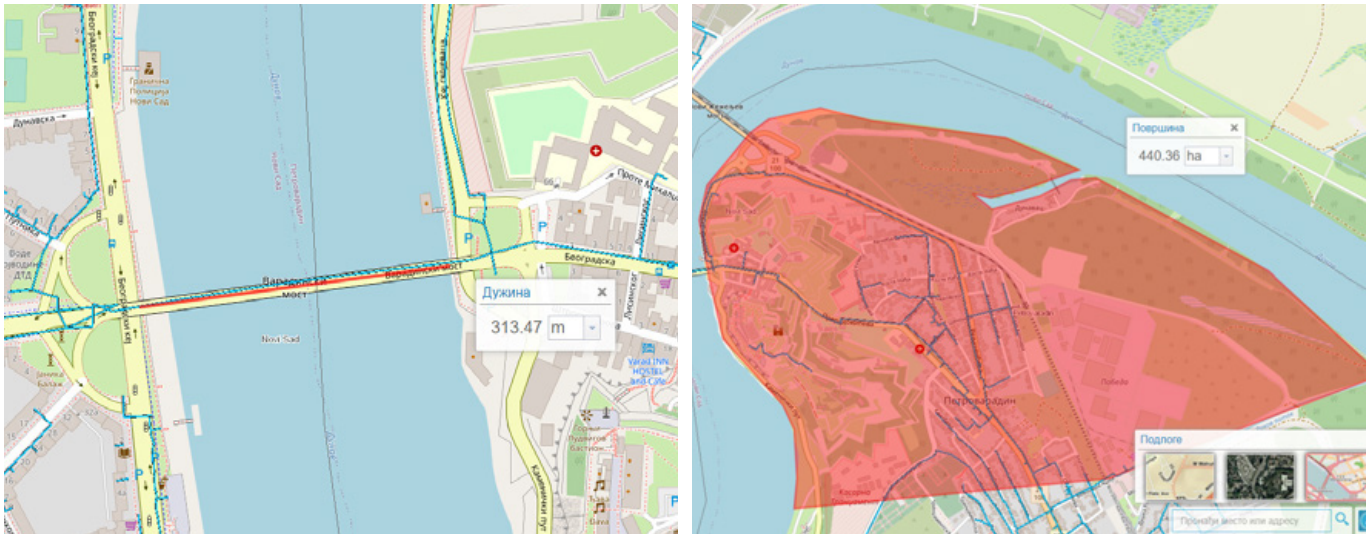


Figure 12.7. Use of standard tools – measurement of distance and surface



Electronic communications network cable ducts

Based on EKMI1 form, which is an integral part of the Rulebook on the manner of collection and publication of the data on type, availability and geographic location of the electronic communications network's capacities, the following cable canalization data are collected (Figures 12.8 and 12.9):

- Name of operator (owner)/ locations/ routes;
- WGS84 coordinates of important positions (start/ end, node);
- Route length/ geodetic footage;

Figure 12.8. Cable details

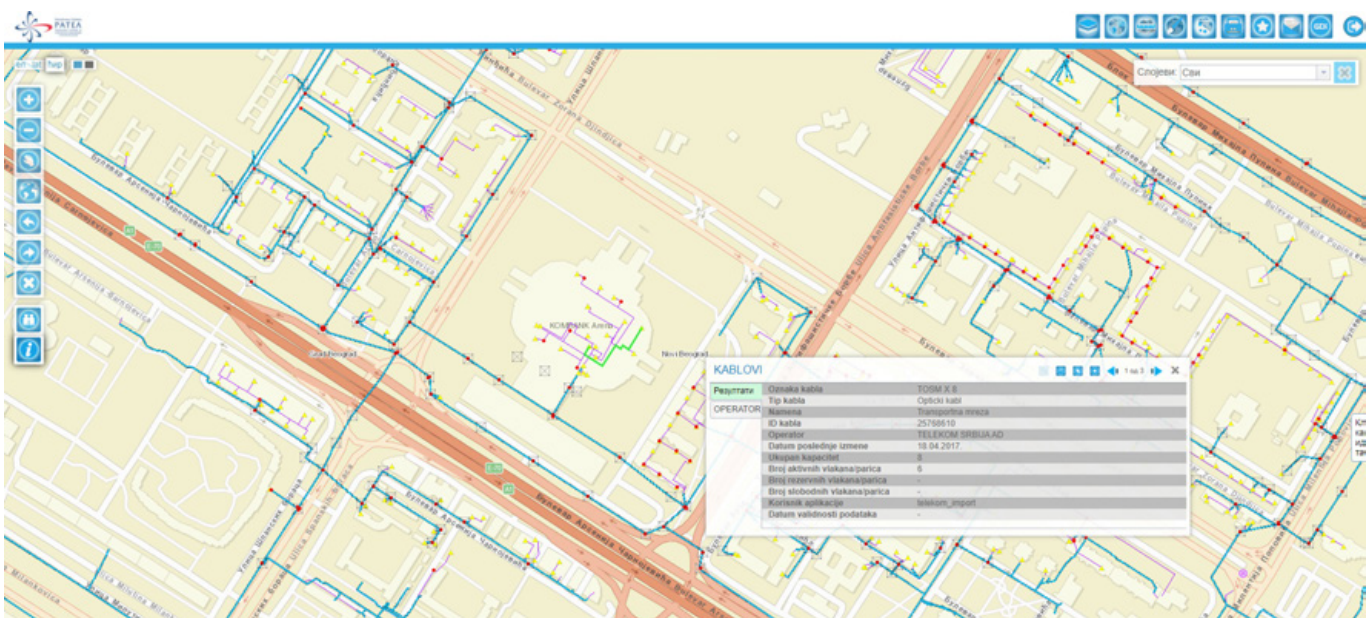
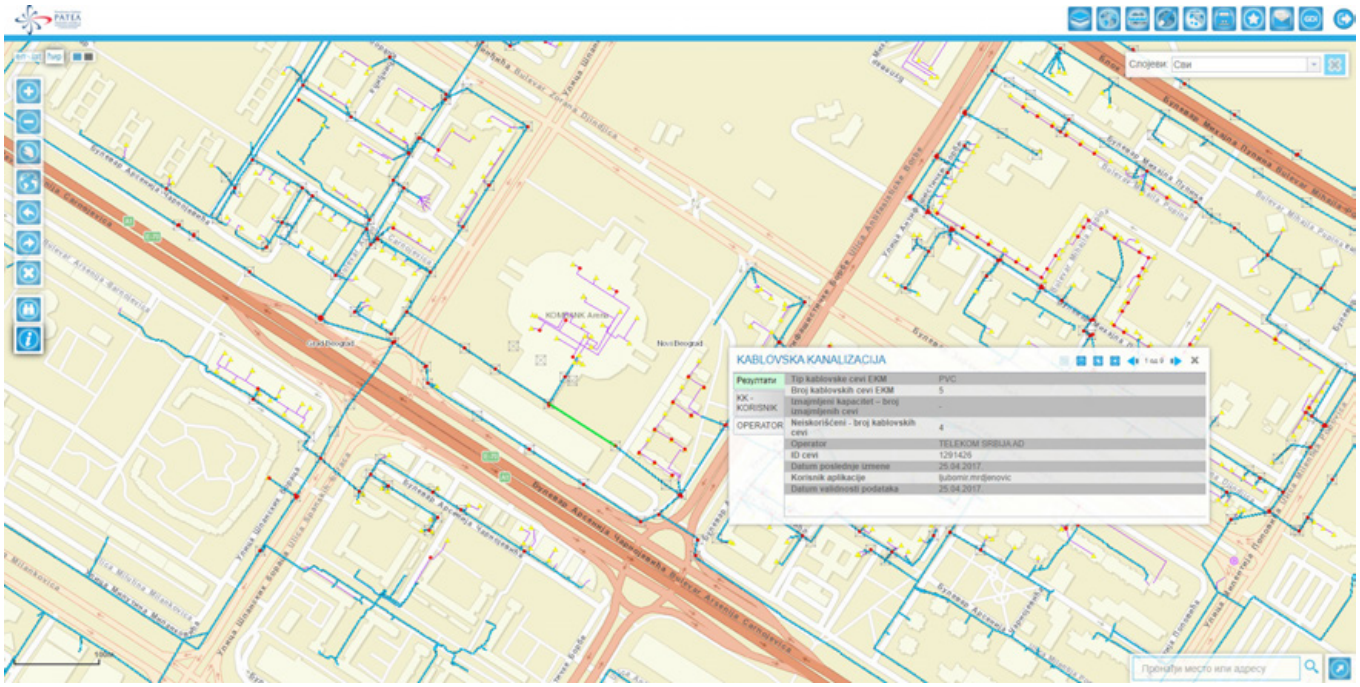


Figure 12.9. Cable ducts segment details



- Cable type;
- Information on cable ducts (type of pipes/ number of pipes on the route/ type of cable shaft/ number of shafts on the route);
- Type of data transmitting equipment (optional);
- Capacity for lease/ unused capacity;
- Data on cable instalments (optional);
- Cable ending in the facility (optional).

Electronic communications network antenna masts

Based on Annex 2, EKMI2 Form of the Rulebook, data on antenna masts and equipment to be collected are the following (Figures 12.10 and 12.11):

- Name of operator (owner);
- Location of antenna mast;
- Mast construction;
- Shape of mast base/ dimensions of mast base (m);
- Mast height (m);
- Facility height in meters (if antenna mast is mounted on a facility);
- Information regarding free space on the mast (length of the free segment/ azimuth range available for mounting);
- Mounted equipment (type/ free capacity) – if subject to lease.

Figure 12.10. Antenna mast data

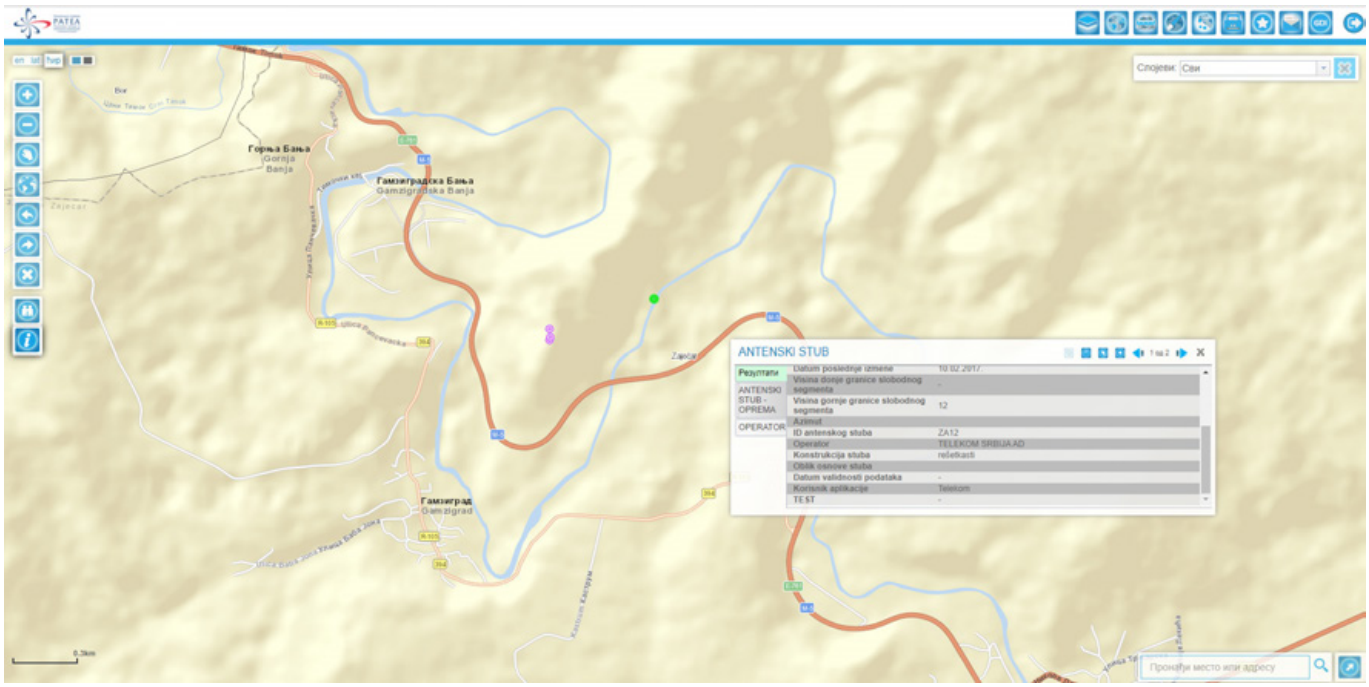
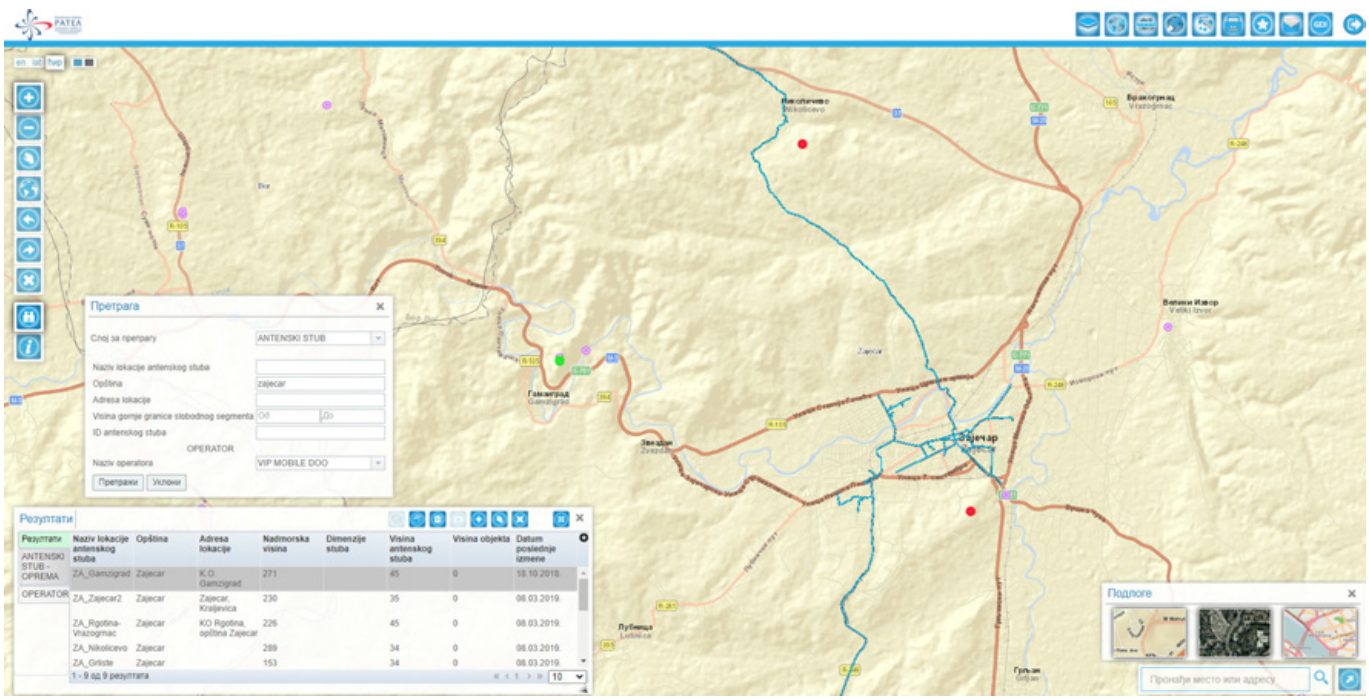


Figure 12.11. Antenna mast spatial query



13. POSTAL SERVICES MARKET

Postal operators in the Republic of Serbia realized over 308 million postal services in 2020, which is by approximately half a million less than in 2019.

In the Republic of Serbia, for the second year in a row, a drop in the volume of postal services by -0.2% has been observed (compared to that by -5% in 2019). For four consecutive years, the postal market income has been rising, in 2020 by more than 10%.

Over 2020, 124 postal items on average were delivered per household, which is 43 postal items per inhabitant, out of which 105 postal services per household, i.e. 36 per inhabitant, from the universal postal service (UPS) domain, which is 2 postal items less compared to 2019.

Postal services in the Republic of Serbia generated over 2020 an income of approximately 23.4 billion dinars, (around 199.25 million EUR), representing 0.43% of the projected GDP (5,463.54 billion dinars[7]).

Data about 11 postal operators performing express services in national postal traffic (NPT) and international postal traffic (IPT) were processed for the needs of 2020 Market Overview. Out of these, 9 operators were carrying out express services in national traffic and 8 operators in international traffic (2 operators only perform services in international postal traffic). As for the courier service, data about 22 operators that were active during 2020 were processed.

During 2020, following a 10-year expiration period, several postal operators' permits ceased to be valid. Some of these operators did not re-apply for the issuance of a new authorization, since they also ceased to perform postal services. In 2020, 11 postal operators that have carried out postal services since 2010 were issued new authorizations, and also 6 new postal operators received their first permits.

A limited number of operators, although possessing an authorization to perform other postal services (courier and express), discontinue periodically their services, making longer or shorter breaks in their activities, which is recorded in the Register of postal operators' authorizations, updated and made publicly available by the Agency on its website. The Law on Postal Services ("Official Gazette

7 Statistical Office of the Republic of Serbia – RS Statistical calender for 2021

of RS“ No. 77/19) stipulates that, if a postal operator discontinues its performance of postal services in less than 12 months, its permit may be revoked. In the national express market, certain operators perform postal services in the name and on behalf of bigger postal providers.

The employee number growth trend in postal industry in the Republic of Serbia has continued for the fifth year in a row (*Table 13.1.)*. The total number of employees grew by 0.53% compared to 2019, amounting to 0.83% of the total number of employees in the Republic of Serbia (2,304,628 in 2020[8]). In 2019, this share was 0.9%, implying that the number of postal workers is declining.

The public postal operator (PPO) is still the biggest postal employer (78.7%), and compared to 2019, it grew its number of employees by 0.4%. The increase in the number of postal employees by 0.5% is also influenced by the recorded number of employees with other postal operators (express and courier services), amounting to approximately 1% compared to the previous year.

Much like in previous years, the employees of auto-transport companies (drivers) such as AD „Nišekspres” and „Autoprevoz Kikinda” were not included in the total number of employees, nor were the employees of the logistics companies (Gebrüder Weiss, Milšped, etc.).

In 2020, the volume of universal postal service (UPS) was 262.1 million, while the volume of other postal services (OPS) amounted to close to 46 million, making up a little under

Table 13.1. Postal employees

Operators	Year				
	2016	2017	2018	2019	2020
PPO	14,868	14,980	15,121	15,001	15,063
Other postal operators	3,096	3,629	3,762	4,031	4,070
TOTAL	17,964	18,609	18,883	19,032	19,133

8 Statistical Office of the Republic of Serbia – RS Statistical calender for 2021

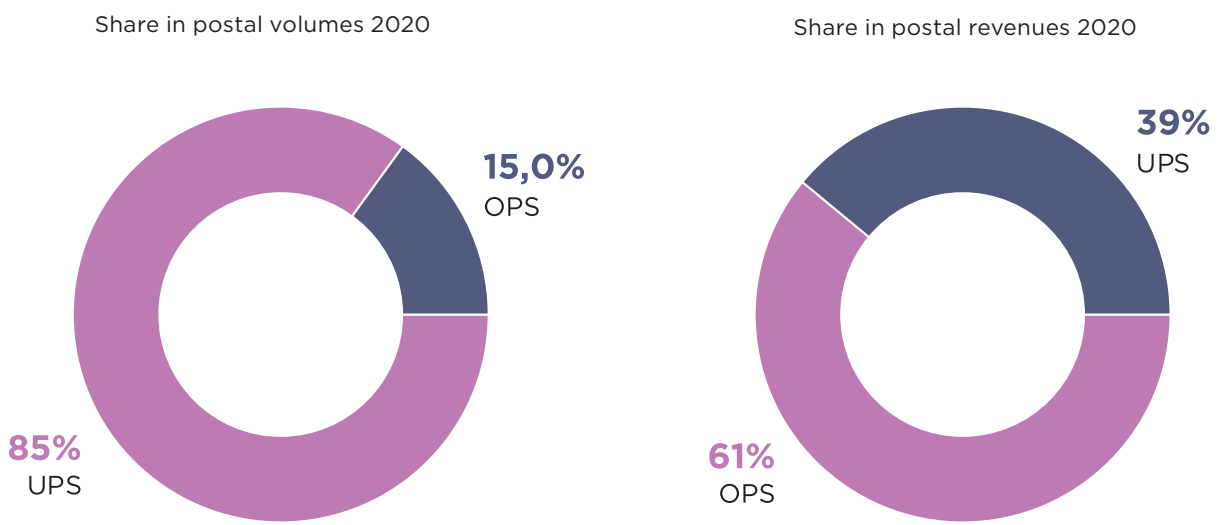
Table 13.2. Postal service market in 2020

Type of service	VOLUME	INCOME	VOLUME	INCOME
	thous.	thous. din	%	%
UPS	262,139	9,110,563.00	85.1	38.9
OPS	45,997	14,316,759.37	14.9	61.1
TOATAL	308,136	23,427,322.37	100	100

15% of the total volume of postal services (Table 13.2). Universal postal service remains dominant, with a share of over 85% in the total volume of postal services and a drop by -2.8% compared to 2019.

However, a drop in the UPS income share by almost 39% has been observed, with a realized income amounting to 9.1 billion dinars. Other postal services marked an income of 14.3 billion dinars in 2020. The growth in income of OPS (former commercial services) has been recorded in 2020 as well, for the eleventh year in a row. This caused an increase in the OPS share in the total income, which amounted to 61% in 2020 (Figure 13.1.).

Figure 13.1. Share of volume and income of UPS and OPS in 2020



13.1. Comparative overview of volume and income trends from UPS and OPS

Pursuant to the Law on Postal Services ("Official Gazette of RS", No. 77/19) as of the end of 2019, a new classification of services has been set: postal services comprise universal postal service and other postal services (commercial services as per the former law).

Universal postal service (UPS) is provided by the PPO (Public Enterprise "Post of Serbia", Belgrade), designated by the provisions of the Law and the exclusive license owner (license for the UPS provision was issued in accordance with the provisions of the former law, following the expiry thereof, the new Law foresees the issuance of a special license), while other postal services are provided by all postal operators, based on an authorization.

Universal postal service (UPS) is, by definition, a service of general interest consisting of a set of postal services provided continuously on the entire territory of the Republic of Serbia, without interruption. This service must comply with the set quality; therefore the universal service provider (USP) must meet certain quality standards. UPS is provided at affordable prices and under equal conditions for all users, without discrimination.

UPS includes collection, sorting, transport and delivery of the following items:

- letter-post items up to 2 kg,
- letters in court, administrative and offense procedures, regardless of the limits,
- collection and delivery of parcels up to 10 kg in national and international traffic,
- delivery of parcels up to 20 kg in international traffic,
- cecograms up to 7 kg, without postal charge in national traffic,
- collection, transmission and payment of postal money orders,

Universal service is set by the Law as a service of general interest, regardless of the type of network industry and therefore the legislator is obliged to establish the mechanisms of provision of this service category.

The European and global postal sector practice has shown that UPS represents a burden to USPs, so a continuous search for new models of UPS funding and elaboration of the existing ones is constantly under way.

In the Republic of Serbia, the Law foresees the funding of UPS from the scope of reserved services. Reserved services represent an exclusive right of the PPO, according to the Law on Postal Services, up until the access of the Republic of Serbia to the European Union.

Reserved service limits are set by the law. The determined limit is 50g in terms of the weight, and two and a half times the amount of the postal charge for the fastest transmission level in terms of the price. In 2020, this amount was 67.5 dinars.

Reserved postal services are entrusted to the public postal operator (PPO), they are part of universal postal service (UPS) and include:

- collection and/or sorting and/or transport and/or delivery of letter-post items up to 50 g;
- collection and/or sorting and/or transport and/or delivery of letters in court, administrative or offense procedures, as registered postal items, regardless of the limits;

- collection and/or transmission and/or payment of postal money orders.

Unlike several previous years which saw a rise in the share of reserved services in the total UPS, it is observable that in 2020 this share has slightly decreased compared to 2019, amounting to 96.2%. The reason for this decrease is the reduction of the reserved service domain from 100g to 50g (items up to 50g in 2019 accounted for 96.3% of UPS).

The most numerous reserved postal item category, letters up to 20g, have kept the largest share in the UPS (92.23%).

As for the structure of the UPS volumes in 2020, the growth is marked by: insured letters (23.91%), insured COD letters (19.68%) (this category was in decline in 2019) and registered printed matter (4.25%). Since 2020 was an election year, item „Notification on day and time of election" marked a growth.

The biggest decline in the UPS volumes during 2020 was observed in the following types of items: addressed direct mail (-19.35%), recorded delivery letters (-18.80%), printed matter (-16.98%), registered letters (-14.53%), postcards (-10.17%) and court letters (-6.99%). For the second year in a row, non-recorded letters, with the biggest share in the UPS volumes accounting for 72.31%, in 2020 have marked a drop by -1,57%.

Revenues stemming from reserved services have remained the most dominant category, accounting for 65% of the total PPO postal income in 2020 (letter-post items participate with 57.1%, and postal money orders with 7.8%). Income share from reserved services continues to drop in 2020 compared to 2019, when it was around 70%. The reserved postal services share, in terms of volume, shows that, despite the reduction of the reserved domain, this service remains dominant, however, in terms of income, it accounts for a smaller portion than before.

Non-reserved services' share in the PPO's total postal income is 6.7% and has been influenced by the reduction of the reserved domain and by the fact that 2020 was an election year, so item "Notification on day and time of election" made a significant increase in income (in 2019, non-reserved postal services accounted for 5.4% of the income).

Revenues from items up to 20g remained the most dominant in the UPS income, accounting for 86.68% in 2020, which is slightly below the value of 2019, which was 87%. Income form postal items up to 50g makes 92.87% of the total UPS income.

The highest income growth is marked by insured letters (almost 139%) and insured COD letters (30%). The growth in income and volume of insured letters was caused by the change in the manner of pension payment, introduced during the state of emergency in the country (banks sent the pensions to home address for users who opted for such manner of payment). These services however have small share in the total volume of services.

The biggest drop in the postal service income compared to 2019 occurred in the following services: addressed direct mail (-19.7%), registered printed matter (-21.4%), printed matter (-17.5%), recorded delivery letters (-11.5%), postcards (-10%), postal money orders (-8,31%) and registered letters (-6,3%).

Postal items handled by the PPO under the concluded agreements with legal persons (above all non-recorded letters and court letters) account for the largest share in UPS, which in 2020, like in the previous year,

amounts to 78.13% of the income and 89% of the volume.

Universal postal service in international traffic was in 2020 around 37 times less present compared to the national traffic (due to the COVID-19 pandemic, there was a standstill in the international traffic). In comparison to 2019, UPS in international postal traffic saw a decrease by -41%, with the volume of inbound items nearly halved. Despite marking a significant drop in the volume compared to 2019, the incoming items to the Republic of Serbia make up 71% of the UPS international items, accounting for 68% of the total income of the international UPS.

Other postal services are performed by postal operators and the PPO, based on an authorization to perform other postal services.

Other postal services include:

- collection, sorting, transport and delivery of parcels over 10 kg in NPT;
- collection, sorting and transport of outbound parcels over 10 kg in IPT;
- sorting, transport and delivery of inbound parcels over 20 kg in IPT;
- value-added services;
- complementary services.

Value-added services are those requiring special features in terms of quality and manner of collection, sorting, transport and delivery. Value-added services are:

- courier services, postal services that include collection of the postal item at the sender's address, and direct transport and delivery at the recipient's address, without sorting;
- express services, postal services that include collection, sorting, transport and delivery of postal items in the shortest delays and guaranteed time frames;
- electronic tracking from collection to delivery of the postal item;
- services that include direct communication between the sender and the person directly involved in the service provision, for the sake of additional instructions regarding the delivery;
- delivery of items with the agreed time of delivery;
- other services in accordance with the law.

For courier and express services, the limits by weight relevant for the reserved postal services do not apply, provided that their price is equal to or is higher than the amount which is two and a half times the price of the fastest transmission category item, according to the PPO's applicable price list.

Complementary postal services include special manner of handling during the collection, sorting, transport and delivery of postal items (services at recipient's request and services at sender's request).

In other postal services, the most dominant category are other postal services in national traffic, accounting for 98.2% of the volumes, generating the largest income as well and accounting for 86.4% of the total postal revenues (*Table 13.3, Figure 13.2*).

Average income per postal item in national traffic (other postal services) in 2020 grew by 6 dinars and amounted to approximately 274 dinars. For the second year in a row, in 2020, an increase in average income per unit has been recorded.

Table 13.3. Structure of other services in 2020

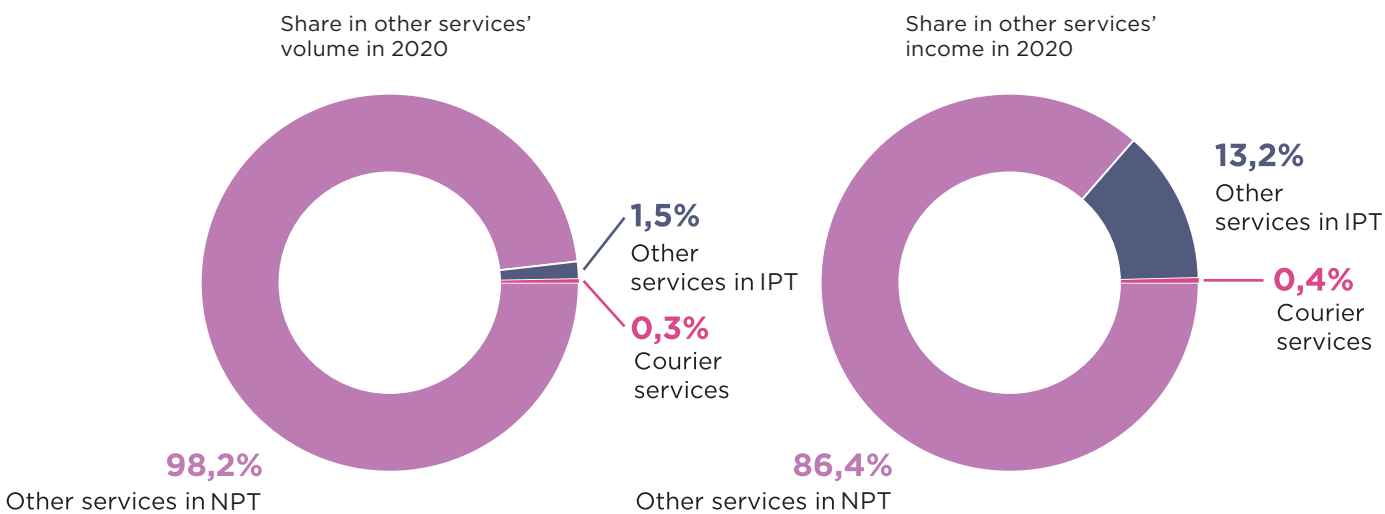
Type of service	Volume	Income	Volume	Income
	in thous.	in thous. din.	%	%
Other services in NPT	45,167	12,372,139	98.2	86.4
Other services in IPT	690	1,892,266	1.5	13.2
Courier services	139	52,354	0.3	0.4
TOTAL	45,997	14,316,759	100	100

Other services in international postal traffic participate with 1.5% in the volumes and generate 13.2% of the revenues (*Table 13.3.*). Average income per item in this category's IPT was approximately 2,742 dinars, which is by almost 142 dinars more than in 2019. A drop both in the volumes and revenues was recorded, which is the result of numerous difficulties in the IPT postal service provision, due to the COVID-19 pandemic.

Courier services in 2020 also marked a decrease in the share in other postal services by 0.3% in the volumes and by 0.4% in the revenues. Average income per service, despite former constant growth, in 2020 remained at the 2019 level and amounts to 376 dinars (*Table 13.3.*).

Compared to 2019, revenues from other services increased by more than 16.6, amounting

Figure 13.2. Shares in other services' volume and income in 2020



to more than 14.3 billion dinars. The biggest income surge was caused by other services in NPT (by 21.4%). Other services in IPT marked a decrease by -6.5%. Revenues from courier services have been in decline for the last two years, with the drop in 2020 amounting to -16%.

The OPS volume and income share trend in the Republic of Serbia over the last five years is shown in Table 13.4.

The most dominant other services (former commercial services) are those in national postal traffic (98% of the total volumes and 86% of their total income). The table shows that both the shares of other services' volume and income in NPS have been on the rise over the last five years.

In 2020 as well, the growth in volume of other postal services (OPS) in national traffic has been recorded (by approximately 19%), while international OPS and courier services marked a drop by -11,5% and -16,4 % respectively, compared to 2019. For the fourth year in a row, courier services' volumes have been in decline.

Table 13.4. Trend of other services' shares in %

Type of service/ year	2016		2017		2018		2019		2020	
%	Volume	Income	Volume	Income	Volume	Income	Volume	Income	Volume	Income
Other services NPT	96.3	76.7	97.3	82.0	97.6	83.4	97.6	83.0	98.2	86.4
Other services IPT	2.8	22.4	2.0	17.3	1.8	16.0	2.00	16.5	1.5	13.2
Courier services	0.9	0.9	0.7	0.7	0.6	0.6	0.4	0.5	0.3	0.4
Total	100	100	100	100	100	100	100	100	100	100

13.2. Analysis of express services and impact of remote commerce

Considering the volumes and revenues generated by national and international express services, distribution by weight category and by content (documents/goods), including ratio of outbound and inbound items in international traffic and analysis of the effects of remote sales, an overview of express services and impact of remote commerce in 2020 is made.

In accordance with the ERGP *(European Regulators Group for Postal Services)* recommendations, the items weighing up to 500 g have been divided by content to items containing documents and those containing goods.

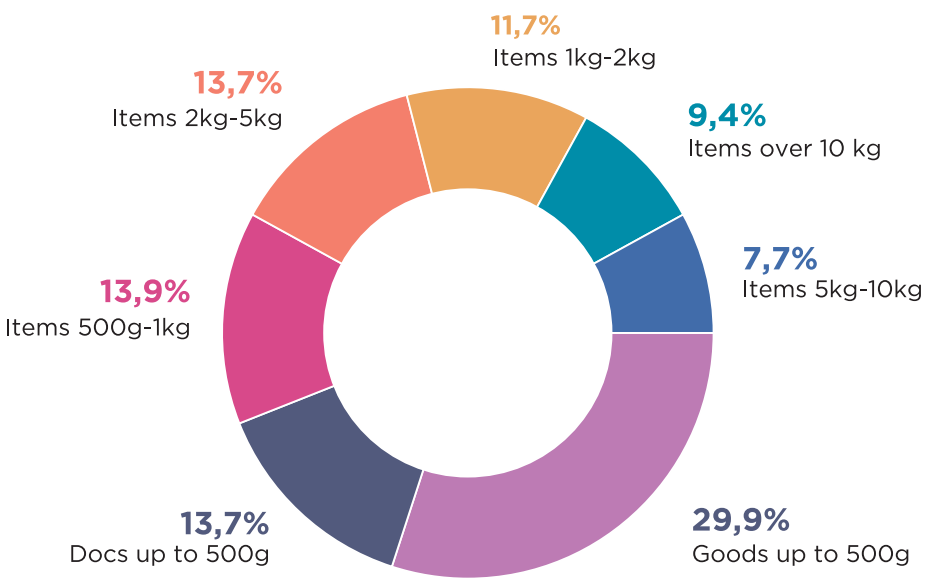
Table 13.5. and *Figure 13.3.* display the structure of express items by weight in national postal traffic for 2020 (in thousand).

Ratio of items containing goods to those containing documents has remained the same, compared to the previous year – the former are almost seven times the latter. Items up to

Table 13.5. Volume structure of NPT express items by weight in 2020 (in thousand)

	Express items NPT							Total express items		Total volume
	Items up to 500 g		Items 500 g-1 kg	Items 1 kg-2 kg	Items 2 kg-5 kg	Items 5 kg-10 kg	Items over 10 kg			
	Docs	Goods						Docs	Goods	
Volume	5,862	12,730	5,927	4,990	5,834	3,284	4,001	5,862	36,766	42,628
Share in total volume	13.7%	29.9%	13.9%	11.7%	13.7%	7.7%	9.4%	13.7%	86.3%	100%

Figure 13.3. Volume structure of NPT express items by weight in 2020



500 g make up almost half of the total volume of NPT express items (43.6%), out of which almost 70% contain goods.

Table 13.6. and Figure 13.4. show the share of items stemming from remote sales, compared to the total volume of NPT express items.

3. the sale of goods via an online shop or an online platform, whereby the goods are delivered to the end-user directly from the manufacturer/retailer ("dropshipping").

Other remote commerce is carried out by other means of communication, in particular

Table 13.6. Share of remote commerce in total NPT express volumes in 2020 (in thousand)

	Docs up to 500 g	Goods up to 500 g	Items 500 g-1 kg	Items 1 kg-2 kg	Items 2 kg-5 kg	Items 5 kg-10 kg	Items over 10 kg	Total
Express volumes	5,862	12,730	5,927	4,990	5,834	3,284	4,001	42,628
Remote commerce volumes	949	7,196	2,904	1,875	1,813	806	849	16,392
Remote commerce share	16.2%	56.6%	49.0%	37.6%	31.1%	24.5%	21.2%	38.5%

Remote sales (remote commerce) are boosting the postal volumes both in national and international traffic.

Remote commerce includes displaying an offer and concluding an agreement on the sale of goods/services by means of one or more remote communication tools. E-commerce is a type of remote commerce realized in such a way that the goods/services are offered, ordered and sold via Internet. E-commerce is particularly performed as:

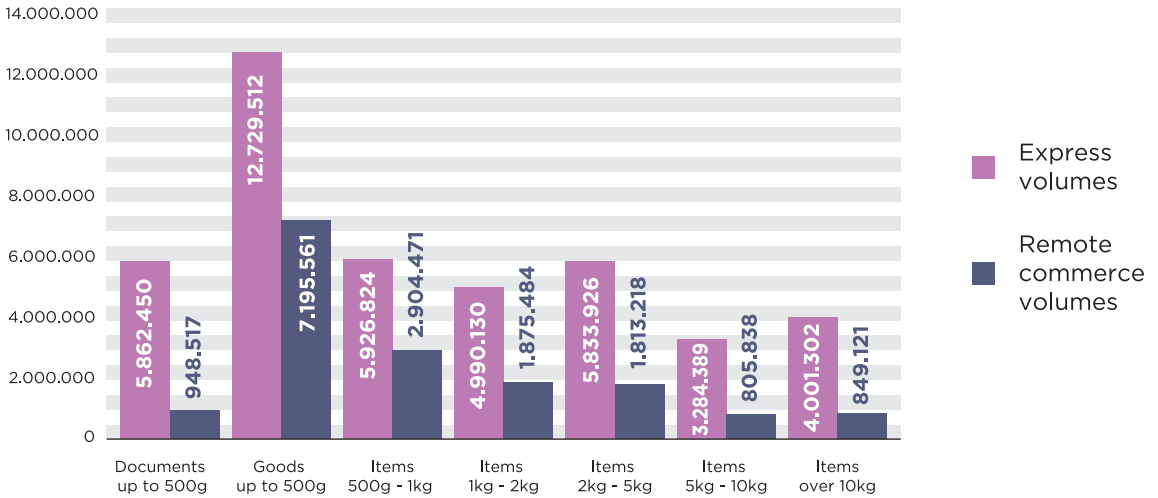
1. the sale of goods/services through an online shop (basic form of e-commerce);
2. the sale of goods/services via an online platform connecting sellers and consumers (*e-commerce* platform sale);

catalogue sales, TV sales, commerce via mail, printed items, advertising material with purchase order, via telephone, mobile phone, text or multimedia messages and automatic machines.

Merchandise payments are effectuated electronically or by COD, and the delivery of goods via mail – in national traffic is usually by means of express postal items.

Items stemming from the remote commerce, which continues to expand on the European market, account for more than 1/3 of the total volume of express postal items in 2020 on the market of the Republic of Serbia (Table 13.6.), especially in the category of goods up to 500 g, accounting for almost 17% of the total express volumes.

Figure 13.4. Share of remote commerce in total NPT express volumes in 2020



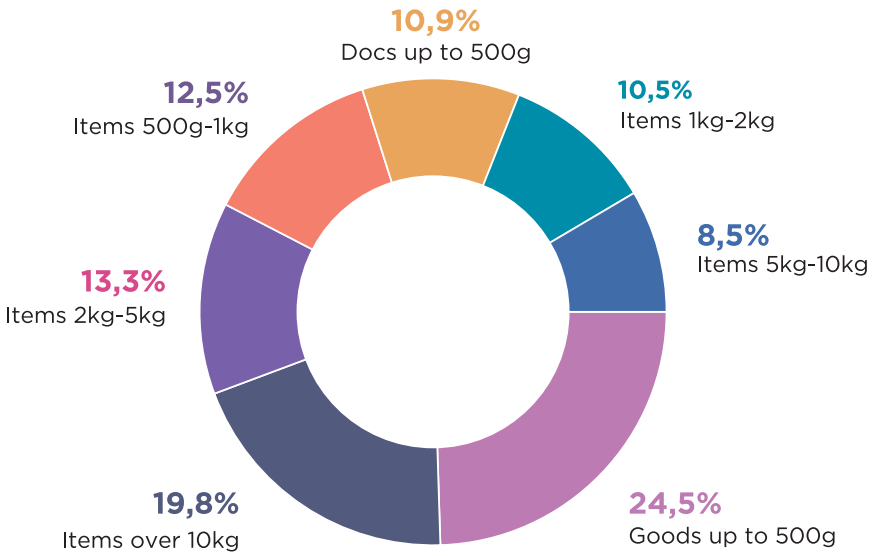
The remote commerce volume share in the total express volumes continued to grow in 2020 as well. In 2018, the share of remote commerce volumes in national traffic was 27% of the total express volumes, in 2019 it was slightly over 31% and in 2020, it grew to more than 38%. The trend of items containing goods up to 500 g having the biggest share (almost 44%) in the total express volumes has continued as well, followed by the item category 500 g – 1 kg (almost 18%). More than 94% of the remote commerce items contain goods, while the rest of them contain documents up to 500 g.

Table 13.7. and Figure 13.5 show shares in the revenues stemming from remote commerce compared to the total income from NPT express items (in million dinars). Revenues from the remote sale items make up around 36% of the total generated revenues from the NPT express items. The most dominant item cat-

Table 13.7. NPT express services income share (in million RSD) by weight in 2020

	NPT express revenues							Total express revenues		Total income
	Items up to 500g		Items	Items 1kg-2kg	Items 2kg-5kg	Items 5kg-10kg	Items over 10 kg			
	Docs	Goods						Docs	Goods	
Income	1,329	2,976	1,514	1,268	1,609	1,028	2,403	1,329	10,798	12,127
Share in total income	10.9%	24.5%	12.5%	10.5%	13.3%	8.5%	19.8%	10.9%	89.1%	100%

Figure 13.5. NPT express services income share by weight in 2020



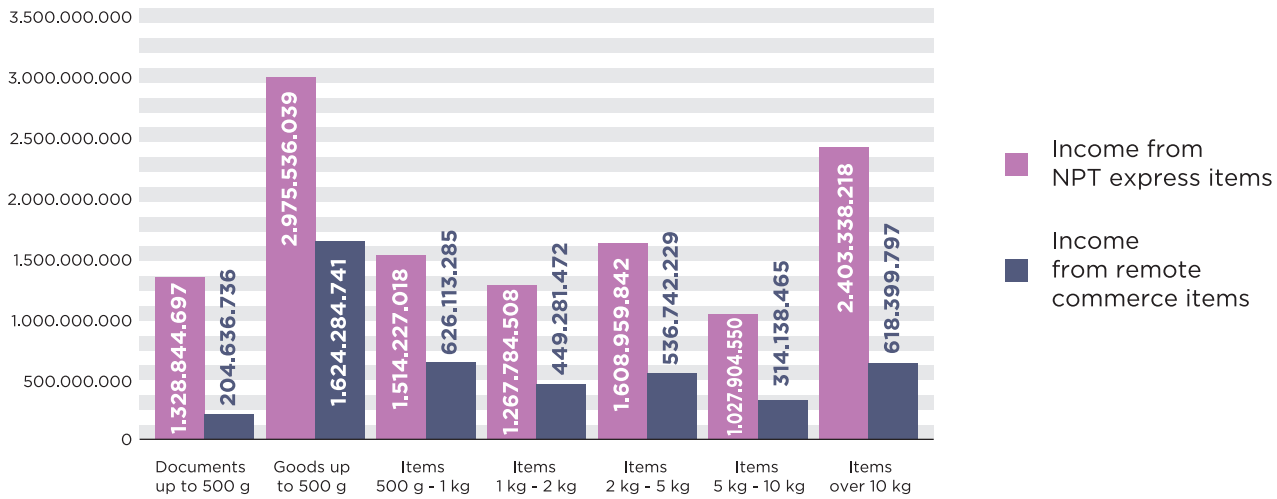
egory, goods up to 500 g, accounts also for the biggest income, amounting to almost 25% of the total revenues from the NPT express items, with slightly over one half of these revenues being those stemming from remote commerce items.

Compared to the situation on the express services market in 2019, a clear growth in all market segments is visible (Table 13.9.). Express items volume grew by 13% in comparison with 2019 (express volume growth in 2017/18 was 14% and that of 2018/19 was 10%). The biggest increase was marked in item category 500 g – 1 kg (close to 27%), and 1 kg – 2 kg (around 26%). The volume growth is accompanied by the income growth (increase by 22%, compared to 2019).

Table 13.8. Share of remote sales income in NPT express service revenues (in million RSD) by weight in 2020

	Docs up to 500g	Goods up to 500g	Items 500g-1kg	Items 1kg-2kg	Items 2kg-5kg	Items 5 kg-10kg	Items over 10 kg	Total
Express revenues	1,329	2,976	1,514	1,268	1,609	1,028	2,403	12,127
Remote sales revenues	205	1,624	626	449	537	314	618	4,373
Remote sales share	15.4%	54.6%	41.3%	35.4%	33.4%	30.6%	25.7%	36.1%

Figure 13.6. Share of remote sales income in NPT express service revenues (in million RSD) by weight in 2020



The only express category that marked a drop in volumes were the items over 10 kg (-10%), and in terms of the revenues, the decrease is not as severe, but still present (-4%).

One of the main driving forces of the further NPT express market development is undoubtedly the development of remote commerce. Year after year, this segment has been on the rise (Figure 13.7.). The volume of remote sale items has increased compared to 2019 by 39% (Figure 13.8.). This is a larger growth rate than that of 2019/2018, when it was 28%. The volume increase also affects the income growth for remote sale items (by 46%).

In addition to national traffic express items, international traffic express items were analysed, based on the postal operators' data provided in Annual Questionnaires for 2020.

Table 13.9. Comparison of remote sales characteristics in 2019 and 2020 (NPT)

Positive/negative growth 2019/2020 (%)	Docs up to 500 g	Goods up to 500 g	Items 500 g-1 kg	Items 1 kg-2 kg	Items 2 kg-5 kg	Items 5 kg-10 kg	Items over 10 kg	TOTAL
Express volumes	14.63	7.09	26.83	25.53	22.98	15.30	-10.09	13.10
Remote sales volumes	26.15	40.14	46.76	51.78	42.74	27.23	10.18	39.21
Express income	46.32	31.28	31.98	26.87	28.67	16.92	-4.54	21.65
Remote sales income	53.42	54.10	37.05	46.95	54.88	44.16	26.61	45.64

In Table 13.10, the volume of outbound and inbound express items (by weight) in international postal traffic (IPT) in 2020 is shown.

Like in the previous year, inbound items account for 65% items in the total IPT express items. The majority of international express items are up to 500 g (both outbound and inbound), containing documents, and are 4 times more frequent than those containing documents in the same weight category.

As for the international express volumes, there has been a slight decrease by -0.02%, compared to 2019. Outbound items dropped by -1.43%, and inbound items slightly increased (by 0.73%).

Figure 13.7. Express volume growth and remote sales growth 2018-2020

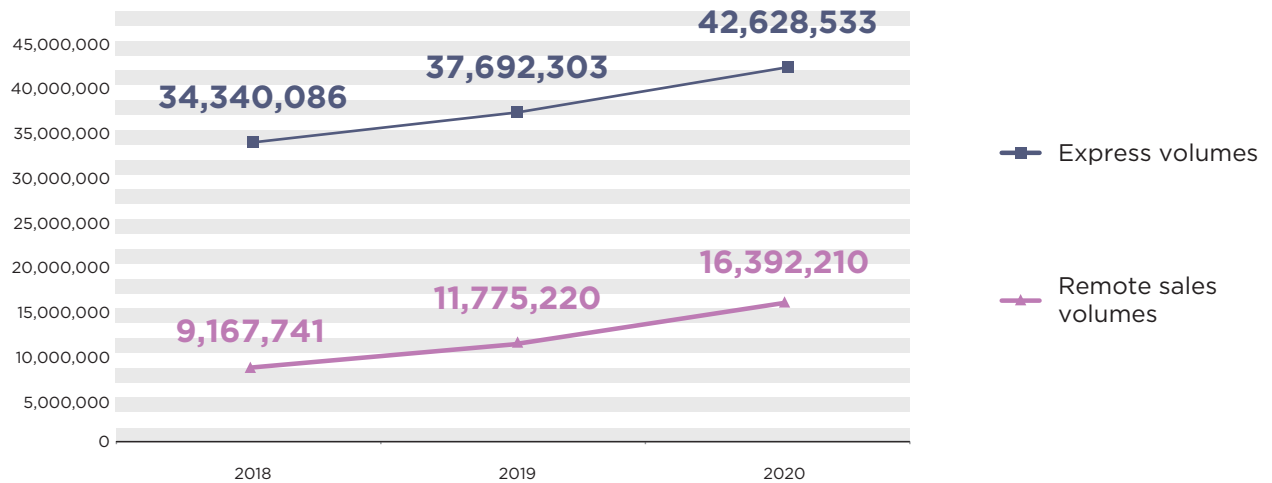
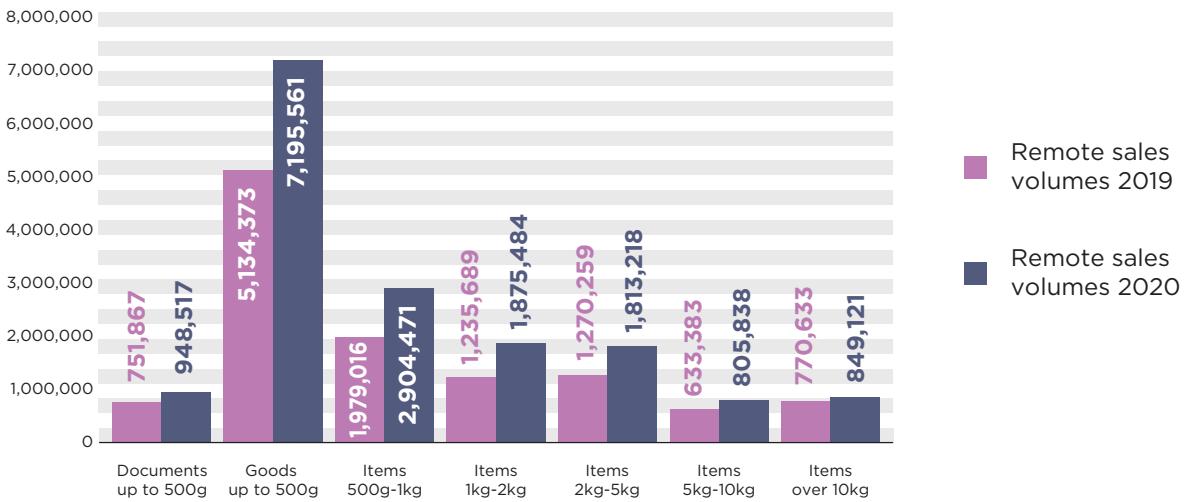


Figure 13.8. Comparison between NPT remote sales volumes of 2019 and 2020



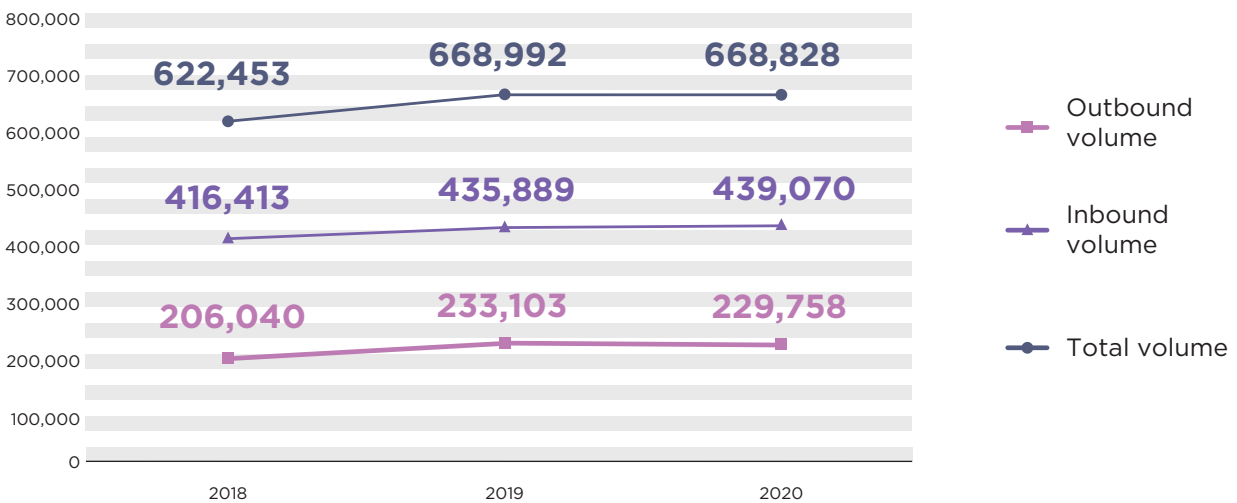
In the recent years, international and national express service volumes were both growing (IPT growth was however lower than NPT, but still positive). The COVID-19 pandemic imposed numerous difficulties on international postal traffic and particularly air transport, which resulted in a negative trend in the international express volumes. This trend is shown in Figure 13.9. (for period 2018-2020).

The year 2020 is specific particularly due to the COVID-19 pandemic. In March 2020, a state of emergency was declared in the country and at the very beginning there was a standstill in the functioning of the postal traffic. Based on the analysed data pertaining to the first quarter of 2020, express services showed a decline in volumes compared to the same period of 2019 (by -1.8%).

Table 13.10. Volume of international express items in 2020

Volume of items	Docs up to 500 g	Goods up to 500 g	Items 500 g-1 kg	Items 1 kg-2 kg	Items 2 kg-5 kg	Items 5 kg-10 kg	Items 10 kg-20 kg	Items over 10 kg	TOTAL
Outbound volumes	109,171	26,513	19,499	18,175	28,518	13,335	7,230	7,317	229,758
Inbound volumes	153,937	45,913	47,303	46,816	52,693	33,953	24,883	33,572	439,070
Share of outbound items (%)	47.52	11.54	8.49	7.91	12.41	5.8	3.15	3.18	100
Share of inbound items (%)	35.06	10.46	10.77	10.66	1.2	7.73	5.67	7.65	100

Figure 13.9. Volumes of IPT express items 2018-2020 (outbound, inbound, total volume)



As of the following quarter, until the end of the year, the express market showed a huge increase in comparison to the same period of 2019 (Table 13.11.). Also, the growth recorded after the first quarter of 2020 was significantly higher than that recorded in the previous years.

This market segment has been growing continuously, showing a significant potential in Q2, Q3 and Q4 2020, since, due to the COVID-19 pandemic and related restrictions, there was a sharp shift in the consumers' habits toward remote and online shopping.

Table 13.11. Comparison of express services by quarters 2018-2020

Quarters (Q)	Positive/negative growth (2018/2019)	Positive/negative growth (2019/2020)
Q1 (January, February, March)	13.67 %	-1.8%
Q2 (April, May, June)	11.46%	15.02%
Q3 (July, August, September)	7.97%	20.53%
Q4 (October, November, December)	5.89%	20.82%

13.3. Postal market trends

The growth trend of other postal services (OPS) compared to that of universal postal service (UPS), has continued over the last 11 years. In respect to the reference year (2011), the OPS income share in the total revenues grew from 40.4% to 61.1%, and the volume share from 4% to 14.9%.

Table 13.12. offers a graphic view of the shares (in %) of postal volumes and revenues over the last five years.

The postal volume dynamics over the last five years is shown in Table 13.13. and Figure 13.10.

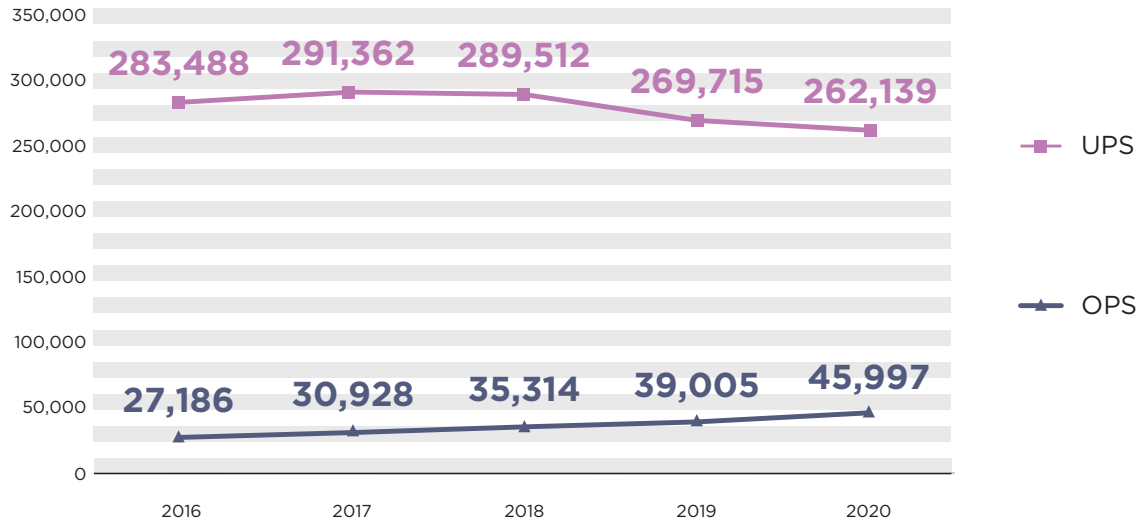
Table 13.12. Overview of shares (in %) of postal volumes and revenues 2016-2020

Type of service	2016		2017		2018		2019		2020	
%	Volume	Income	Volume	Income	Volume	Income	Volume	Income	Volume	Income
UPS	91.2	48.7	90.4	46.9	89.1	44.7	87.4	42.1	85.1	38.9
OPS	8.8	51.3	9.6	53.1	10.9	55.3	12.6	57.9	14.9	61.1
Total	100	100	100	100	100	100	100	100	100	100

Table 13.13. UPS volume and OPS volume 2016-2020

Type of service	Volume in thousand units					Positive/negative volume growth in %			
	2016	2017	2018	2019	2020	17/16	18/17	19/18	20/19
UPS	283,488	291,362	289,512	269,715	262,139	3%	-1%	-7%	-3%
OPS	27,186	30,928	35,314	39,005	45,997	14%	14%	10%	18%
Total	310,674	322,290	324,826	308,720	308,136	4%	1%	-5%	-0.2%

Figure 13.10. Trend of UPS volume and OPS volume (in thousand)



Postal service revenues in 2020 saw an increase by 10,5% compared to 2019. Table 13.14. shows the last five years income.

For five years in a row there have been an increase in the UPS income, amounting in 2020 to 2.2% compared to the previous year. Over the last five years, the UPS revenues have increased by 11.1%.

The OPS income has been on a continuous rise, amounting over the last five years to 65.7%. Only in comparison to the previous year, an increase by 16.6% was observed.

Figure 13.11. shows trends of UPS and OPS revenues over the last five years.

As for the courier services, there has been a continuous decline in the OPS share, both in the volume and income (Figure 13.12, Figure 13.13.).

Table 13.1. UPS income and OPS income 2016-2020

Type of service	Income in thous. RSD					Positive/negative volume growth in %			
	2016	2017	2018	2019	2020	17/16	18/17	19/18	20/19
UPS	8,197	8,473	8,756	8,916	9,111	3.4%	3.3%	1.8%	2.2%
OPS	8,639	9,605	10,851	12,277	14,317	11.2%	13%	13.1%	16.6%
Total	16,836	18,078	19,607	21,193	23,427	7.4%	8.5%	8.1%	10.5%

Figure 13.11. UPS and OPS income trend (million RSD)

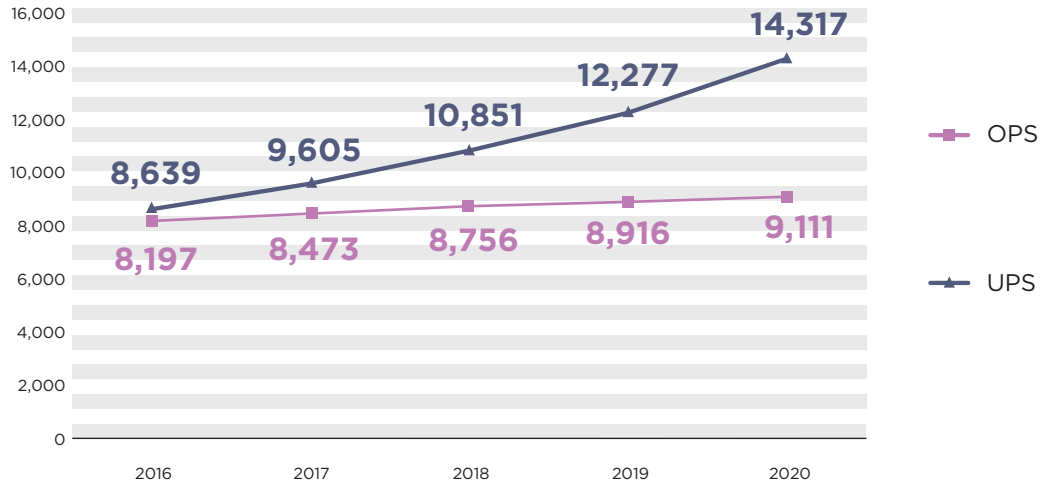


Figure 13.12. Trend of courier volumes 2016-2020

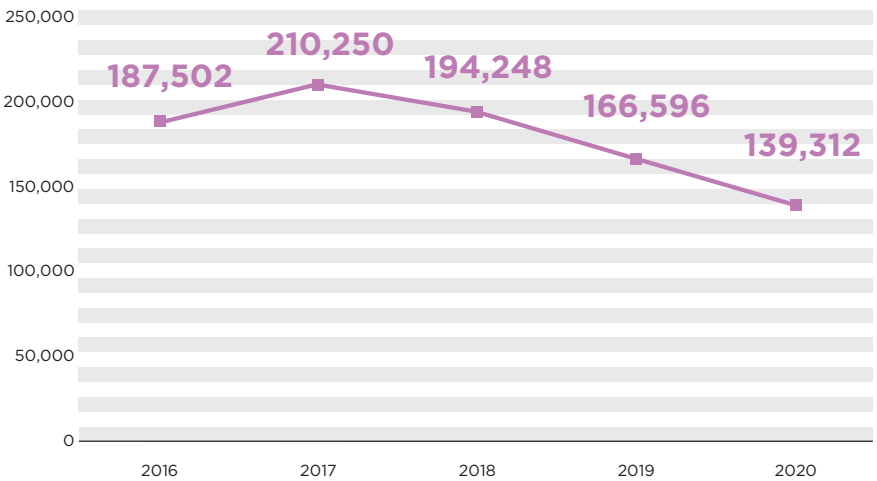
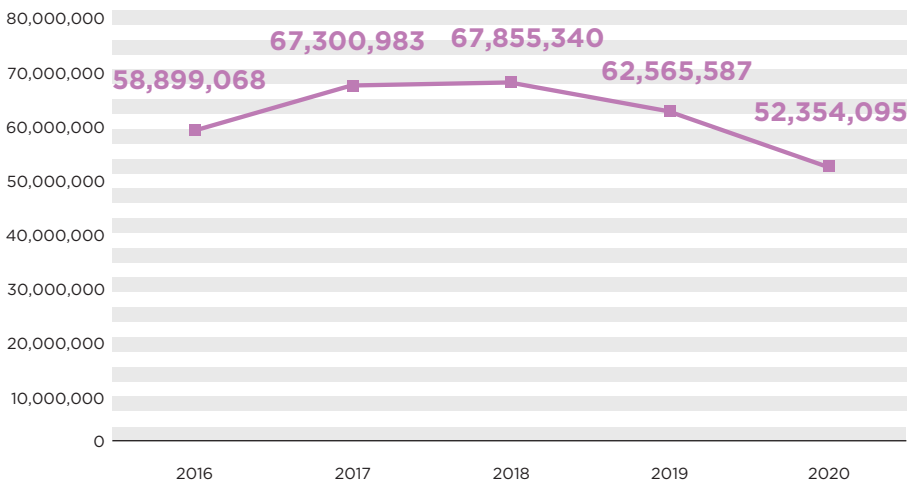


Figure 13.13. Trend of courier revenues 2016-2020



13.4. Express postal market concentration

The Herfindahl-Hirschman index (HHI [9]) is the most reliable description of the market concentration. The value of HHI depends on the number of market participants and on the difference in their relative market power. With the increase in the number of market participants, the HHI values drops. The maximum HHI value is 10,000 (in case of a clear monopoly), while the minimum is close to zero (the nearer the HII value is to zero, the market is more competitive). The index value is determined as the sum of single market share square values of all market participants.

From the point of view of express services (national and international) as a separate postal market compared to the UPS market, where the PPO holds a monopoly, HHI for 2020 was 2,649, implying that the express postal market is concentrated. Compared to 2019, the 2020 HHI value is therefore slightly higher (in 2019 it was 1,881, Table 13.15).

Unlike the previous year (with seven postal operators with volume share over 1%), in 2020 there have been six postal operators with express volume share more than 1%, based on which the HHI value is calculated. By reducing the number of postal operators that do not meet the requirements for index calculation, its own value is increased, suggesting a decrease in the market competition. Different economy sectors use different value intervals for HHI, nonetheless the HHI value of 2,649 corresponds in most of the cases to a competitive market.

Table 13.15. HHI values 2018-2020

	2018	2019	2020
HHI value	1,829	1,881	2,649
Operators with express volume share over 1%	7	7	6

9 HHI – Herfindahl-Hirschman index – a measurement reflecting a market's concentration, showing the level of competition within a market. https://www.modernanalyst.com/Careers/InterviewQuestions/tabid/128/ID/1003/What-is-the-Herfindahl-Hirschman-Index-HHI-and-why-would-you-use-it.aspx

13.5. Overview of postal markets in the EU based on ERGP Report[10]

Reliable, accurate and comparable data on the postal market and its development are of crucial importance both for the users and operators, on one hand, and the postal market regulators, on the other. One of the aims of ERGP (European Regulators Group for Postal Services) is to analyse and publish reports on the EU market main indicators, so as to identify the most important postal market development trends and give timely expert advice to the European Commission (EC) regarding the future development of the regulatory frame. The data used for the analysis and elaboration of the report on key indicators are collected by means of questionnaires sent out to all EU member countries including candidate countries. The 2019 data were provided by 31 countries (the report covers period 2015-2019).

For the sake of an easier market monitoring, the totality of the EU markets is divided in 4 areas:

- Western countries (AT, BE, DE, DK, FI, FR, IE, LU, NL, SE),
- Eastern countries (BG, CZ, EE, HR, HU, LT, LV, PL, RO, SI, SK),
- Southern countries (CY, EL, IT, MT, PT),
- non- EU countries (RS, CH, MK, NO)

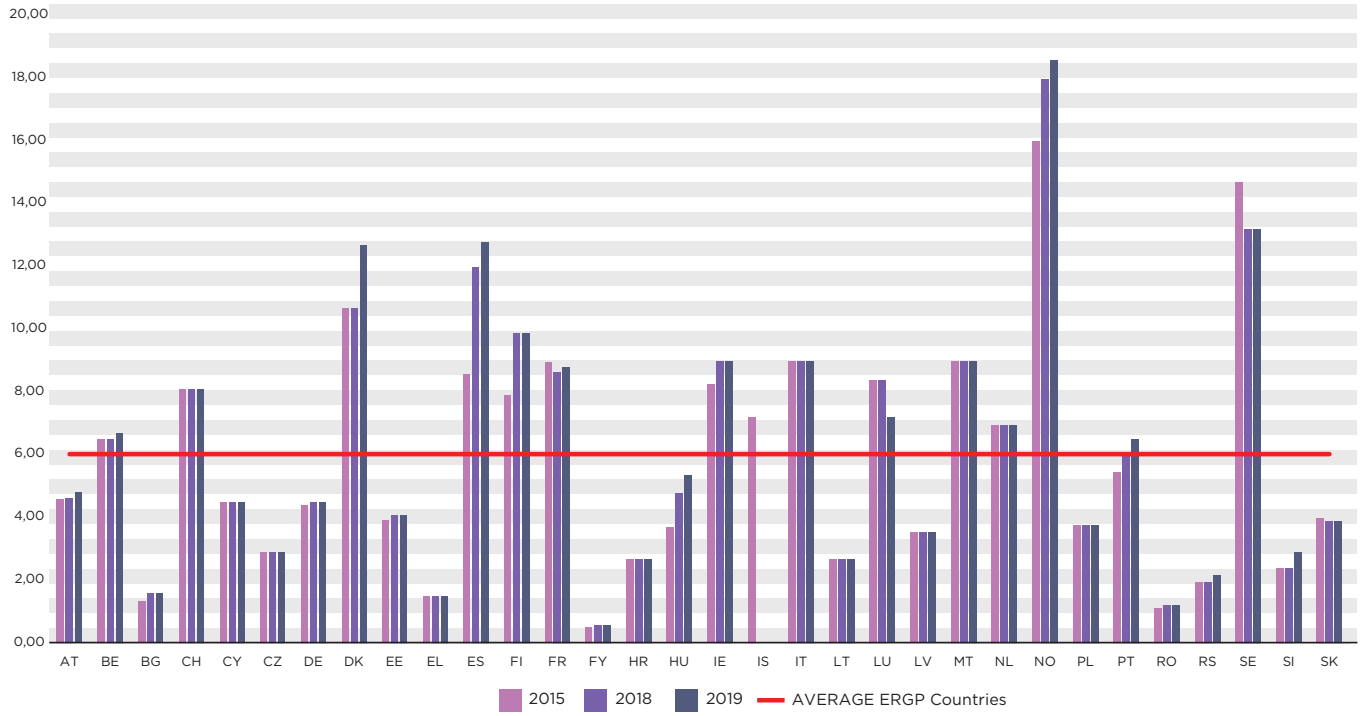
One of the traced and analysed parameters is the USP parcel postage fee in national postal traffic. Norway remains at the top of the list with parcel postage of 18.6 EUR and the Republic of North Macedonia at the bottom, with 0.58 EUR, pointing out to a large disparity between the European countries. In several of the European countries, including the Republic of Serbia, parcel postages remained unchanged over the last four years – CH, CY, CZ, HR, MT, NL, EL, PL, SK, SE, LT, LV. Postages are displayed in Figure 13.14.

The average price for sending an international parcel up to 2 kg in 2019 in the cheapest European zone is 18.71 EUR. In comparison with 2018, this represents an increase by 1.5%. The discrepancy between prices of parcels in national and international traffic is still present (international parcel is on average around 355% more expensive), unlike the letters, where such discrepancy does not exist. The price gap between international and national parcels up to 2 kg is the largest in the following countries: North Macedonia, Greece, Bulgaria, Romania, Republic of Serbia. This big gap caused the EC to undertake measures to harmonize these prices, by adopting Regulation on cross-border parcel delivery services.

Over the period 2015-2019, the number of postal operators in the European market has grown by 1125 operators. Only 6 countries display a reduction in this number (HR, IE, LU, LV, PL and SE). Figure 13.15. shows the change in the number of active postal operators between 2015 and 2019.

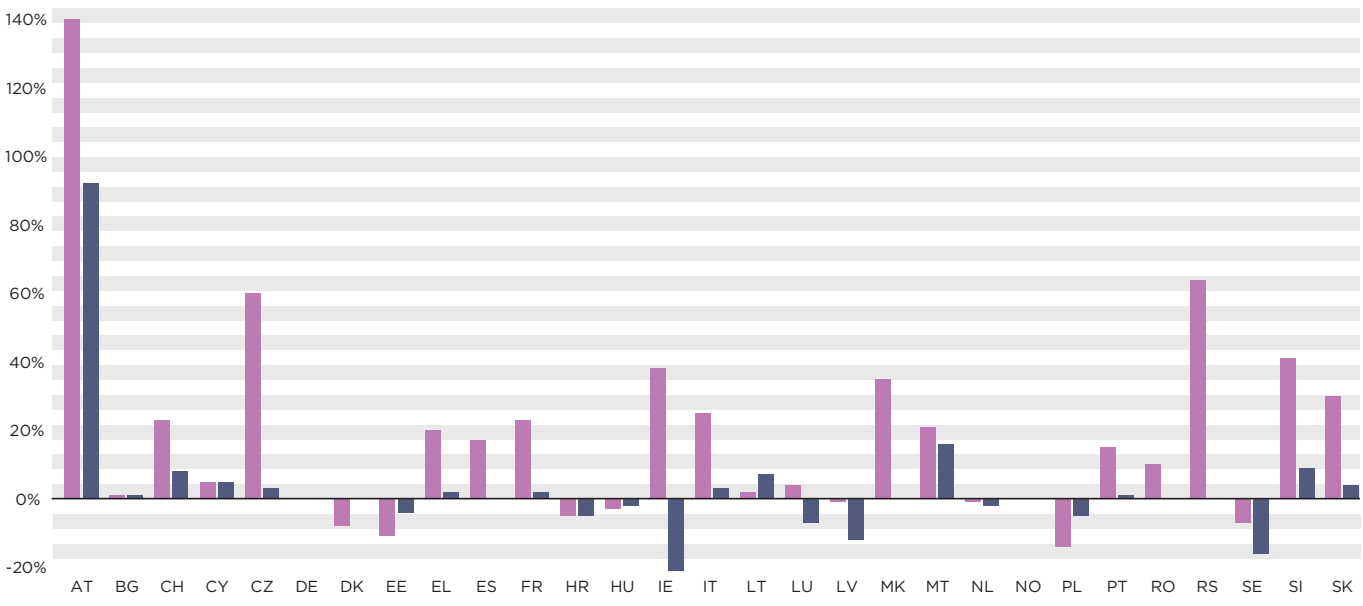
10 ERGP PL II (20) 23 –Report on Postal Core Indicators, https://ec.europa.eu/docsroom/documents/44305, 27.11.2020. Last available data on the EU postal service market pertain to 2019.

Figure 13.14. Postages of priority parcel up to 2 kg in NPT in 2015, 2018 and 2019



	AT	BE	BG	CH	CY	CZ	DE	DK	EE	EL	ES	FI	FR	FY	HR	HU	IE	IS	IT	LT	LU	LV	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK
2015	4,60	6,50	1,33	8,11	4,50	2,90	4,40	10,70	3,92	1,50	8,58	7,90	8,95	0,52	2,70	3,69	8,25	7,22	9,00	2,68	8,40	3,54	9,00	6,95	16,00	3,77	5,45	1,12	1,96	14,70	2,39	4,00
2018	4,62	6,50	1,58	8,11	4,50	2,90	4,50	10,70	4,08	1,50	12,00	9,90	8,65	0,58	2,70	4,80	9,00		9,00	2,68	8,40	3,54	9,00	6,95	18,00	3,77	6,10	1,21	1,96	13,20	2,39	3,90
2019	4,81	6,70	1,58	8,11	4,50	2,90	4,50	12,70	4,08	1,50	12,80	9,90	8,80	0,58	2,70	5,37	9,00		9,00	2,68	7,20	3,54	9,00	6,95	18,60	3,77	6,50	1,21	2,16	13,20	2,89	3,90
AVERAGE	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03	6,03

Figure 13.15. Change in number of active postal operators 2015-2019 in %



AT	BG	CH	CY	CZ	DE	DK	EE	EL	ES	FR	HR	HU	IE	IT	LT	LU	LV	MK	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK
140%	1%	23%	5%	60%	0%	-8%	-11%	20%	17%	23%	-5%	-3%	38%	25%	2%	4%	-1%	35%	21%	-1%	0%	-14%	15%	10%	64%	-7%	41%	30%
92%	1%	8%	5%	3%	0%	0%	-4%	2%	0%	2%	-5%	-2%	-21%	3%	7%	-7%	-12%	0%	16%	-2%	0%	-5%	1%	0%	0%	-16%	9%	4%

Over the past years, the total postal volume in all ERGP countries has been dropping, and as of 2015, the average decrease has been -3.6%. The biggest drop is attributed to the letter-post items, which are the most numerous postal items, causing the total volumes to drop, despite the growth of parcel volumes. Table 13.16 shows volumes and changes in percentages for 2018-2019 and 2015-2019.

The decreasing trend in the letter-post services is present across the majority of European countries, and the most dominant in the South European countries. The exceptions to this trend are Ireland and Lithuania. As for the parcel services, the majority of the countries have seen a growth compared to 2018, with the exception of: Bulgaria, Czech Republic, Malta and Slovakia, where a decline in parcel volumes has been observed.

Unlike the volumes, the total revenues have grown by around 1.9% compared to 2015, mainly thanks to an increased parcel service income – in 2019 it accounted for approximately 55% of the total revenues. The income from letter-post services is on the decline (Table 13.17.).

Table 13.16. Total volume of postal services: average annual change in % 2018-2019 and 2015-2019

	2015 (million)	2018 (million)	2019 (million)	Average change 2018-2019	Average change 2015-2019
Total postal service volume	62,892	56,843	54,258	-4.5%	-3.6%
Letter-post volumes	57,822	49,828	46,582	-6.5%	-5.3%
Parcel volumes	5,070	6,554	7,153	9.1%	9.2%

Table 13.17. Total income from postal services: average annual change in % 2018-2019 and 2015-2019

	2015 (million)	2018 (million)	2019 (million)	Average change 2018-2019	Average change 2015-2019
Total postal service income	€ 65,566	€ 68,672	€ 70,472	+ 2.6%	+ 1.9%
Letter-post revenues	€ 33,615	€ 31,045	€ 30,248	- 2.6%	- 2.6%
Parcel revenues	€ 31,287	€ 36,350	€ 38,811	+ 6.8%	+5.6%

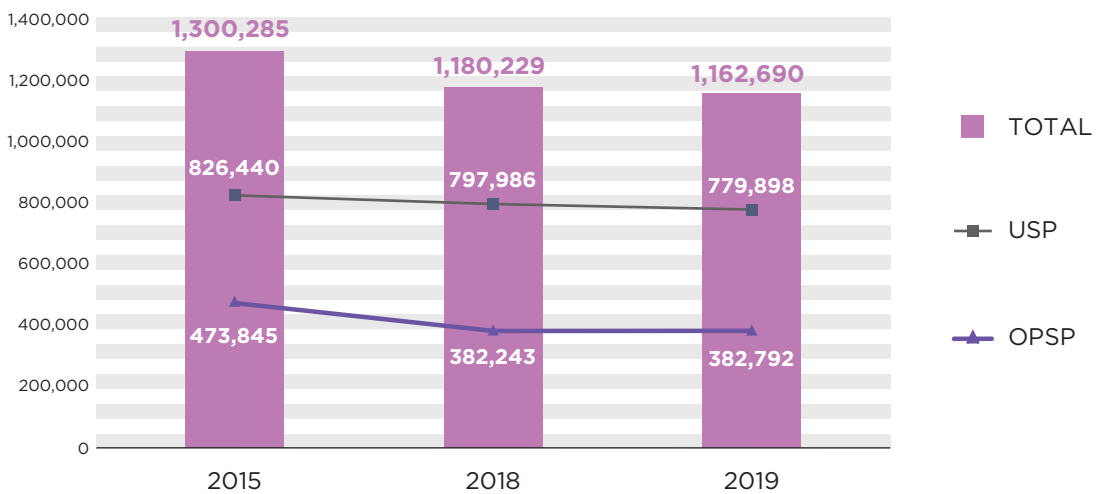
The total employment over 2015-2019 plunged by approximately -10.6%, the reason being a gradual reduction of the USP number of employees by roughly -5.6% in the observed period. Likewise, the number of employees with other postal operators first showed a drop over 2015-2019, followed by a modest rise in 2019. Like in the previous years, the USP employee share is significantly higher than that of other postal operators. In 2019, only in three countries (Germany, Cyprus and Greece) the number of other postal operators' employees exceeded that of the USP employees. As for the average share of employees with the USP in 2015 and 2019, there has been a decrease, from 77.2% in 2015 to 72% in 2019. (Figure 13.16.).

In the countries that provided data for period 2015-2019, an increased number of postal network units by 16.2% is observable. The USP recorded a drop in this number by -3.4%, while other postal operators recorded a rise by 44.3%. The number of USP postal network units has not significantly changed over the past two years, however that of other postal operators grew in 2019 by 15.9% in comparison to the year before (Figure 13.17).

Last year was heavily marked by the COVID-19 pandemic, which imposed a set of restrictions on our everyday life, impacting inevitably the postal markets. ERGP, in a 2020 study, researched influence of the pandemic on the EU postal sector.[11] The majority of European countries made changes to the postal item delivery (in order to avoid personal contacts due to the pandemic, by using parcel delivery boxes), with the provision of universal postal service carried out without major problems.

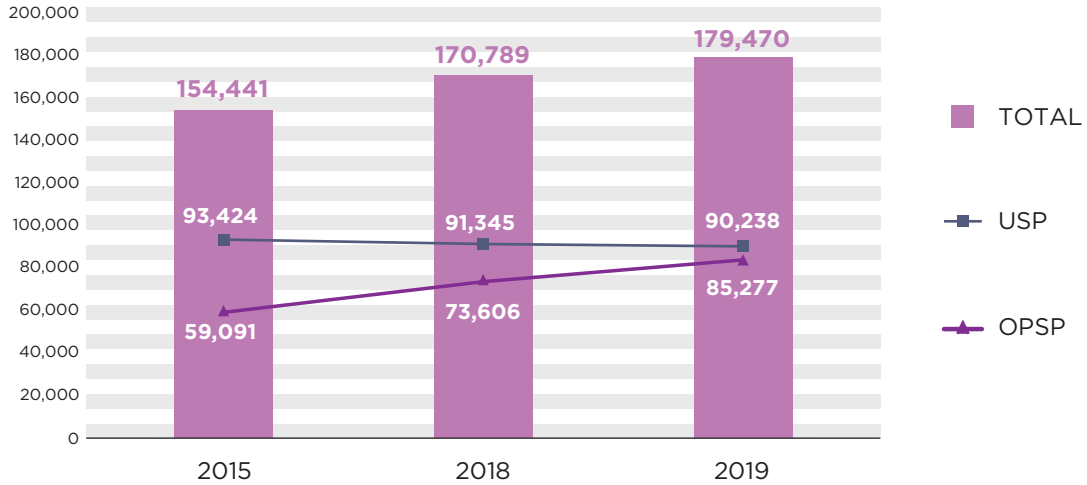
The study showed that in the EU there had been a decrease in the letter-post volumes and increase in the parcel volumes, due to the growth of e-commerce. The majority of countries saw an exponential growth of parcel volumes during the periods of strict lockdowns, followed by a declined positive growth, in the periods of opening. Unexpected operational slowdowns occurred in international post-

Figure 13.16. Total number of employees at USP and other postal operators: 2015-2019



11 https://ec.europa.eu/docsroom/documents/43322;
https://ec.europa.eu/growth/content/measures-adopted-postal-services-due-covid-19-outbreak_en

Figure 13.17. Total number of postal network units at USP and other postal operators: 2015-2019



al traffic as well. Border and airport closures worldwide caused huge disruptions in the transport of postal items. In the majority of countries, the USPs were faced with big delays in postal item transmission, with rare exceptions of neighbouring countries that were able to establish postal items exchange by roads. In certain countries, international postal services became more expensive, with some of them being discontinued (such as EMS or small parcel).

Private postal operators using their own logistic network encountered less challenges in international transport, however they as well experienced slow customs procedures, which made their postal flows unpredictable. It is noteworthy that some of the postal operators were forced to close down or to lay off their workforce, due to small workload during lockdowns. Operators that based their business on postal services stemming from e-commerce were less struck by the negative side of the situation.

13.6. Conclusion

A drop in the volume of universal postal service by -2.8%, compared to 2019, despite the growth of other postal services volumes, caused the total realized postal service volumes to drop in 2020 by -0.2%.

A decreasing trend in letter-post services, present in European countries as well, has once again marked the postal market in our country: letter-post volumes fell by -1.8%. Letter-post services are part of UPS and are provided solely by the PPO.

Postal market in the Republic of Serbia is specific in the fact that parcel service volumes in it are extremely low. Despite the other postal operators also being authorized to provide parcel services outside the UPS scope, as of 2010 until today these services have been provided only by the PPO, both within the UPS scope and OPS. In 2020, after a four year increase of parcel volumes, a drop by -20% has been recorded, compared to 2019.

Rather than for parcels, Serbian postal users opt for express services, which are only slightly more expensive, unlike express service rates in the EU countries, where an express item postal charge is several times higher than that of a parcel, which explains why parcels are more popular in the EU markets.

There has been a growth in the express volumes in the Serbian market, which resulted in a continuous rise of other postal service volumes. The annual OPS growth rate has over the last two years amounted to 13%, and even increased to 16.6% in 2020.

In the national postal market, a volume growth by 39% has been recorded in the items stemming from e-commerce, which belong to express services (during 2019-2020 the growth was 28%), including an income growth by incredible 45%.

Postal operators during the pandemic have been constantly adapting to the measures and regulations imposed by the Government of the Republic of Serbia. On the proposal of the Ministry of Trade, Tourism and Telecommunications, the Ministry of Interior started issuing special licenses allowing the postal operators' employees, as essential workers, to circulate and provide postal services during the state of emergency. They were one of the rare economic entities that did not discontinue their business activities due to the pandemic.

The courier service providers, however, displayed an oscillating number of active operators, a phenomenon recorded as early as in the previous years as well. Disloyal competition, comprised from various associations performing transport and delivery of items, has strikingly influenced this postal market segment. A steady drop by -34% in the volume of realized services has been observed over the last three years in the courier market, resulting also in the fall of income by -22%.

All of the above once more reaffirmed the need and necessity for an additional effort to be invested both by the legislator and the independent regulator in order to ensure fair and equal conditions for all market players, and, primarily by removing disloyal competition, the protection of the most vulnerable market participants. The new Law on postal services, which entered into force at the end of 2019, strengthened the existing and set new competencies of the Agency.

The Agency, in 2020, pursuant to the provisions of the new Law on Postal Services, adopted nine bylaws, which, along with the

regulations of the line Ministry, represent a regulatory stronghold for an overall postal market regulation. Expert monitoring as a new competence of the Agency is expected to give a comprehensible insight into the activities of registered postal providers.

Natural and legal entities, as users of postal services, expressed their needs regarding postal services, during the survey on the satisfaction of postal users, organized by the Agency in 2020. The results clearly show that more and more end-users prefer express services, mainly because those offer more flexibility in sending and receiving of postal items, but also have shorter and guaranteed transmission deadlines.

Even though the movement of people in periods of 2020 was restricted, the need for the transport of goods has grown. The Internet sale and online shopping are expected to flourish in the future. Postal markets continue to grow and expand in the segment of remote commerce, which was particularly demonstrated during 2020.

14. QUALITY OF POSTAL SERVICE PROVISION

Pursuant to the Law on Postal Services, the Agency prescribes and monitors the quality parameters of postal service provision. The quality of universal postal service (UPS) is reflected in the results of the quality measurements performed by the public postal operator (PPO) as the sole universal service provider (USP) in the Republic of Serbia. The Agency during 2021 has undertaken an independent measurement of the UPS quality and the results of this screening will be available in the next postal market overview.

The quality of provision of other postal services, primarily express postal services, is currently being examined based on the available data provided by the postal operators.

14.1. Quality of universal postal service provision

In accordance with the new Law on Postal Services („Official Gazette of RS", No. 77/19; hereinafter: the Law), the Regulatory Agency for Electronic Communications and Postal Services adopted the Rulebook on quality parameters for performing postal services („Official Gazette of RS", No. 114/20; hereinafter: the Rulebook), which entered into force on September 12, 2020, stipulating that the full application of the transit times prescribed by the standards is expected from the PPO in 2023.

Having in mind that, during the first nine months, the Rulebook on quality parameters for performing postal services and minimum quality in universal postal service provision („Official Gazette of RS", Nos. 146/14 and 98/17; hereinafter: the former Rulebook) was in force, the analysis of the PPO's report on the UPS quality will be assessed in accordance with the provisions of the former Rulebook. The PPO defined the independent measurement criteria back in 2019, based on the provisions of the former Rulebook, according to which the independent measurement of transit times in 2020 was organized, therefore it was not reasonable to make adjustments to the new Rulebook in September.

In conclusion, the Agency will be guided by the provisions of the former Rulebook in its analysis and assessment of the annual report on the UPS quality for 2020.

The PPO (USP) is obligated to provide to the Agency an annual report on the UPS quality. The annual report on the UPS quality must

be elaborated in accordance with adopted standards SRPS EN 13850:2014, SRPS EN 14508:2014 and SRPS EN 14012:2014. During 2020, in national postal traffic, a continuous independent measurement[13] according to standard SRPS EN 13850:2014, as well as a continuous internal (by the PPO) measurement of non-recorded letter-post transit times with internal panelists, using RFID equipment (so-called AMQM).[14]

The UPS quality assessment was carried out based on the data obtained in an independent measurement, internal PPO measurement and the data from the Agency questionnaire, including the following indicators:

- transit and delivery speed and reliability;
- availability of universal postal service;
- security of items;
- efficiency of complaint handling;
- service users' satisfaction and availability of information, etc.

Speed and reliability of postal items transport and delivery

Speed and reliability of transport and delivery of postal items in the Republic of Serbia are measured by means of transport and delivery times of national non-recorded letter post items and international priority and air letter-post items. In national and international traffics, standards are prescribed by the Agency.[15] Taking into account that the Rulebook came into force in September 2020, the PPO could not fully adapt its quality measurement to the Rulebook's provisions, therefore the obtained measurement results will be compared against the provisions of the former Rulebook, which ceased to be valid in September 2020.

As mentioned before, in addition to the independent measurement, the PPO undertook a continuous internal measurement of the non-recorded letter post item transit times. The results of both measurements are given in Table 14.1, together with AMQM measurement results carried out since 2016 in national postal traffic.

Table 14.1. Transit times in national letter-post traffic

Transit time	AMQM					Independent annual measurement	Former Rulebook targets for 2020
	2016	2017	2018	2019	2020	2020	
D+1	77.66%	67.12%	67.16%	57.55%	49.92%	52.33%	83%
D+2	95.04%	89.52%	91.42%	85.24%	86.99%	73.19%	88%
D+3	98.21%	95.56%	96.78%	93.16%	96.08%	85.20%	93%

13 Internal measurement carried out by company „Central", Belgrade

14 Internal measurement carried out by the PPO is performed in line with a PPO internal act „Methodology for QoS monitoring in postal traffic "

15 Rulebook on quality parameters for performing postal services („Official Gazette of RS", No. 114/20)

The above table shows that the achieved transit times are inferior to the set targets for 2020, especially in terms of D+1 transit times, where a major discrepancy is observed. Targeted transit times for non-recorded items to be reached by the PPO in 2020 are considerably higher than those revealed in the 2020 independent measurement (primarily targets for D+1 and D+2).

In international postal traffic, the international standard prescribed by the Universal Postal Union (UPU) is J+5 for 80%, whereas the Association of European public postal operators (PostEurop) prescribed the speed indicator J+3 for at least 85% and reliability indicator J+5 for at least 97%. In order for the measurement results be valid and comparable among the EU member countries, the Directive 97/67/EC (2002/39/EU and 2008/6/EU) prescribed standard EN 13850 – Quality of services – Measurement of the transit time of end-to-end services for single piece priority mail and first class mail. This standard defines the ways to make preparations for the screening, the manner of screening and analysis of the obtained data. Continuous monitoring of transit times organized by an independent organization is a prerequisite for obtaining quality and valid data.

The internal quality measurement in international traffic revealed that the quality is not on a satisfactory level. The provided data about international items show that in 2020, compared to 2019, a decline trend, present as of 2017, in the effectuated transit times for inbound items had continued (Table 14.2.). However, the drastic drop in the international traffic quality in 2020 is caused above all by the COVID-19 pandemic, which provoked disturbance in international air traffic, affecting the provision of international postal services and causing substantial delays in the circulation of inbound and outbound postal items.

The PPO has failed to fulfill the quality standard for many years in the past, with 2020 bringing yet another even larger distortion of quality, primarily because of the COVID-19 pandemic. It is necessary for the PPO, despite difficult circumstances, to undertake measures to improve quality in order to meet the target values prescribed by the Rulebook.

Table 14.2. Transit times in international inbound letter-post traffic

Transit time	International traffic					Prescribed standard
	2016	2017	2018	2019	2020	
J+3	58.45%	48.10%	40.61%	33.1%	7.7%	85%
J+5	87.90%	82.94%	80.81%	70.9%	26.5%	97%

Availability of universal postal service

The availability of universal postal service is assessed based on the territorial accessibility of post offices, accessibility of post letter boxes, working hours of post offices, availability of post office counters and availability of item delivery.

of the number of items inserted in letter boxes. Based on a one-month screening, a daily average volume is determined and an analysis of justifiability regarding presence of the letter box at a certain location is performed.

One of the criteria for the quality of postal service accessibility are the working hours

Table 14.3. Availability of post offices and letter boxes

Postal network capacities	Year					Trend (%)			
	2016	2017	2018	2019	2020	17/16	18/17	19/18	20/19
Number of post offices	1,516	1,530	1,534	1,526	1,518	0.92	0.26	-0.52	-0.52
Number of letter boxes	1,964	1,958	1,935	1,969	1,927	-0.31	-1.17	1.75	-2.13

The declining number of post offices, recorded for the first time in 2019, has continued in 2020 as well. In 2020, the PPO had a network comprising 1,518 post offices, which is 8 post offices less than in 2019. Out of these, 1,317 are corporate post offices, 177 are contractual post offices in rural areas and 24 contractual post offices in urban areas. In comparison to 2019, the number of contractual post offices has been reduced, while that of corporate post offices was increased. The average number of inhabitants per post office is somewhat less than 5,000, still above the European average (around 4,500 of inhabitants per post office).

Unlike in 2019, when a rise in the number of letter boxes was recorded, 2020 marked a decline in this number (Table 14.3.), more precisely, there were 42 letter boxes less in 2020 compared to 2019, which is a drop by 2%. Pursuant to the prescribed Methodology for QoS monitoring in postal traffic, the PPO shall, at least once a year, carry out an analysis

of post offices, showing the time (number of hours per day) during which the post offices are available to their customers.

Out of 1,518 post offices, 986 (64.95%) are in rural, and 532 (35.05%) are in urban areas. Further analysis showed that 1,096 post offices (72.20%) are open during up to 7 hours a day, 394 post offices (25.95%) work between 7 and 12 hours, 17 post offices (1.12%) work more than 12 hours, whereas 11 post offices (0.72%) work around the clock. Out of 1,317 corporate post offices, 166 are open less than 4 hours a day.

Working hours in densely populated communities are longer, therefore in urban areas, with 532 post offices available to customers, there are more post offices working 7 to 12 hours daily (62.4%), whereas in rural areas, with 986 post offices, 92.29% are open for customers 7 hours a day.

One of the parameters of availability of postal counters to customers regarding the provision of universal postal service is the waiting time of customers in line, determined by screening. For 2020, there has been no screening of the average waiting time in line, due to the preventive and protective measures related to COVID-19.

The availability of postal items delivery is the accessibility of the delivery to end-users. The Postal Directive prescribes that the USP must deliver postal items to all inhabitants at least 5 days a week, with possible exceptions. The legislation of the Republic of Serbia has also prescribed a 5-day delivery, i.e. delivery on business days, with possible exceptions, defined by the Agency in the Rulebook on the conditions for and the manner of provision of postal services („Official Gazette of RS", No. 115/2020), Articles 11 and 12, in force as of September 2020. Since over the first nine months, the former methodology was applied, whereby the delivery was performed in local, larger and largest delivery areas, Table 14.4. shows the delivery coverage of inhabitants and households on the territory of the Republic of Serbia.

The analysis of data about the number of inhabitants and households by delivery areas showed that around 69% of inhabitants and households were covered by the everyday, i.e. 5-day delivery. Around 20% of inhabitants and households receive their mail 2 or 3 times a week, with almost 11% inhabitants and households receiving their postal items once a week.

Security of items

An overview of lost and damaged items in the period 2016-2020 is shown in Table 14.5.

The increase in the share of lost and damaged items continues in 2020 as well (average value per item category). The share of lost and damaged postal items in 2020 was 0.013% (13 lost and damaged per 100,000 received), representing a drop compared to 2019 when it was 0.011% (11 lost per 100,000 received). The negative trend has been present during the entire observed period (2016-2020).

Table 14.4. Inhabitants and households per delivery area

Delivery area	Inhabitants	Households	% Inhabitants	% Households
Local	4,960,302	1,989,897	69.02%	69.02%
Larger	1,450,412	581,854	20.18%	20.18%
Largest	776,148	311,363	10.80%	10.80%
Total	7,186,862	2,883,114	100%	100%

Table 14.5. Lost and damaged items in national traffic

TYPE OF ITEM	2016	2017	2018	2019	2020
REGISTERED ITEMS					
- lost per 100,000 items	8	9	16	35	36
- damaged per 100,000 items	0	0	0	0	0
RECORDED DELIVERY ITEMS					
- lost per 100,000 items		4	3	2	3
- damaged per 100,000 items		0	0	0	0
COURT LETTERS					
- lost per 100,000 items		12	11	12	14
- damaged per 100,000 items		0	0	0	0
INSURED LETTERS					
- lost per 100,000 items	0	1	0	0	6
- damaged per 100,000 items	0	0	0	0	1
PARCELS					
- lost per 100,000 parcels	0	2	0	2	2
- damaged per 100,000 parcels	0	2	2	1	6
MONEY ORDERS					
- lost per 100,000 items	0	0	0	0	0
Percentage of lost and damaged items	**0.007**	**0.008**	**0.010**	**0.011**	**0.013**

Paid damages in UPS domain

Table 14.6. shows an overview of paid damages, by type of recorded postal items in national postal traffic (NPT) for the period 2016-2020.

Unlike the previous observed period, paid damages in national postal traffic in 2020 were by 9% higher than in 2019, but the number of filed requests was lower by 29%. The reason for that was an increased number in insured item and parcel paid damages (the decrease in the number of indemnity requests is primarily in the domain of registered items).

In international postal traffic, indemnity was paid for 38 items, compared to 44 items in 2019. Even though the number of indemnity requests in 2020 was decreased, there was an increase in the paid indemnity amount. The only increase compared to 2019 was that of the number of indemnity requests for parcels and insured letters.

Efficiency of complaint handling

In 2020, 1,016 written complaints were sent to the work, regional and local PPO's units, which is by 35.8% less than in 2019, when 1,583 complaints were filed. Out of these 1,016 complaints, 60.73% refer to delivery, 14.76% to at-the counter business and 24.51% to other complaints. Out of the total number of complaints, 40% were deemed justified.

Over 2020, 28,561 inquiries were received through the PPO's corporate website, which compared to the previous year represents an increase by 44%. Out of the total number of all inquiries, 28,082 (98%) refer to service information, while 479 (2%) are complaints: there were 336 complaints pertaining to delivery (64% deemed justified), 14 to at-the counter business (all deemed justified) and 129 are other complaints (26% of justified).

As for the complaint handling procedures carried out in 2019, claims concerning nation-

Table 14.6. Paid damages by type of postal items in NPT

NPT	2016		2017		2018		2019		2020	
	vol.	din.	vol.	din.	vol.	din.	vol.	din.	vol.	din.
Registered items	433	347,304.00	568	446,258.00	946	805,151.00	2,313	983,195.00	1,604	937,539.50
Insured letters	3	5,371.00	3	3,896.00	5	4,980.00	2	8,085.00	10	64,982.00
Parcels	5	6,857.05	15	38,817.15	7	23,741.00	11	22,945.00	25	115,417.30
Money orders	0	0.00	2	32,540.07	1	3,000.00	1	2,000.00	2	1,371.00
TOTAL	**441**	**359,532.05**	**588**	**521,511.22**	**959**	**836,872.00**	**2,327**	**1,016,255.00**	**1,641**	**1,119,309.80**

al traffic were resolved on average in 3 days, which is at the same level as in 2019. The duration of the resolution of damage procedures was extended by 3 days, from 11 to 14 days (Table 14.7.), which complies with the prescribed deadlines.

ity, speed, assortment, price and manner of service provision were commonly highly rated.

The PPO made available to its users several channels for questions and complaints

Table 14.7. Average time for complaint resolution, realization and payment of indemnity in national postal traffic

Year	Resolution of damage claim	Indemnity realization	Indemnity payment	Total for resolution and indemnity payment
	(days)	(days)	(days)	(days)
	1	2	3	4=2+3
2016	**3**	**10**	**4**	**14**
2017	**4**	**9**	**4**	**13**
2018	**4**	**10**	**5**	**15**
2019	**3**	**6**	**5**	**11**
2020	**3**	**9**	**5**	**14**

These deadlines are fairly longer in case of international traffic claims, taking into account that the complaint handling procedures are carried out in at least two countries.

Users' satisfaction and availability of information

In its annual QoS report, the PPO regularly informs RATEL about the level of service users' satisfaction and the availability of information on products and services. The PPO has conducted a survey on the Index of satisfaction regarding legal persons (sample of 205 legal entities), carried out by means of personal interviews of pre-selected customers and including rating of different letter-post service parameters. The parameters such as: reliabil-

(e-mail, by telephone, via website, by mail, directly at post office counters), which complies with the requirements of standard SRPS EN 14012:2014. By its internal act, which came into force in 2019, the PPO aims to improve its communication with users via its Call Center, corporate website and Facebook page. All these measures are expected to contribute to a better availability of information, user's interface of the complaint and inquiry filing procedure and an overall quality level in this activity segment.

Complaints pertaining to universal postal service

The UPS items in the volume of 49,780,354 in national postal traffic were the object of 55,588 inquiries, the majority of which were found to be ungrounded (88.8%). Based on the PPO's General Terms and Conditions, should the sender think that a recorded item was not delivered to the recipient, or was not delivered within the proper deadline, an inquiry procedure shall be initiated at the post office. The resolution of the inquiry is later on used in the process of indemnity claim. The majority of inquiries were filed for court letters (89%).

Out of the total number of filed indemnity requests, the majority referred to lost items (93.5%), followed by claims for damaged items and other items (1.53% and 1.83% respectively), and finally to deadline exceeding (0.35%). There were approximately 3% of unjustified inquiries (Table 14.8.).

In international postal traffic (IPT), there were 11,370 inquiries filed in the UPS domain, out which 37% referred to outbound items, and 63% to inbound items. Almost all of the filed inquiries (99%) were deemed unjustified, while 38 inquiries in IPT were accepted.

14.2. Quality of provision of other postal services (OPS)

The quality of OPS provision is analyzed based on the available data provided by postal operators in the annual questionnaires. The introductory part contains an overview of general information on the postal operators' network availability and innovations, followed by an analysis of the complaints filed by users about the work of postal operators while providing OPS.

The share of business units adapted to persons with disabilities makes 18% of the total number of business units. Six postal operators (including the express service providers and the PPO) dispose of the totality of 300 business postal office units adapted to persons with disabilities. The total number of business units is 1,660, out of which the majority belong to the PPO, a sole USP.

As for the postal network resources enabling a greater service availability, 60 parcel lockers were reported in 2020. Parcel lockers are the postal network resources for collection/ delivery of postal items, with a growing number of postal operators expressing wish to use them throughout Europe and the world. A number of operators is planning to introduce this ser-

Table 14.8. Complaints about UPS in NPT

Total number of filed complaints	Groundless	Resolved as:				Indemnity
		Lost	Damaged	Deadline expiration	Other complaints	Amount
(in RSD)	2	3	4	5	6	7
1=2+3+4+5+6	2	3	4	5	6	7
1,698	55	1,580	26	6	31	1,145,435.80

vice next year. With a 24h accessibility, the parcel lockers greatly contribute to the simplicity and availability of postal delivery, by adapting to the users' needs.

The current hot topic and the EU project entitled the *European Green Deal* has set the goal of improving the environmental situation and making Europe the first climate-neutral continent. The European Commission, by adopting this strategy, is about to pass regulations pertaining to the whole transport sector, postal markets included, concerning a significant reduction in carbon emissions. Postal operators throughout Europe carry out various activities in order to protect the environment (use of electrical vehicles, recycled wrapping materials, postal sorting centers powered by solar energy etc.). In our country, the postal providers had 17 electrical vehicles in 2020, the number they are planning to expand significantly in 2021.

Complaints in OPS domain

The OPS complaint structure in national postal traffic (NPT), based on the data provided by eight postal operators performing express services, is shown in Table 14.9. the majority of complaints in 2020 was ungrounded (around 54%), followed by complaints pertaining to damaged items (around 28% of all filed complaints, i.e. around 59% of resolved and justified complaints), and then by complaints pertaining to lost items (slightly over 9% of the total number of complaints), whereas the least number of complaints were those pertaining to expiration of item transit times (around 7%) and other complaints, around 2% (transit times are defined by each of the operator's General Terms and Conditions of the postal service provision, in accordance with the Law).

When comparing the number of complaints in the OPS domain in NPT, with those in 2019, an increase in the total number of complaints is visible (by 80%), which is due primarily to the more complete 2020 data provided by the operators. The volume of OPS in NPT has increased in 2020, and it is naturally followed by an increase in the number of complaints as well.

During 2020, 90 complaints were filed for international postal traffic (IPT) OPS, out of which 36% are complaints referring to damaged items, 34% to lost items, 12% pertaining to transit time expiration, 7% are other complaints, and 11% are unjustified. There was a

Table 14.9. Complaints about OPS in NPT

Total number of filed complaints	Groundless	Resolved as:				Indemnity
		Lost	Damaged	Deadline expiration	Other complaints	Amount (in dinars)
1=2+3+4+5+6	2	3	4	5	6	7
53,730	29,089	4,964	14,653	3,847	1,177	133,907

drop by 42% in the number of OPS IPT complaints, compared to 2019.

Postal operators providing courier services did not report any complaints in 2020.

Study on users' satisfaction

The Agency is, among other, obligated to follow the development in the area of postal services, to carry out measures in order to improve and encourage competition in the postal markets, to prescribe quality standards in the area of postal services and monitor their application, including the level of postal users' satisfaction and fulfillment of their needs. In 2020, the Agency performed a survey on the level of satisfaction of postal users (natural and legal persons)[16]. The study focused on all postal services, UPS and OPS.

According to the study results, natural persons prefer express services, followed by parcel services, with letter-post services at the end. 79% of citizens are satisfied with the post office's working hours, with 68.64% being satisfied with the post office's distance form their residence. When it comes to complaints, 42.1% of natural persons are not acquainted with the manner of filing a complaint, against 24.6% of those who are, while the remaining 33.3% are acquainted only partially. 53.6% of the citizens do not wish to receive advertising materials. The most frequent reason to file a complaint (17.6% of the respondents – natural persons filed a complaint) is the expiration of transit times. The study also covered users who are persons with disabilities, and the general conclusion is that, according to their assessment, postal facilities are not adapted to their needs, and that there is generally a poor accessibility of basic postal services.

Legal persons use postal services for business correspondence and in most of the cases send letter-post items, followed by express items. The respondents – legal persons in almost the entire sample rated working hours of post offices with the highest mark. Legal persons are generally satisfied with the dispatching procedure of the postal items. Roughly a third of legal persons is acquainted with the manner of filing a complaint. In this category, persons with disabilities were inquired as well, and the ratings and results were similar to the category of natural entities above.

The analysis of the study results regarding the levels of postal users' satisfaction highlights the need for improvement of the quality of information given to the users regarding complaint filing, and their rights in case the postal operator fails to fulfill its obligations. It is also of great importance to pay attention to the rights of people with disabilities and adapt more postal facilities for access.

Agency's competence in respect of complaints

By coming into force of the new Law on Postal Services, the Agency received a new competence in respect of users' complaints. The Agency is entitled to mediate in an out-of-court dispute settlement between the postal operator and the user, initiated by a filed user's complaint.

The postal operator is obliged to comment within eight days from the day of receipt of the complaint in national postal traffic and within the period prescribed by the acts of the Universal Postal Union in international postal traffic, by making a decision on the merits of the complaint.

16 https://www.ratel.rs/cyr/page/cyr-studije-iz-oblasti-postanskih-usluga

The new law also foresees that the user may file a complaint with the Agency against the decision of the postal operator, within 15 days from the day of receiving the decision on rejection of the complaint. The user may also file a complaint to the Agency for not submitting a decision on the complaint filed.

Initiating and conducting an out-of-court dispute settlement procedure does not preclude or affect the exercise of the right to judicial protection, in accordance with the law.

Within its new competence, the Agency, during 2020, participated in the proceeding of 96 complaints filed with the Agency, out of which the majority pertained to other postal services (OPS). Apart from 34 complaints pertaining to various grounds, such as: addressing directly to the Agency, without previously filing a request with the postal operator, complaints about the amount of the indemnity, behavior of a courier worker, manner of delivery, non-submittal of the response to a complaint and similar, the majority of complaints were related to damaged items (25), delivery deadline expiration (15), non-delivery of items (15), delay in the payment of COD amount (4), loss of items (1), excess postage payment (2).

In order to reduce the number of complaints and to inform postal users about the packaging requirements for different types of postal items, taking into account that pursuant to Law, the sender is responsible for the correct packaging of postal items, the Agency suggested to postal operators they should describe in detail the recommendations for an adequate packaging of postal items in their General Terms and Conditions for the provision of postal services and publish those on their website.

14.3. Quality of service, user protection and complaint handling in the EU[17]

One of the main tasks to be carried out by the national regulators is to ensure the fulfillment of obligations prescribed in the Directive, particularly in terms of the achieved quality of service. ERGP continuously monitors the liberalization effects on the postal market, using, among other, special indicators such as QoS measurements to assess postal development, user protection and complaint handling procedures, to make sure the consumers are protected in line with the Directive. The aim is to collect all necessary data for the QoS monitoring and assessment of user satisfaction and complaint handling success rate in the context of regulatory measures undertaken in this field.

The quality-related ERGP report is based on the data of 32 member countries in 2019 and shows the current national regulatory bodies' practice regarding the QoS and user satisfaction on one hand, and user protection and complaint handling on the other.

There are six key issues regarding the quality of service and user satisfaction that are being analyzed:

1. quality of service screening, taking into account transit times, accuracy and reliability of service,
2. collection and delivery,
3. access points,
4. measurement of user satisfaction,
5. research of user needs,
6. aspects of e-commerce.

17 ERGP PL II (20) 22 – Report on quality of service, consumer protection and complaint handling

Figure 14.1. shows the movement of the priority letter QoS (D+1) during 2009-2019. Eastern European countries have made positive steps forward since 2017, while Western European countries have kept the results reached in 2018. The rest of European countries saw a drop in the quality of this service. In 2019, 24 countries used EN 13850 standard for the measurement of transit time for priority letter.

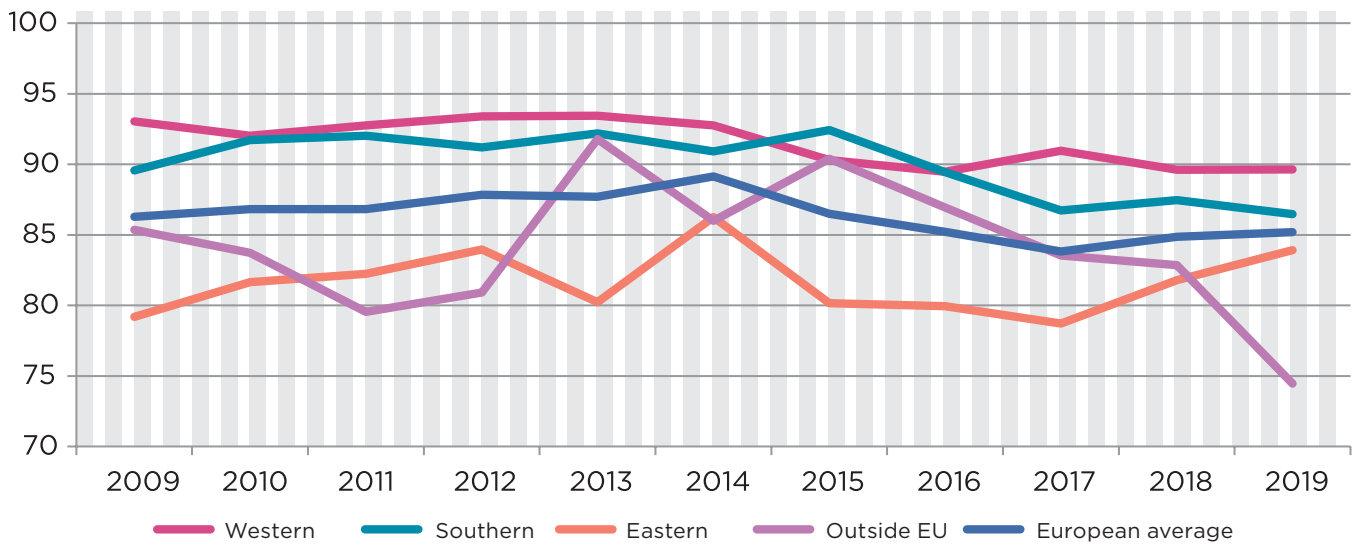
Seventeen countries have defined their regulatory targets for non-priority letters. Nine countries used European standard EN 14508, whereas two countries used EN 13850 for the measurement of transit time quality of non-priority mail.

As for the measurement of transit times for parcels, different methodologies were used. Three countries used technical report TR 1547, five countries used standard EN 13850, two countries used a „track and trace" system based methodology and two countries used another methodology.

The number of letter boxes owned by the USP has dropped in the period 2015-2019 by 4.4%. Since 2015, the majority of ERGP countries have seen a steady decline in the number of post letter boxes (Figure 14.2.). Only a few countries were an exception in 2019 compared to 2018, with a negligible rise in the number of letter boxes (FI, FR, RS, SI, ES). Also, a great deal of counties saw an increase in the number of parcel lockers.

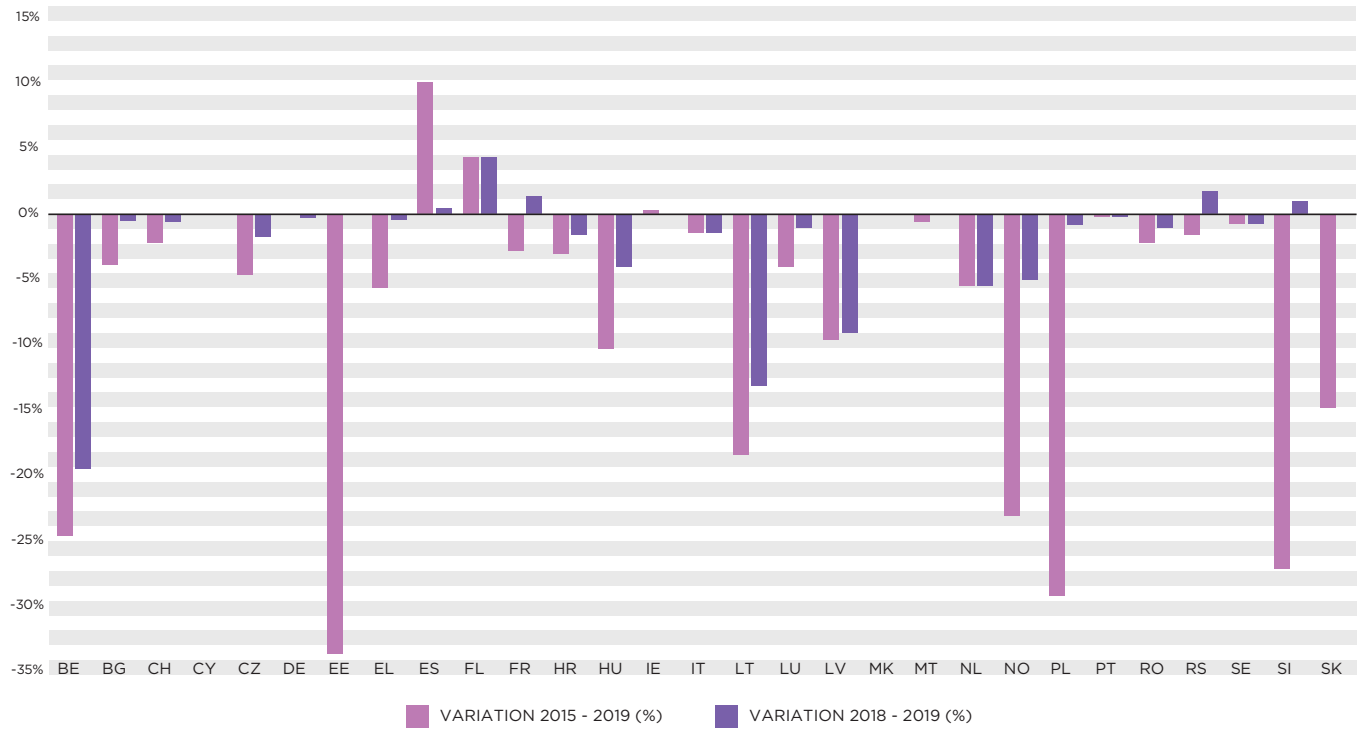
The number of NRAs which declared themselves competent in the cases of users' complaints has remained over the last three years

Figure 14.1. Average values of priority letter QoS (D+1)



18 Western: AT, BE, DE, DK, FI, FR, IE, LU, NL, UK; Southern: CY, EL, ES, IT, MT, PT; Eastern: BG, CZ, EE, HR, HU, LT, LV, PL, RO, SI, SK; Outside EU: CH, IS, MK, ME, NO, RS

Figure 14.2. Percentage changes with respect to number of letter boxes for 2015-2019 and 2018-2019



	BE	BG	CH	CY	CZ	DE	EE	EL	ES	FL	FR	HR	HU	IE	IT	LT	LU	LV	MK	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK
VARIATION 2015 - 2019 (%)	-24.60	-3.90	-2.20	0.00	-4.60		-33.60	-5.60	10.10	4.40	-2.80	-3.00	-10.30	0.30	-1.40	-18.40	-4.00	-9.60	0.00	-0.60	-5.50	-23.10	-29.20	-0.20	-2.20	-1.60	-0.70	-27.10	-14.80
VARIATION 2018 - 2019 (%)	-19.50	-0.50	-0.60	0.00	-1.70	-0.30	0.00	-0.40	0.50	4.40	1.40	-1.60	-4.00	0.00	-1.40	-13.10	-1.00	-9.10	0.00	0.00	-5.50	-5.00	-0.80	-0.20	-1.00	1.80	-0.70	1.00	0.00

the same – 27 of them are engaged in the complaint procedures. In the majority of countries (82%), NRAs are authorized to proceed in this matter for all postal services.

Despite the regulators' handling of users' complaints, a significant number of countries (18%) still do not have this competence within the hands of NRA.

In all the countries where NRAs are authorized to handle complaints, there are prescribed procedures for complaint resolution.

The following graph shows the current situation regarding the NRAs' competences and scope of activities, in the area of complaint resolution in 2019.

A great number of NRAs (72%) have been settling disputes on a voluntary basis, while for 6 countries (including the Republic of Serbia, pursuant to the new Law on Postal Services), this obligation is prescribed by the Law. Three countries have not defined this competence yet.

In out-of-court dispute settlements, different legal approaches are used. In Malta, for example, users can file a request before the Tribunal for consumer protection authorized to settle disputes between the buyer and the seller. In Poland, the NRA president is also a person authorized to mediate in out-of-court

Figure 14.3. Overview of NRA competences with respect to users' complaints in 2019

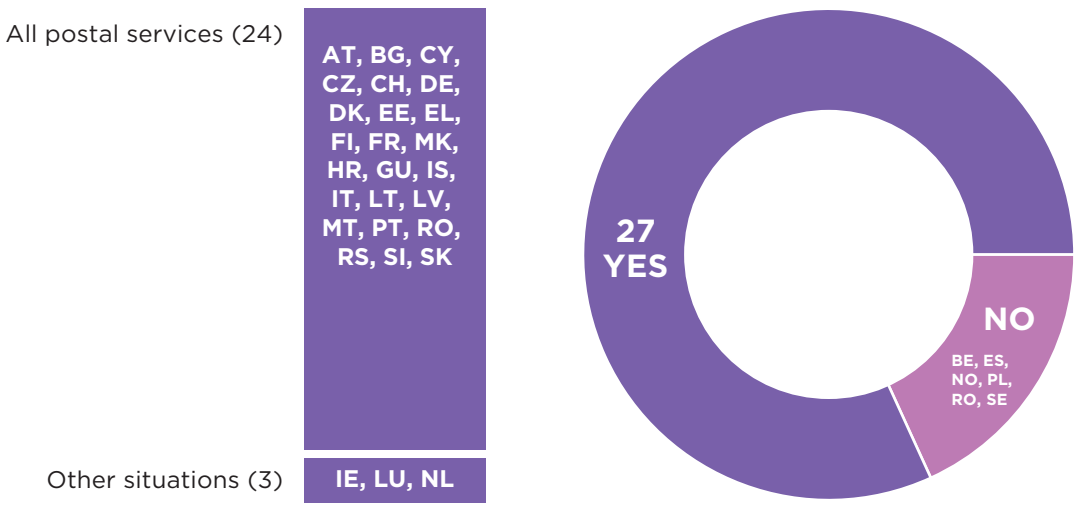
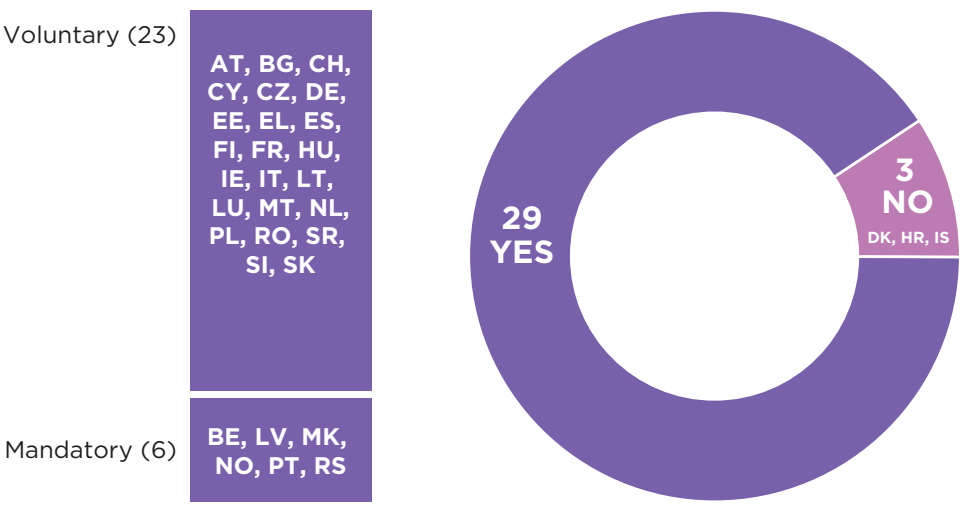


Figure 14.4. Out-of-court dispute resolution in 2019



dispute settlement cases. As for the monitoring of the consumer satisfaction indicators, 50% of the NRA respondents (16) periodically carry out such research and publish the results thereof (Figure 14.5.).

13 USPs perform a screening of the users' satisfaction, out of which 12 publish the findings, while 2 USPs do not carry out such study.

17 NRAs carry out a research on the users' needs, with 16 of them publishing the results thereof (Figure 14.6.).

Only 12 NRAs mentioned that the USP performs studies in connection with the users' needs.

Figure 14.5. Monitoring of users' satisfaction carried out by NRA and USP

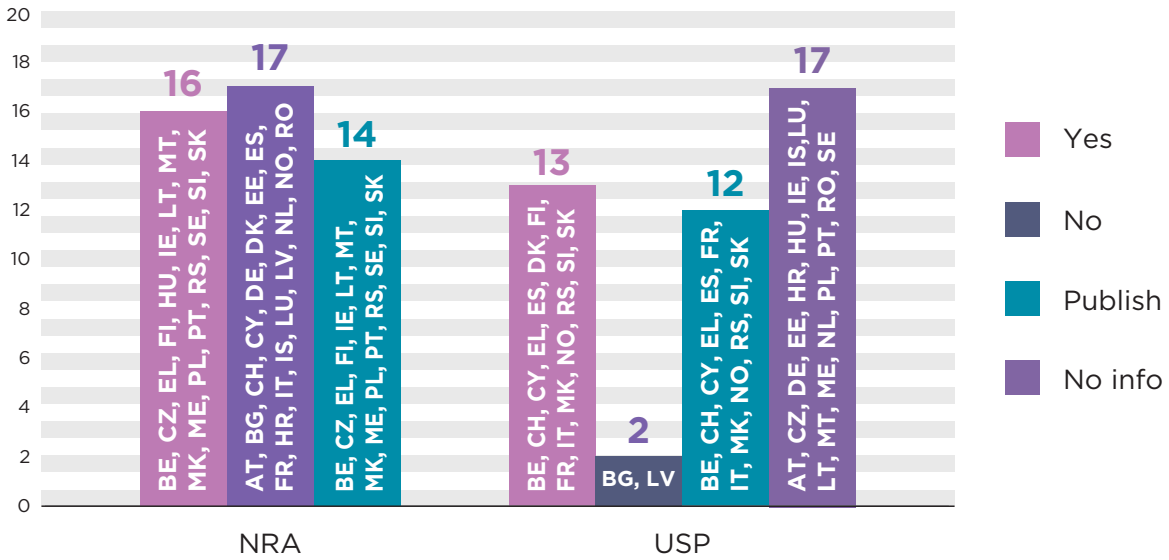
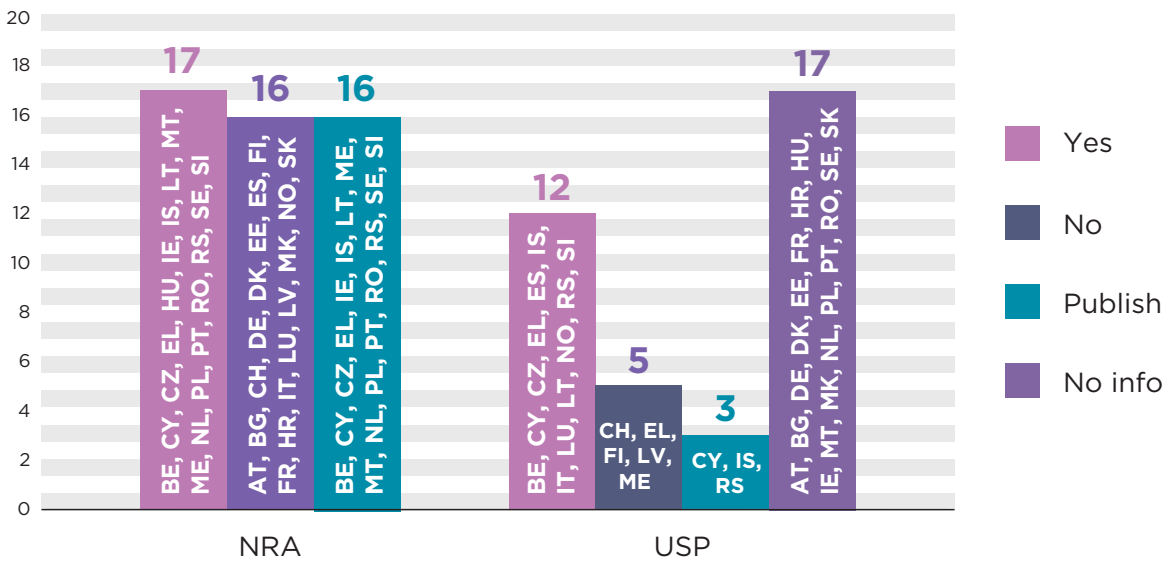


Figure 14.6. Study on users' needs carried out by NRA and USP



14.4. Conclusion

In the UPS quality analysis, the Agency pays particular attention to the observance of transit times and fulfillment of quality targets in accordance with the Rulebook on quality parameters for performing postal services („Official Gazette of RS", No. 114/20). The parameters referring to the transit times of postal items against which the quality of UPS is assessed are way below the dynamics prescribed by the Rulebook. Based on the shown data, between 2016 and 2020, there has been a drop by almost 28% in transit times for standard D+1. Full target reach, in terms of the minimum transit times, is foreseen for 2023. It is therefore necessary for the PPO to undertake measures to improve quality levels regarding the transit times and security of items. In terms of technological phases, the PPO should focus on the delivery of items, without however neglecting other parts of the technological chain, in order to eliminate possible flaws and malfunctions negatively impacting the quality of service, staff education, implementation of modern technical and technological solutions, coupled with an enhanced technological process control. It is equally important, for the sake of the QoS enhancement and complaint control, to work on the education of postal service users in respect of their rights and obligations, and especially in the area of the correct addressing and packaging of postal items.

The quality of other postal services is currently assessed against the several parameters provided by the postal operators. The volume of these services increases year after year, inherently affecting the growing number of complaints. The increasing significance of other postal services to the users and dense competition in this postal market segment prompt the postal operators to follow global trends in the attempt to improve their business, introduce new technological solutions and implement selected quality standards. Based on the shown data on the volume of complaints pertaining to other postal services, with the majority referring to damaged postal items, the conclusion is that the operators providing other postal services should pay special attention to the packaging of items. This means that the postal providers should educate the users about the best adequate packaging for particular postal item type and contents.

Through the competences vested in the Agency pursuant to the new Law on Postal Services, primarily those regarding complaint handling and expert monitoring, a more thorough screening of quality and the users' needs is planned, including cooperation with the operators in the activities that will contribute to a decreased number of complaints and an improved quality of service.

15. SECURITY RISKS IN ICT SYSTEMS

The year 2020 will be remembered as a year of challenges and global disruptions caused by the COVID-19 pandemic. Cyber criminals abused the state of pandemic and our perpetual Internet search for health and pandemic information. We are all affected by cyber threats equally, regardless of the job we have, position we occupy or need we have to stay informed. The digitization entered our lives on a much larger scale than we ever anticipated, and we ended up using Internet to fulfil our daily professional tasks, teaching our children and getting informed about the pandemic. Cyber criminals learned to use our necessity to adapt to the life and work circumstances in an emergency and our struggle to fight off the fear from the virus and uncertainty, finding the ways to reach our personal data stored on our mobile devices.

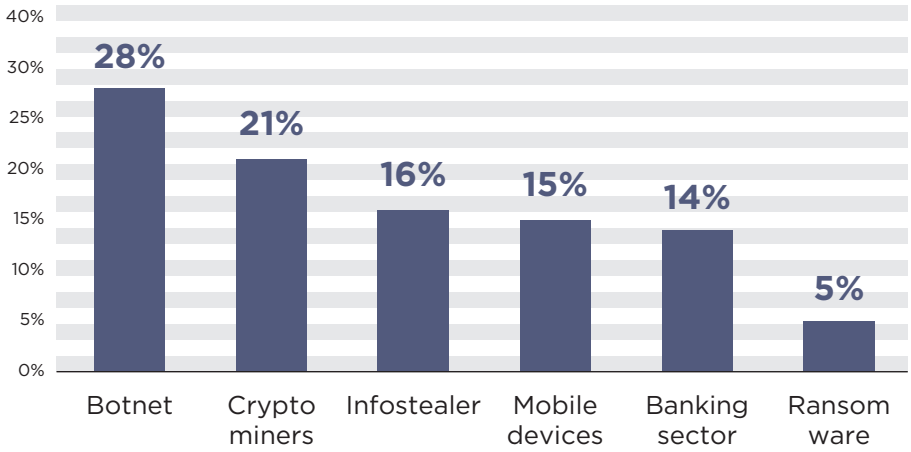
In December 2020, a SolarWinds attack was detected, which soon afterwards became declared the most sophisticated cyber-attack of the year. This is a so-called supply chain type of attack, carried out by compromising the SolarWinds Orion products and inserting a malicious code into the legitimate software update. By downloading the new version of the software, all users unknowingly enabled the attackers to easily penetrate the system, using a so-called backdoor entrance. That way, the malicious attackers gained their access to numerous organizations worldwide, such as the US Department of the Treasury, Department of Commerce, Department of Energy, the National Security Agency (NSA), the National Nuclear Security Administration (NNSA) and several of the State Department networks. The extreme attack sophistication is reflected, among other, in the fact that the malware was inserted into a legitimate software update published in March this year, while the attack was only detected by FireEye company a few months later.

15.1. Cyber security worldwide

Statistics of attacks by different types of malware

However, despite all the changes that marked 2020, the share of different malware types from the CheckPoint report shown in Figure 15.1, such as Botnet (attacks from infected devices') used as initial vectors for other types of attacks, as well as those overtaking the victim's device resources in order to mine cryptocurrencies (Cryptojacking) remain dominant. On the other hand, although at the bottom

Figure 15.1. Malware shares by type

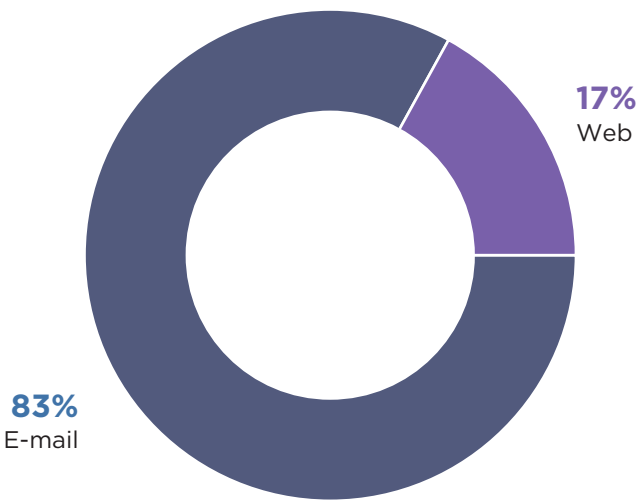


of the list, Ransomware creates even greater damage than the previous years, despite only a mild rise in the number of attacks, since it does not reflect the severity proportion of these attacks. Alongside the mentioned threats, during 2020, so-called Infostealer malware was frequently used, specially developed to target the financial sector, mobile devices, but also designed for data collection, to be used by the attackers in subsequent steps of the attack.

Ways of malware distribution

As for the ways of malicious software distribution (Figure 15.2), the attacks using e-mail remain dominant in 2020, in comparison to those using web pages. The analyses furthermore show that e-mail based malware attacks grew by 20% compared to 2019.

Figure 15.2. Shares of attacks using e-mail and web pages for malware distribution



Statistics of attacks by different malware families

The percentage of organizations worldwide infected by a specific malware family is shown in Figure 15.3. Many malware families kept their ranking from 2019, however a new moment is that Agent Tesla and Formbook rose from bottom positions to the top five malware families in 2020. Even though Emotet malware family is still maintaining its top position by the number of infected organizations, there are substantial differences in terms of its new functionalities. In 2020, Emotet in several cases resulted in a ransomware attack, such as Trickbot, Qbot and other.

Statistics of attacks from infected devices' networks by different malware families

Attacks originating from infected devices' networks were the most frequent in their class during 2020 as well. Unlike 2019, in 2020 among the top-ranked malware distributed via infected devices' networks was also Dridex malware family. In September, Emotet and Trickbot were part of the most striking attack in 2020, against one of the biggest healthcare service providers in the USA. The Ryuk ransomware attack caused locking of computers, databases and telephone systems in the whole organization for almost a month. The investigation revealed that Emotet and Trickbot had also been part of this attack.

Statistics of attacks on financial sector by different malware families

As shown in Figure 15.5, Dridex and Trickbot malware families were used in the majority of cyber-attacks in the financial sector in 2020. Financial institutions reported an elevated number of phishing attacks whereby malicious attackers falsely appear as renown banks. Many such campaigns are driven by

Figure 15.3. Shares of organizations infected by specific malware family

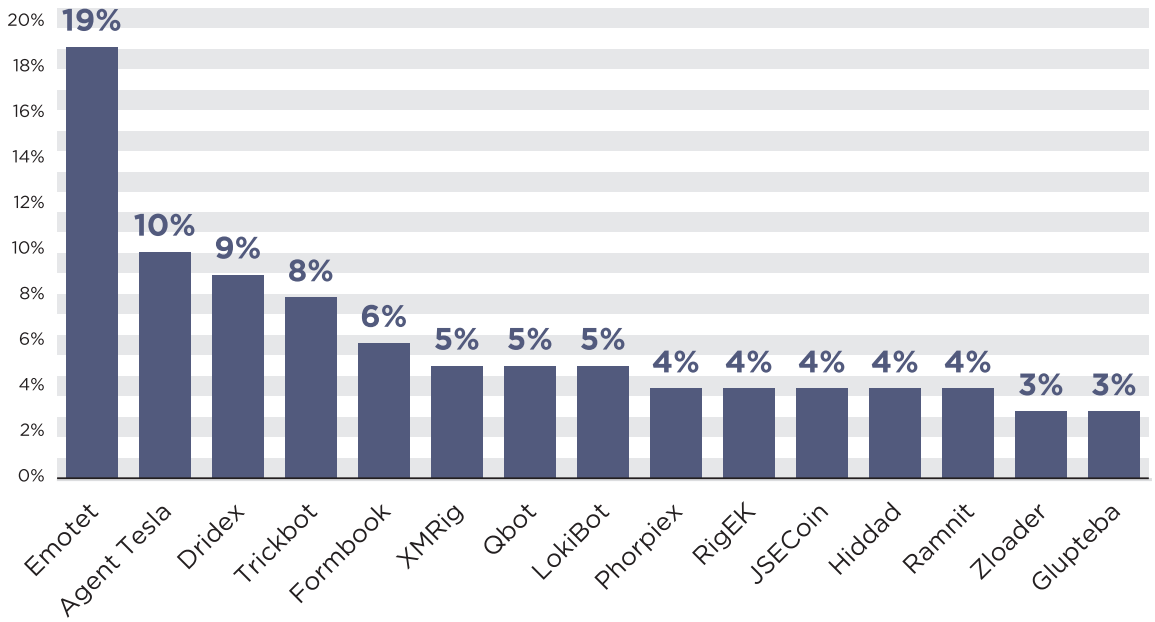


Figure 15.4. Share of different malware families from infected devices' networks

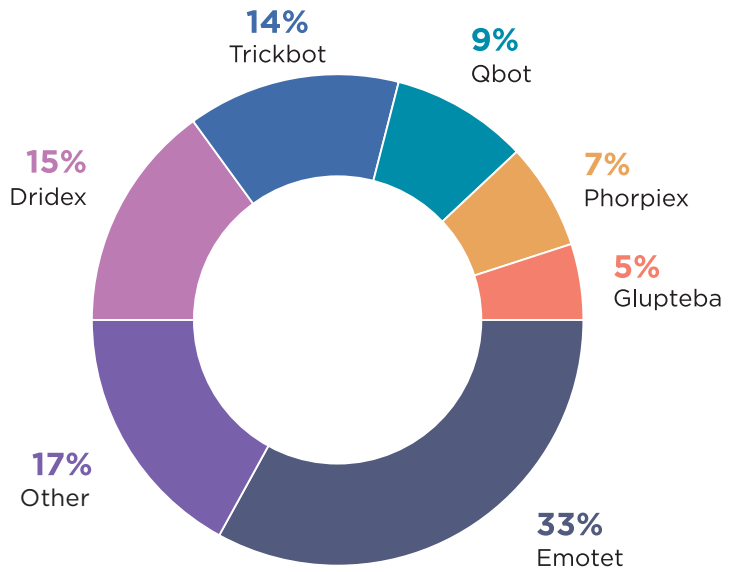
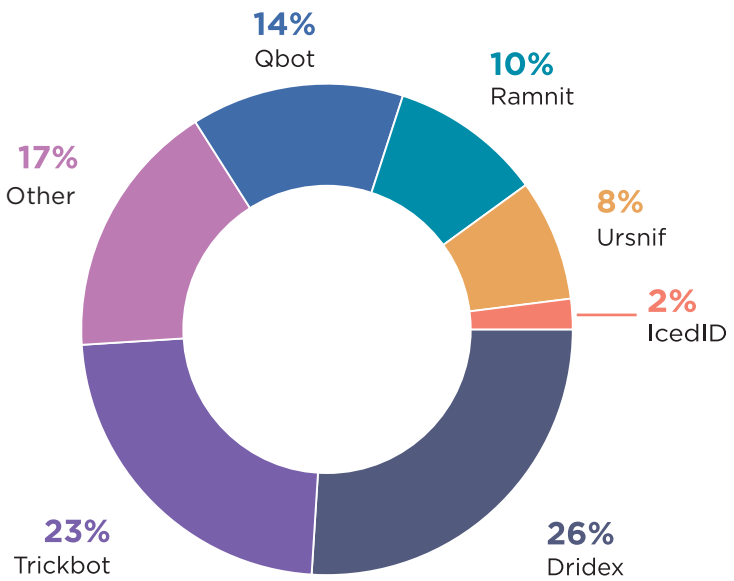


Figure 15.5. Share of different malware families in financial sector



the COVID-19 crisis, reflected above all in the new financial struggle, changes in the labour market and shift to remote working. During 2020, a significant increase in the number of Qbot malware was observed, created with an intent of stealing bank credentials, and distributed mainly via unsolicited mail.

Statistics of attacks on mobile devices by different malware families

Based on the distribution percentage of different malwares designed for mobile devices shown in Figure 15.6, it is observable that Hiddad, short from "Hidden Ad", rose from the

position number four in 2019 to the highest position, as the most popular malware family in 2020. *Hiddad* is designed to display adds, while simultaneously gathering information on the system in the background. It disposes of simple and smart mechanisms to linger on the victim's mobile device – the icon is hidden on the device and remains masked behind other applications after installation from "Google Play Service" and "Google Play Store". This malware family joins the COVID-19 trend, abusing ads containing information about the coronavirus pandemic.

Statistics of attacks by different malware families designed for theft of user data

A malicious software named Infostealer, specially designed for the theft of user data, kept its prominent position as one of the most popular ones in 2020 as well, followed by malware families Agent Tesla, LokiBot and Formbook, that can be found on the dark net and require no particular skill and knowledge to be applied in practice. In April, a LokiBot malware family campaign was observed, which targeted users in the US, Turkey, Portugal, Germany and Austria. Another malware family that abused the COVID-19 pandemic, AZORult, was distributed last March as a map showing the coronavirus presence by country. With the app displaying the map as a front, an illicit data collection was running in the background. Figure 15.7. shows the percentage of different malware families designed for user data theft.

Check Point Global Threat indeks

Figure 15.8 offers graphical display of Check Point Global Threat index values by country, in 2020. This index is calculated based on the data on attacks gathered in real time through the Threat Cloud World Cyber Threat Map platform and describes the probability that a device in an observed country be infected by a malicious software. Different countries are attributed different levels of probability of infection. Darker shades indicate higher probability of malware infection, while grey shades represent areas offering not enough data for analysis.

Figure 15.6. Share of different malware families designed to attack mobile devices

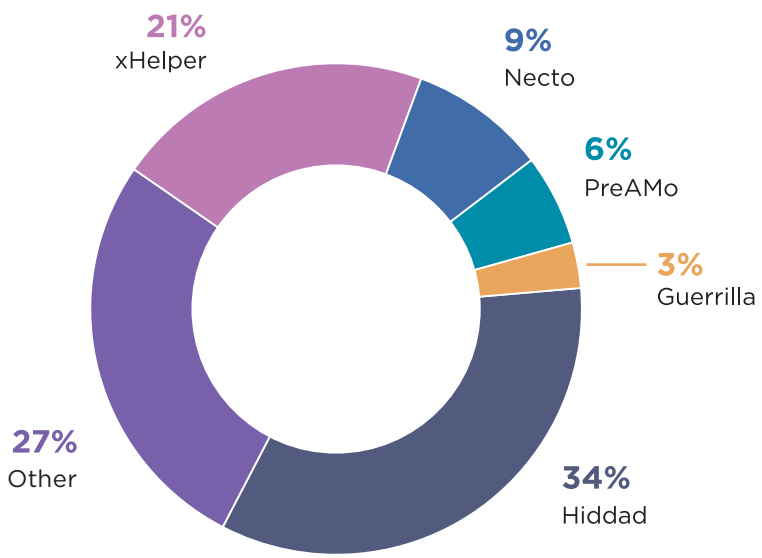


Figure 15.7. Share of different malware families designed for data theft (Infostealer)

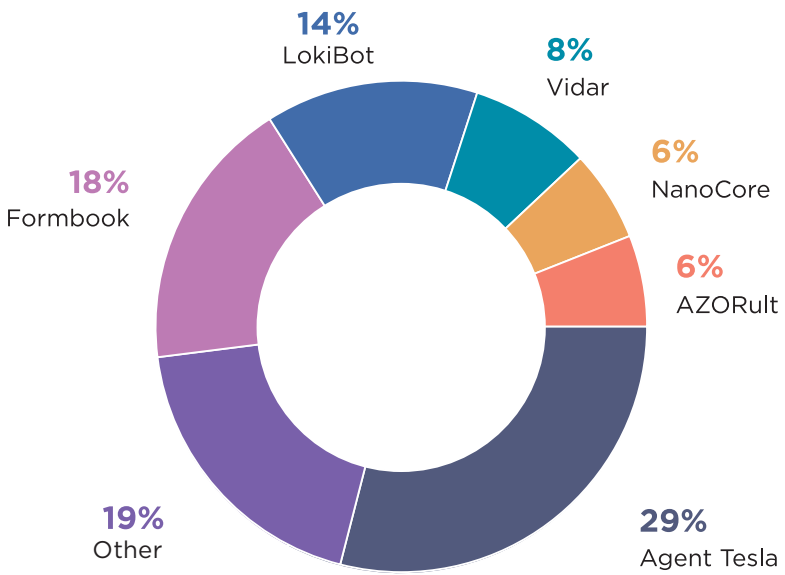
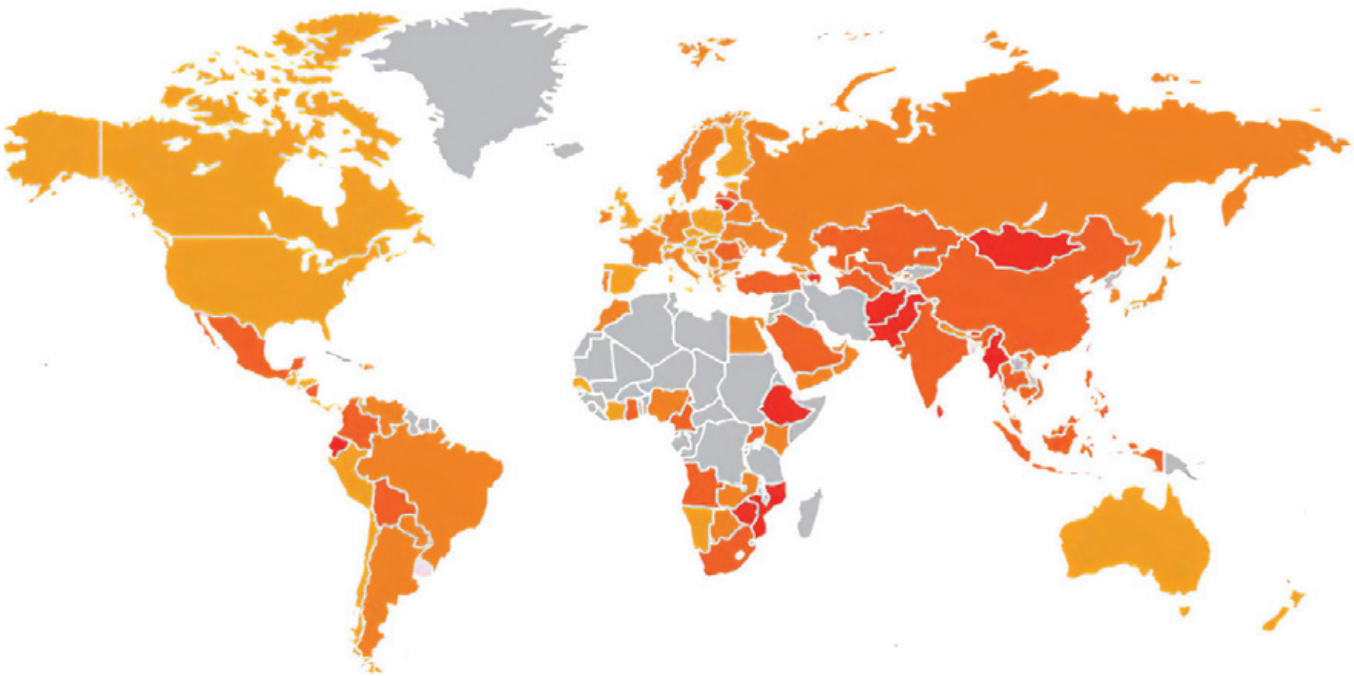


Figure 15.8. Graphical display of Check Point Global Threat index values by country



15.2. Information security in the Republic of Serbia

Pursuant to the Law on Information Security ("Official Gazette of RS", Nos. 6/16, 94/17 and 77/19), all ICT systems operators are obligated to inform the competent authorized body on the incidents in ICT systems that could severely disrupt the information security. During 2020, 276 such incidents, including those detected by the International CERTs, were reported to the National CERT (Figure 15.9). Top five reported incidents in 2020 are shown in Figure 15.10.

Incidents stemming from criminal acts prosecutable ex officio are reported in accordance with legal and by-law provisions or forwarded to the Special Prosecutor's Office for High-Tech Crime. In total, nine cases (incidents) were forwarded to this office in 2020.

Criminal acts against computer and data security

In the period January 2020 – end of December 2020, there have been no opened investigations nor criminal charges raised by the Special Prosecutor's Office for High-Tech Crime.

The data regarding the perpetrators and offenses under the authority of this office are as follows:

- Reported individuals: 456
- Individuals requested to provide necessary notifications: 308
- Individuals against whom evidence was demonstrated: 202
- Individuals with proposal for indictment: 61
- Individuals legally sentenced in a first-instance ruling: 49
- Plea agreements: 46.

Figure 15.9. Reported incidents in 2020 by incident groups

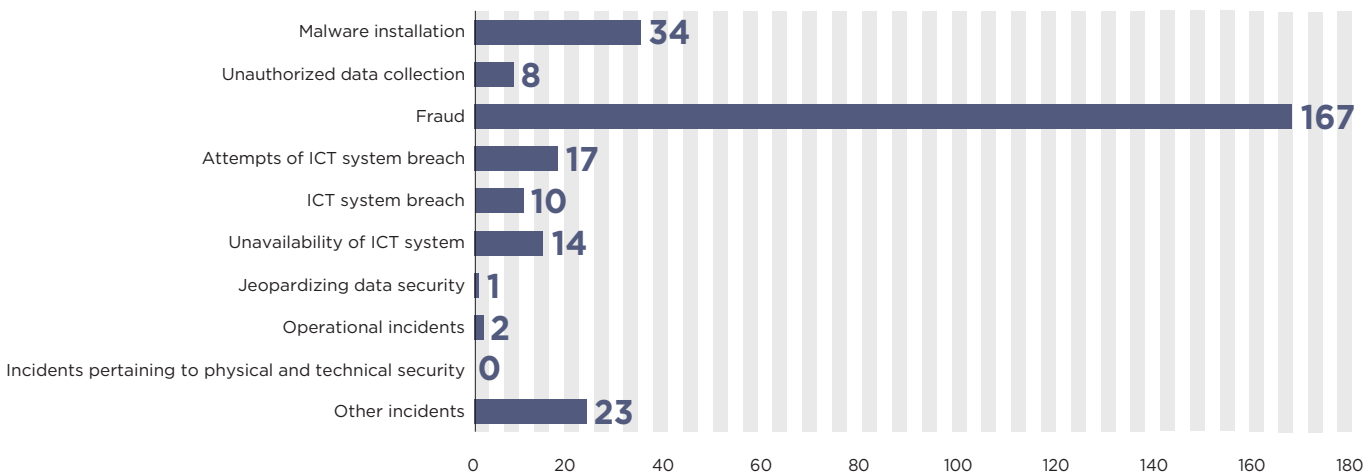
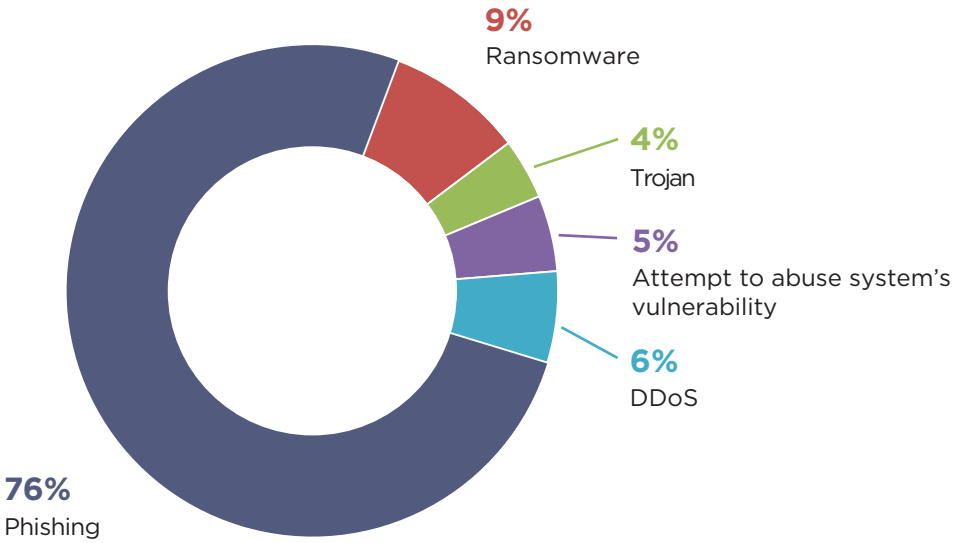


Figure 15.10. Top five reported incidents in 2020



Internet threats

According to a report by Kaspersky referring to Q1 2020, Serbia was ranked 10th in the world when it comes to the number of users attacked by ransomware trojans (Table 15.1).

During Q3 2020, Serbia occupied the 13th position among countries most frequently under threats coming from the Internet (Table 15.2.).

Sources:

https://blogs.microsoft.com/on-the-issues/2020/12/17/cyberattacks-cybersecurity-solarwinds-fireeye/

https://thehackernews.com/2020/12/microsoft-says-its-systems-were-also.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+TheHackersNews+%28The+Hackers+News+-+Cyber+Security+Blog%29&_m=3n.009a.2381.bl0ao0dhkl.1i2p

https://www.reuters.com/article/us-usa-cyber-breach-idUSKBN28R2ZJ

Check Point Cyber Security Report 2021, https://securelist.com/it-threat-evolution-q1-2020-statistics/96959/

Table 15.1. Top 10 countries attacked by ransomware trojans

No.	Country*	% of attacked users**
1	Bangladesh	6.64
2.	Uzbekistan	1.98
3.	Mozambique	1.77
4.	Ethiopia	1.67
5.	Nepal	1.34
6.	Afghanistan	1.31
7.	Egypt	1.21
8.	Ghana	0.83
9.	Azerbaijan	0.81
10.	**Serbia**	**0.74**

* Countries with the number of Kaspersky product users above 50,000.
** Share of targeted users compared to the total number of Kaspersky product users in the observed country.

Table 15.2. Geographic distribution of Internet threats (Q3 2020)

No.	Country*	% of attacked users**
1.	Vietnam	8.69
2.	Bangladesh	7.34
3.	Latvia	7.32
4.	Mongolia	6.83
5.	France	6.71
6.	Moldavia	6.64
7.	Algeria	6.22
8.	Madagascar	6.15
9.	Georgia	6.06
11.	United Arab Emirates	5.98
12.	Nepal	5.98
13.	Spain	5.92
14.	**Serbia**	**5.87**
15.	Montenegro	5.86
16.	Estonia	5.84
17.	Qatar	5.83
18.	Tunisia	5.81
19.	Belarus	5.78
20.	Uzbekistan	5.68
21.	Myanmar	5.55

* Countries with the number of Kaspersky product users above 10,000
** Share of targeted users compared to the total number of Kaspersky product users in the observed country.

Note: The above results are based on the data from users of Kaspersky products on their devices.

www.ratel.rs