



RATEL

OVERVIEW

of the market of telecommunications and
postal services in the Republic of Serbia in 2022

2022



OVERVIEW

OF THE MARKET OF TELECOMMUNICATIONS AND POSTAL SERVICES IN THE REPUBLIC OF SERBIA IN 2022

Belgrade, June 2023

Title:

Overview of the market of telecommunications
and postal services in the Republic of Serbia in 2022

Publisher:

REGULATORY AUTHORITY FOR ELECTRONIC COMMUNICATIONS
AND POSTAL SERVICES - RATEL

Palmotićeveva 2, Beograd

www.ratel.rs

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Grocka, Belgrade

Circulation:

200 copies

OVERVIEW

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***Note:**

The data used to analyze and prepare the market overview of telecommunications in the Republic of Serbia is obtained from questionnaires submitted by participants in the mentioned market to the Regulatory Authority for Electronic Communications and Postal Services by June 30, 2023. Certain data will be provided subsequently, after collection and processing, as an addition to the document "Overview of the Telecommunications and Postal Services Market in 2022."

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 km ²
Population ¹ (without AP Kosovo and Metohija), estimated by the Statistics Office	6 647 003
Country code:	+381
Internet domain:	.rs
GDP in 2021 ²	7 090.74 billion dinars (60.37 billion euro)
Average net income in 2021 ³	74 933 dinars (637.95 euros)

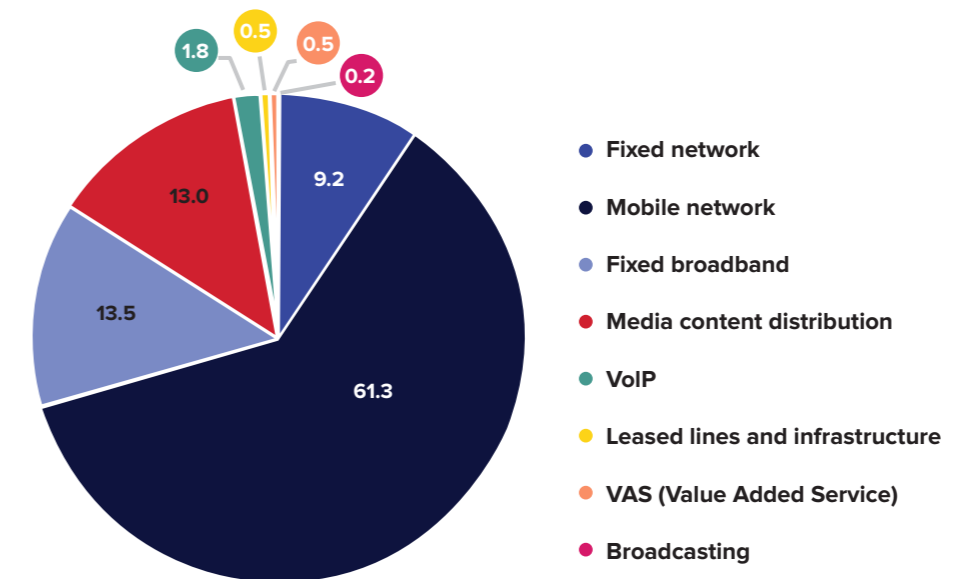


The data used for the overview of telecom market in the Republic of Serbia have been obtained based on the questionnaires provided by the telecom market participants, and they mainly refer to the territory of the Republic of Serbia without Kosovo and Metohija since this area is under the control of the 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.

The total revenues made in the electronic communications market of the Republic of Serbia in 2022 amounted to approximately 242.9 billion dinars which is by 10.1% more compared with the previous year. The total revenues amounted to 2.01 billion euros, which is a slight growth compared to 1.9 billion euro 2021. The share of revenues from electronic communications in the Serbian GDP in 2021 was around 3.4%.

In terms of market share accounted for by different services in the Serbian electronic communication market in 2022, the same as in the previous years, the largest share went to mobile service provision, accounting for 61.3% of the total revenues.

Figure 1.2. Structure of revenues by services in 2022



Source: RATEL

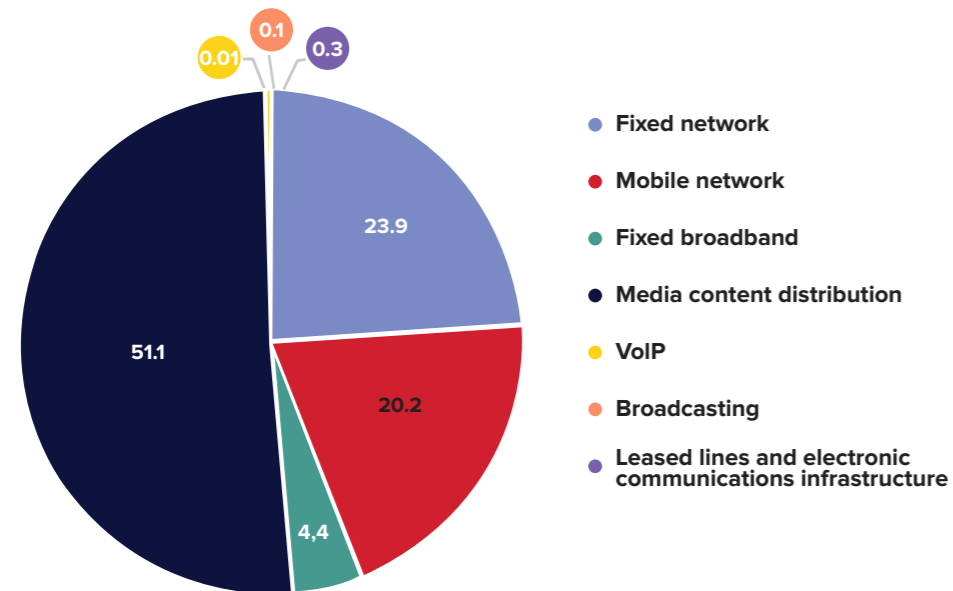
The total investments made in the electronic communications sector in 2022 amounted to 85.2 billion dinars (726 million euros), which is by 35% more than in the previous year when they amounted to 63.2 billion dinars. Considered in euros, the investments increased from 537.7 million to 726 million euros, which is also a 35% increase. Investments made in media content distribution have the largest share with more than 43 billion dinars (370 million euros) and account for nearly 51.1% of the total investments in 2022, while investments in fixed network which amounted to 20.3 billion dinars (173 million euros) account for 23.9% of the total investments made in 2022.

1. Statistics Office 2022 census data.

4 2. Statistics Office estimation – as the sum of four quarters. Data taken from the publication Statistical Calendar of the Republic of Serbia, 2023, issued by the Statistics Office (the average RDS/EUR exchange rate for 2022 was 1174588), p. 35.

3. Ibidem, p. 42.

Figure 1.3. Structure of investments by services in 2022



Source: RATEL

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 2018-2022 are given in Table 1.1.

Table 1.1. A comparative overview of the number of users of basic electronic communications services in the Republic of Serbia (2018-2022)

Service	Indicator	Year				
		2018	2019	2020	2021	2022
Fixed telephone - subscribers	Million	2.43	2.42	2.41	2.37	2.36
	Per 100 households	97.87	97.34	97.01	95.45	91.24
Mobile telephone - users	Million	8.43	8.45	8.26	8.50	8.62
	Per 100 households	120.42	121.40	119.25	123.72	129.70
Fixed broadband - subscribers	Million	1.55	1.62	1.73	1.80	1.95
	Per 100 households	62.39	65.27	69.56	72.34	75.26
Media content distribution - subscribers	Million	1.88	2.00	2.10	2.14	2.21
	Per 100 households	75.55	80.42	84.51	85.94	85.53
Bundle services - subscribers	Million	1.27	1.42	1.56	1.63	1.75
	Per 100 households	51.23	56.90	62.54	65.39	67.54

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 data for 2020, 2021 and 2022. According to the collected data on natural entities and the data received from the Statistics Office on net income, in 2022, the cost of the low basket equalled 1.63% of the average net salary, and the cost of the high usage basket equalled 7.85% of the average net salary.

Table 1.2. Low usage basket of electronic communications services

LOW USAGE BASKET	2020		2021		2022	
	Average bill (dinars)	% of the average salary	Average bill (dinars)	% of the average salary	Average bill (dinars)	% of the average salary
Fixed phone	653.50	1.09%	601.16	0.91%	572.28	0.76%
Mobile phone (prepaid)	310.70	0.52%	308.19	0.47%	350.35	0.46%
TV (public broadcasting service tax)	255.00	0.42%	299.00	0.45%	299.00	0.40%
Total	1 219.20	2.03%	1 208.35	1.83%	1 221.63	1.63%
Average net salary (RSD)***	60 073		65 864		74 993	

Source: RATEL

Table 1.3. High usage basket of electronic communications services

HIGH USAGE BASKET	2020		2021		2022	
	Average bill (dinars)	% of the average salary	Average bill (dinars)	% of the average salary	Average bill (dinars)	% of the average salary
Fixed phone	653.50	1.09%	601.16	0.91%	572.28	0.76%
Mobile phone (postpaid)	1 754.67	2.92%	1 804.62	2.74%	2 084.62	2.78%
TV (public broadcasting service tax) *	255.00	0.42%	299.00	0.45%	299.00	0.45%
Internet **	1.546.74	2.57%	1.360.01	2.07%	1.372.54	1.83%
Media content distribution	1.305.76	2.17%	1.500.50	2.28%	1.490.19	1.99%
Total	5 515.67	9.18%	5 565.29	8.45%	5 818.63	7.76%
Average net salary (RSD)***	60 073		65 864		74 993	

Source: RATEL

Notes:

*Since January 2016, pursuant to the Law on Temporary Regulation of Public Media Service Tax Collection (Official Gazette of RS, nos. 112/15, 108/2016, 95/2018, 86/2019, 153/2020 and 129/2021), a monthly public broadcasting service tax is collected.

**Fixed broadband (excluding the mobile Internet package)

***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.

According to available data, the total number of people in the Republic of Serbia employed in the telecommunications sector in 2022 amounted to 14.2 thousand.

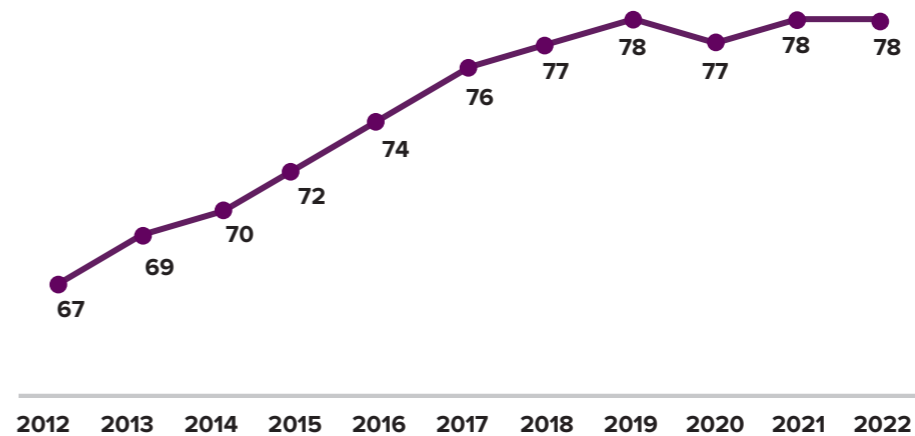
EU TELECOM MARKET STATE OF PLAY

2.

Fixed broadband access

The number of fixed broadband subscribers in the EU Member Countries, households-wise, has remained on the same level in 2022 as the year before.

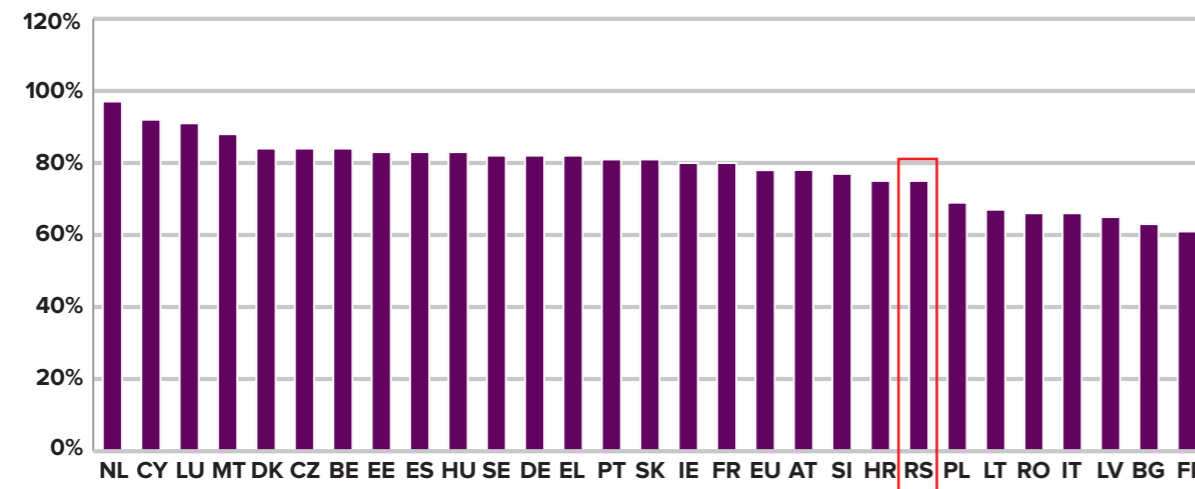
Figure 2.3. Average number of fixed broadband subscribers per 100 households - EU



Source for the EU: EC (Communications Committee – COCOM) <https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity>, as on October 4, 2023

Source for Serbia: RATEL

Figure 2.4. Fixed broadband penetration rate per 100 households – EU by Member States



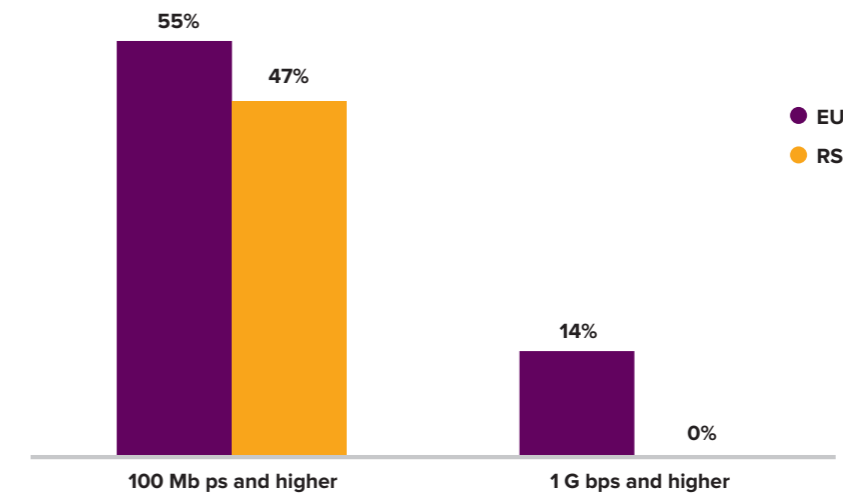
Source for the EU: EC (Communications Committee – COCOM) <https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity>, as on October 4, 2023

Source for Serbia: Statistical Office of Serbia

In the EU Member States, the number of fixed broadband subscribers ranges from 61% to 97%. The Netherlands, Cyprus and Luxemburg have the highest recorded rate of fixed broadband subscribers per 100 households (over 90%). On the other hand, Finland and Bulgaria have the lowest rates, below 65%. At the end of 2022, the number of fixed broadband subscribers per 100 households in Serbia was 75.

As for the fixed broadband access rate, in the EU 55% of the subscribers used Internet packages of at least 100 Mbps, whereas around 14% 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, Spain, Romania, Portugal, Luxemburg, Hungary, Belgium and Poland, where more than 65 % of users have access to such speeds, whereas the least connections at these speeds (below 20%) are available in Greece (8%). In Serbia, 47% of the subscribers had Internet access rate of at least 100 Mbps, whereas the number of subscribers with access to connection of over 1 Gbps is insignificant.

Figure 2.9. Fixed broadband users share, according to connection speed

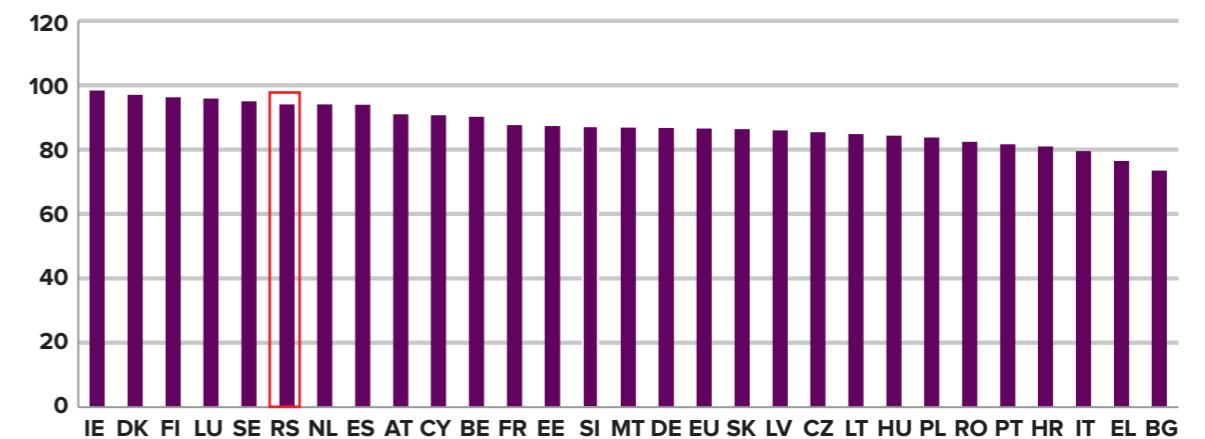


Source for the EU: EC (Communications Committee – COCOM) <https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity> as on August 2, 2023

Source for Serbia: RATEL

In the EU, the mobile broadband penetration rate mostly corresponds to the fixed broadband access one. In Ireland, Denmark, Finland, Luxemburg and Sweden the mobile broadband penetration rate is above 95%. Bulgaria has the lowest mobile penetration rate of 73%. In Serbia, at the end of 2022, the number of active mobile broadband users per 100 inhabitants was around 94, which is above the EU average (87).

Figure 2.10. Mobile broadband penetration rate per 100 inhabitants



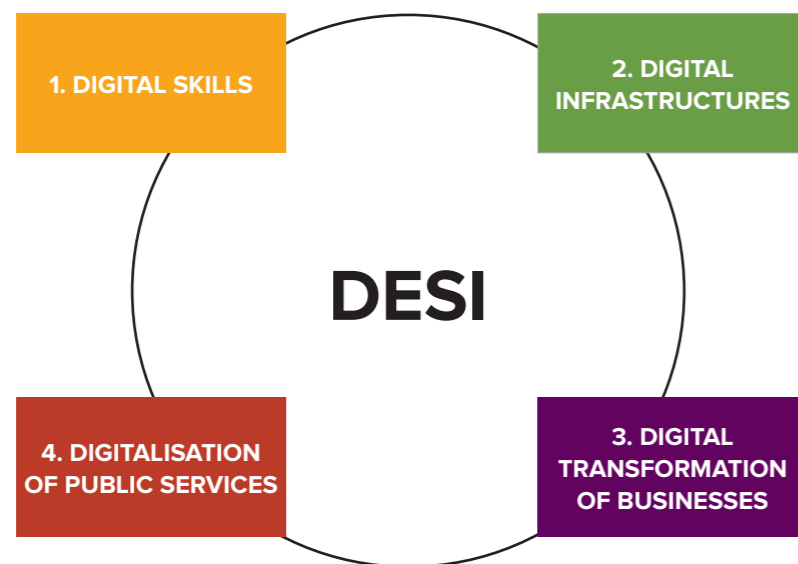
Source for the EU: EC (Communications Committee – COCOM) <https://digital-strategy.ec.europa.eu/en/policies/desi-connectivity>, as on August 2, 2022

Source for Serbia: Statistical Office of Serbia

3. DIGITAL ECONOMY AND SOCIETY INDEX

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. It provides an insight in country's general performance and offers a simple way to identify areas with room for improvement. The EU member states DESI has been calculated since 2014, whereas in Serbia's case it was first calculated in 2017, thus allowing the positioning of this country on the European map of digital performance. As of 2023, an improved DESI consists of 4 components: Digital skills, Digital infrastructure, Digital business transformation and Digitalisation of public services (Figure 3.1.)

Figure 3.1. DESI components



At the end of 2022, the EU adopted the Digital Decade Policy Programme 2030, establishing concrete objectives and resources for reaching digital transformation targets in Europe by 2030. This program also introduces a mechanism of tracking the progress in the fulfilment of the common goals of digital transformation by means of the improved DESI. Taking into account that DESI is included in the report on the state of the EU digital decade, the EC performed substantial changes in 2023 and adapted DESI to major initiatives that will affect the EU digital transformation in the following period.

The EC introduced a set of changes in the DESI dashboard for 2022 in order to adjust the index with four main areas and digital decade targets, improve the methodology and take into account the latest technological and political changes. Thirty-two indicators in total are structured around four main digital decade components, with eleven DESI indicators for 2022 representing the KPIs of progress, measuring the goals set in the program.

A significant change to the methodology, published in September 2023, is the absence of DESI indicator, dimension and sub-dimension weighing, which means that indicators were not aggregated into sub-dimensions, sub-dimensions into dimensions, and dimensions into the total index. In other words, DESI for 2022 was established on a set of indicators giving a multi-dimensional, detailed overview of the collective annual progress made by the countries towards the set objectives up to 2030. Accordingly, the final index value for 2022 not being calculated neither for the EU member states, nor for Serbia, a uniform ranking and positioning of Serbia on the EU countries list was not possible. On the other hand, the displayed values of respective single indicators for Serbia and the EU are comparable, thanks to the adjustment to the newest methodology.

Through some changes to the methodology, several definitions and terms were modified, along with various insertions and exclusions of selected indicators in/from the previously defined four dimensions, the titles of which were also changed. Accordingly, dimension *Digital skills* (previously *Human capital*) saw one inclusion and one exclusion of indicators, whereas in dimension *Digital infrastructures* (previously *Connectivity*), beside the exclusion of two indicators, another two sub-dimensions were cancelled, which led to a different indicator arrangement. Dimension *Digital transformation of businesses* (previously *Integration of digital technologies*) saw the least of changes: only one indicator deletion, while dimension *Digitalisation of public services* (previously *Digital public services*) went through a significant change by being expanded by one additional sub-dimension and four new indicators, minus one recent indicator.

Each of the dimensions consists of several sub-dimensions along with corresponding indicators, with an overview of the current dimensions and sub-dimensions featuring below.

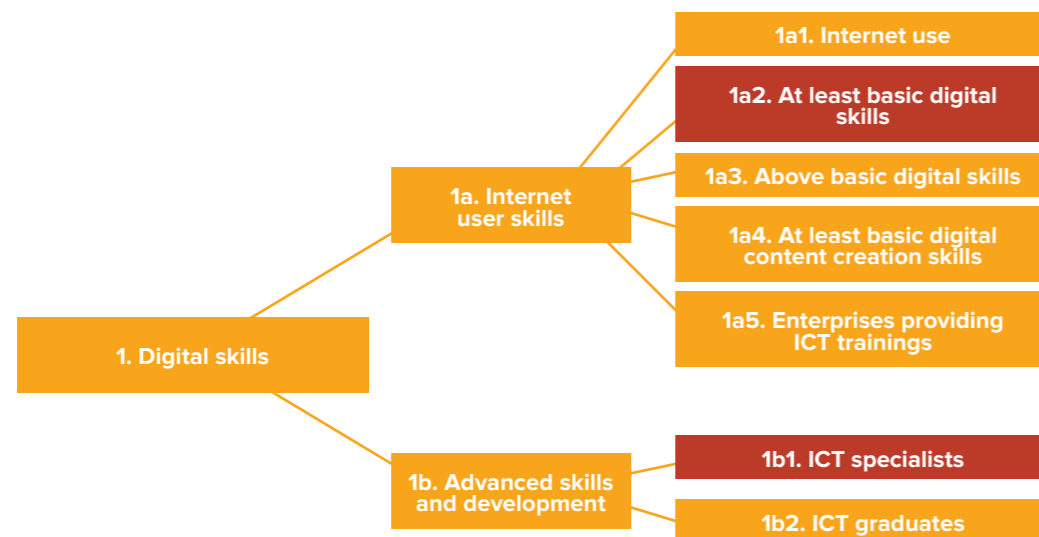
Dimensions/Sub-dimensions
1. Digital skills
1a. Internet user skills 1b. Advanced skills and development
2. Digital infrastructures
2a. Fixed broadband access 2b. Mobile broadband access
3. Digital transformation of businesses
3a. Digital intensity 3b. Digital technologies for businesses 3c. e-Commerce
4. Digitalisation of public services
4a. e-Government 4b. e-Health

Digital skills

This dimension comprises digital skills, from basic to advanced ones, indispensable for an active participation in digital society, as well as the number of experts with advanced digital skills. In this sense, digital skills, along with Internet access, analysed within the previous dimension, represent a necessary base for digital economy and society.

Sub-dimensions included in the Digital skills dimension and their indicators are shown in Figure 3.2.

Figure 3.2. Digital skills: sub-dimensions and their indicators



According to this dimension's indicators, Serbia ranked below the European countries, with notice, however, that it made progress for all indicators with the available 2022 data, compared to the year before. For example, the share of ICT graduates is an exception to Serbia's ranking position, since this indicator is significantly higher than the EU average and since better results were only achieved by Estonia and Ireland. Indicator Enterprises providing ICT trainings saw a remarkable progress, reaching the European average, whereas for the rest of the dimension's indicators, Serbia scored below the average.

A comparative view of this dimension's average indicator values for the EU and the achieved values for Serbia during the previous two years is given in Figure 3.3. Since the indicators of At least basic digital skills and ICT specialists measure the Digital Decade Policy Programme 2030 targets, the information regarding these particular indicators also includes EU target values.

Figure 3.3. Comparative view of Digital skills indicator values for the EU and Serbia

	SERBIA		EU	EU
	DESI 2022	DESI 2023	DESI 2023	2030 Target
1a1 Internet use	80%	83%	89%	
% individuals	2021	2022	2022	
1a2 At least basic digital skills	41%	42%	54%	80%
% individuals	2021	2022	2021*	
1a3 Above basic digital skills	12%	12%	26%	
% individuals	2021	2022	2021*	
1a4 At least basic digital content creation skills	64%	64%	66%	
% individuals	2021	2021*	2021*	
1a5 Enterprises providing ICT trainings	16%	22%	22%	
% enterprises	2020*	2022	2022	
1b1 ICT specialists	3.3%	3.4%	4.6%	approximately 10% of total employment
% of total employment	2021	2022	2022	
1b2 ICT graduates	7.7%	7.3%	4.2%	
% graduates	2021	2022	2021*	

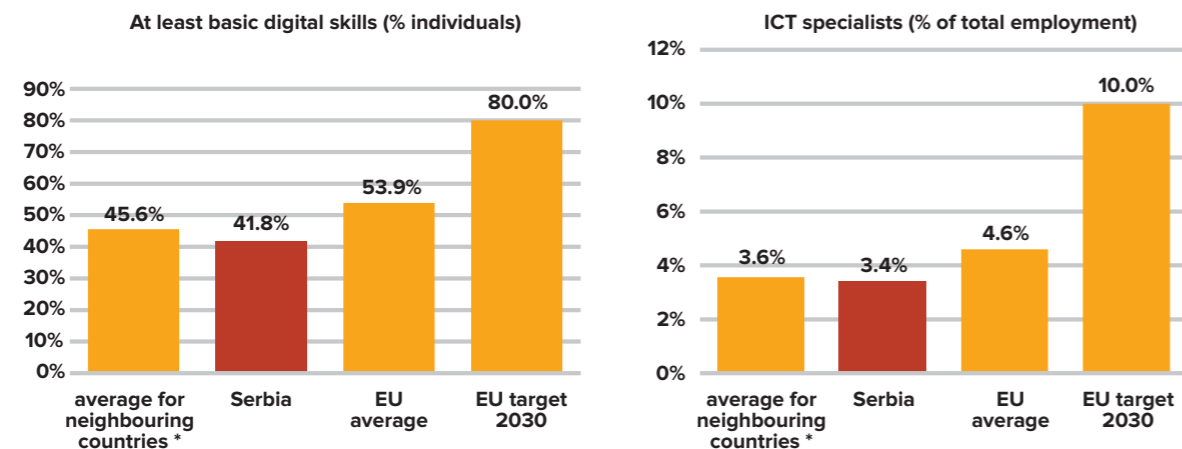
* For certain indicators there are no available data for the corresponding year, therefore only latest available data are shown, following the EU example.

Source for the EU countries: <https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators>

Source for Serbia: Statistical Office of Serbia

In order to better consider the position of Serbia regarding the indicators measuring the Digital Decade 2030 targets, a comparison is made in Figure 3.4. between the current achievements of Serbia and average values of the neighbouring countries, EU member states and set targets.

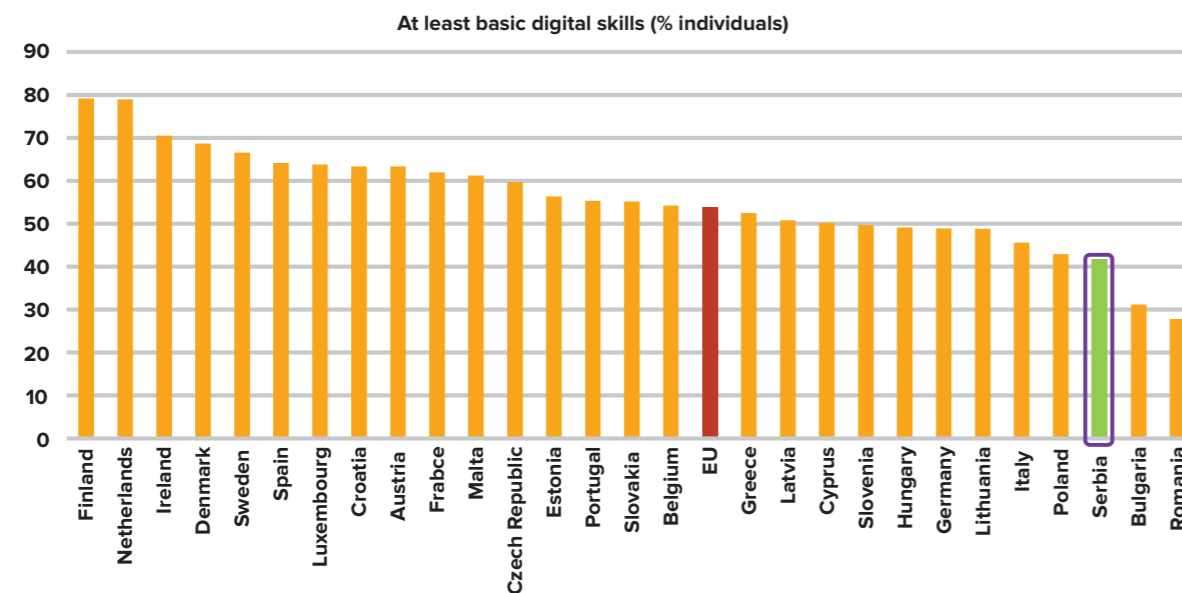
Figure 3.4. Comparative view of indicator values for the neighbouring countries, EU and Serbia



* Neighbouring countries: Slovenia, Hungary, Romania, Bulgaria, Croatia and Greece.

Figure 3.5. features the current values of the above two indicators for individual EU countries and Serbia.

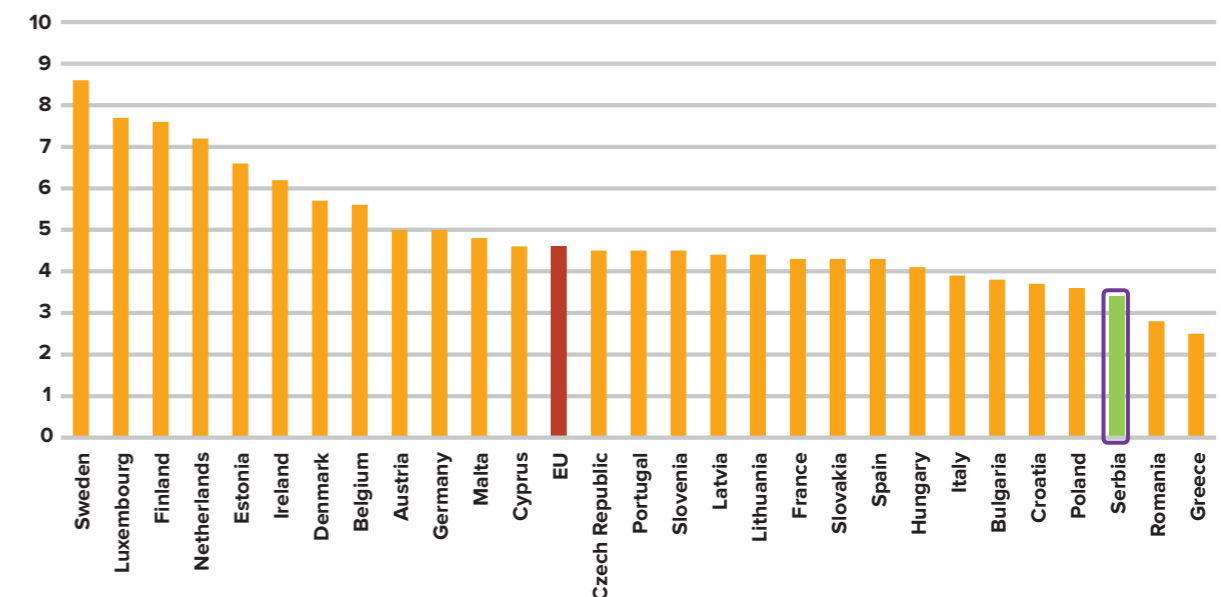
Figure 3.5. Indicator values for the EU countries and Serbia for 2022



Source for the EU countries: https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?indicator=desi_1a2&breakdown=ind_total&period=desi_2023&unit=pc_ind&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE

Source for Serbia: Statistical Office of Serbia

ICT specialists (% of total employment)



Source for the EU countries: https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?indicator=desi_1b1&breakdown=total&period=desi_2023&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE&unit=pc_ind_emp

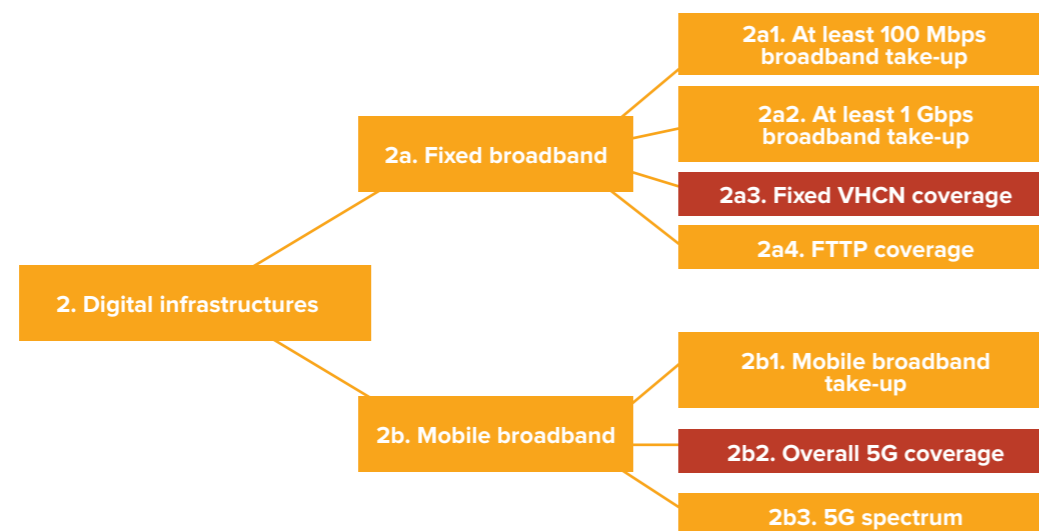
Source for Serbia: Statistical Office of Serbia

Digital infrastructures

Dimension Digital infrastructures refers to an efficient and sustainable infrastructure necessary for digital economy and society and gives information about types and quality of Internet access and its reach. Within this dimension, fixed and mobile broadband access along with indicators measuring offer and demand are analysed.

Sub-dimensions included in the Digital infrastructures dimension and their indicators are shown in Figure 3.6.

Figure 3.6. Digital infrastructures: sub-dimensions and their indicators



According to the Digital infrastructures' indicator values, Serbia ranks below the European average, except for indicator FTTP (Fiber to the Premises) coverage, and due to its growth, in comparison to the previous year, Serbia has ranked among the above-average countries. It is noteworthy that for all indicators of this dimension with available data for 2022, comparable or higher values were achieved, compared to the year before. A drastic increase in the values of indicator At least 100 Mbps broadband take-up is primarily due to the changes of the calculation methodology, since the current methodology foresees the ratio of subscribers to the number of households with broadband access, instead of the total number of households. Despite the value of indicator At least 1 Gbps broadband take-up being manifold increased, Serbia, due to the global trend of significant increase in the number of subscribers with at least 1 Gbps broadband take-up, has not managed to improve its ranking on the list and come closer to the European average. The VHCN (Very High Capacity Network) coverage both in Serbia and in the EU has expanded by a similar rate, leaving the previous year's ranking unchanged. The 2022-year data for indicator Mobile broadband take-up are not available, so the data for Serbia, like in the EU case, refer to the year 2021. Like in the previous years, Serbia has scored zero value regarding the 5G network, due to the fact that in 2022 no decision on the 5G spectrum auction was made.

A comparative view of this dimension's average indicator values for the EU and the achieved values for Serbia during the previous two years is given in Figure 3.7. Since the indicators of Fixed VHCN coverage and Overall 5G coverage measure the Digital Decade Policy Programme 2030 targets, the information regarding these particular indicators also includes EU target values.

Figure 3.7. Comparative view of Digital infrastructures indicator values for the EU and Serbia

	SERBIA		EU	EU
	DESI 2022	DESI 2023	DESI 2023	2030 Target
2a1 At least 100 Mbps broadband take-up	26%	47%	55%	
% households	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	0.04%	0.25%	13.8%	
% households	2021	2022	2022	
2a3 Fixed VHCN coverage	59%	63%	73%	100%
% households	2021	2022	2022	
2a4 FTTP coverage	50%	61%	57%	
% households	2021	2022	2022	
2b1 Mobile broadband take-up	79%	79%	87%	
% individuals	2021	2021*	2021*	
2b2 Overall 5G coverage **	0.0%	0.0%	81%	100%
% populated areas	2021	2022	2022	
2b3 5G spectrum	0.0%	0.0%	68%	
The amount of spectrum assigned and ready for 5G use within 5G pioneer bands	2022	2023	2023	

* For certain indicators there are no available data for the corresponding year, therefore only latest available data are shown, following the EU example.

** In 2022 there was no decision on the 5G spectrum auction.

Source for the EU countries: <https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators>

Source for Serbia: RATEL, Statistical Office of Serbia

In order to better consider the position of Serbia regarding the indicators measuring the Digital Decade 2030 targets, a comparison is made in Figure 3.8. between the current achievements of Serbia and average values of the neighbouring countries, EU member states and set targets.

Figure 3.8. Comparative view of indicator values for the neighbouring countries, EU and Serbia

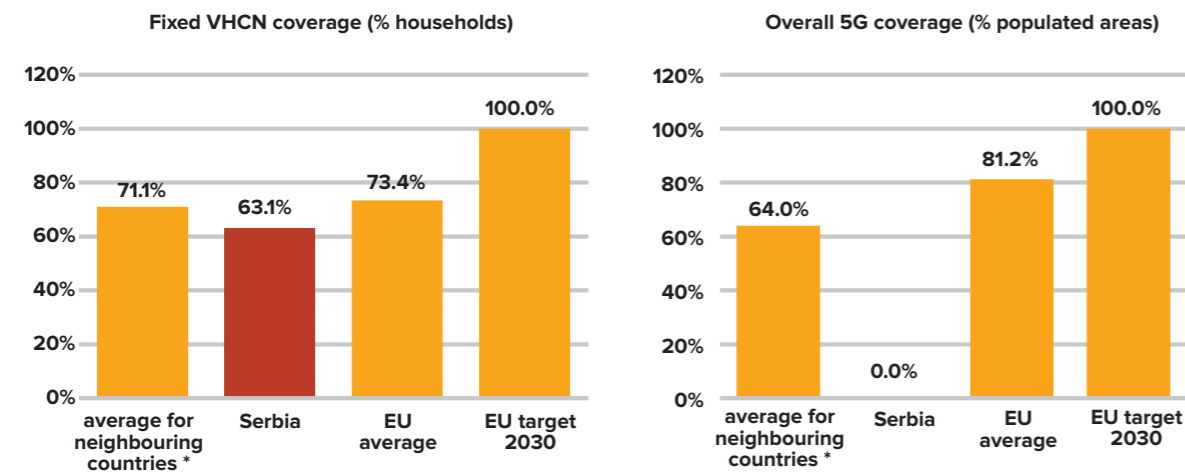
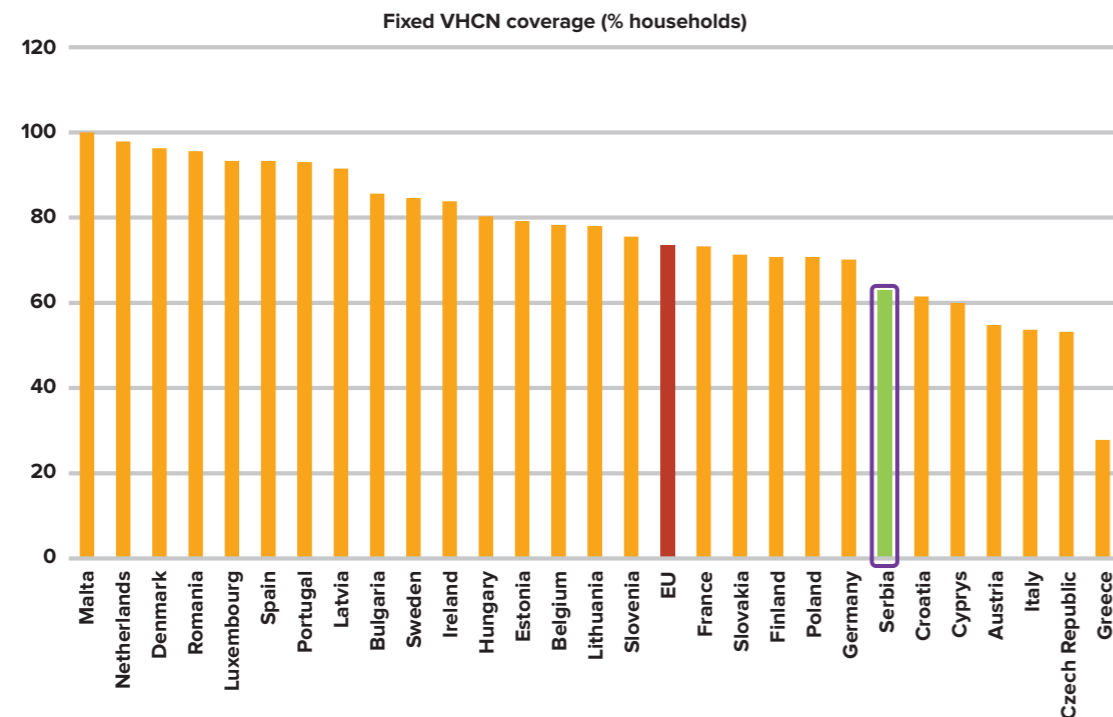


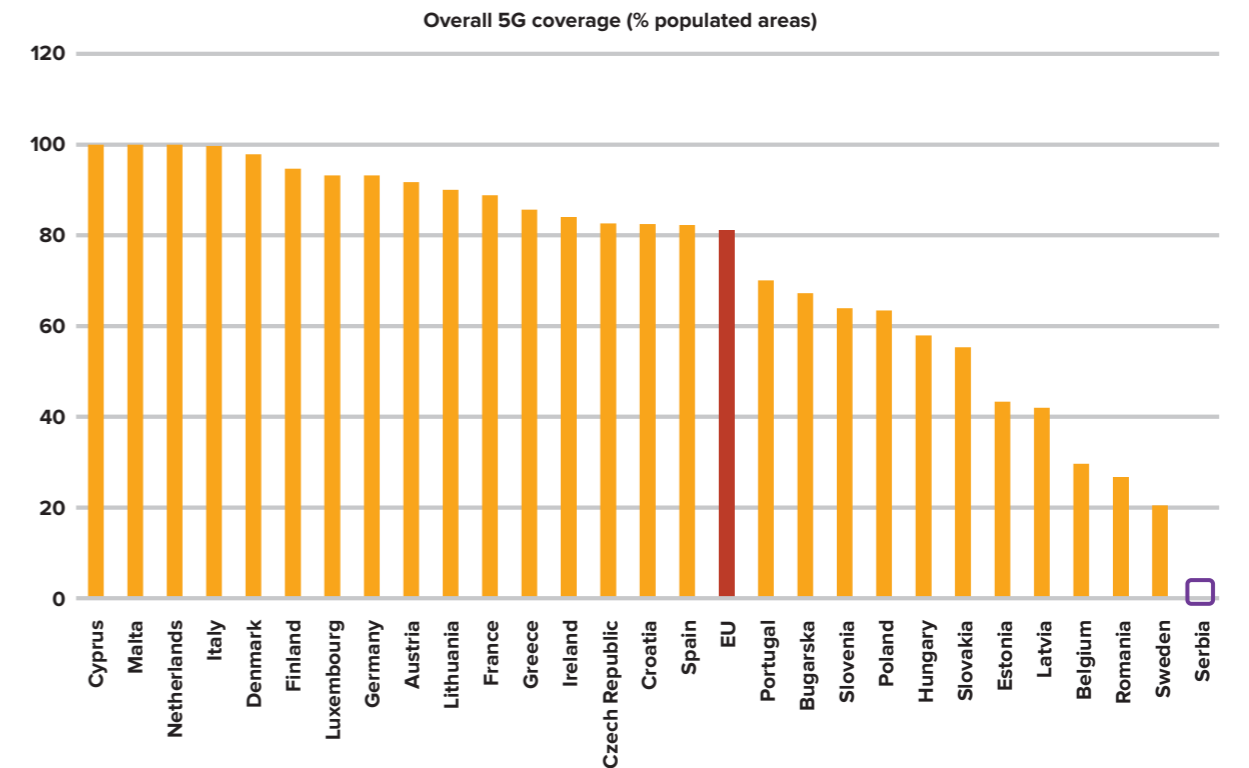
Figure 3.9. shows the current values of the above two indicators for individual EU countries and Serbia.

Figure 3.9. Indicator values for the EU countries and Serbia for 2022



Source for the EU countries: https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?indicator=desi_2a3&breakdown=total_pophh&period=desi_2023&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE&unit=pc_hh_all

Source for Serbia: RATEL



Source for the EU countries: https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?indicator=desi_2b2&breakdown=total_pophh&period=desi_2023&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE&unit=pc_hh_all

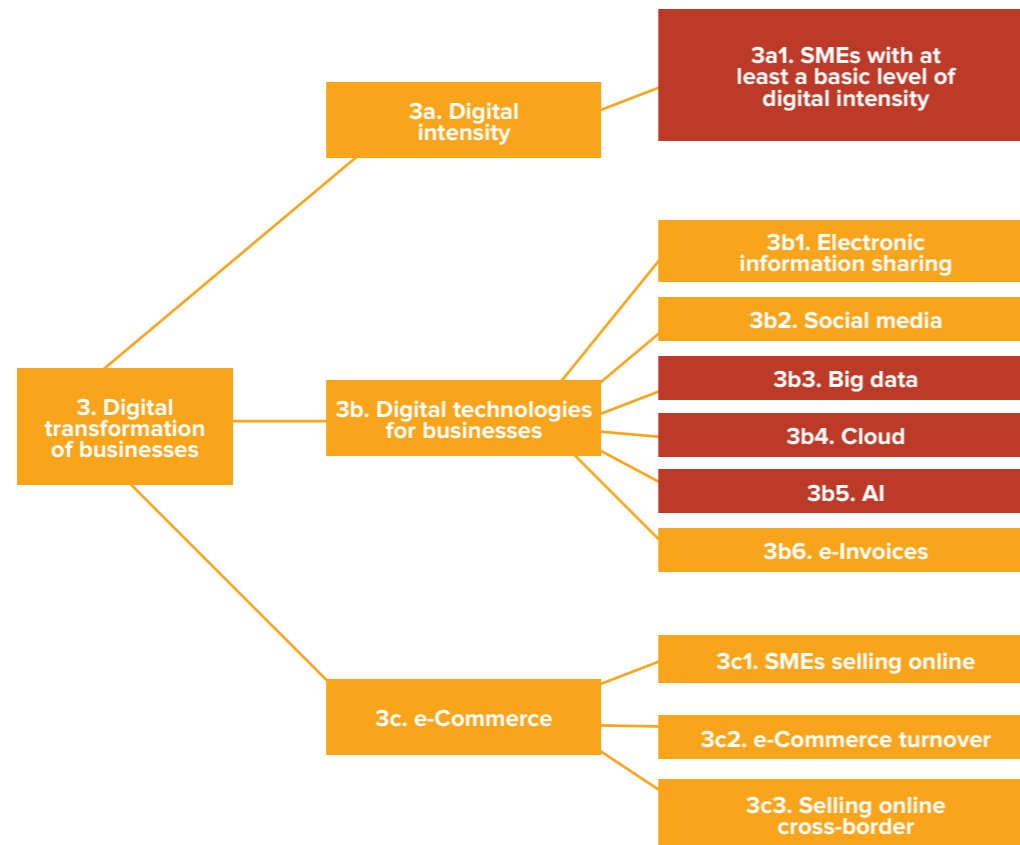
Source for Serbia: RATEL

Digital transformation of businesses

This dimension reflects the fact that digitalisation in business operations represents one of the main drivers of economic growth. The implementation of digital technologies (Cloud, Big Data, AI, IoT, etc) in order to enhance the efficacy, reduce the costs or improve the customer and business relations has become an inevitable prerequisite for competition.

Sub-dimensions included in the Digital transformation of businesses dimension and their indicators are shown in Figure 3.10.

Figure 3.10. Digital transformation of businesses: sub-dimensions and their indicators



Based on the achieved results for 2022, the most indicators with outstanding, above-average results for Serbia, in comparison with the EU, are in the dimension Digital transformation of businesses. A significant increase in the values of indicator SMEs with at least a basic level of digital intensity placed Serbia very high on the list of European countries, leaving only Scandinavian countries, Ireland, Netherlands and Malta with better ranking positions. The discrepancy compared to the previous year is the result of certain changes in the calculation methodology, where, due to the restricted data comparability, it was impossible to make a reliable assessment with respect to Serbia’s progress in this area. The country is, however, on the good way to reach the target indicator values up to 2030. A manyfold increase in the values for indicators AI (Artificial Intelligence) and e-Invoices propelled Serbia to a high sixth place among the European countries, while a modest growth of the value for indicator SMEs selling online placed it in the eighth place. For indicators Electronic information sharing, Social media, Cloud, e-Commerce turnover and Selling online cross-border, higher values than the year before were scored, but still not enough for Serbia to reach the EU average. Compared to the year before, in this dimension Serbia scored lower values only for indicator Big data, significantly lagging behind the EU average, however remaining at the neighboring countries’ level.

A comparative view of this dimension’s average indicator values for the EU and the achieved values for Serbia during the previous two years is given in Figure 3.11. Since the indicators of SMEs with at least a basic level of digital intensity, Big data, Cloud and AI measure the Digital Decade Policy Programme 2030 targets, the information regarding these particular indicators also includes EU target values.

Figure 3.11. Comparative view of Digital transformation of businesses indicator values for the EU and Serbia

	SERBIA		EU	EU
	DESI 2022	DESI 2023	DESI 2023	2030 Target
3a1 SMEs with at least a basic level of digital intensity	45%	78%	69%	90%
% SMEs	2021	2022	2022	
Electronic information sharing	22%	24%	38%	
% enterprises	2021	2022	2021*	
3b2 Social media	16%	17%	29%	
% enterprises	2021	2022	2021*	
3b3 Big data	4%	3%	14%	75%
% enterprises	2020*	2022	2020*	
3b4 Cloud	22%	26%	34%	75%
% enterprises	2021	2022	2021*	
3b5 AI	1%	12%	8%	75%
% enterprises	2021	2022	2021*	
3b6 e-Invoices	19%	53%	32%	
% enterprises	2021	2022	2020*	
3c1 SMEs selling online	27%	27%	19%	
% SMEs	2021	2022	2022	
3c2 e-Commerce turnover	4%	9%	11%	
% SMEs	2021	2022	2022	
3c3 Selling online cross-border	3%	4%	9%	
% SMEs	2021	2022	2021*	

* For certain indicators there are no available data for the corresponding year, therefore only latest available data are shown, following the EU example.

Source for the EU countries: <https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators>

Source for Serbia: RATEL, Statistical Office of Serbia

In order to better consider the position of Serbia regarding the indicators measuring the Digital Decade 2030 targets, a comparison is made in Figure 3.12. between the current achievements of Serbia and average values of the neighbouring countries, EU member states and set targets.

Figure 3.12. Comparative view of indicator values for the neighbouring countries, EU and Serbia

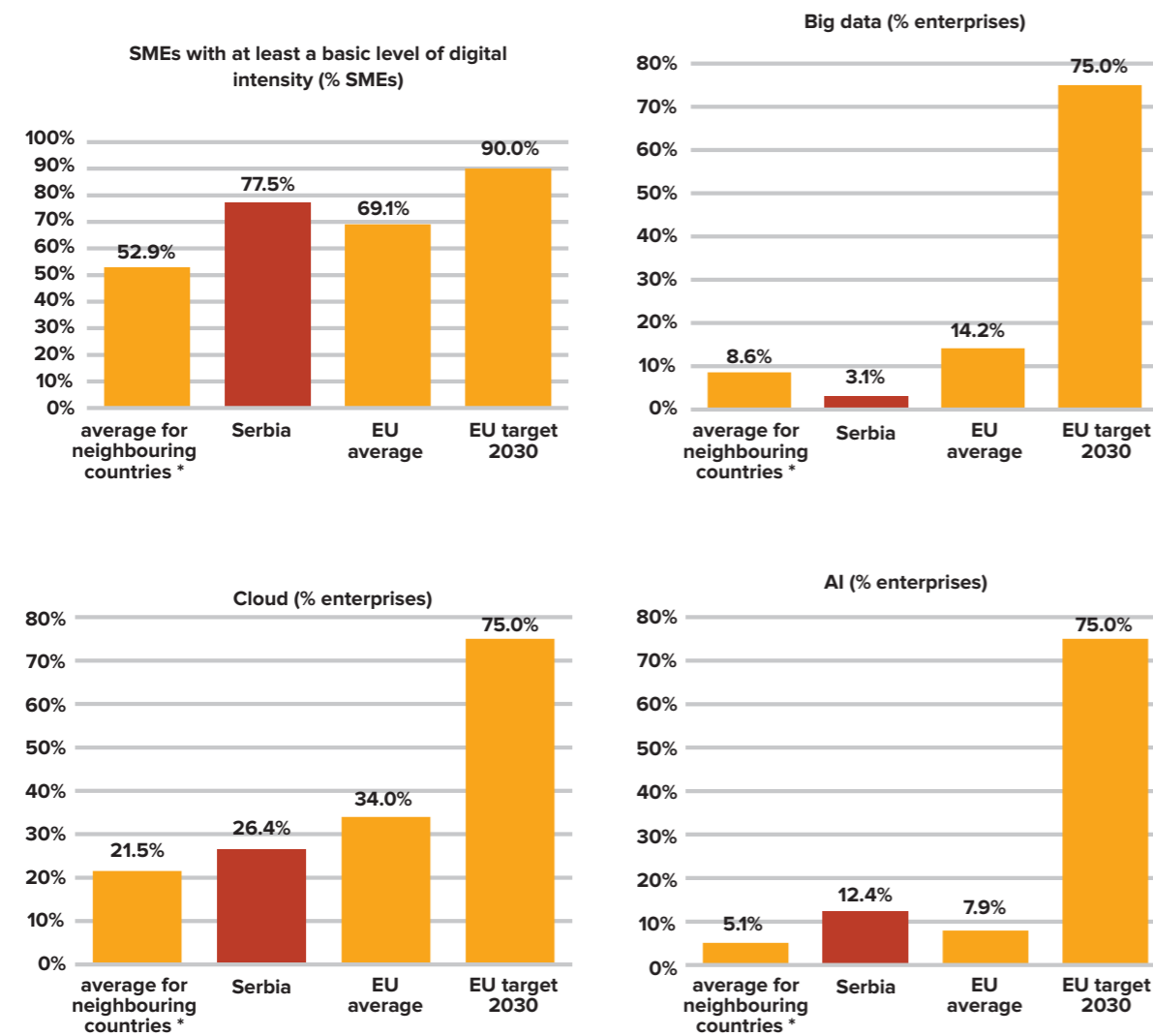
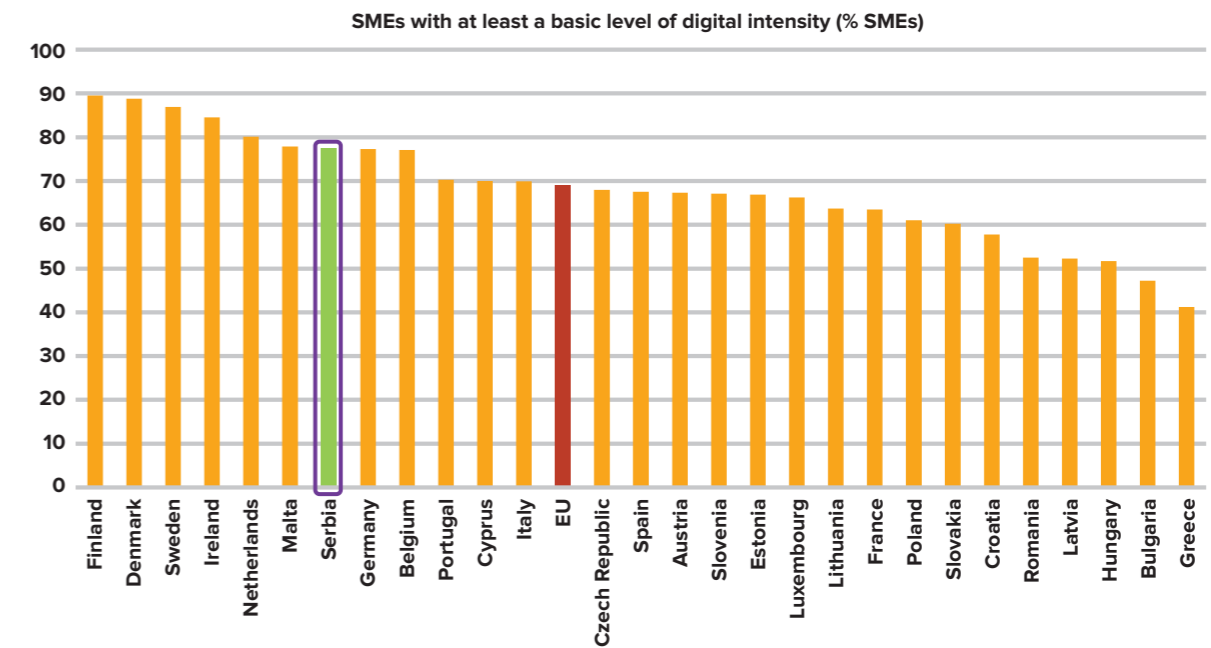


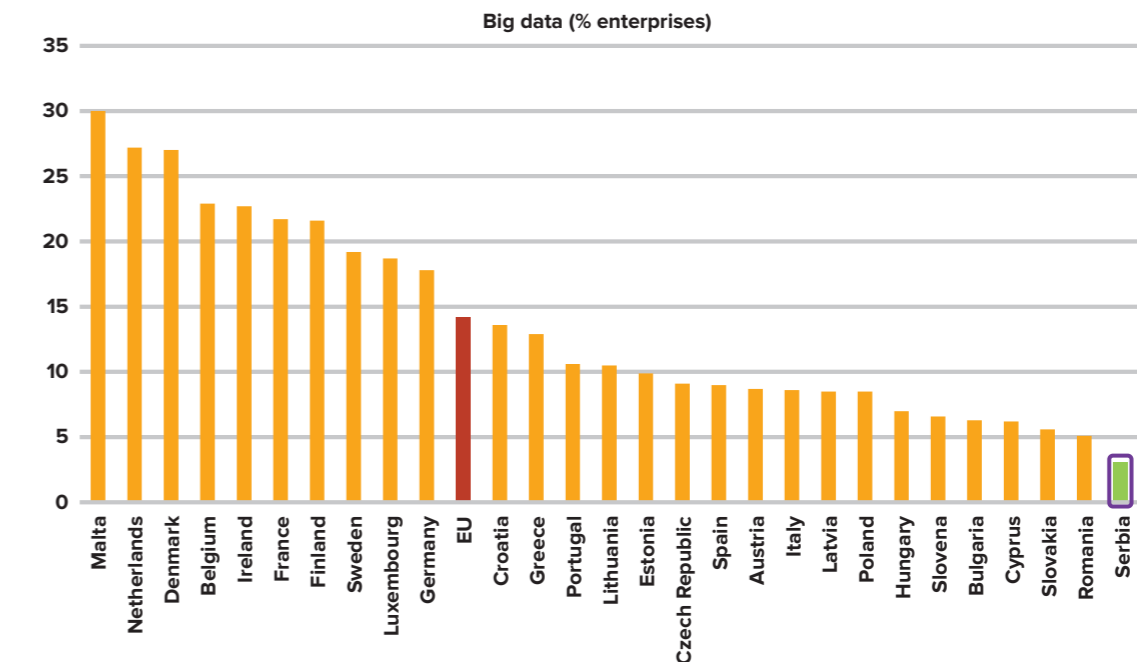
Figure 3.13. features the current values of the above four indicators for individual EU countries and Serbia.

Figure 3.13. Indicator values for the EU countries and Serbia for 2022



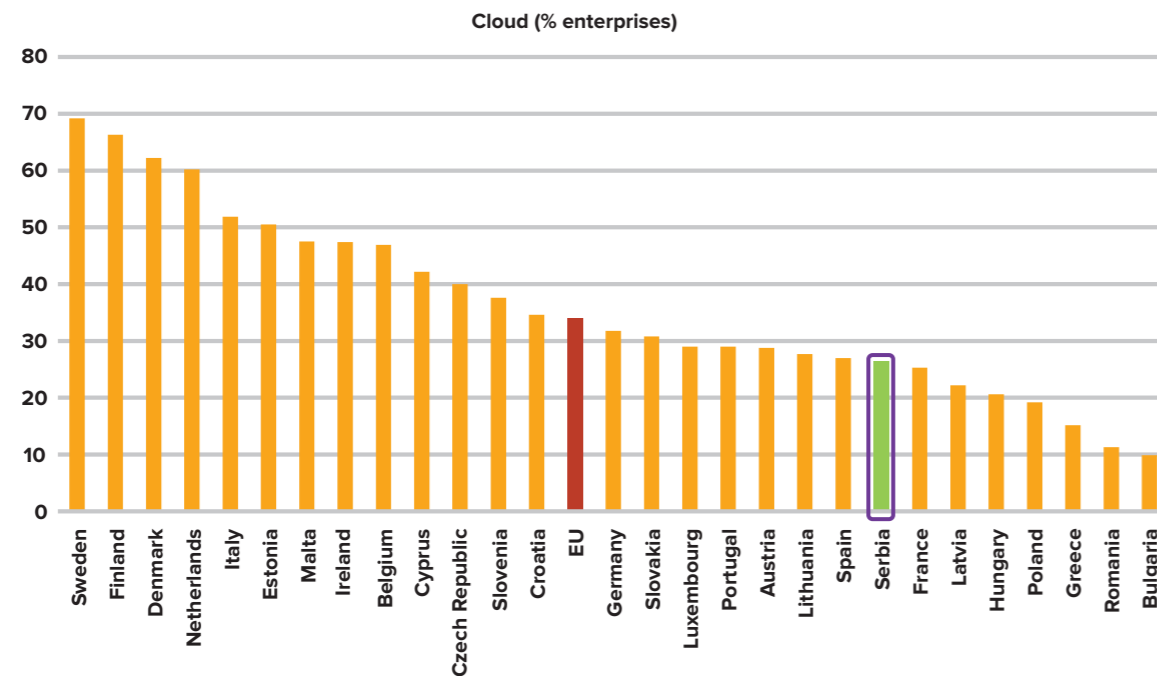
Source for the EU countries: https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?indicator=desi_3a1&breakdown=ent_sm_xfin&period=desi_2023&unit=pc_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE

Source for Serbia: Statistical Office of Serbia



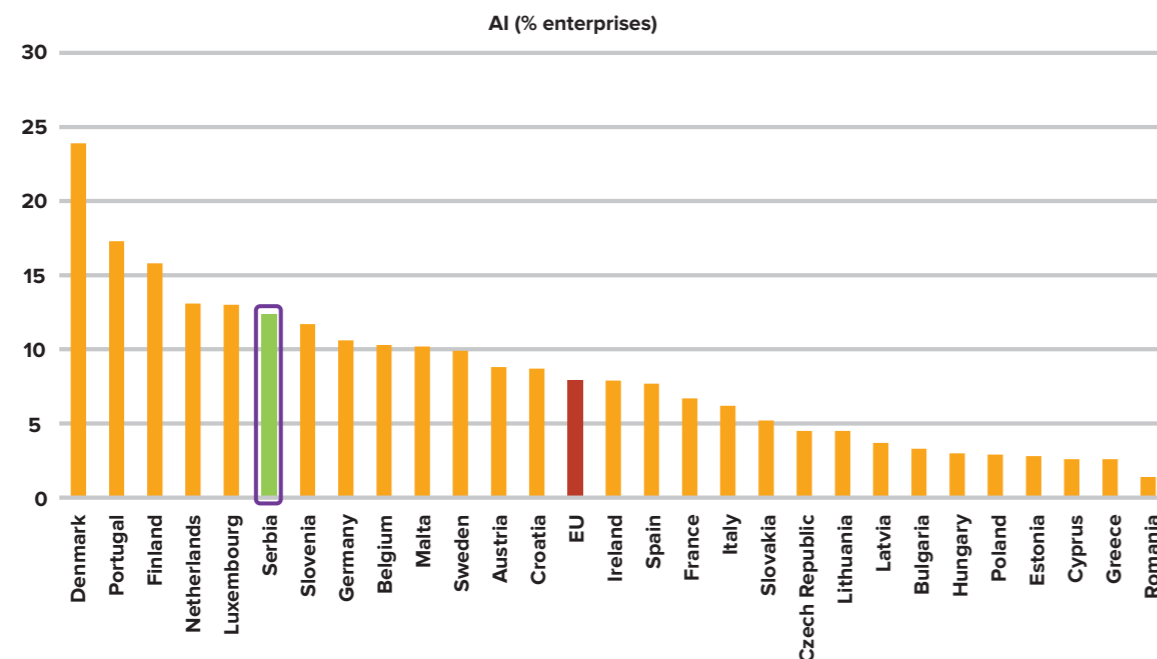
Source for the EU countries: https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?indicator=desi_3b3&breakdown=ent_all_xfin&period=desi_2023&unit=pc_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE

Source for Serbia: Statistical Office of Serbia



Source for the EU countries: https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?indicator=desi_3b4&breakdown=ent_all_xfin&period=desi_2023&unit=pc_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE

Source for Serbia: RATEL



Source for the EU countries: https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?indicator=desi_3b5&breakdown=ent_all_xfin&period=desi_2023&unit=pc_ent&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE

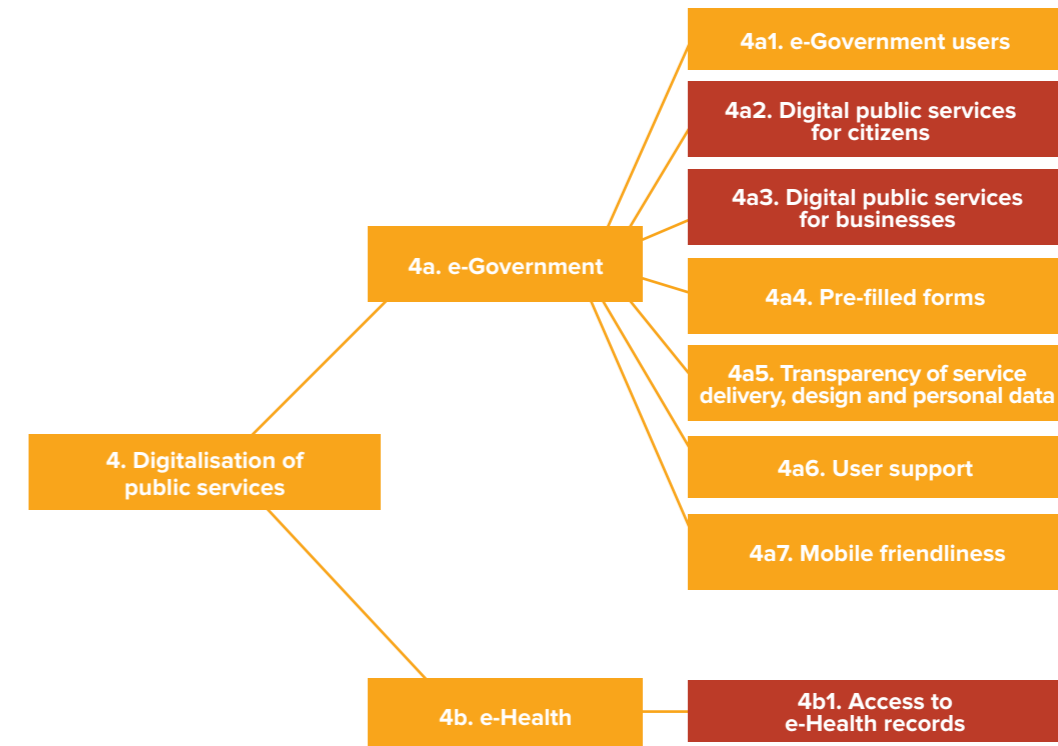
Source for Serbia: RATEL

Digitalisation of public services

Dimension Digitalisation of public services refers to digital technologies advancing the interaction between legal and natural persons with public administration.

Sub-dimensions included in the Digitalisation of public services dimension and their indicators are shown in Figure 3.14.

Figure 3.14. Digitalisation of public services: sub-dimensions and their indicators



The dimension Digitalisation of public services went through the biggest changes in the methodology by being expanded with an additional sub-dimension, four new indicators but also reduced by one indicator. An increase in the value of indicator Pre-filled forms ensured a steady position of Serbia in the first third of the most successful European countries on the list. The value of indicator Mobile friendliness is on the European average, whereas the other indicators' achievements are below the EU average. Due to an above-average increased value of indicator Digital public services for businesses, in comparison to the EU, Serbia came significantly closer to the EU average. On the other hand, despite a higher growth rate of indicator Digital public services for citizens, Serbia remains among the least successful countries, similarly as in the case of indicator User support. The values of indicators e-Government users and Transparency of service delivery, design and personal data are slightly below the EU average, while the available data for new indicator Access to e-Health records were not assessed in relation to the situation in the EU, and since not comparable, will not be part of the analysis.

A comparative view of this dimension’s average indicator values for the EU and the achieved values for Serbia during the previous two years is given in Figure 3.15. Since the indicators of Digital public services for citizens, Digital public services for businesses and Access to e-Health records measure the Digital Decade Policy Programme 2030 targets, the information regarding these particular indicators also includes EU target values.

Figure 3.15. Comparative view of Digitalisation of public services indicator values for the EU and Serbia

	SERBIA		EU	EU
	DESI 2022	DESI 2023	DESI 2023	2030 Target
4a1 e-Government users	NA*	65%	74%	
% Internet users	2021	2022	2022	
4a2 Digital public services for citizens	43	52	77	100
Score (0 to 100)	2021	2022	2022	
4a3 Digital public services for businesses	68	80	84	100
Score (0 to 100)	2021	2022	2022	
4a4 Pre-filled forms	79	83	68	
Score (0 to 100)	2021	2022	2022	
4a5 Transparency of service delivery, design and personal data	NA*	57	65	
Score (0 to 100)		2022	2022	
4a6 User support	NA*	49	84	
Score (0 to 100)		2022	2022	
4a7 Mobile friendliness	NA*	94	93	
Score (0 to 100)		2022	2022	
4b1 Access to e-Health records	NA*	NA*	72	100
Score (0 to 100)			2022	

* For certain indicators there are no available data for Serbia.

Source for the EU countries: <https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators>

Source for Serbia: Statistical Office of Serbia

In order to better consider the position of Serbia regarding the indicators measuring the Digital Decade 2030 targets, a comparison is made in Figure 3.16. between the current achievements of Serbia and average values of the neighbouring countries, EU member states and set targets.

Figure 3.16. Comparative view of indicator values for the neighbouring countries, EU and Serbia

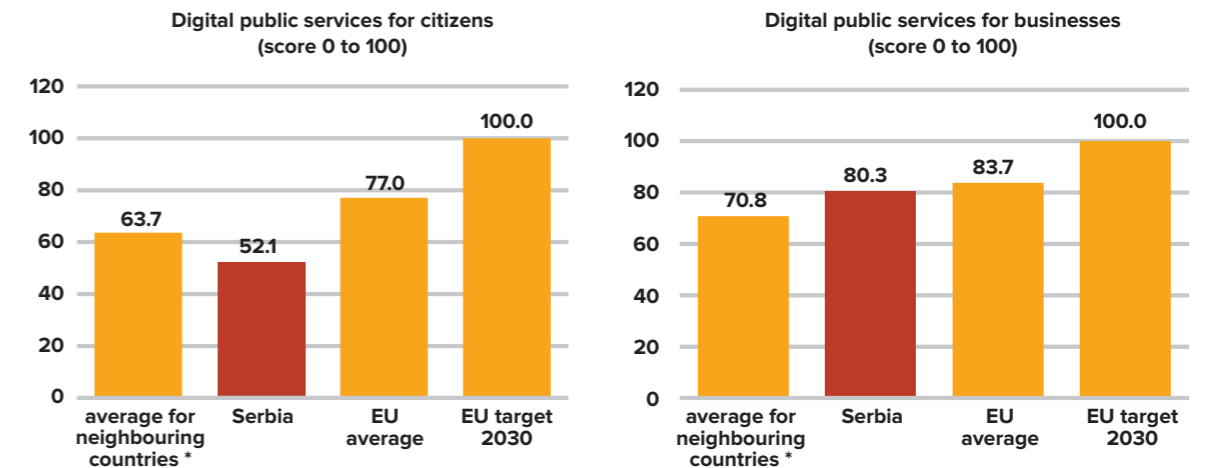
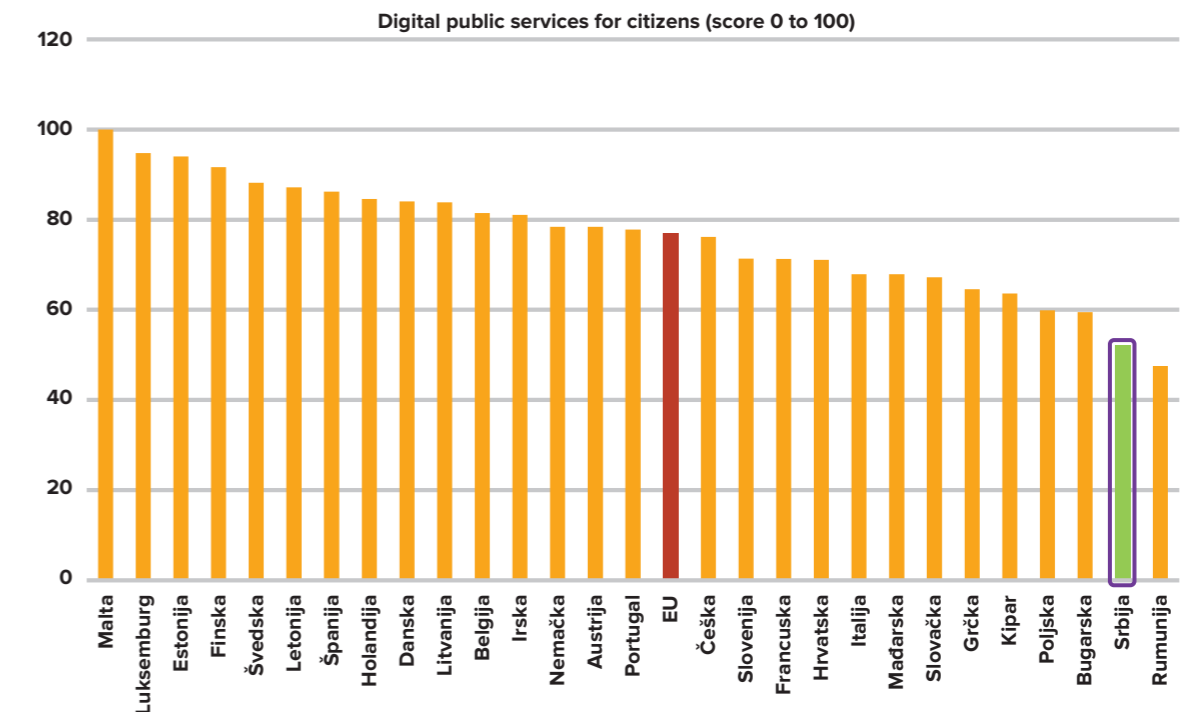


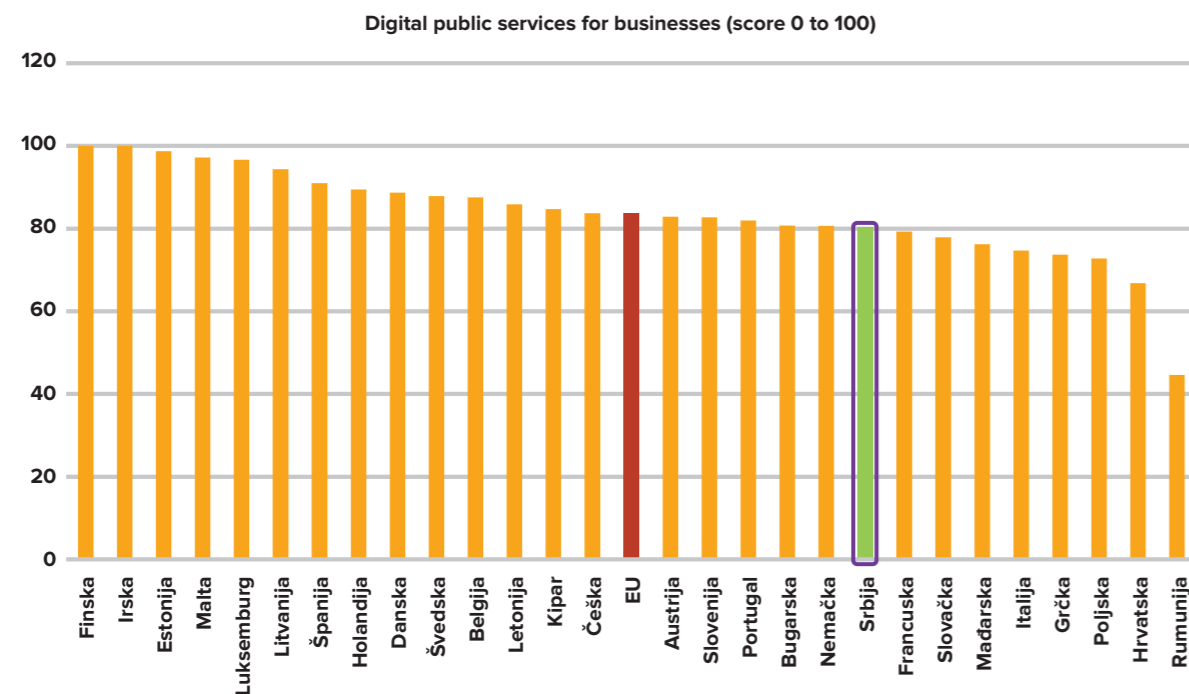
Figure 3.17. shows the current values of the above indicators for individual EU countries and for Serbia.

Figure 3.17. Indicator values for the EU countries and Serbia for 2022



Source for the EU countries: https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?indicator=desi_4a2&breakdown=all_egov_le&period=desi_2023&unit=egov_score&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LV,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE

Source for Serbia: Statistical Office of Serbia



Source for the EU countries: https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts/desi-indicators?indicator=desi_4a3&breakdown=all_egov_le&period=desi_2023&unit=egov_score&country=AT,BE,BG,HR,CY,CZ,DK,EE,EU,FI,FR,DE,EL,HU,IE,IT,LT,LU,MT,NL,PL,PT,RO,SK,SI,ES,SE

Source for Serbia: Statistical Office of Serbia

Comparative indicator values for all four dimensions for Serbia suggest a general increase in the DESI values for Serbia, but also a need to apply further efforts in order to continue the positive trend, especially focusing on the indicators measuring the Digital Decade Policy Programme 2030 targets, as well as those tied to unsatisfactory results.

PUBLIC FIXED TELECOMMUNICATIONS NETWORKS AND SERVICES

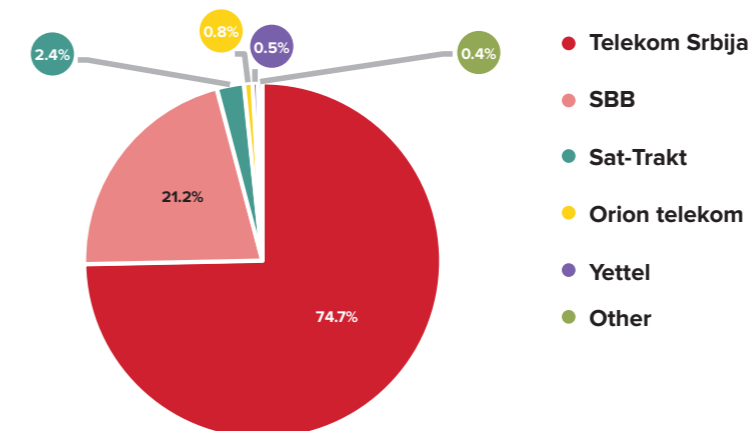
4.

At the end of 2022, there were 22 operators registered for the public telephone service provision over fixed-line network.

In 2022, Telekom Srbija had approximately 2% 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 2022. 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 3% more subscribers in respect to the previous year.

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

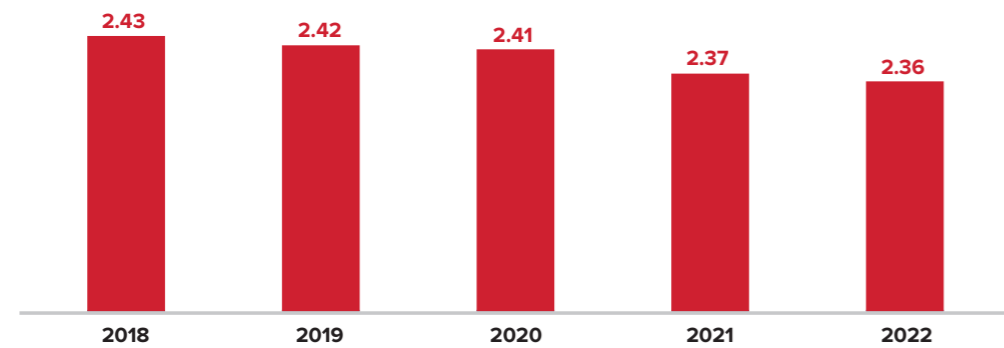
Figure 4.1. Market shares of public fixed telecom service operators via fixed network



Source: RATEL

The number of fixed line subscribers continued to slightly decrease, amounting to 2.36 million at the end of 2022. The number of subscribers also includes users of electronic communications services provided at a fixed location via public mobile networks (Cellular Local Loop - CLL) by Telekom Srbija and A1 Srbija, which take up 0.3% of the total number of subscribers in 2022. Residential users are still dominant, with 87% share in the total number of users. In 2022, all operators have a 100% digitalization rate. The number of payphones continued to decrease, amounting to 2,006 in 2022.

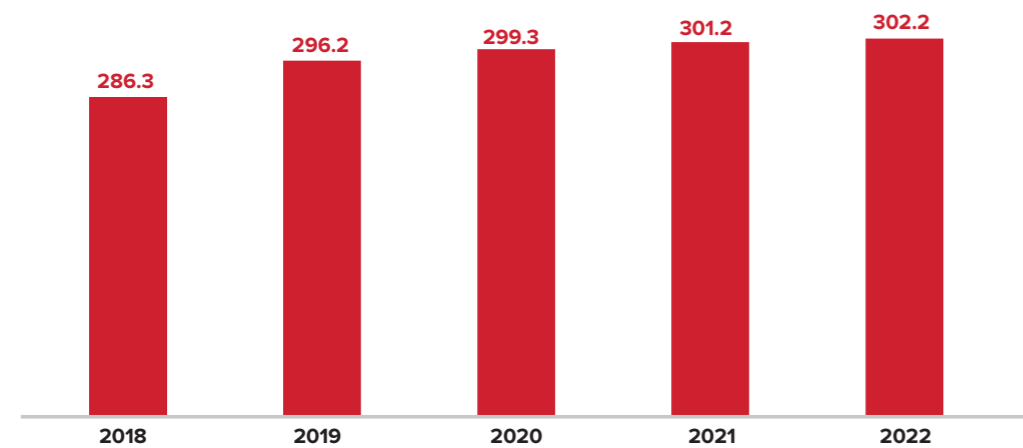
Figure 4.2. Number of fixed network subscribers (million)



Source: RATEL

The share of business subscribers in 2022 was approximately 13%. The trend over the past years is shown in Figure 4.3.

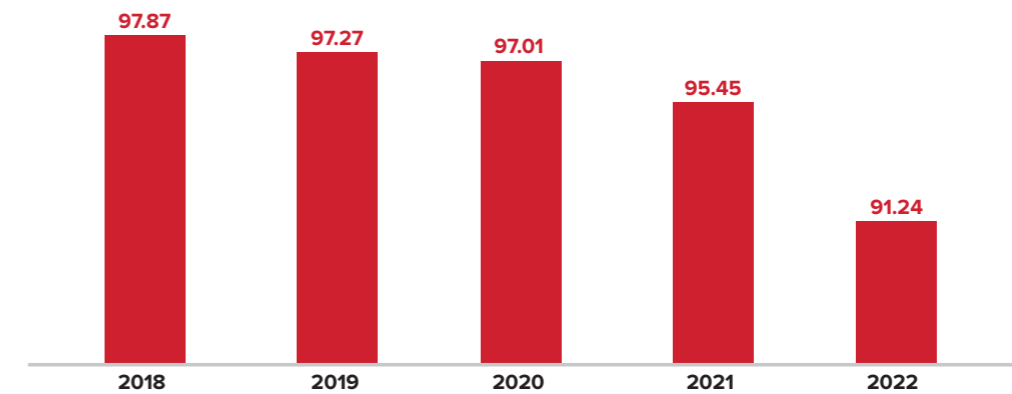
Figure 4.3. Number of business subscribers (in thousands)



Source: RATEL

Fixed telephony penetration rate, in terms of households, was 91.24% in 2022, as given in Figure 4.4.

Figure 4.4. Fixed line penetration rate –households

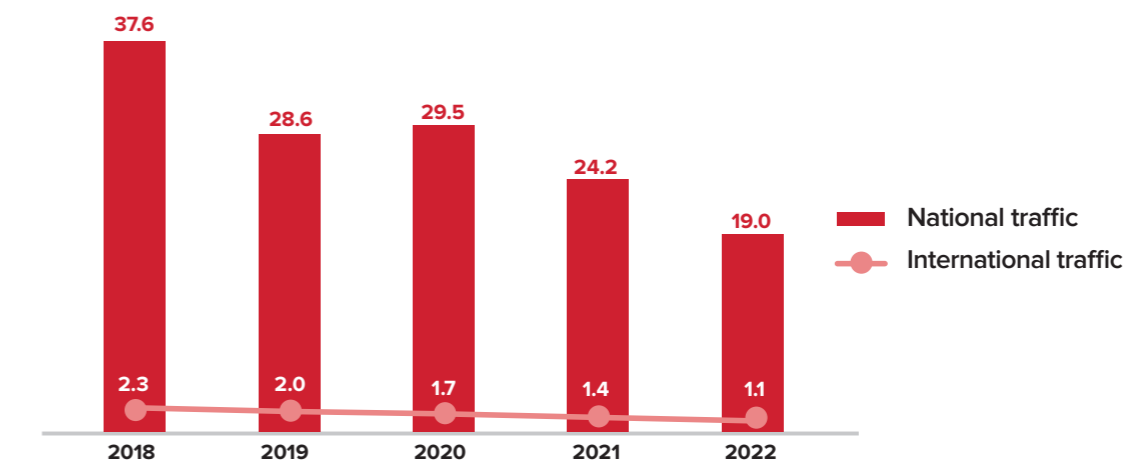


Source: RATEL

The number of ISDN subscribers in 2022 was approximately 15.2 thousand, which is by 13% less than the previous year. There are 8% of ISDN subscribers with 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 2022 decreased by approximately 21.8% year on year, the national traffic being estimated to 1.90 billion of minutes and the international traffic to 106 million of minutes. The decrease seen in the total national traffic is mainly due to increase in traffic toward other fixed networks, whereas international traffic, with 23.1% of minutes less than in the previous year, continues to drop due to the increasing trend of using VoIP applications.

Figure 4.5. Total traffic (in hundreds million minutes)

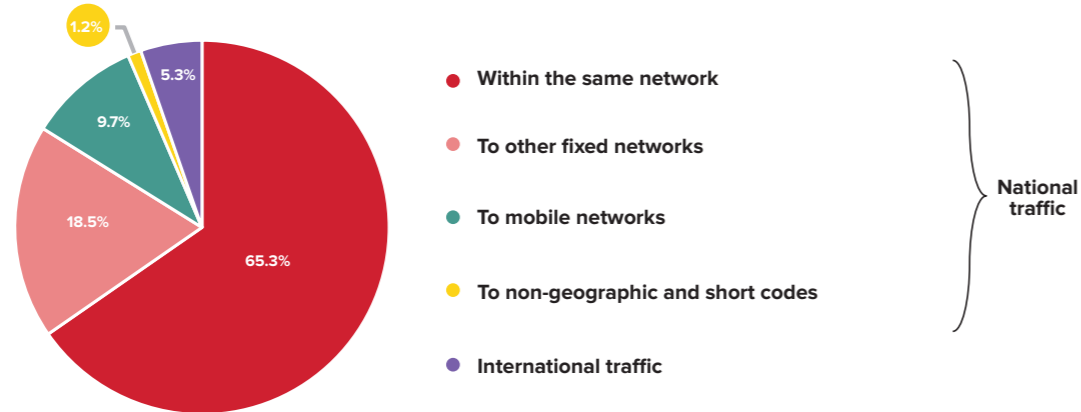


Source: RATEL

The biggest share in the total traffic still goes to the traffic made within the same network (65.3%), whereas the smallest share goes to the traffic made to non-geographic numbers and short codes (1.2%). Fixed network

traffic distribution in 2022 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.

Figure 4.6. Fixed network traffic distribution in 2022



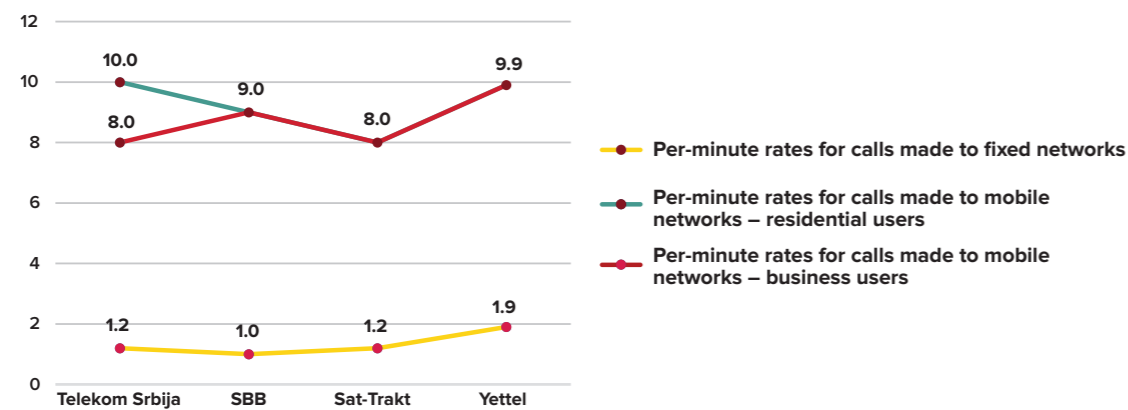
Source: RATEL

The average call duration was 4.31 minutes for a call made within the same network, 1.93 minutes for a call made to mobile network and 5.12 minutes for an international call.

The total number of VoIP operators at the end of 2022 was approximately 30 thousand, which is a 56% increase year on year. There were 4.4 million of minutes of traffic and 205 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 1.9 dinars per minute for fixed-line calls, and between 8 and 10 dinars per minute for the calls made to mobile networks.

Figure 4.7. Fixed-line calls and fixed-to-mobile telephone service rates in 2022 VAT included (RSD)

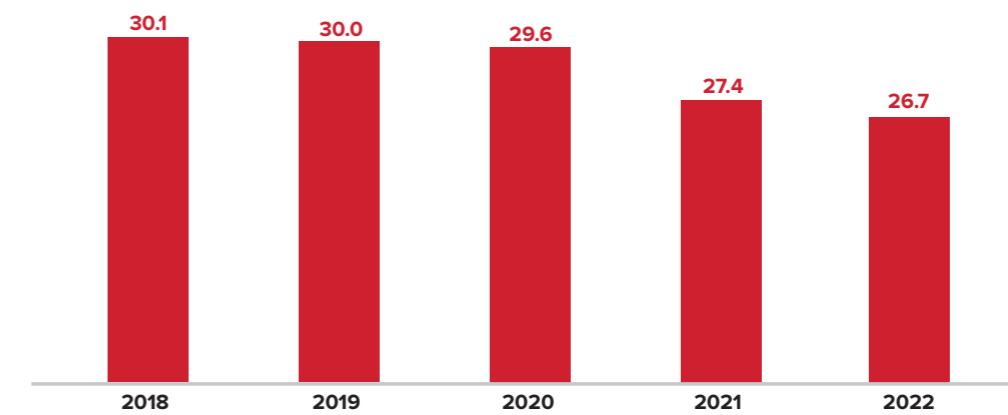


Source: RATEL

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 revenues from fixed telephone services provided by all operators registered for this service in the territory of the Republic of Serbia in 2022 were somewhat lower compared to the previous year, amounting to 26.7 billion dinars, including the revenues made from VoIP services in the amount of 4.3 billion dinars. The investments made in the fixed telephony services in 2022 amounted to approximately 20.4 billion dinars, which is an increase in respect to the previous year.

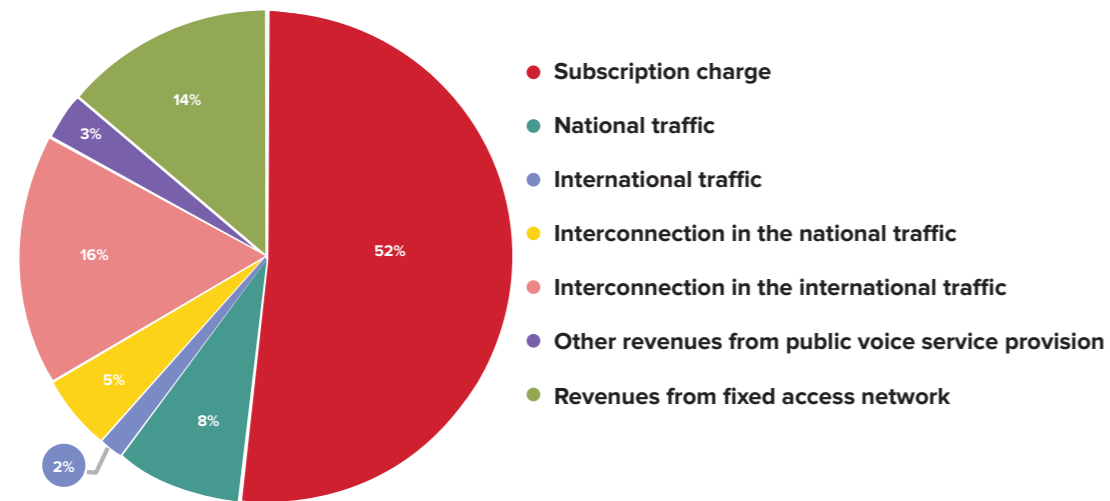
Figure 4.8. Revenues from fixed telecom networks and services (billion dinars)



Source: RATEL

Despite being lower than in the previous year, the subscription charges, in the amount of 12 billion dinars, still have the largest share in the total revenues, accounting for almost one half of total fixed network service revenues in 2022, without revenues from VoIP. The revenues made from the national traffic, amounting to 1.8 billion, and the revenues made from the international traffic, amounting to 0.4 billion, are lower compared with the previous year and have a smaller share in the total revenues. The decrease in the number of minutes of international traffic is the result of the decrease in the number of subscribers and minutes of traffic made. The revenues from the national interconnection dropped slightly, whereas the revenues from interconnection in the international traffic increased somewhat.

Figure 4.9. Structure of revenues from fixed telecom network in 2022

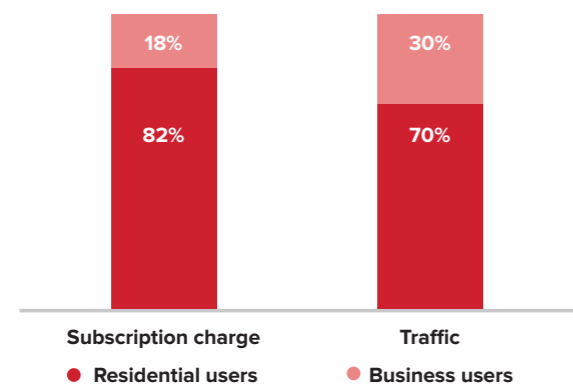


Source: RATEL

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.

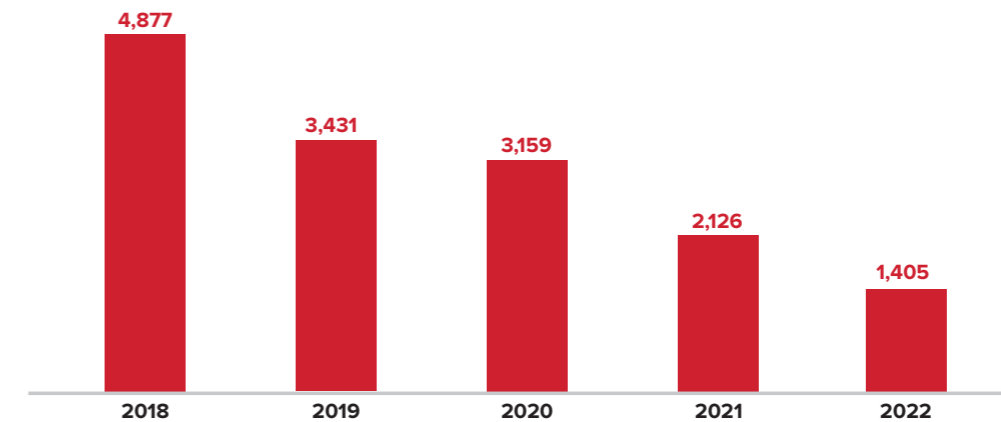
Figure 4.10. Share of residential and business users in the revenues made from subscription charge and traffic made



Source: RATEL

The use of the number portability service on public fixed telephone networks is slightly decreasing. In 2022, the monthly average of ported numbers was 1,405.

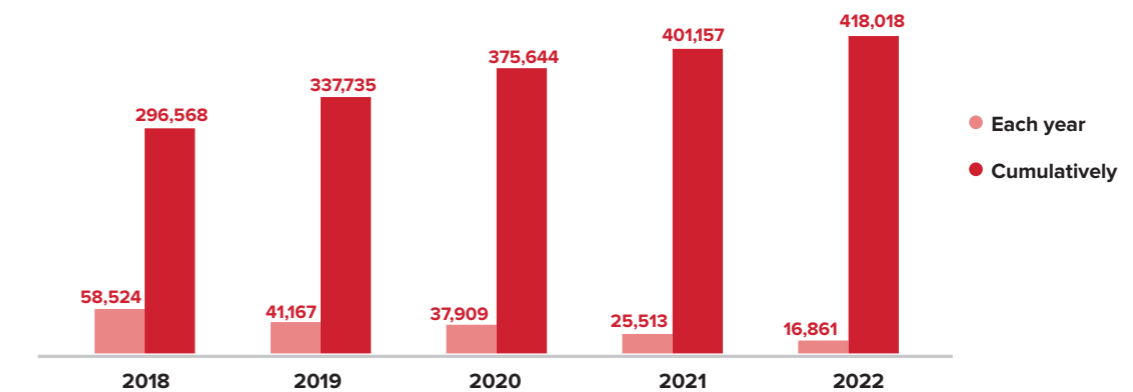
Figure 4.11. Monthly average of ported numbers each year



Source: RATEL

During 2022 there were 16,861 fixed line subscribers who changed the operator while keeping the same number, so that the total of ported numbers amounted 418,018 at the end of 2022 (Figure 4.12).

Figure 4.12. Portings made each year and in total



Source: RATEL

Leased Lines

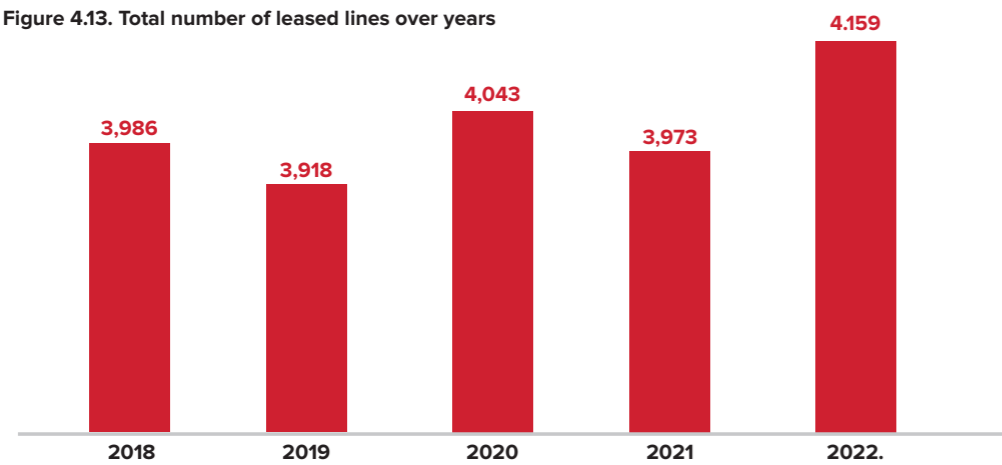
Leased lines are a significant part of the market of electronic communications, being the essential means for service provision for some operators, as transport infrastructure. Also, big business users (as end-users) use leased lines to connect remote branches and to enable various data transmission.

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).

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 42 operators in Serbia in 2022 and the total number of national and international leased lines was 4,159, while national lines accounted for 94.8% of the total in 2022.

Figure 4.13. Total number of leased lines over years



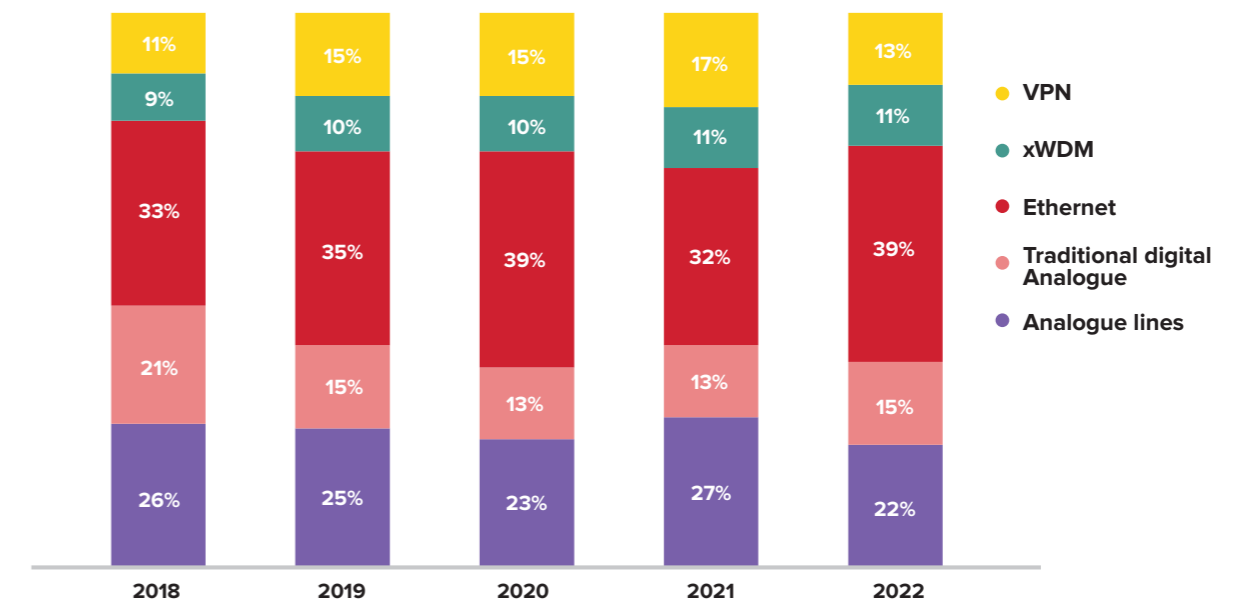
Source: RATEL

As for technologies, most national leased lines are Ethernet based, 39% in 2022. The share of traditional digital lines remained unchanged, whereas the share of analogue lines increased, and the number of lines based on xWDM and VPN increased as well. Since 2018, data are being collected on VPN end-user service,

which is an equivalent of the traditional leased lines service in terms of high-quality access provision, and which has a 13% share in the total number of lines.

Analogue leased lines account for almost 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.

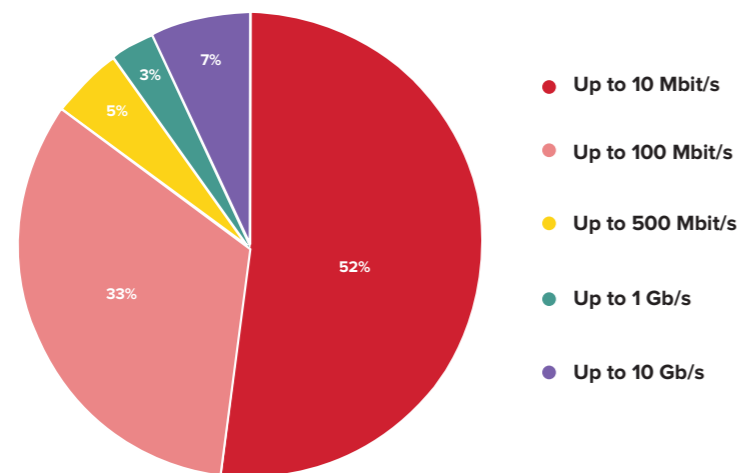
Figure 4.14. Distribution of national leased lines according to access type



Source: RATEL

In terms of speed, the most common national line transmission technologies in 2022 are Ethernet 10 Mbit/s lines with 52% (cf. 35% in 2021), followed by Ethernet 100 Mbit/s lines with 33% share. The least common are Ethernet 500 Mbit/s with 5% share and 1 Gb/s lines with 3% share, while 10 Gb/s lines have a 7% share.

Figure 4.15. Distribution of Ethernet national leased lines according to speed in 2022

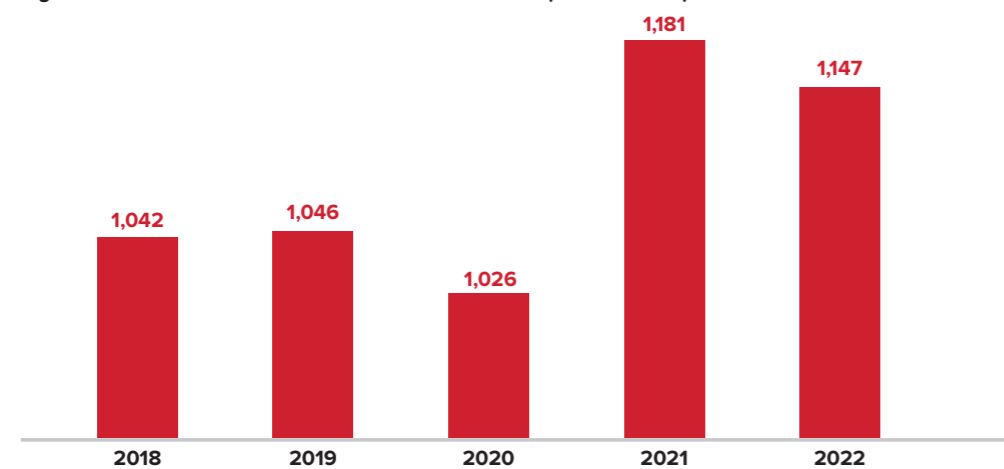


Source: RATEL

Leased lines are 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 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 the national and international leased lines in 2022 were approximately 1.14 billion dinars, which is by 3.3% less compared to the previous year. The share of revenues made from international lines in the total revenues is 18%.

Figure 4.16. Revenues made from leased lines in 2022 (million dinars)



Source: RATEL

PUBLIC MOBILE TELECOMMUNICATIONS NETWORKS AND SERVICES

5.

Mobile telephony services in the Republic of Serbia were provided by the following three operators in 2022:

- **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;¹
- **Yettel Ltd.**, 100% owned by PPF TMT Bidco 1 B.V., the Netherlands
- **A1 Srbija Ltd.**, 100% in the ownership of Mobilkom CEE Beteiligungsverwaltung GmbH, Austria.

The three network operators were using parts of the following RF bands on technologically neutral basis, based on the individual licences for RF usage issued upon public bidding procedure:

- 791-821/832-862 MHz;
- 890-915/935-960 MHz;
- 1710-1780/1805-1875 MHz;
- 1900-1915 MHz (not used by the operators yet);
- 1920-1980/2110-2170 MHz.

The operators are using GSM (2G), UMTS (3G) and LTE (4G) technology for commercial use.

The licences for 900 MHz and 2100 MHz RF bands 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 the network operators, a virtual mobile operator is also registered: **Globaltel Ltd.**

In early 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 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, valid until March 2025 with the possibility of a 2-year extension.

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 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, valid until 2026 with the possibility of a 5-year extension.

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.

Yettel Ltd. has been in the Serbian telecoms market as Telenor Ltd. since 2006. In 2018 the ownership structure changed, when Telenor Group sold its business in Central and Eastern Europe to PPF Group (in Bulgaria, Hungary, Serbia and Montenegro).

A1 Srbija 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. A1 Srbija 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., Yettel Ltd. and A1 Srbija 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 31.12.2021.

I		Telekom Serbia	Yettel	A1
1.	Total number of active sites with mobile telephony base stations	3051	2374	2444
2.	Raw land sites (RL) (freestanding land polls) with base stations	1804	1348	1394
3.	Rooftop sites (RT) (antenna systems on buildings and masts on buildings) with base stations	1180	962	988
4.	Indoor sites with base stations	57	40	44
5.	RT + indoor sites	10	24	18
II				
6.	ADAS indoor	6	5	8
7.	DAS indoor	56	58	53
8.	ADAS + DAS indoor	5	1	1
III				
9.	2G base station sites (all frequency ranges)	2457	2309	2372
10.	2G 1800 network base stations	0	6	41
11.	2G 900 network base stations	2298	2267	2296
12.	2G 900 + 2G 1800	159	36	35
IV				
13.	3G network base stations	2977	2367	2428
14.	3G 2100 network base stations	2939	60	2417
15.	3G 900 network base stations	13	1162	11
16.	3G 900 + 3G 2100 network base stations	25	1145	0
V				

17.	4G network base stations	2979	2345	2439
18.	4G 800 network base stations	690	675	195
19.	4G 1800 network base stations	60	49	39
20.	4G 2100 network base stations	0	3	0
21.	4G 800 + 4G 1800 network base stations	626	613	631
22.	4G 800 + 4G 2100 network base stations	3	3	8
23.	4G 1800 + 4G 2100 network base stations	25	20	51
24.	4G 800 + 4G 1800 + 4G 2100 network base stations	1575	982	1515
VI.				
25.	Indoor repeater sites	782	450	578
26.	Indoor 2G repeater sites	74	2	68
27.	Indoor 3G repeater sites	264	24	106
28.	Indoor dual repeater sites (2G + 3G)	216	211	8
29.	Indoor 4G repeater sites	7	3	0
30.	Indoor dual/triple repeater sites (4G + 2G/3G)	221	210	396
VII				
31.	Outdoor repeater sites (only remote if different from donor)	12	27	0
VIII				
32.	WiFi sites	1280	14	0

33.	Indoor WiFi sites	471	0	0
34.	Outdoor WiFi sites	556	13	0
35.	Indoor + outdoor WiFi sites	253	1	0
IX				
36.	2G 900 base radio stations	2457	2325	2331
37.	2G 1800 base radio stations	159	42	76
38.	3G 900 base radio stations	38	2317	11
39.	3G 2100 base radio stations	2964	1231	2417
40.	4G 800 base radio stations	2894	2278	2349
41.	4G 1800 base radio stations	2286	1687	2236
42.	4G 2100 base radio stations	1603	1016	1574
43.	WiFi AP	2991	14	0
44.	Indoor WiFi AP	1983	1	0
45.	Outdoor WiFi AP	1008	13	0
46.	Indoor repeaters	1211	629	578
47.	Outdoor repeaters	12	42	0
X				
48.	Optic to the base stations	1750	884	955
49.	Single microwave connection to optical transmission point	946	863	688
50.	Multiple microwave connection to optical transmission point	355	627	801

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

Name	Telekom Serbia	Yettel	A1
Percentage of territory covered by 2G network signal	92.51%	87.85%	89.46%
Percentage of population covered by 2G network signal	99.35%	98.87%	99.11%
Percentage of territory covered by 3G network signal	79.30%	89.32%	77.51%
Percentage of population covered by 3G network signal	97.24%	99.07%	97.01%
Percentage of territory covered by 4G network signal	84.74%	76.17%	74.66%
Percentage of population covered by 4G network signal	98.26%	96.70%	96.17%

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

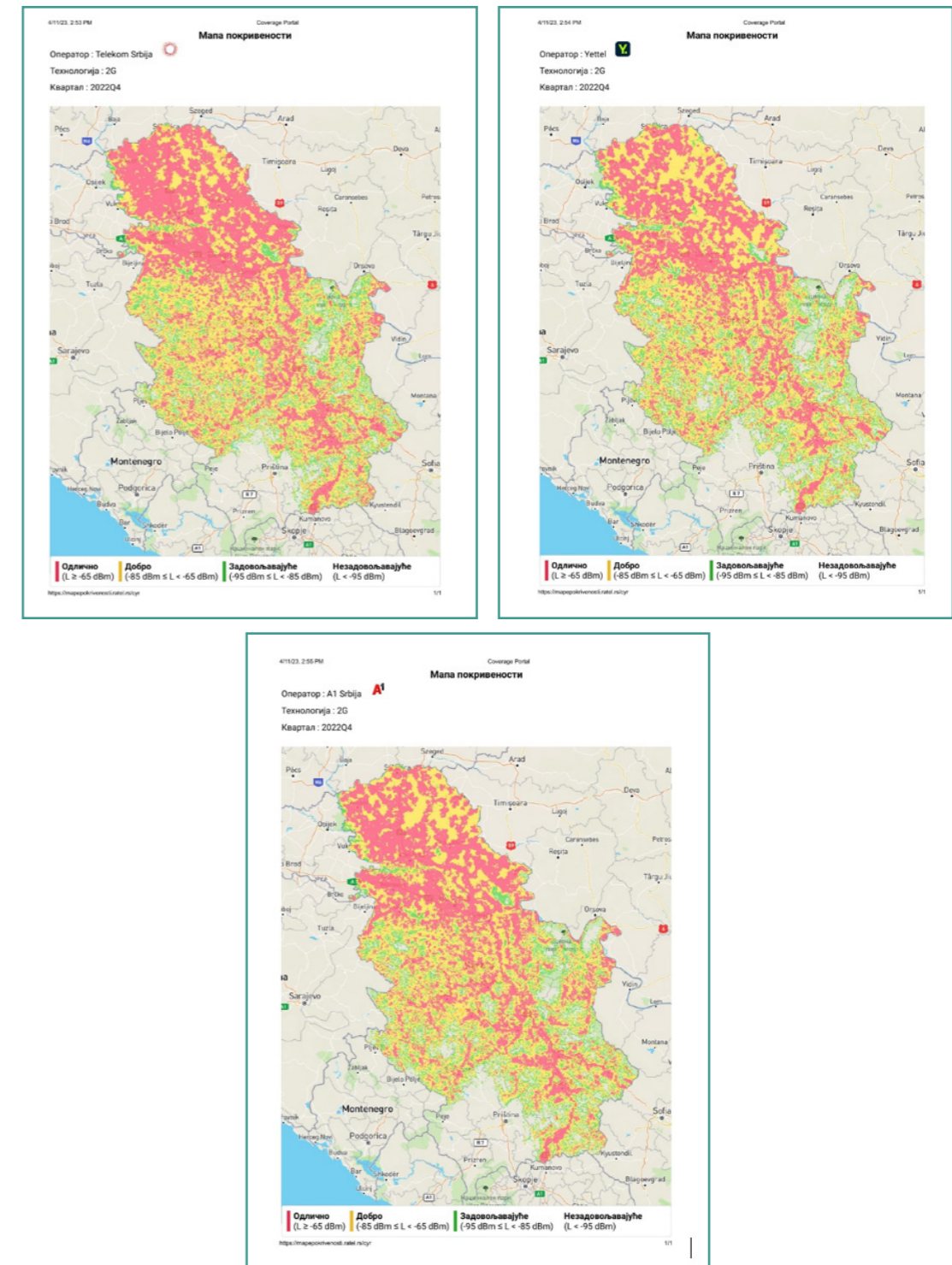


Figure 5.2. Graphic presentation of mobile telephony signal coverage for UMTS technology

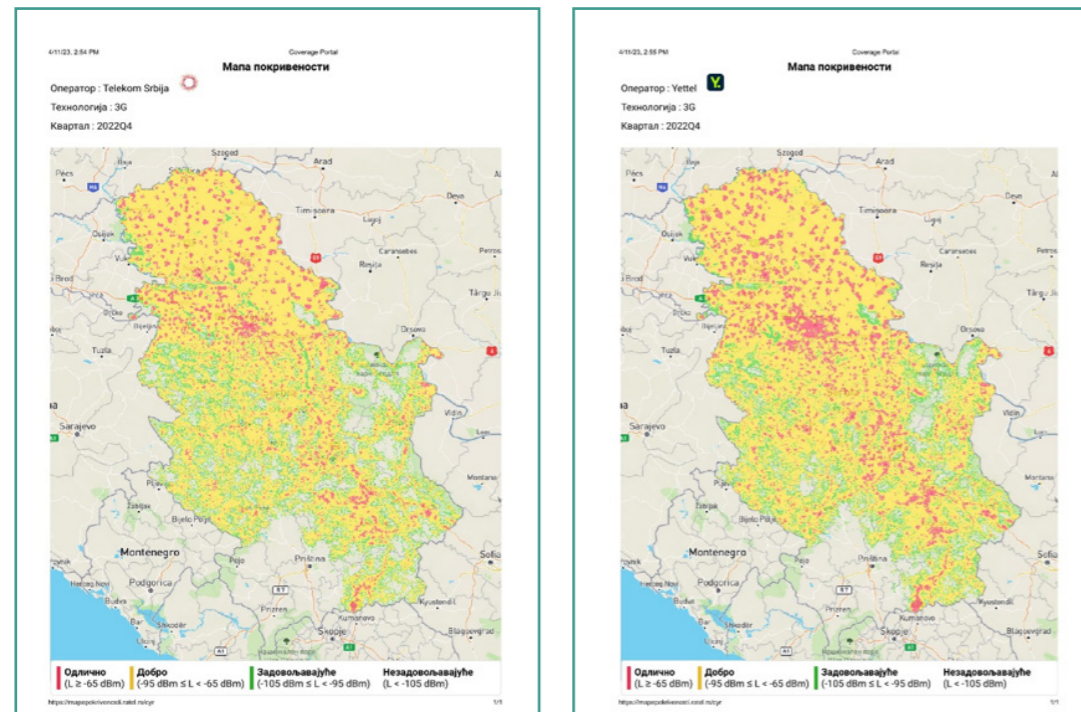
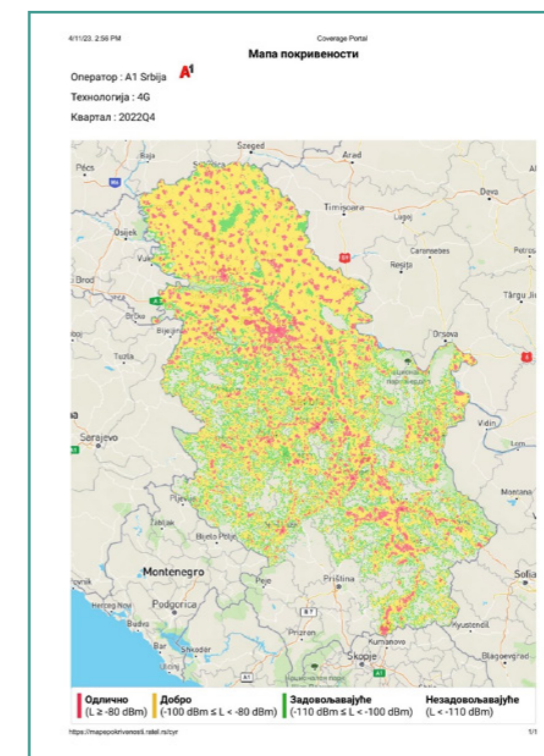
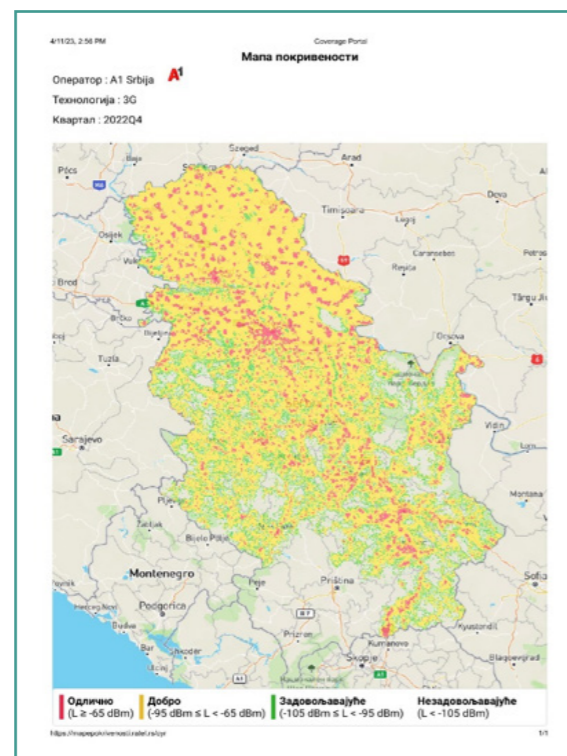
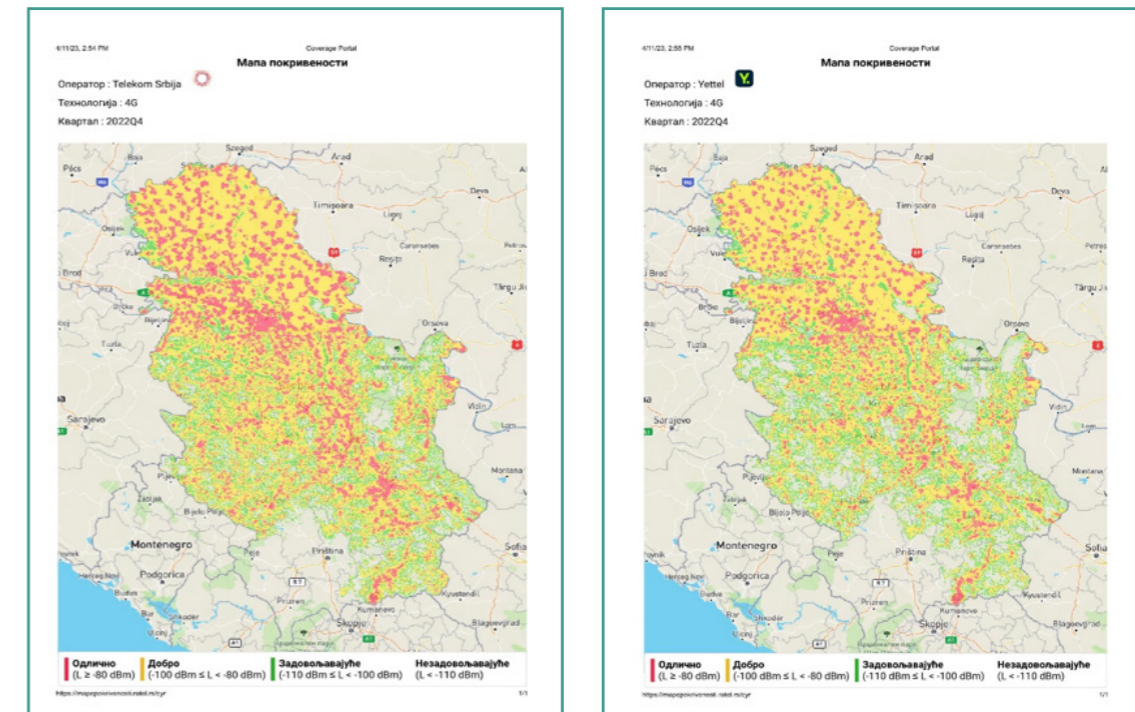
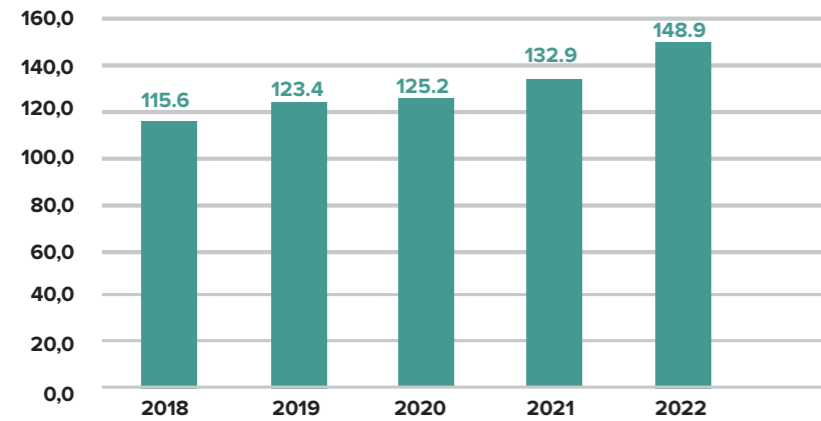


Figure 5.3. Graphic presentation of mobile telephony signal coverage for LTE technology



The revenues from mobile networks in 2022 amounted to around 148.9 billion dinars or 1.27 billion euro. Observed in the national currency (RSD) the revenues increased by 12% year on year.

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



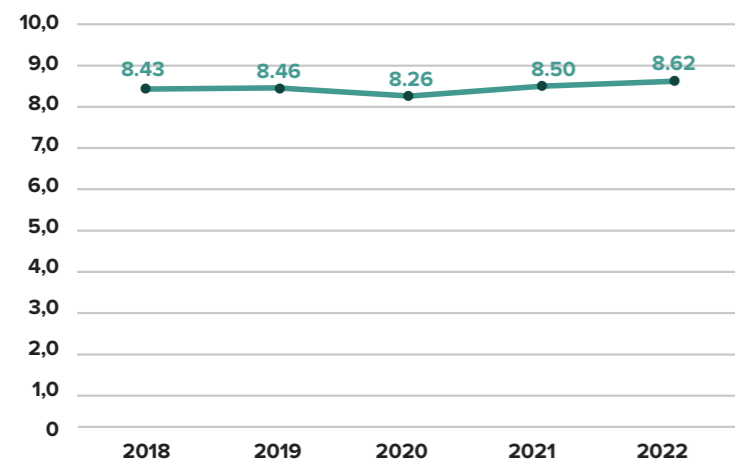
Source: RATEL

Investments in this market segment increased by 3% compared with the previous year, amounting to 17.4 billion dinars.

The total number of mobile users increased by 1.4% year on year, amounting to 8,621,147 at the end of 2022.

Figure 5.5. shows the trend in the total number of users over the previous period.

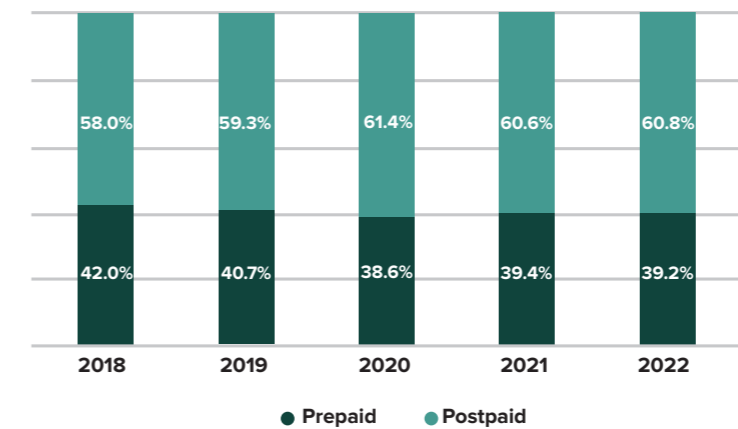
Figure 5.5. Total number of active mobile telephony users (million)



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. After a growth trend that lasted for years, in 2022 the postpaid user take-up increased by 0.2%, amounting to 60.8%.

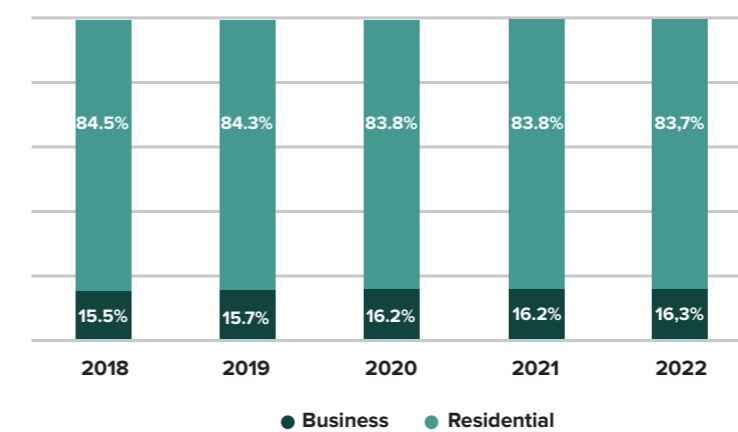
Figure 5.6. Prepaid/postpaid user ratio



Source: RATEL

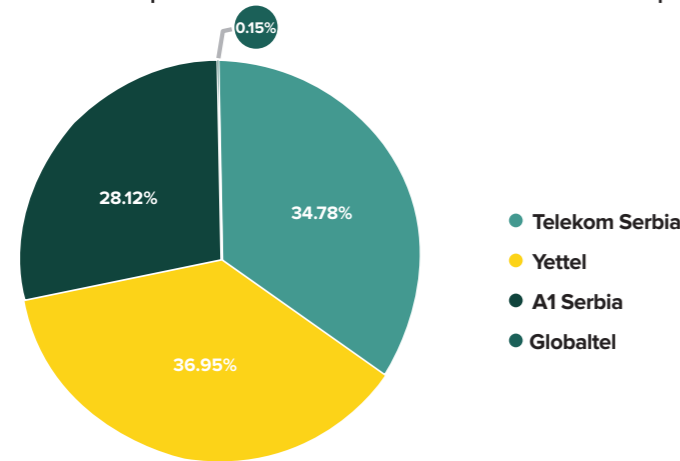
Residential and business ratio is given in Figure 5.7. Residential users are dominant in user structure over the years. In 2022 the share of residential users in the total number of users remained unchanged, with 83.7%.

Figure 5.7. Residential/business user ratio



Source: RATEL

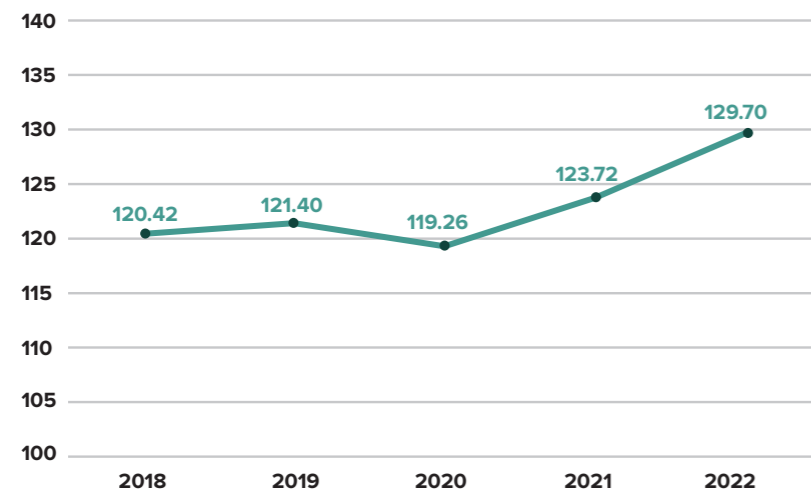
Figure 5.8. Share of operators in the total revenues made from mobile telephony (%)



Source: RATEL

The number of mobile network users is again higher than the number of inhabitants in 2022, the mobile penetration rate being 129.70%, which means that some users are using more than one SIM card.

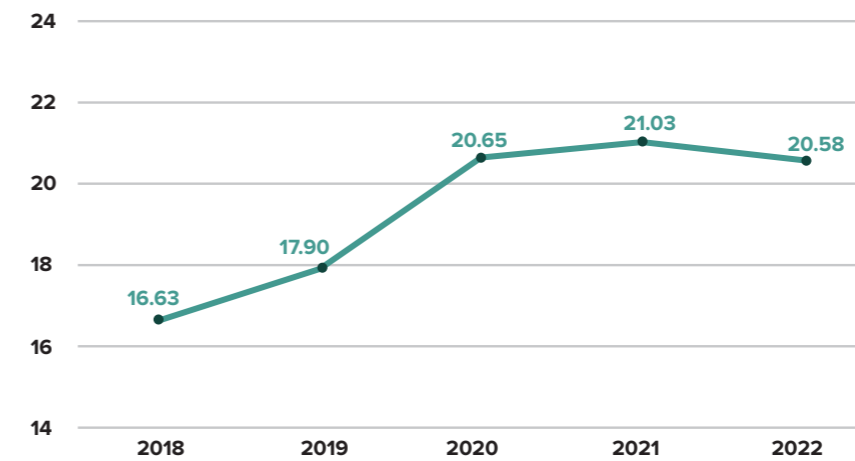
Figure 5.9. Mobile penetration rate



Source: RATEL

The minutes of calls made from mobile networks have been constantly increasing year after year. In 2022, the total outgoing traffic on the mobile network amounted to 20.58 billion minutes, which is an increase of 2.1% compared with the previous year when it amounted to 21.03 billion minutes. The annual average of traffic per user in 2022 was 2,391 minutes or approximately 6 minutes and 33 seconds a day.

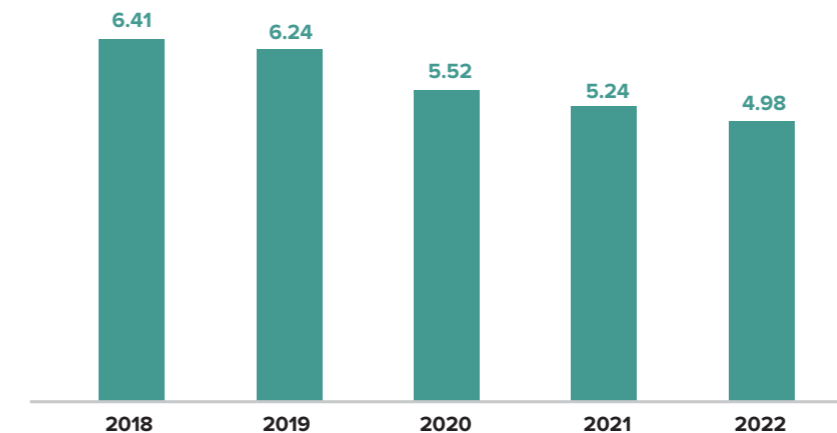
Figure 5.10. Total outgoing traffic (billion minutes)



Source: RATEL

The number of sent text messages continued to decrease. In 2022, the total of 4.98 billion SMS messages were sent, which is a decrease by 5% compared with 2021 when 5.24 billion SMS messages were sent. The average number of text messages sent in 2022 per user was 579, or 1.6 SMS messages a day. In 2022, residential users accounted for 86% of SMS messages.

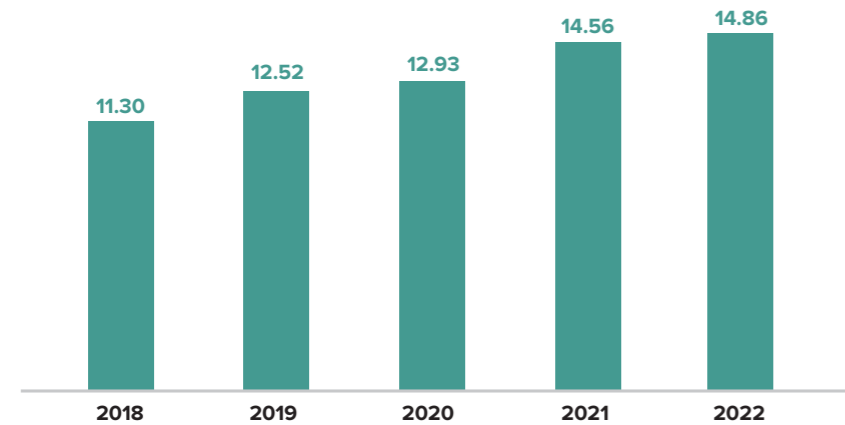
Figure 5.11. Number of sent text (SMS) messages (billion)



Source: RATEL

The number of MMS messages showed an increase for a fourth year in a row. In 2022, 14.86 million MMS messages were sent, which is a 2.1% increase in respect to 2021. In 2022, residential users accounted for 83.4% of MMS messages.

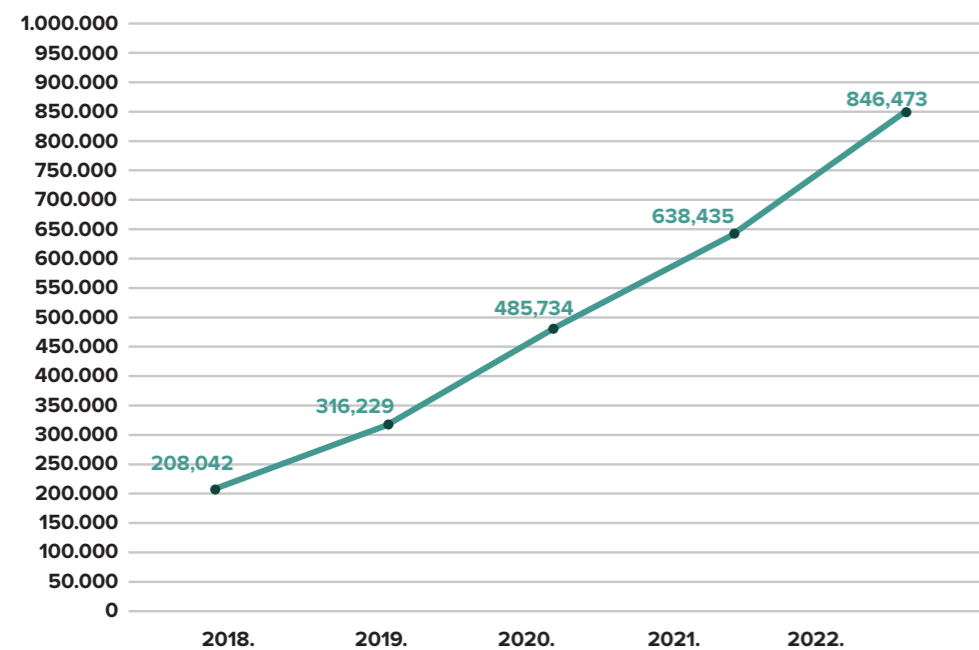
Figure 5.12. Number of MMS messages sent (million)



Source: RATEL

Data traffic has been constantly growing during the observed period (Figure 5.13). In 2022, the volume of the transmitted data increased by around 33%.

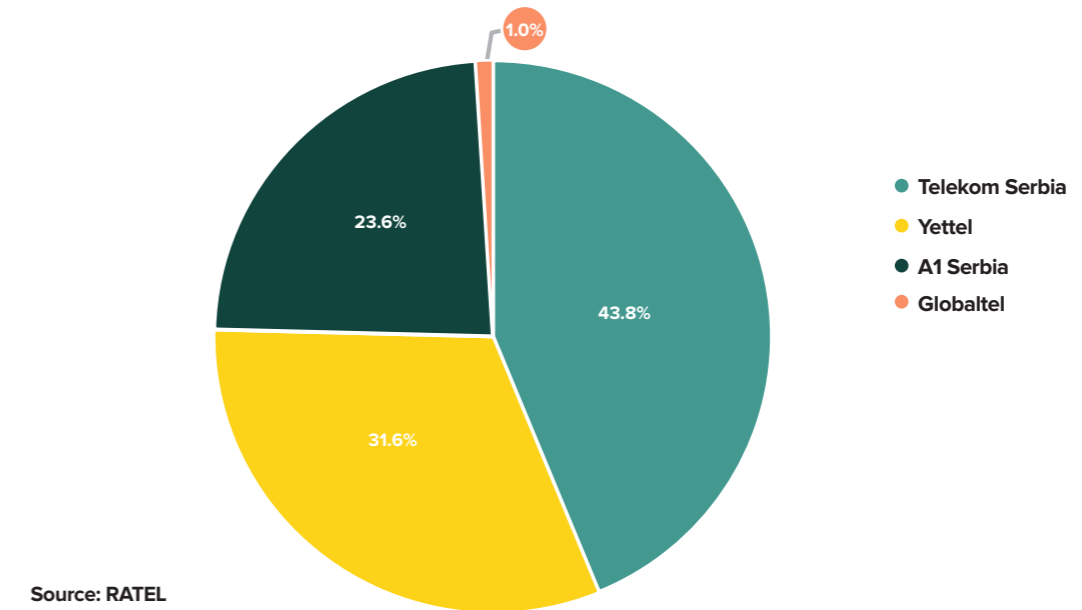
Figure 5.13. Data traffic in TB (GPRS+UMTS+LTE)



Source: RATEL

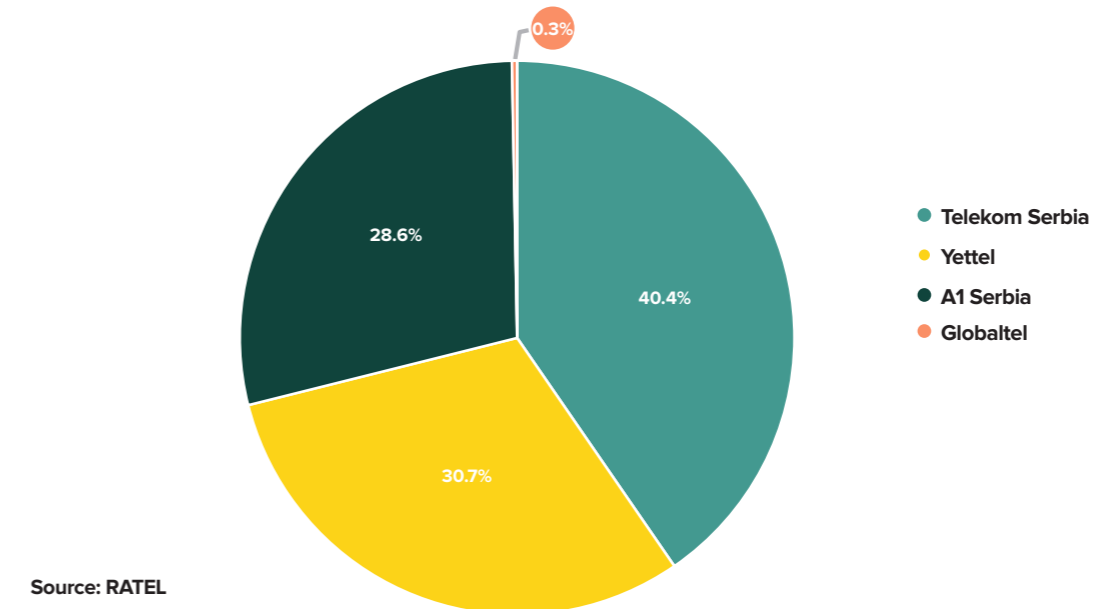
Figures 5.14– 5.18 show market share of the mobile operators and MVOs in terms of total number of users, outgoing traffic, number of text and multimedia messages (SMS and MMS) sent and the volume of data traffic made.

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



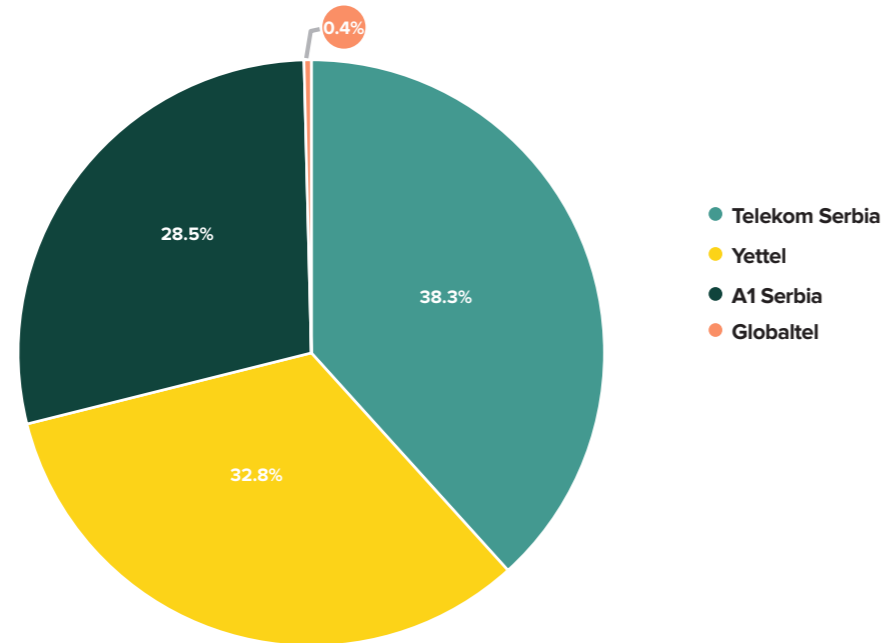
Source: RATEL

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



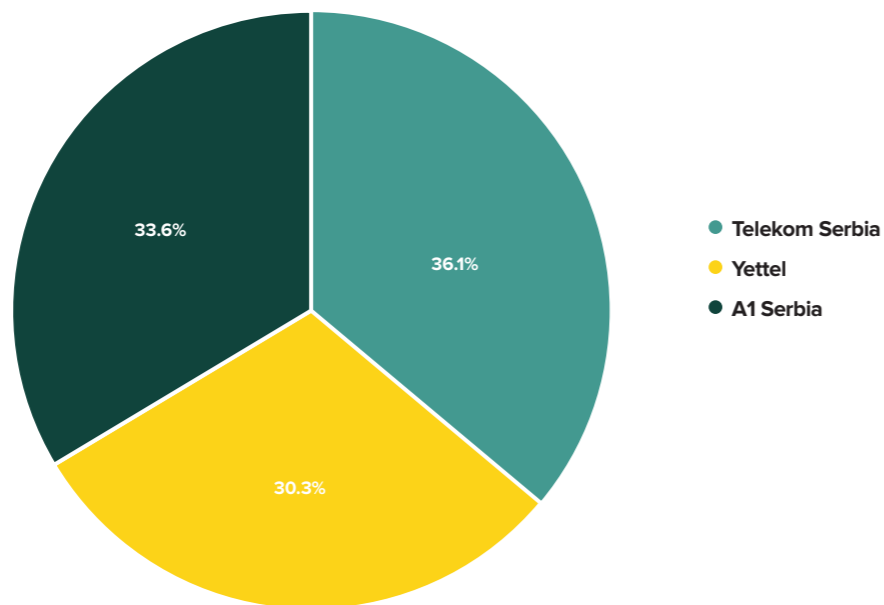
Source: RATEL

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



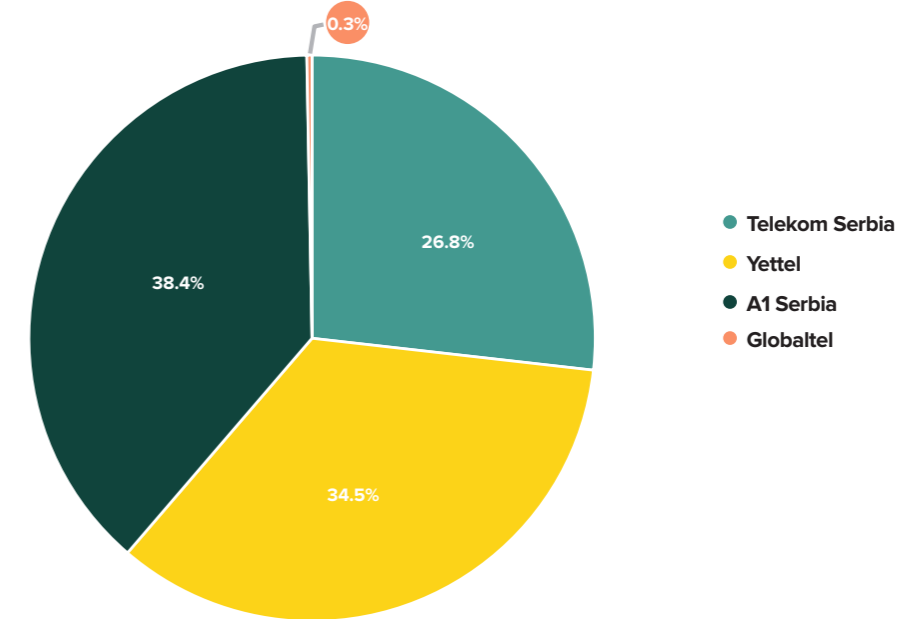
Source: RATEL

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



Source: RATEL

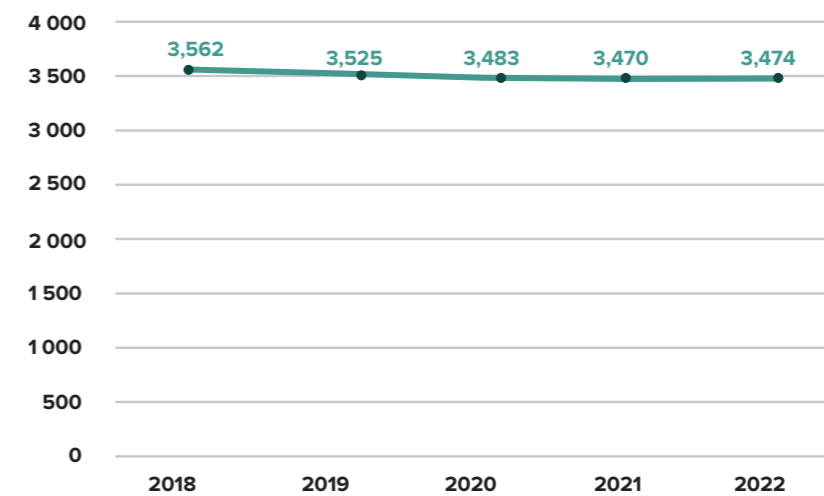
Figure 5.18. Share in data traffic (GPRS+UMTS+LTE) (%)



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.

Figure 5.19. HHI values

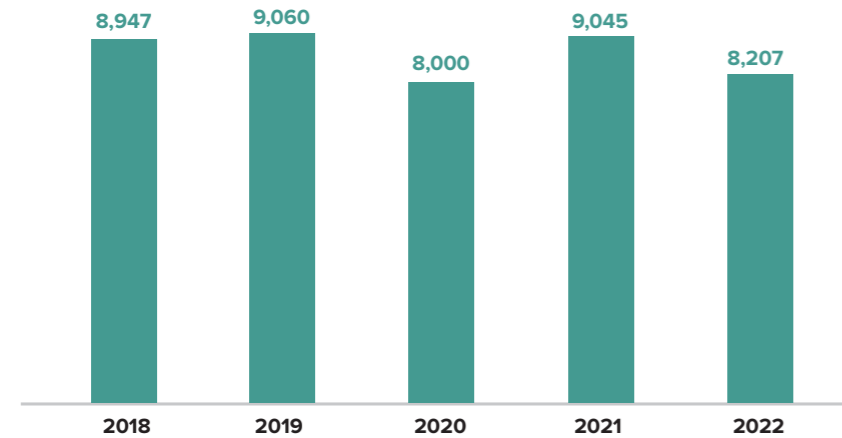


Source: RATEL

The value of HHI for 2022 increased slightly, indicating a higher market concentration and a drop in the level competition.

The average number of ported mobile numbers increased by 9.3% in respect to the previous year, with an average number of 8,207 ported numbers per month in 2022.

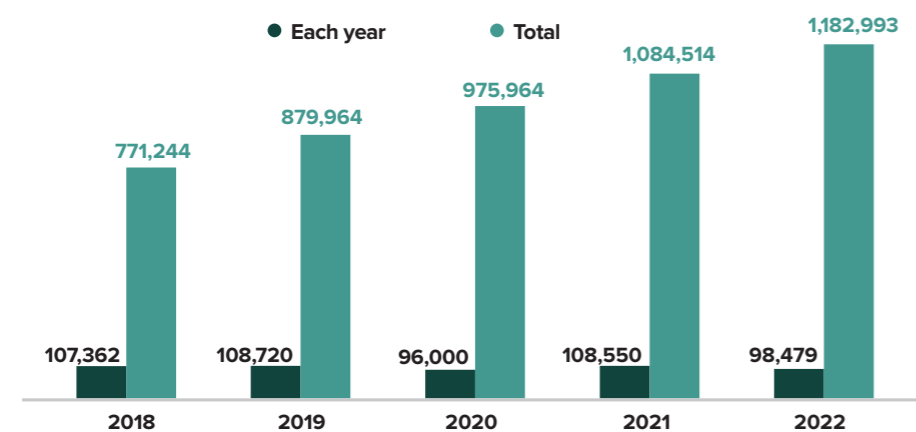
Figure 5.20. Average number of portings on mobile network a month for each year



Source: RATEL

In 2022, around 98,479 numbers were ported on mobile networks, reaching the total of 1,182,993 ported numbers since the beginning of number portability service.

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

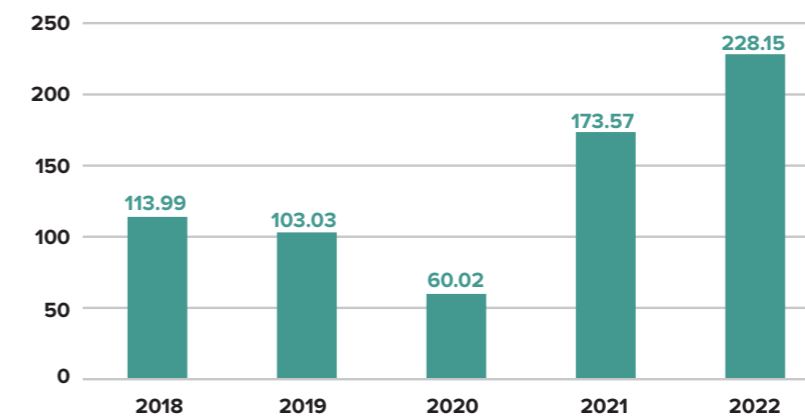


Source: RATEL

In addition to the national traffic, users also generate roaming traffic abroad. Voice traffic abroad followed a downtrend over the first three years of the observed period, mainly due to the use of VoIP applications. Another reason for the significant drop in 2020 was the COVID-19 pandemic which led to a decrease in the volume of

roaming service usage. However, over the last two years of the observed period, roaming traffic has increased significantly mainly as a result of the “roam like at home” principle applied in the Western Balkans region as of 1 July 2022, whereby all surcharges have been abolished, so that the regulated voice, SMS and data traffic in roaming are charged in accordance with the domestic retail pricelists.

Figure 5.22. Number of roaming minutes (million)

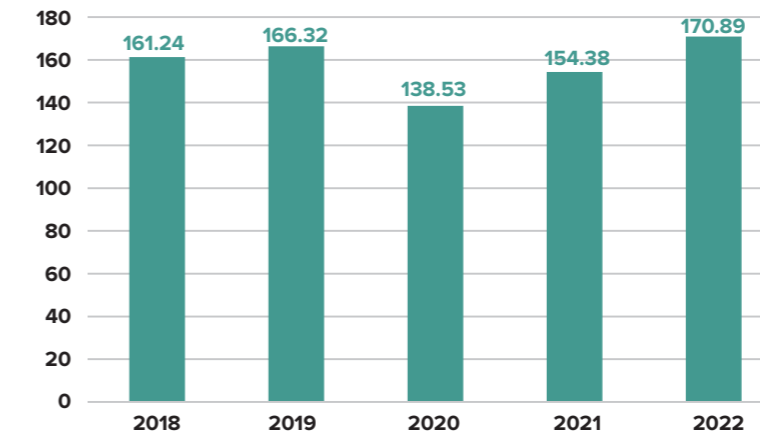


Source: RATEL

In addition to voice traffic, the subscribers also use mobile Internet abroad and according to the available data for 2022, there were 3394 TB of roaming mobile Internet traffic made. In addition, 47 million text (SMS) messages were sent.

In addition to the users of the national networks, foreign network subscribers also generate voice traffic that had varied in terms of volume over the years, but has lately been marked by an uptrend.

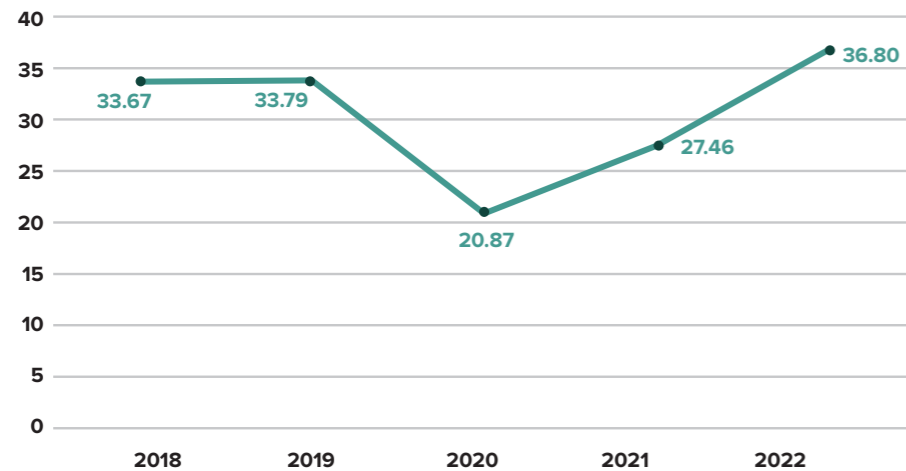
Figure 5.23. Number of roaming minutes made by foreign subscribers (million)



Source: RATEL

The revenues made from roaming, which include revenues made from outbound roaming and revenues made from inbound roaming, have followed a slight downward trend for several years. In 2022, there was a significant increase, by 34%.

Figure 5.24. Roaming revenues (mil. EUR)



Source: RATEL

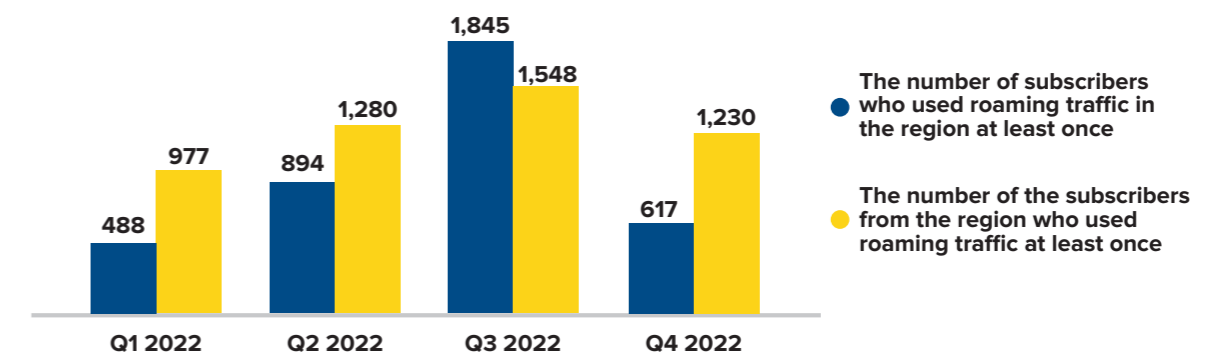
REGIONAL ROAMING

6.

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 communications 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 lasted until 30 June 2021, as of 1 July 2021 all surcharges were to be abolished and regulated calls, SMS and data transfer in roaming were to 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 number of visitors from the region using roaming, which outnumbers the national network subscribers using roaming in the region (with the exception of Q3).

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



Source: RATEL

Comparative data for all four quarters of 2022 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 service show that prepaid users generate more outgoing calls minutes compared to incoming calls, which indicates active usage of roaming voice services in 2022 (Figures 6.2 and 6.3)

Figure 6.2. Roaming outgoing calls made by prepaid users in the region (million minutes)

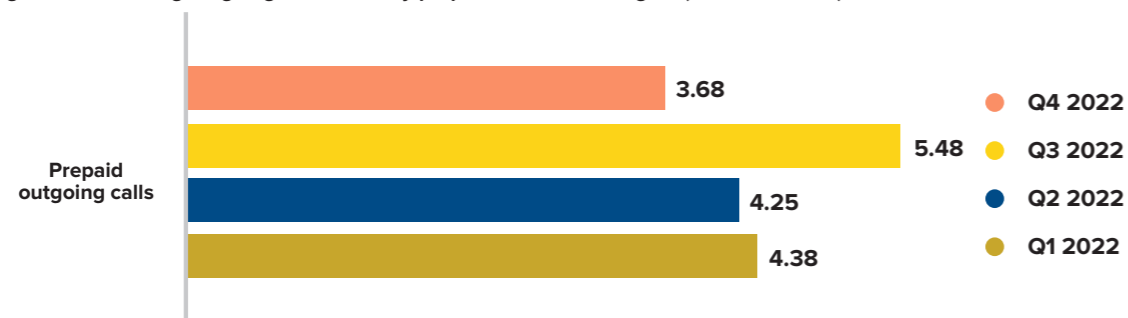
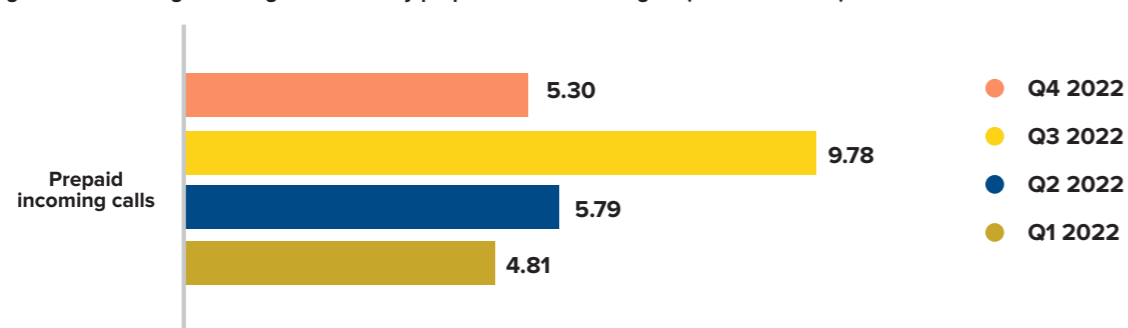


Figure 6.3. Roaming incoming calls made by prepaid users in the region (million minutes)



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 2021 (Figures 6.4 and 6.5).

Figure 6.4. Roaming outgoing calls made by postpaid users in the region (million minutes)

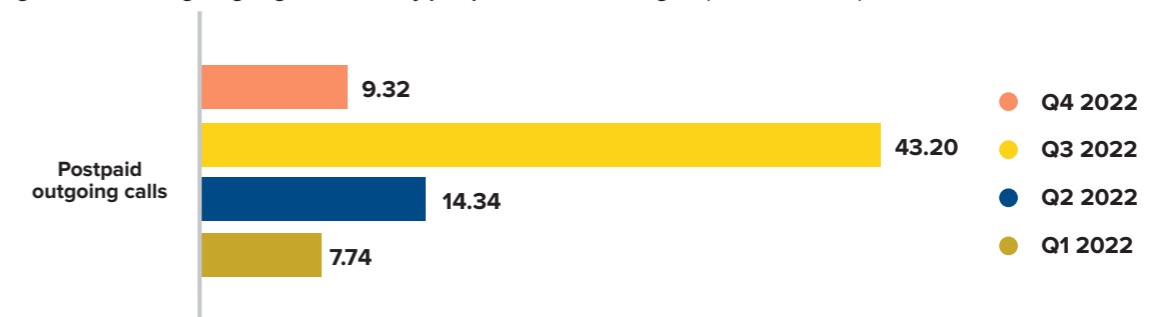
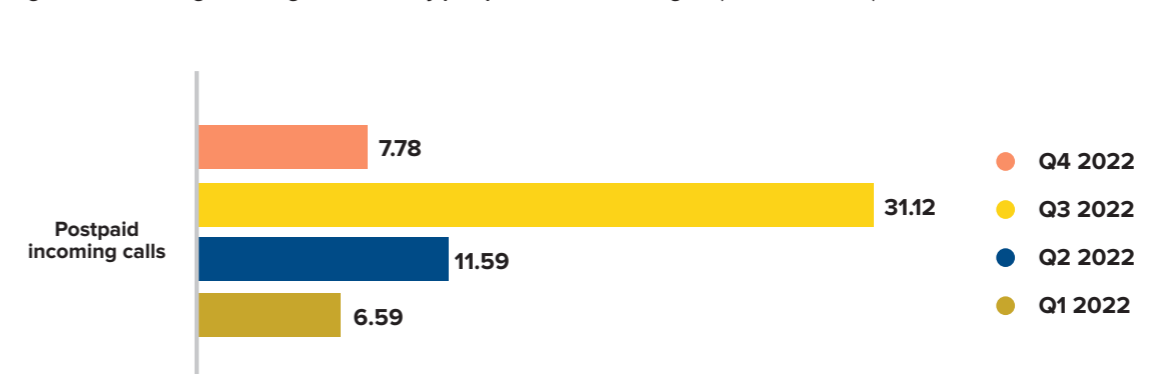
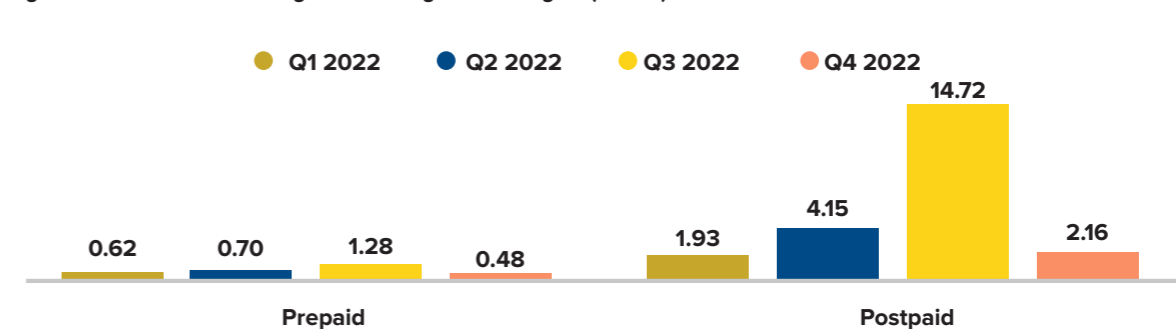


Figure 6.5. Roaming incoming calls made by postpaid users in the region (million minutes)



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

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



Both prepaid and postpaid users used roaming data transmission the most during the third quarter of 2022 (Figures 6.7 and 6.8).

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

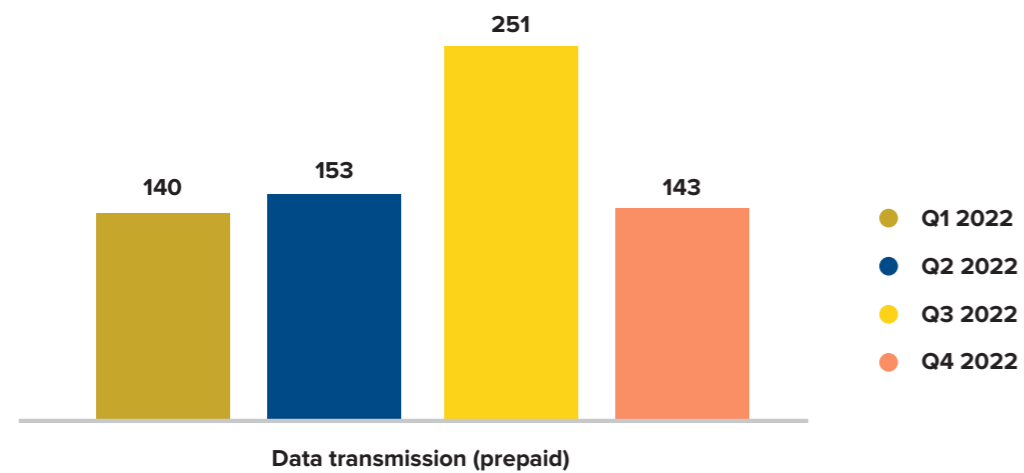
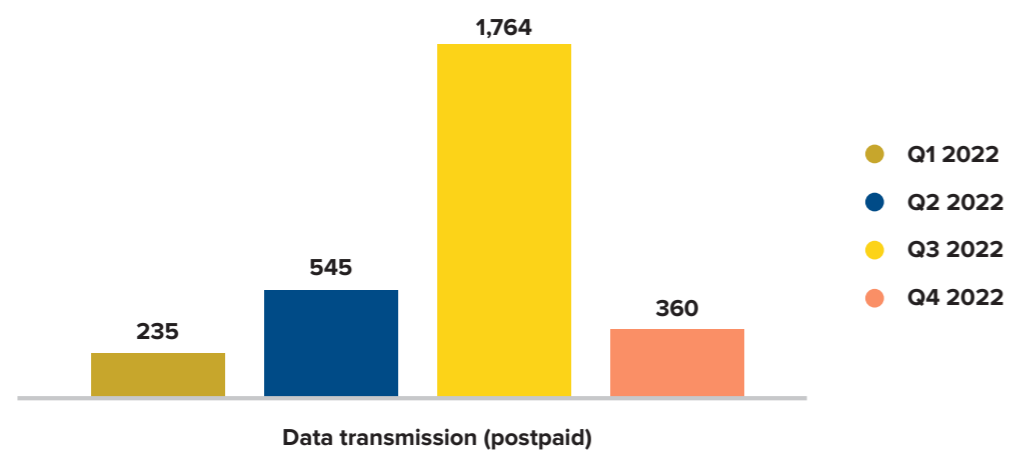


Figure 6.8. Roaming data traffic made in the region - postpaid (TB)



The data illustrating the trend of revenues made from roaming do not include the revenues made from tariff additions.

The revenues made from outgoing roaming calls provided to prepaid users in the region are higher than the revenues made from incoming roaming calls, as given in Figures 6.9. and 6.10. The lowest revenues from outgoing calls were made in Q4 2022, while the lowest revenues from incoming calls were made in Q1 2022.

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

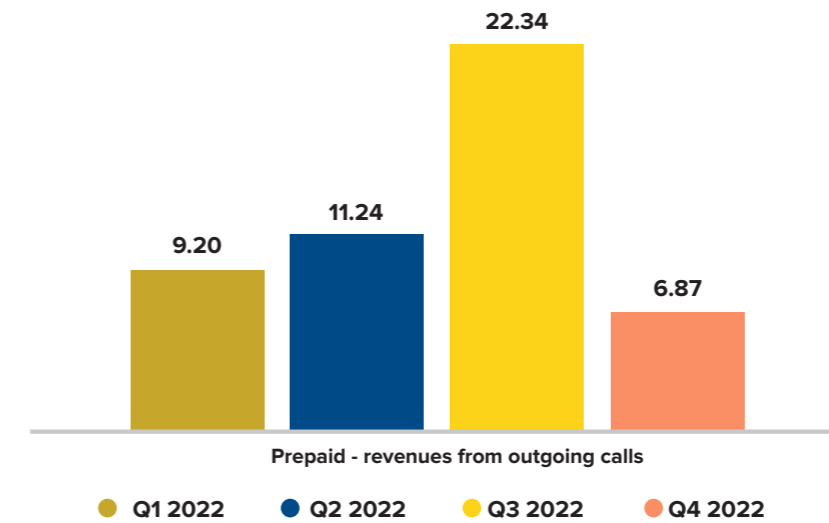
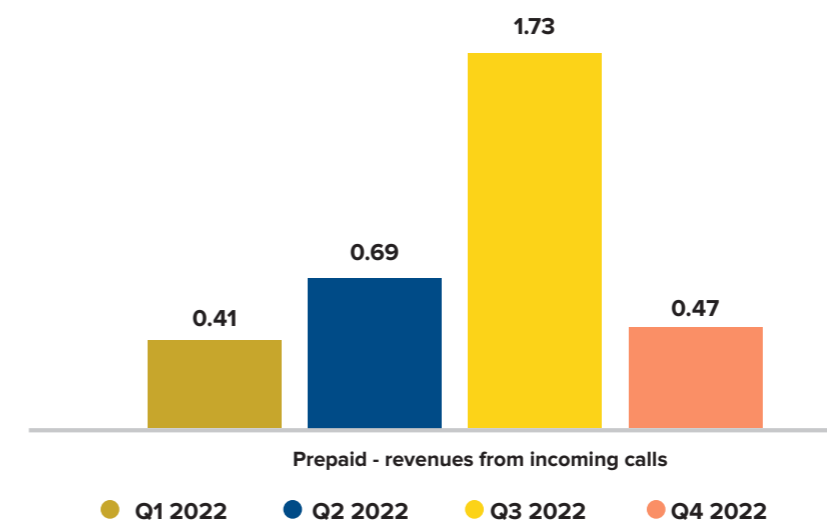


Figure 6.10. Revenues made from incoming roaming calls provided to prepaid users in the region (mil. RSD)



The revenues made from outgoing roaming calls provided to postpaid users in the region are given in Figure 6.11, whereas the revenues made from the incoming roaming calls are rather low, as given in Figure 6.12.

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

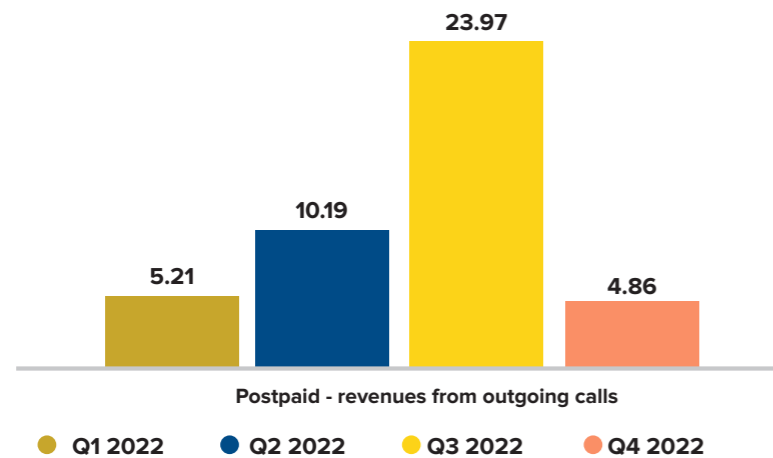
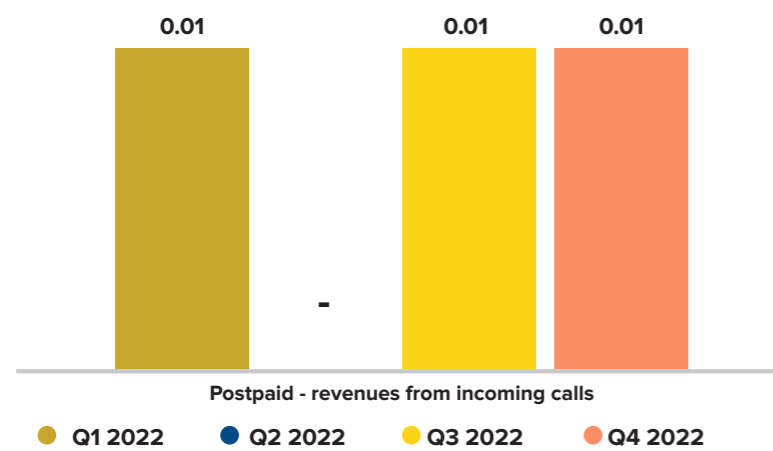
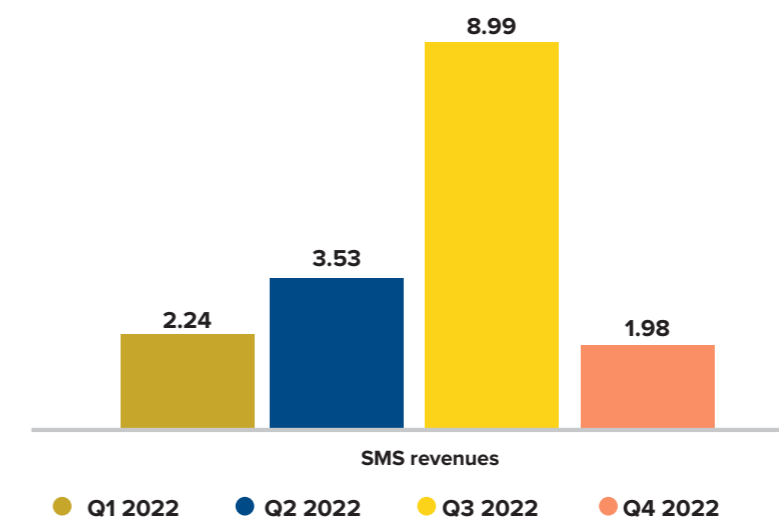


Figure 6.12. Revenues made from incoming roaming calls provided to postpaid users in the region (mil. RSD)



Revenues made from SMS roaming were highest in Q3 2022, during the holiday season when people travel more to the region (Figure 6.13).

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



The revenues made from data roaming generated by postpaid users in the region are significantly higher in all four quarters of 2022, compared to the revenues made from data roaming provided to prepaid users. Data roaming was most used during Q3 2022 and the revenues made from providing the service to postpaid users were significantly higher than the revenues generated by prepaid users (Figures 6.14. and 6.15).

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

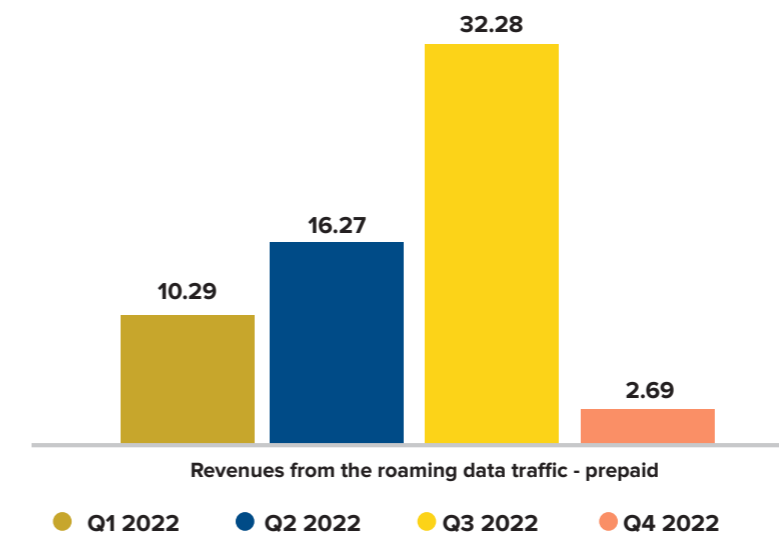
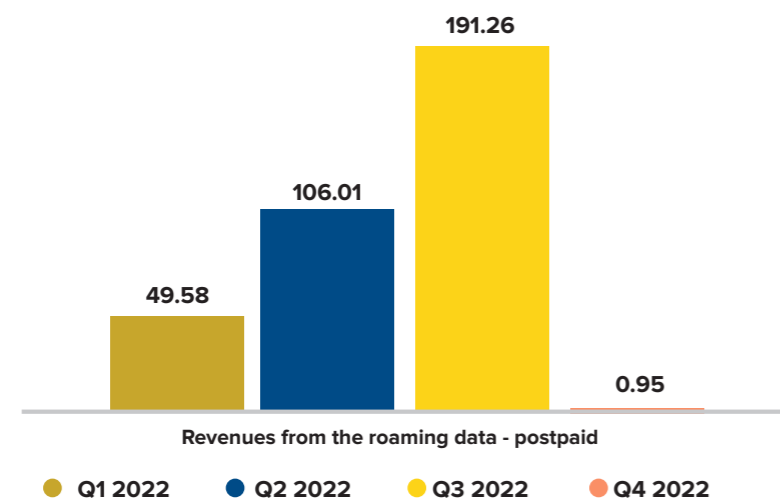


Figure 6.15. Revenues made from the roaming data in the region – postpaid (mil. RSD)



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.

BROADBAND INTERNET SERVICES

7.

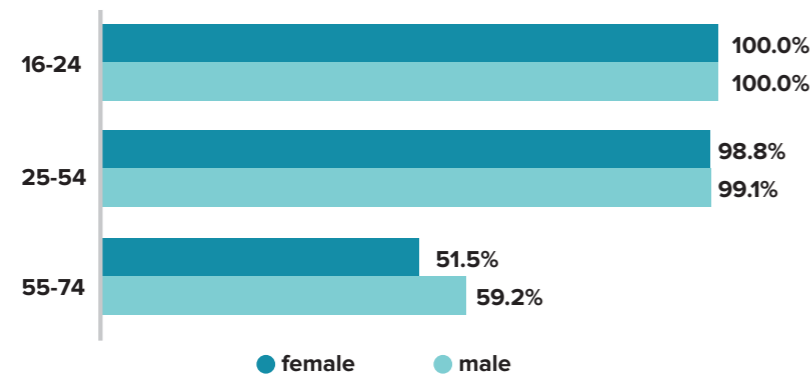
The broadband market in Serbia has been experiencing a significant growth for years, which continued in 2022. In addition to the rise in the total number of users, an uptrend is seen in the demand for the high-rate internet packages. We have witnessed the rise and expansion of the Internet of Things (IoT) in the past decade. Our world is becoming increasingly connected, from smartphones and tablets to home devices. Average global internet speed is increasing, the demand for capacity is on the rise and new application requiring higher speeds keep on appearing. Video streaming has become one of the services requiring the greatest bandwidth and is likely to continue growing, as the quality of video is constantly being improved and video content is displayed on large screen TV sets. 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.

According to the survey on ICT usage by individuals, households and business, carried out in 2022 by the national Statistical Office on the sample of 2,800 households and 2,800 individuals, the number of internet users remained the same as in the previous year, as eight out of ten persons in Serbia have used the Internet in first quarter of 2022.¹

The Internet was most used by the youngest population (16 – 24 years) and equally used by male and female population. In 2022, the share of respondents from younger population who have an account on the social networks, such as Facebook and Twitter, was 97%.

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.

Figure 7.1. Internet users by gender and age

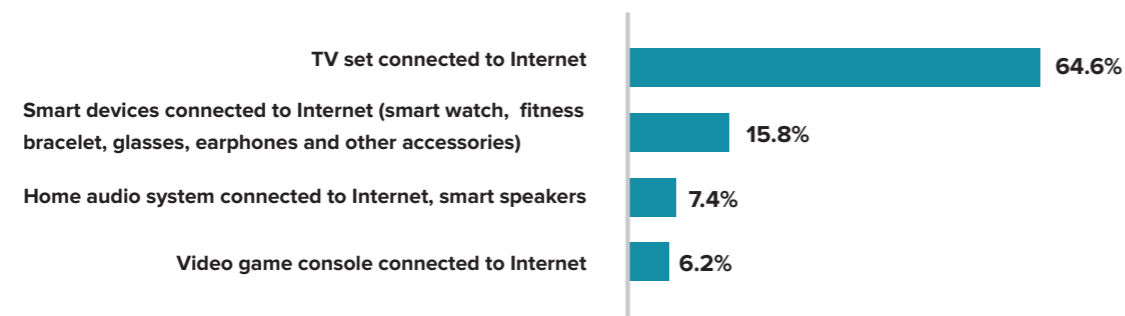


Source: Statistical Office of the Republic of Serbia

It would be hard to imagine life without telecom systems and the Internet and it seems that this is just the beginning of the technological advantages of modern digital era. Internet access has become a constant in our everyday life, and its importance for 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.

Internet of Things (IoT) is a new area, developing fast. IoT technology enables connecting a 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 15.8% of the respondents accesses the Internet via devices such as smart watch, fitness bracelet, glasses, earphones and other accessories. TV set connected to Internet was used by 64.6% of the respondents. This is particularly common for the younger population (16-24) where more than 73.8% of the respondents used this access mode.

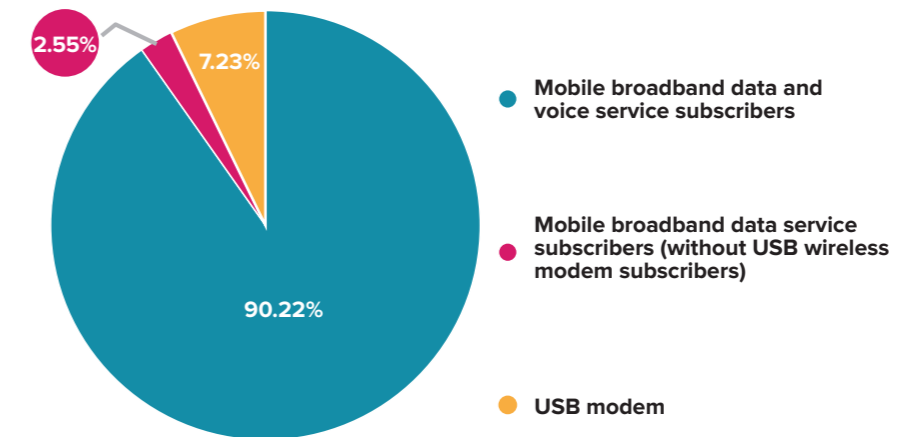
Figure 7.2. Mobile devices used for internet access



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 users of the mobile internet service provided in 2022 by three mobile operators: Telekom Srbija, Telenor and A1, and one virtual mobile network operator - Globaltel.

Figure 7.3. Mobile broadband user structure

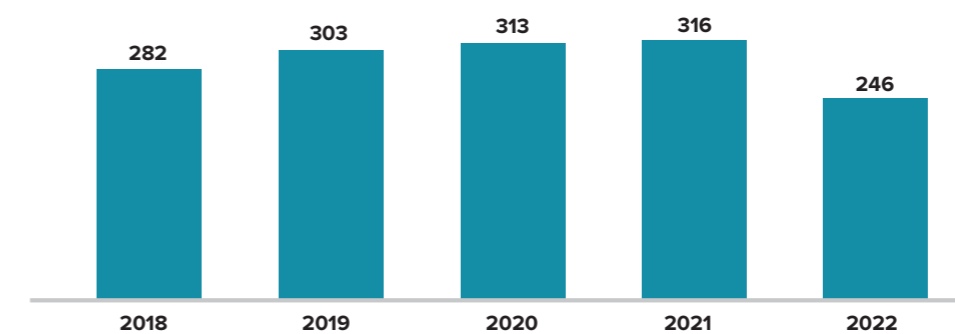


Source: RATEL

The total number of active mobile broadband users in 2022 was 7.3 million, including the subscribers of mobile broadband data and voice service, data service only and subscribers using USB wireless modem for the internet access. This is a 2.8% increase compared to 2021, when the number of active broadband users was around 7.1 million. Data show that the number of subscribers who purchased mobile broadband internet services independently of voice services increased by 6.3% compared to the previous year.

It should be noted that the number of M2M subscriptions, amounting to 246 thousand in 2022, dropped by 22% year on year.

Figure 7.4. Number of M2M subscriptions (thousand)

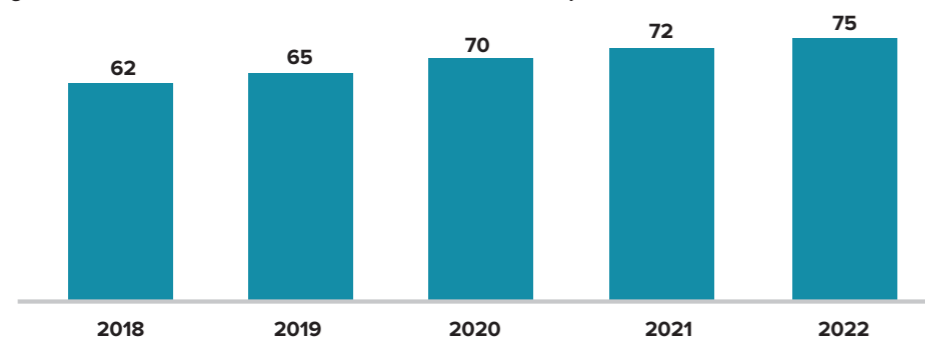


Source: RATEL

The increase in the number of users resulted in the increase in the traffic volume, which is 1.3 times bigger compared with the previous year, amounting to 825 million GB on an annual level for entire UMTS and LTE traffic (the traffic includes mobile internet users, via cell phones and modems). LTE had a 94% share in the total traffic in 2022. As expected, the increase in the total traffic is the result of the increase in LTE traffic, whereas UMTS dropped by 14.8%.

The bestselling mobile internet package for private postpaid users offered 150 GB of data transmission at the price of 1,249 dinars.

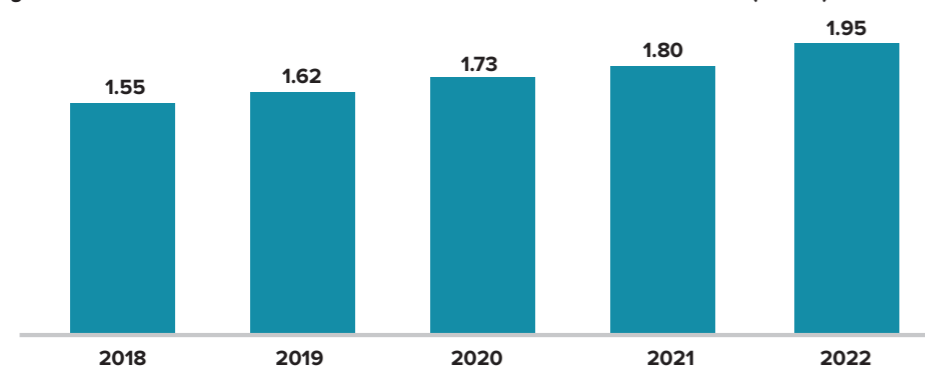
Figure 7.5. Number of fixed broadband internet subscribers per 100 households



Source: RATEL

In 2022, seventy-five out of one hundred households (75.3%) had fixed broadband access. The total number of fixed broadband subscribers in 2022 was 1.95 million, which is an 8.33% increase compared with the previous year (Figure 7.6).

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



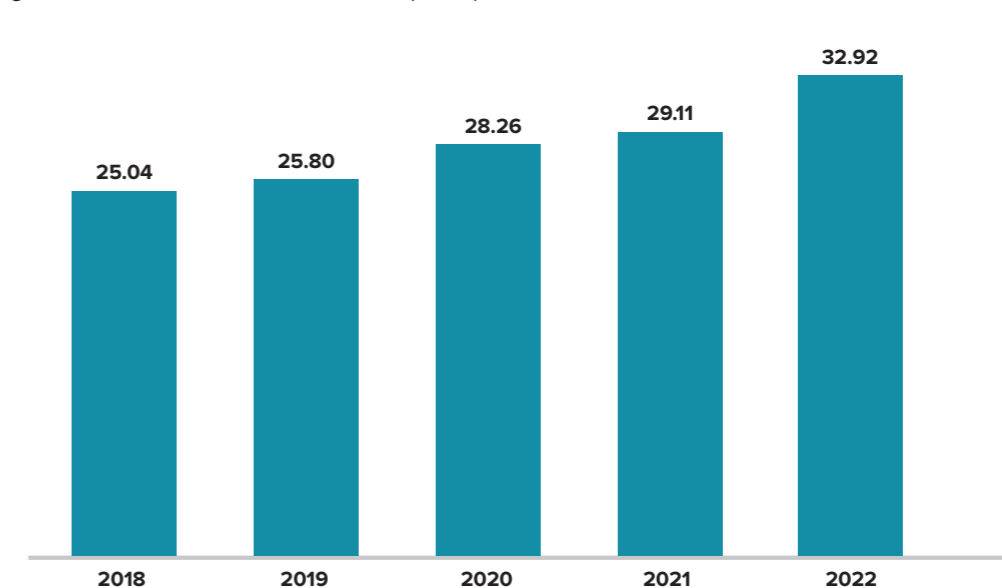
Source: RATEL

In terms of technology used, based on the available data, the biggest percentage increase of 47% was seen in the number of broadband users with FTTH (Fiber to the Home) or FTTB (Fiber to the Building) fibre-optics internet

access, corresponding to 26% of the total number of users. 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 0.2% rise in the number of users accessing the Internet over coaxial cable network. The number of users of xDSL decreased by 2%, following a downtrend six years in a row. xDSL subscriber structure changed significantly with a significant increase of the number of users of VDSL technology that account for 62% of the total number of xDSL users. However, in 2022 for the first time there was a decrease in the number of VDSL users, of 2.4%.

The increase in the number of users is reflected in the increase in the revenues from fixed broadband Internet, which rose by 13% compared to 2021 (Figure 7.7).

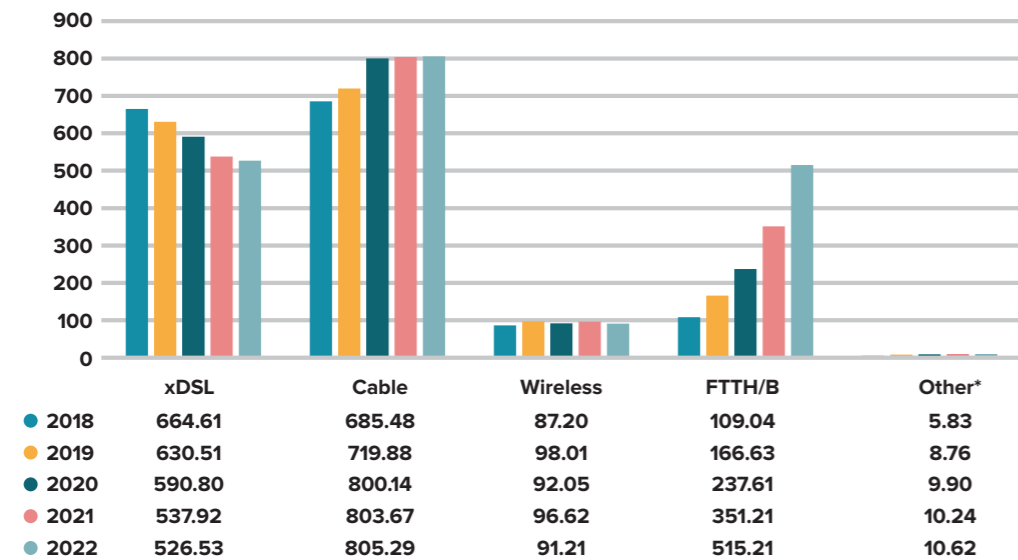
Figure 7.7. Revenues from fixed broadband (billion)



Source: RATEL

The coaxial cable infrastructure is, for the fifth year in a row, the most widely used access technology with 42% of the total number subscribers, followed by xDSL infrastructure with 27% of users (Figure 7.8).

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



* Ethernet, LAN

Source: RATEL

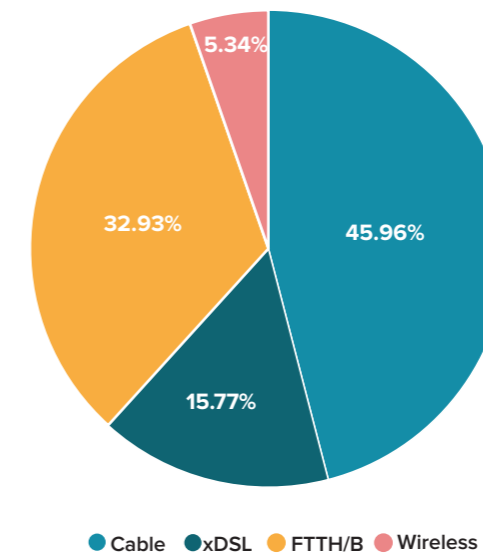
The availability of high-speed Internet is important to ensure a high-quality access to internet content, including the content generated by end-users (various services and information). The Internet was most used for voice/video calls (90.9%), online messaging using Skype, Messenger, WhatsApp and Viber (89%), and social networks (Facebook, Twitter) (81.9%).

In 2022, the revenue made via coaxial cable infrastructure equalled 45.96% of the total revenue made from broadband access, showing a slight decrease compared with the previous year.

A significant drop in the revenue share is seen in the services provided via xDSL. In terms of the number of users, this access comes right after the coaxial cable access which means that it remains widely used, however the drop in the revenue share is a result of the low speed provided using this technology, at lower prices. The share in the revenue from services provided via xDSL technology in 2022 was 15.77%.

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 FTTH/B infrastructure, with a 32.93% share in 2022 (Figure 7.9).

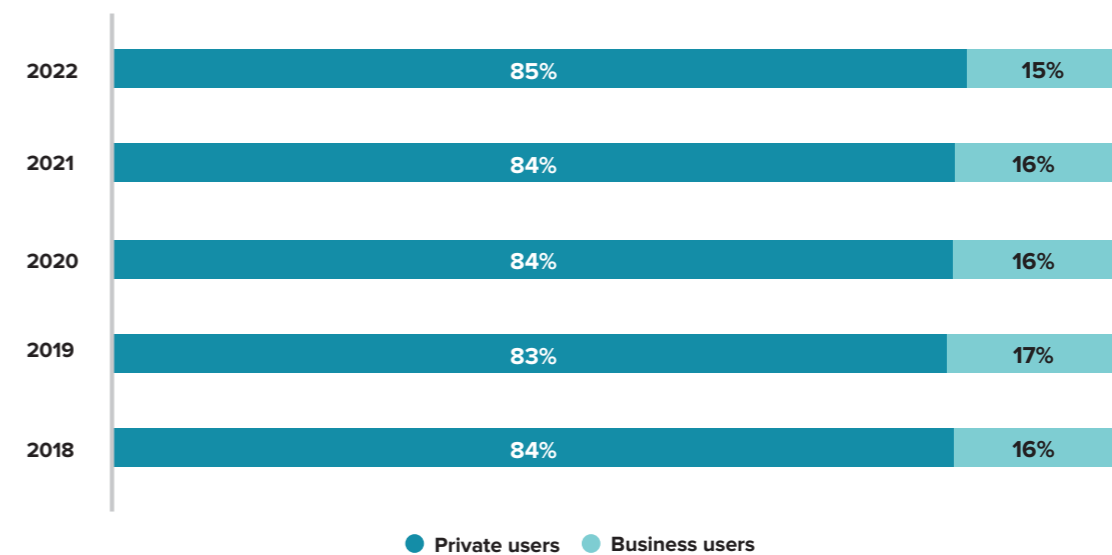
Figure 7.9. Structure of revenues made from fixed broadband, by access technologies



Source: RATEL

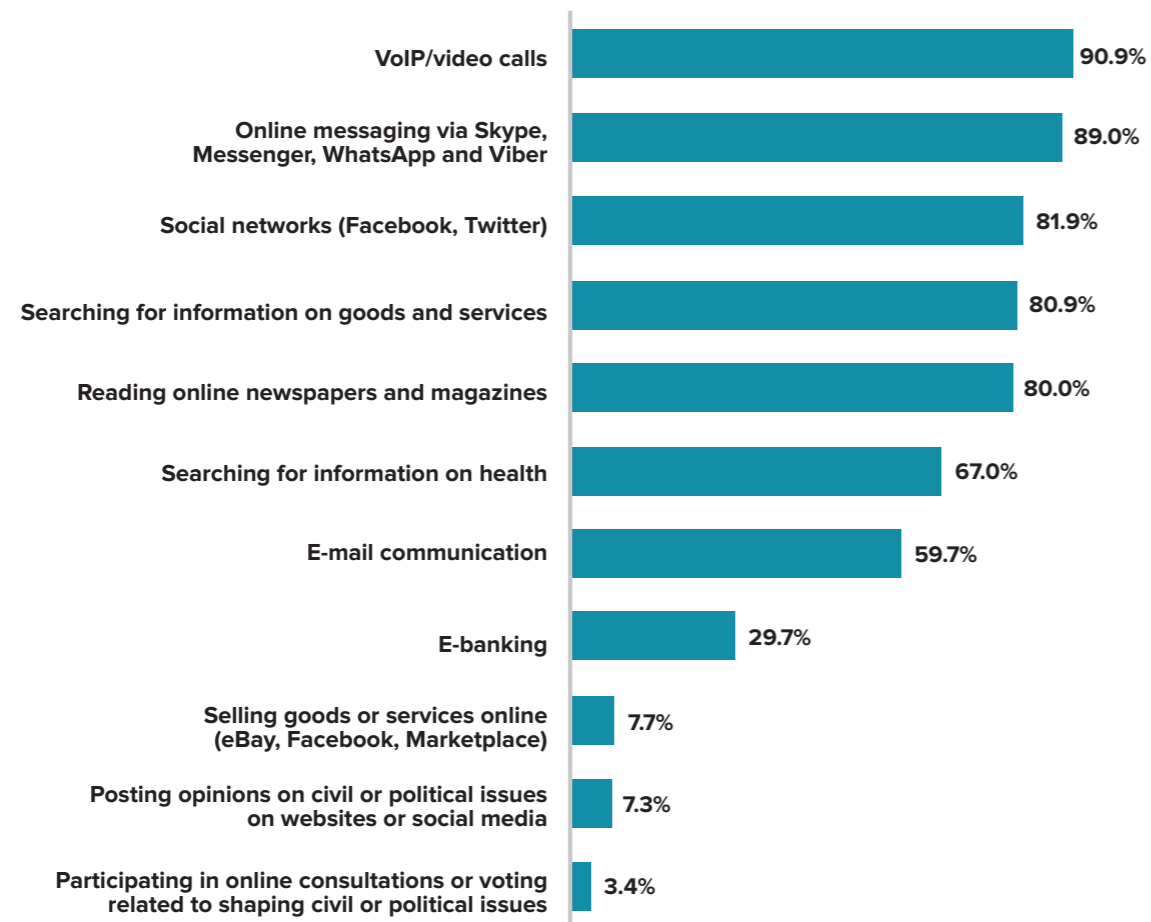
The revenues from fixed broadband access provision to business users had a similar distribution as in the previous years, corresponding to 15% in 2022. The share of private and business users in the total revenues made in the past 5 years is illustrated in Figure 7.10.

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



Source: RATEL

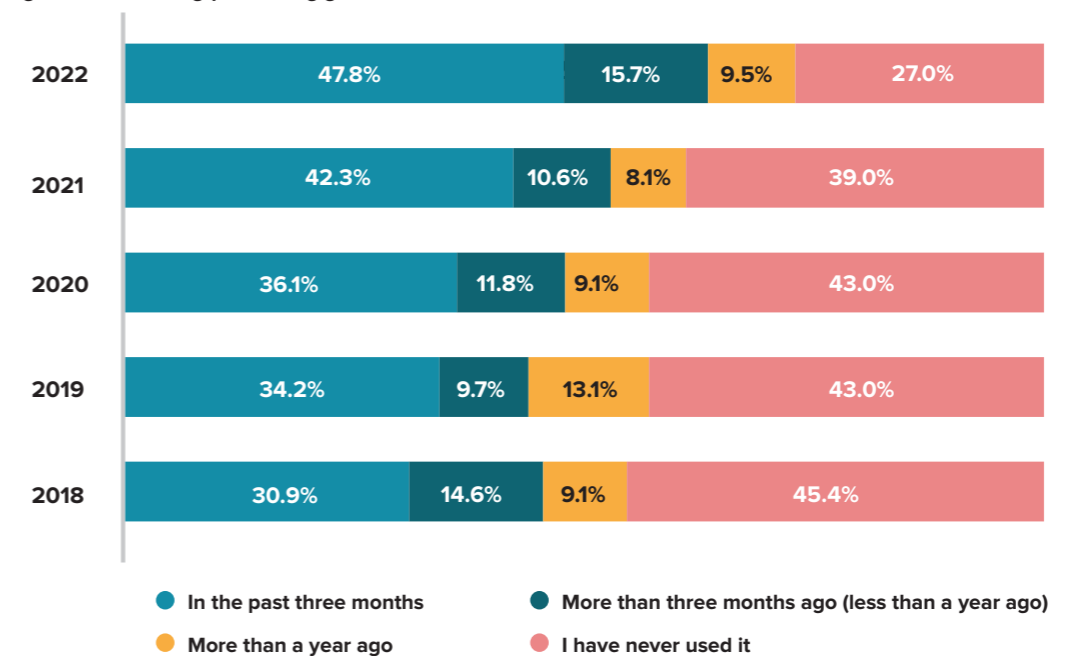
Figure 7.11. Types of internet usage for private purposes



Source: Statistical Office of the Republic of Serbia

The technological developments are changing user habits. Online purchase of goods and/or services has been growing over the past years. The growth trend continued in 2022 and the changes in the habits of individuals regarding online purchases over the last 5 years can be seen in Figure 7.12.

Figure 7.12. Ordering/purchasing goods or services online



Source: Statistical Office of the Republic of Serbia

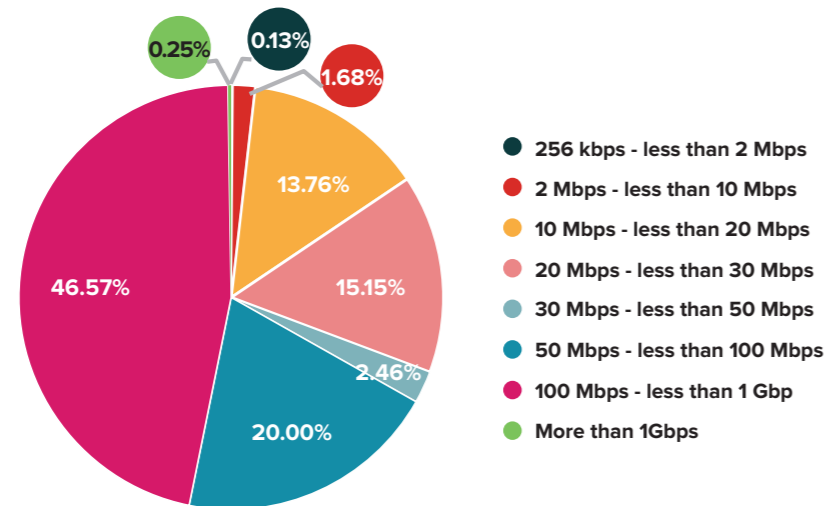
Although the number of fixed broadband users has been significantly increasing over the past years, fixed broadband can considerably differ in terms of speed, which affects the quality and the functionality of the internet access. Changes in user habits, increased number of users accessing video streaming 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, in 2022 the internet packages offering 20 Mbps were the most sold, at the price ranging between 890 and 2,599 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, and helps create and introduce regulatory measures targeted at bridging the digital divide.

According to available data there is an increasing demand for high-speed packages on fixed broadband market. The share of users who used the packages of at least 50 Mbps but less than 100 Mbps was 20% in 2022. However, there was a significant increase in the share of users for packages of at least 100 Mbps but less than 1 Gbps, which grew from 36% in 2021 to 47% in 2022.

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

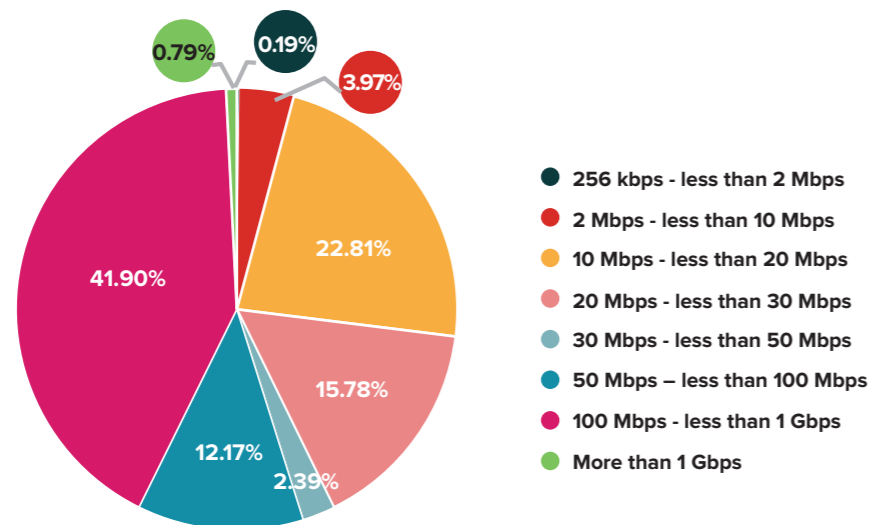


Source: RATEL

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 1,372 dinars for private users and 3339 dinars for business users in 2022, compared to 1,361 dinars for private users and 3,848 dinars for business users in 2021.

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



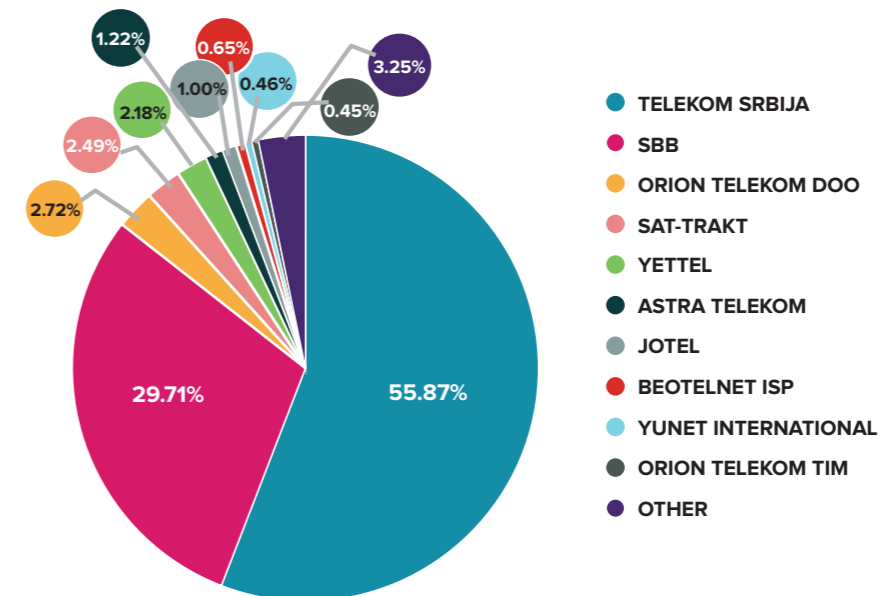
Source: RATEL

Out of the total number of companies with Internet connection, 84.9% have their own website. Remote access to company e-mails is available to 86.5% of employees, while remote access to company documents (files, charts, presentations photos) is available to 63.7% of employees, while 57.2% of them also have remote access to accounting, sales and orders application or CRM system. Number of companies holding online meetings (via Skype, Zoom, MsTeams, Webex) has been growing year after year, reaching 41% in 2022.

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 2022 was around 4.26 billion GB (3.96 EB). The assessed international link capacity usage was approximately 1.55 million Mb/s and the leased international link capacity (lit/equipped) was around 6.2 million Mb/s.

Telecommunications Company “Telekom Srbija” remains to be the largest operator of fixed broadband in the Republic of Serbia in 2022, with a market share of 55.87% in terms of the number of subscribers. Other leading ISPs in the market are: SBB with 29.71% market share, followed by Orion telekom, Sat-Trakt, Yettel, Astra telekom, Jotel, BeotelNet-ISP, Yunet International and Orion Telekom Tim, each of them holding a significantly smaller share compared to Telekom Srbija and SBB. Together, these 10 operators hold 96.75% of the Serbian ISP market in terms of the number of subscribers.

Figure 7.15. Market share of the leading ISPs in 2019



Source: RATEL

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. The data on municipalities were provided by 86 ISPs. Data on penetration rates for Kosovo and Metohija 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.

Table 7.1. Internet penetration rate by districts

District	Penetration rate (%)
Belgrade	104.32
South Bačka	94.01
Srem	76.76
South Banat	74.76
Nišava	72.51
Šumadija	71.14
Raška	70.22
Central Banat	69.37
North Bačka	69.03
Podunavlje	67.23
Braničevo	67.00
Pomoravlje	66.48
Mačva	63.06
West Bačka	62.84
Pčinja	61.20
Kolubara	60.96
Morava	60.52
Rasina	60.26
Bor	56.35
Zlatibor	55.21
North Banat	51.96
Zaječar	51.78
Jablanica	50.29
Pirot	49.90
Toplica	46.35

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. Graphic image on the map of Serbia

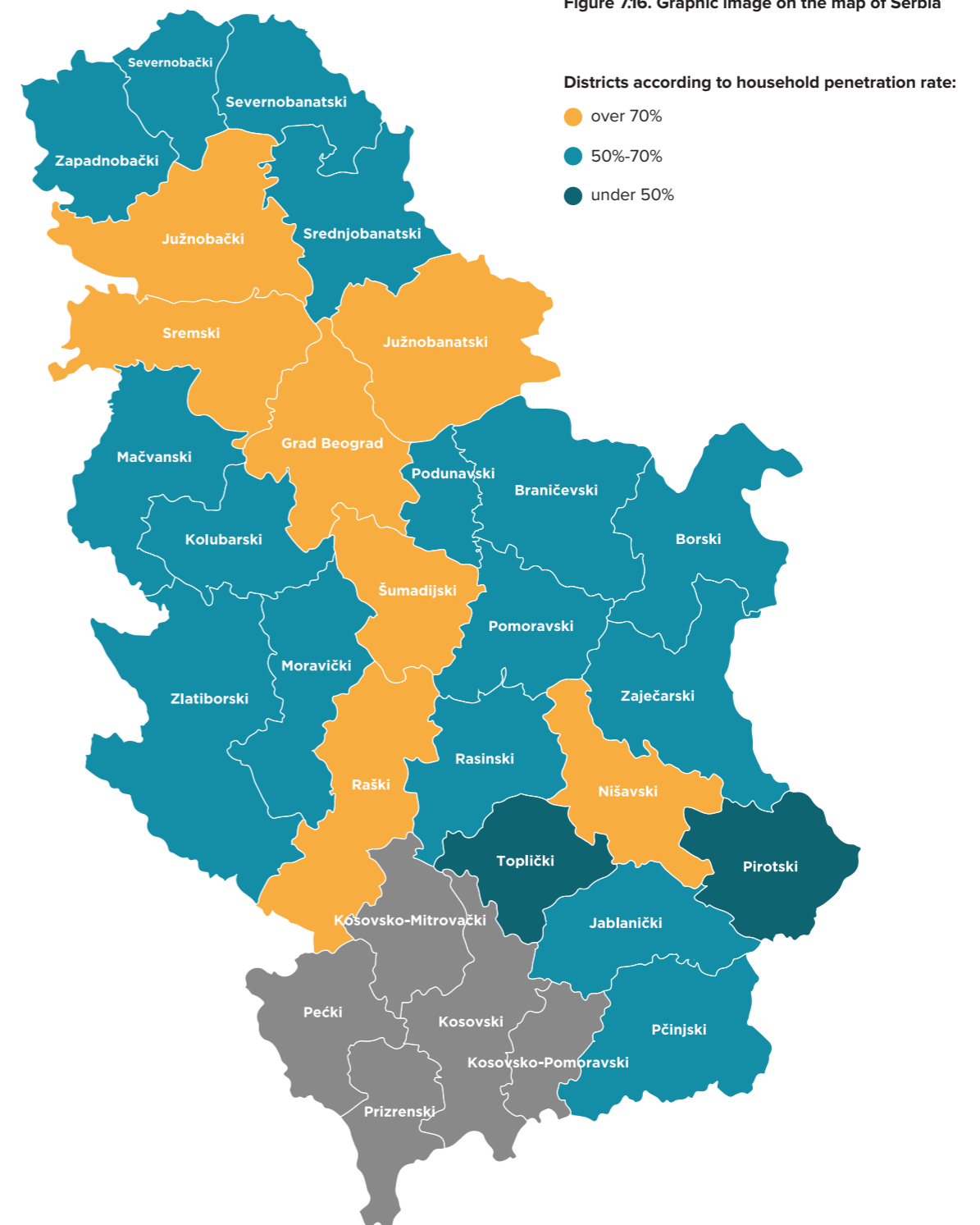


Table 7.2. List of 10 municipalities/cities with the biggest number of subscribers

City/municipality	Penetration (%)
Čajetina	155.63
Novi Sad grad	118.82
Beograd grad	104.32
Pančevo	93.79
Niš	87.88
Požarevac grad	85.83
Stara Pazova	84.00
Veliko Gradište	82.85
Kragujevac	81.62
Sremska Mitrovica	80.40

Table 7.3. Municipalities with internet penetration below 20%.

City/municipality	Penetration (%)
Gadžin Han	19.74
Kučevo	13.05
Bosilegrad	11.10
Trgovište	10.02
Crna Trava	9.32

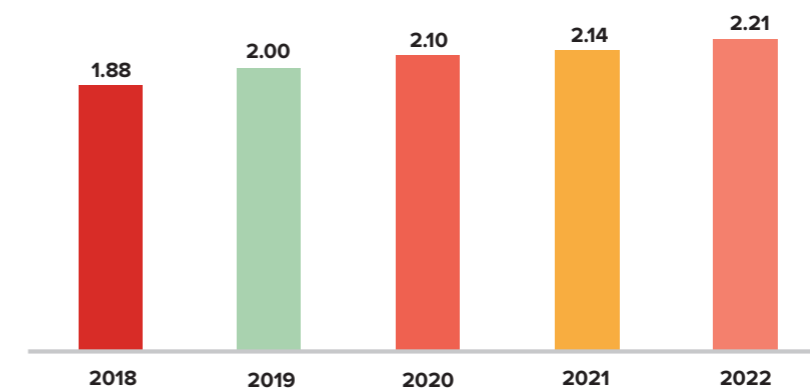
MEDIA CONTENT DISTRIBUTION

8.

In 2022, there were 42 registered media content distribution operators providing the service via cable distribution network (coaxial, hybrid and optical), copper pair network, 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. The company registered since 2016 for the provision of this service in the Serbian market mts Antena TV Ltd. was merged with Telekom Srbija in 2021.

The total number of subscribers of the media content distribution service in 2022 was 2.21 million, which is an increase by 3.6% compared to the previous year, mostly due to the increase of IPTV and DTH subscribers. Approximately 1.62 million subscribers used the service of media content distribution within a package (bundled service), usually combined with broadband access and/or fixed telephony.

Figure 8.1. Total number of subscribers (in million)



Source: RATEL

The penetration was 33.32% in terms of population and 85.53% in terms of the total number of households.

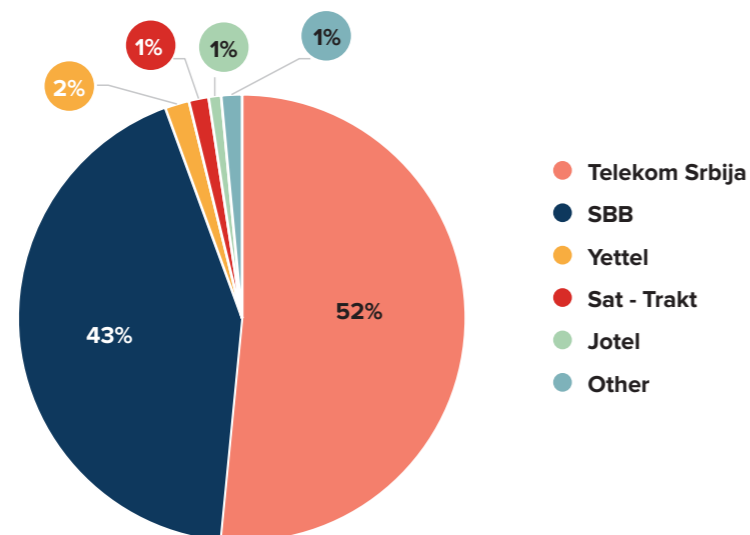
Figure 8.2. Household penetration (in %)



Source: RATEL

The largest media content distribution operator in the Republic of Serbia in 2022 was Telekom Srbija, Joint Stock Co., with a market share of 52%, in terms of number of subscribers. Serbia Broadband – Srpske kablovske mreže Ltd. (SBB Ltd.), accounted for around 43% of the market share in 2022. Together with the Public Enterprise “Pošta Srbije” and Sat-Trakt Ltd, they accounted for a market share of 98% pertaining to media content distribution, in terms of number of subscribers.

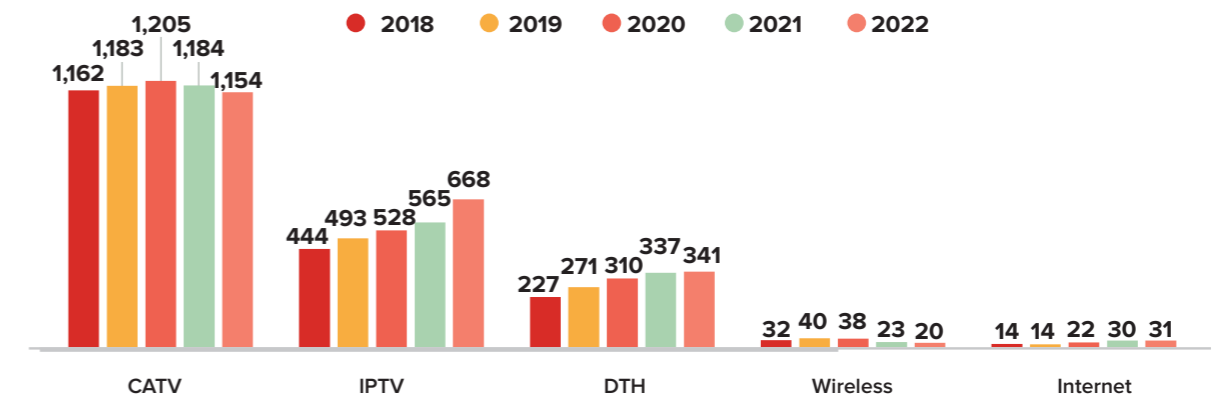
Figure 8.3. Market share of leading operators in 2022



Source: RATEL

Media content distribution via cable distribution systems (CATV) remained dominant in 2022, with around 1.15 million subscribers, which is a decrease by 2.5% compared to the previous year. The number of IPTV subscribers via copper pair network increased by approximately 18% compared to the previous year, whereas the number of DTH subscribers via satellite network rose by approximately 1.5%. The number of media content distribution subscribers via wireless network decreased in 2022, amounting to approximately 20 thousand, whereas the number of media content distribution subscribers via internet amounted to approximately 31 thousand.

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

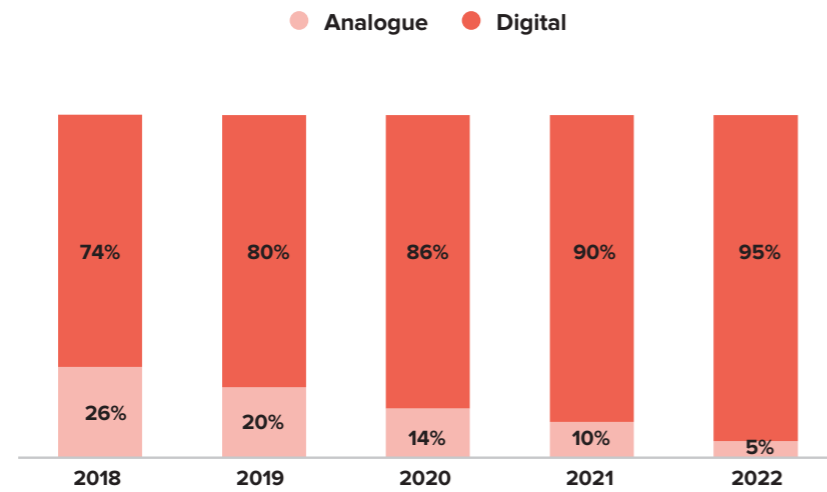


Source: RATEL

The share of subscribers by type of distribution has not changed substantially during 2022 for the most widely used technologies, while the shares of other types of distribution decreased slightly, from 2.5% to 2.3%. In particular, these are the subscribers using the distribution via Internet taking up 1.4%, whereas wireless network subscribers decreased from 1.1% to 0.9%. Pay TV, present on the market since 2016, had around 11 thousand subscribers in 2022.

In 2022, as much as 95% of the total number of CATV subscribers followed 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 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.

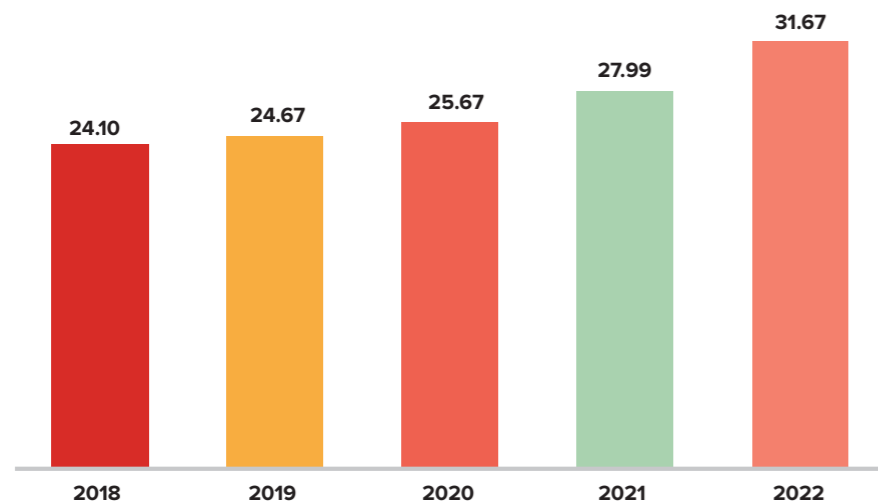
Figure 8.5. Distribution of CATV subscribers



Source: RATEL

The total income of media content distribution operators in 2022 amounted to 31.67 billion dinars, which is by 13% more compared to the previous year.

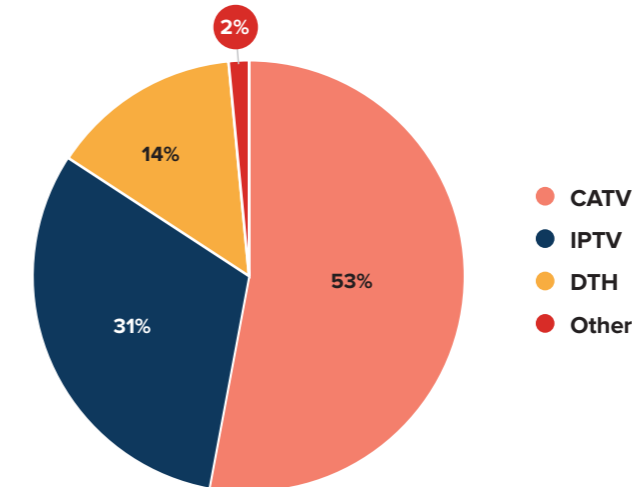
Figure 8.6. Revenue trends on media content distribution market (in billion dinars)



Source: RATEL

CATV accounts for the biggest share in the revenues from the media content distribution in 2022 (53%), followed by IPTV (31%) and DTH (14%) at the same level as in the previous year. 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 2%.

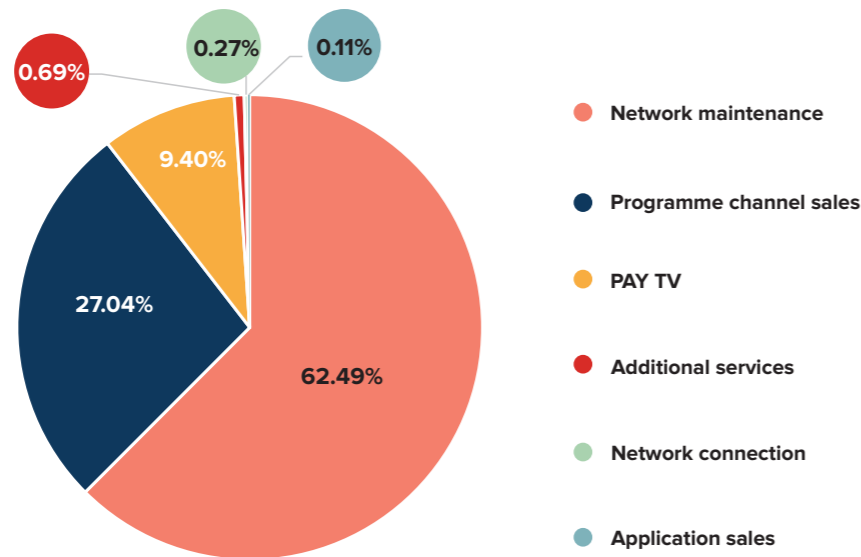
Figure 8.7. Structure of revenues from media content distribution in 2022



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 90% of the total income, as shown in Figure 8.8. Revenues made from additional PAY TV service make up almost 9% of the total revenues. Network connection charges account for approximately 0.27% of the total revenues in 2022, resulting from the trend where 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 0.69% of the total revenues in 2022. 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 0.11%, a rather negligible portion of the total income.

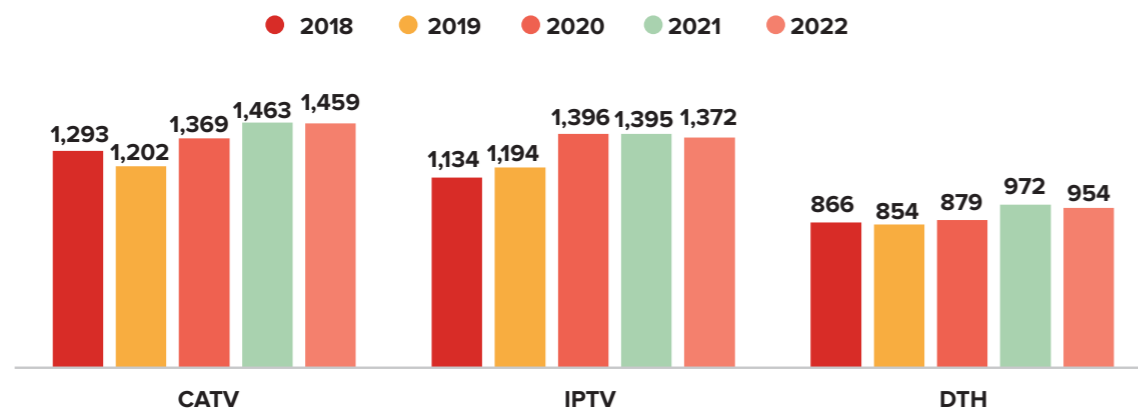
Figure 8.8. Share of revenues from media content distribution in 2022



Source: RATEL

In 2022, the average monthly subscription was 1029 dinars for basic analogue CATV package, and it 1481 dinars for digital CATV. The average subscription for basic IPTV package has marked a slight rise compared to the previous year, amounting to 1372 dinars, whereas the average monthly subscription for DTH is 954 dinars.

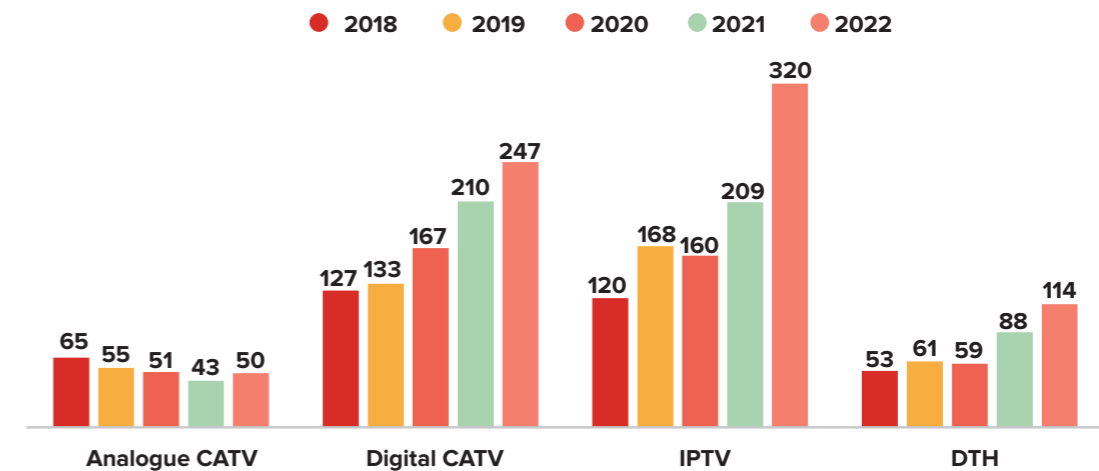
Figure 8.9. Average monthly subscription for basic package of the most popular types of distribution (in dinars)



Source: RATEL

The average number of TV programmes in the basic package in 2022, for different types of distribution, ranged from 50 in case of analogue CATV to 320 in case of IPTV. A big disproportion remains 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.

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



Source: RATEL

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 programme plan included in the subscription, contain additional educational, sports, film and other additional HD programmes. According to the available data, in 2022, these programmes were followed by more than 630 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 2022, 1.7 million subscribers used additional services and with over 1.7 billion requests for an additional service (more than 1000 requests annually per subscriber), where more than 51 million requests involved Video on Demand, i.e., 29 requests per subscriber annually.

Regardless of the type of distribution service network (cable, telephony, wireless), watching media content in digital format on more than one TV device requires an additional set-top box for each device which is charged extra. During 2022, more than 570 thousand subscribers rented additional receivers.

In addition to the distribution service, some TV content is available on mobile devices through different apps, without having to connect to the distribution network or to close a subscriber contract with an operator. The user of the app does not pay for a monthly subscription, instead, the app is usually activated by an SMS charged at a predefined rate. This rate is, in fact, the fee for the usage of the application during a specific, usually shorter, period. 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 8.1. shows the data on the penetration of media content distribution service per household on a district level. 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 20%.

Table 8.1. Penetration of media content distribution service by districts

Municipality	Penetration rate (%)
Belgrade	117.87
South Bačka	102.99
Srem	90.14
Braničevo	87.53
Šumadija	86.17
Kolubara	83.74
South Banat	83.51
Central Banat	81.55
Podunavlje	80.47
Raška	79.71
Nišava	79.58
Pomoravlje	77.64
Mačva	77.24
Rasina	77.08
Zlatibor	75.39
Morava	73.83
West Bačka	71.83
Pčinja	71.34
Pirot	69.45
Zaječar	67.47
Bor	66.71
North Bačka	66.16
Jablanica	63.56
Toplica	54.67
North Banat	53.99

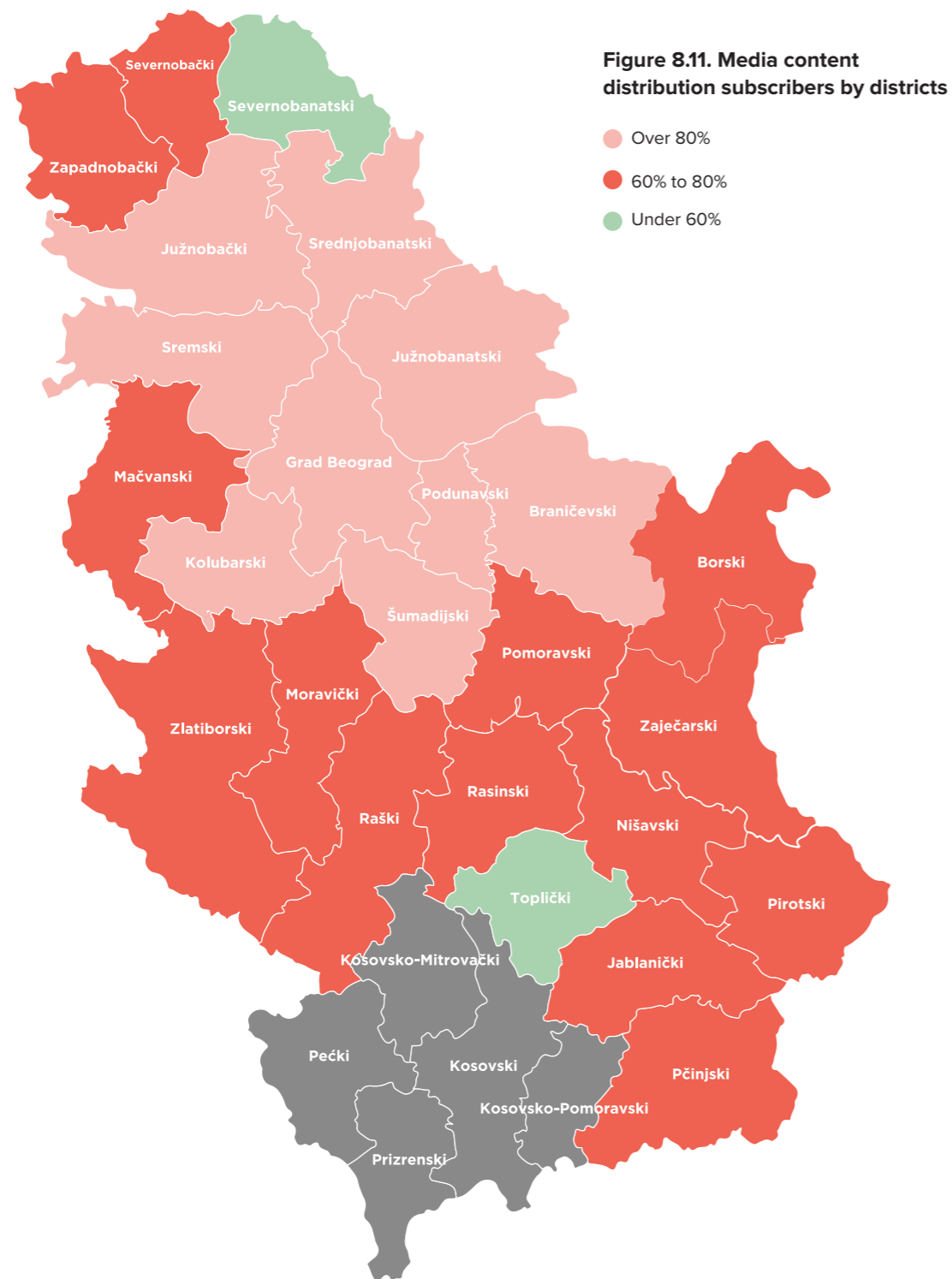


Table 8.2. List of 10 municipalities/cities with the highest media content distribution service penetration rate

Municipality	Penetration rate (%)
Čajetina	204.52
Novi Sad grad	127.85
Beograd grad	117.87
Veliko Gradište	107.11
Požarevac grad	105.81
Dimitrovgrad	100.10
Stara Pazova	99.29
Raška	97.49
Beočin	97.06
Kragujevac	96.70

Table 8.3. Municipalities with penetration of media content distribution service per household under 20%

Municipality	Penetration rate (%)
Crna Trava	19.77
Ada	19.32
Senta	18.39

9. BUNDLED SERVICES

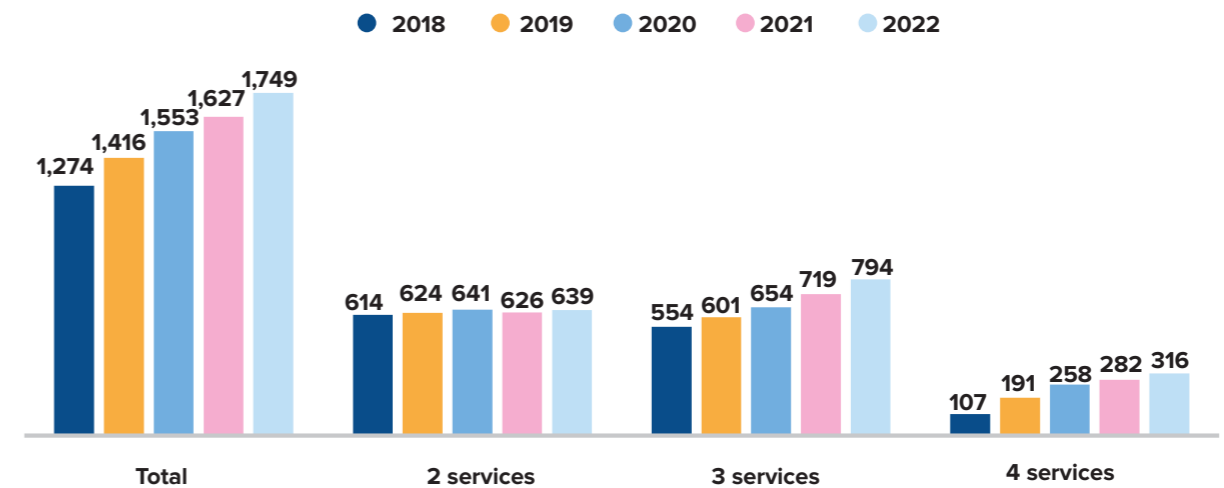
Bundled services are commercial offers of two or more services at a flat rate, which is lower than the sum of individual prices for each of the services. In the electronic communications market, service packages (bundled services) are the result of the horizontal integration, enabling the operators to 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 certain costs and attract new subscribers, regardless of the operator's network chosen for the provision of retail services. Bundling services into packages also makes it possible for the operators 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, thanks 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 a single registration and single bill.

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, sold separately from the voice service via mobile network.

Based on the available data, in the market of the Republic of Serbia, bundled services are offered by 32 operators, out of which 11 operators offer 3-service packages, whereas 4-service packages are offered by one operator. The total number of bundled service subscribers in 2022 was around 1.75 million, which is an increase of 8% compared to the previous year. The triple-play package subscribers account for the growth by 11%, while the number of double-play service packages fell by 2% compared to 2021. The number of 4-service subscribers grew by 12% in 2022.

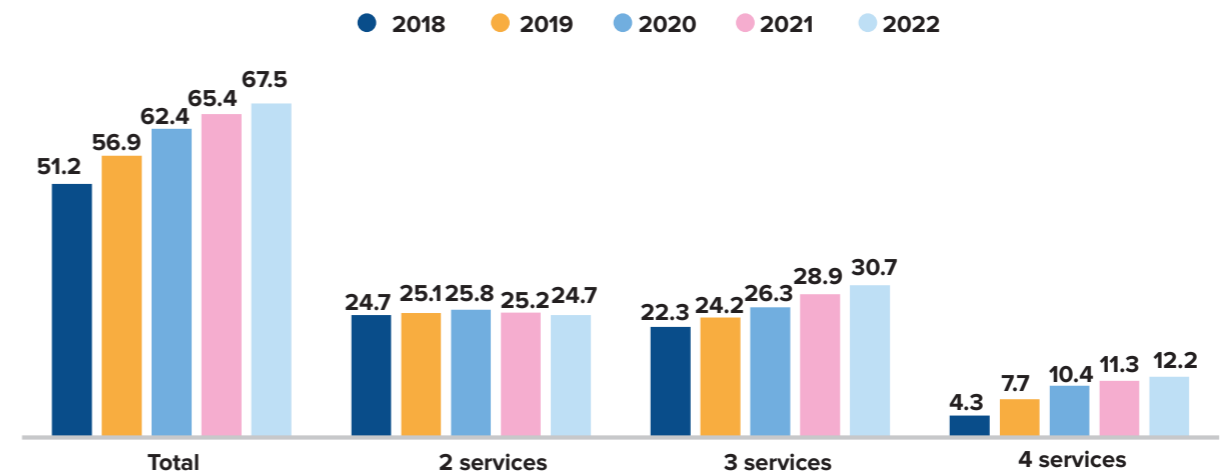
Figure 9.1. Number of bundled service subscribers (in thousand)



Source: RATEL

In 2022, the penetration of bundled services by the number of households was around 68%.

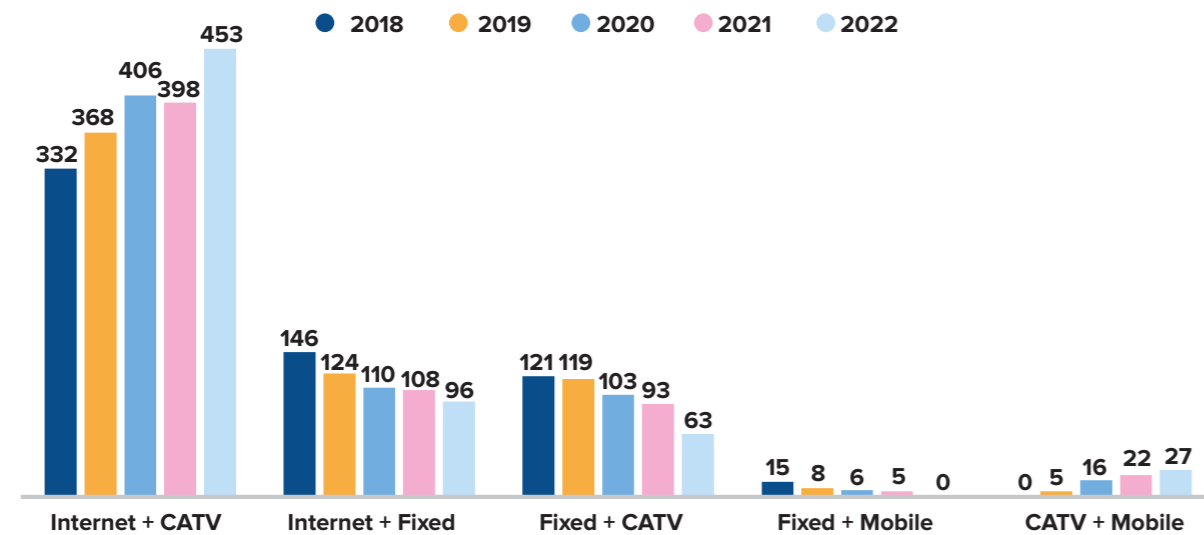
Figure 9.2. Bundled service penetration by the number of households (%)



Source: RATEL

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 2022 the number of subscribers of broadband Internet access and media content distribution increased (by 14%), while the number of subscribers of packages including fixed telephony and media content distribution decreased (by 32%), as well as subscribers of the broadband Internet and fixed telephony package (by 11%). The number of subscribers of packages with mobile telephony remained low.

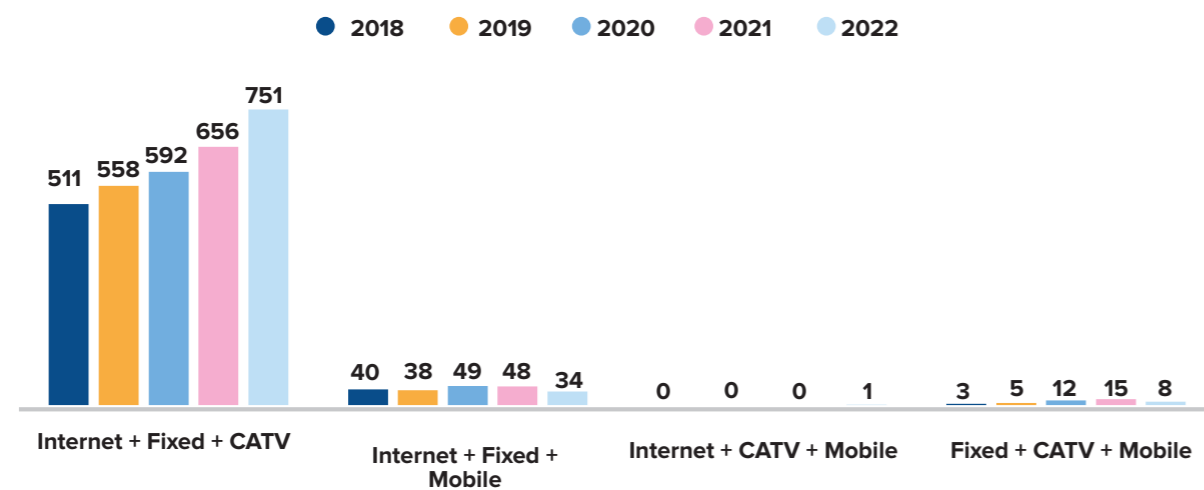
Figure 9.3. Number of 2-service package subscribers (in thousand)



Source: RATEL

The best selling 3-service package is a bundled service including broadband Internet access, fixed telephony and media content distribution, with a 14% increase in the number of subscribers. A fall in the number of subscribers was however present in the package containing broadband Internet access, fixed and mobile telephony, as well as the 3-service package offering fixed telephony, media content distribution and mobile telephony, on the market since 2016, with around 8 thousand subscribers in 2022. A bundle consisting of broadband Internet, media content distribution and mobile telephony has been available since 2022.

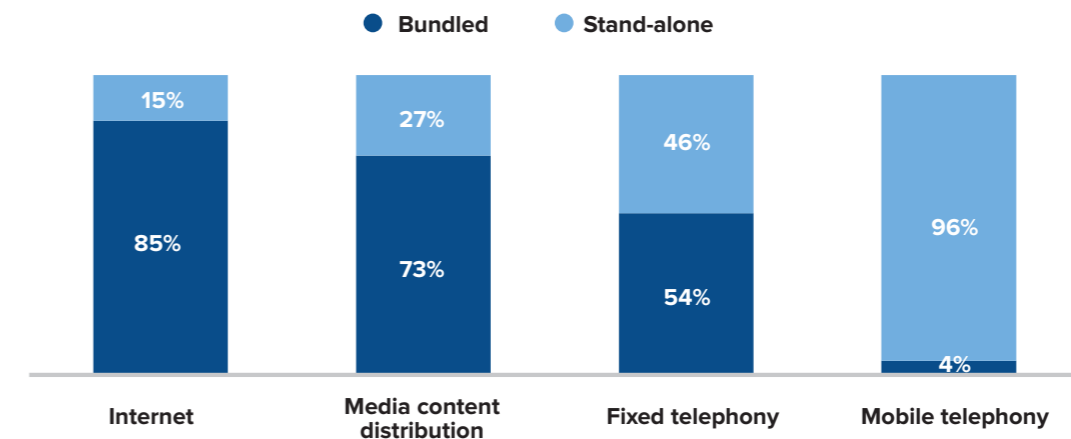
Figure 9.4. Number of 3-service package subscribers (in thousand)



Source: RATEL

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 1.6 million subscribers in 2022. It is followed by the service of media content distribution, used in package by more than half of its subscribers (around 1.6 million), while the least purchased bundled service is mobile telephony.

Figure 9.5. Share of stand-alone and bundled services subscribers in 2021

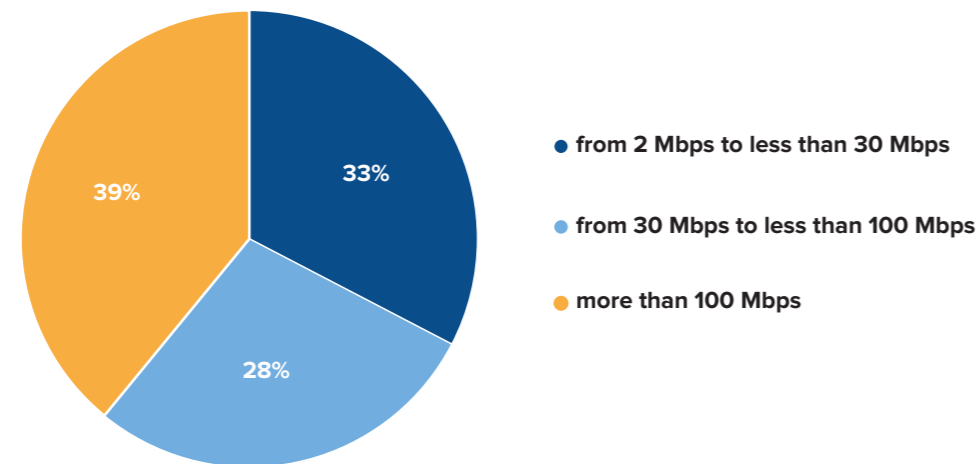


Source: RATEL

In the majority of cases, subscribers purchase the service of broadband Internet access from the same operator providing media content distribution or fixed telephony. For that reason, broadband Internet is usually purchased within a package, since the subscribers benefit from the opportunity to pay less and have easier registration and billing procedures (for example, instead of several subscriber agreements for each individual service they purchase, only one package contract is signed with the operator, and instead of various separate bills for each individual service, only one bill for the bundle is received, etc.).

Within the best selling 2-service and 3-service packages in 2022, containing broadband Internet access service, as much as 39% of the subscribers opted for the Internet speed over 100 Mbps. Within the package containing broadband Internet access and media content distribution services, 67% of the subscribers opted for the above rate, whereas 45% 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, 44% of the subscribers used the Internet rate from 2 Mbps to less than 30 Mbps.

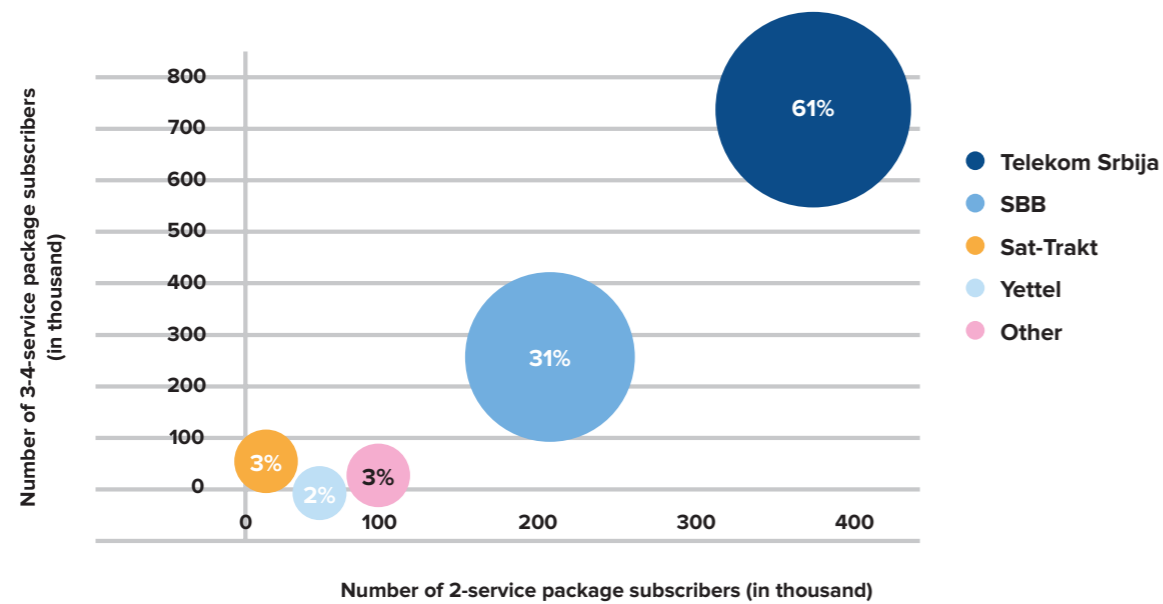
Figure 9.6. Subscribers of best selling service packages by Internet speed in 2022



Source: RATEL

The majority 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.

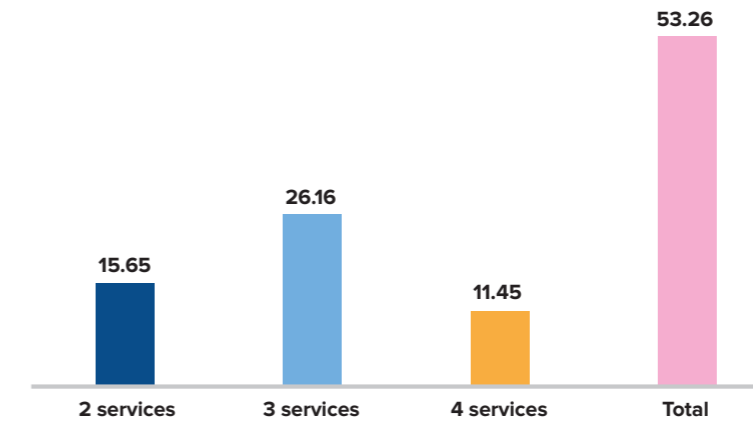
Figure 9.7. Share of operators by the number of bundled service subscribers in 2022



Source: RATEL

From the sale of bundled services in 2022, the operators earned more than 53.3 billion dinars, the most of which (around 26.2 billion dinars) was generated from the sale of triple-play bundles, while the sale of quad-play packages accounted for the smallest income share (around 11.5 billion dinars).

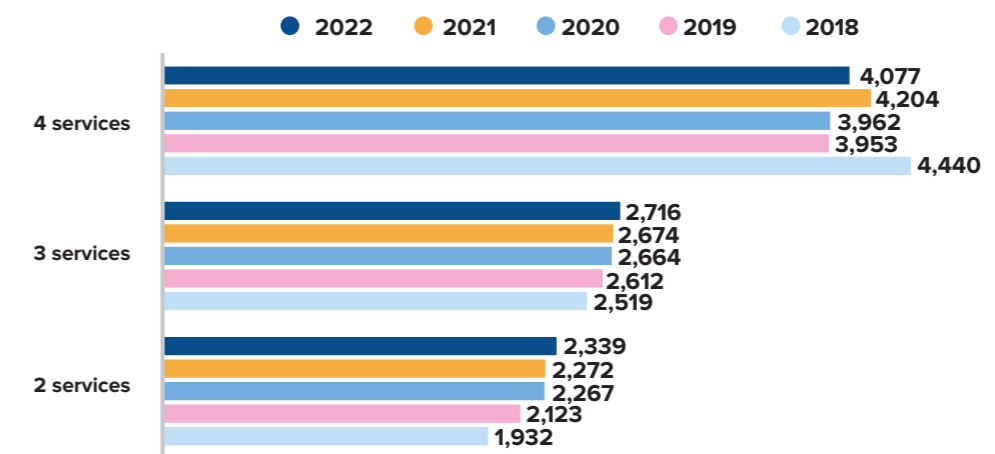
Figure 9.8. Earned income from bundled service sales in 2022 (in billion dinars)



Source: RATEL

Monthly subscriptions for the bestselling packages in 2022 range between 850 dinars for the cheapest package up to 5,399 dinars for the most expensive one, depending on the operator and the package content, and are more or less similar to those of the previous year. Operators often offer bundled services at promotional prices, which are considerably lower than the regular ones, for a limited period, 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 a mobile telephony package included in the bundled service. The average bestselling bundled services subscription amounts 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 RSD)



Source: RATEL

10. VALUE ADDED SERVICES AND MESSAGING SERVICES

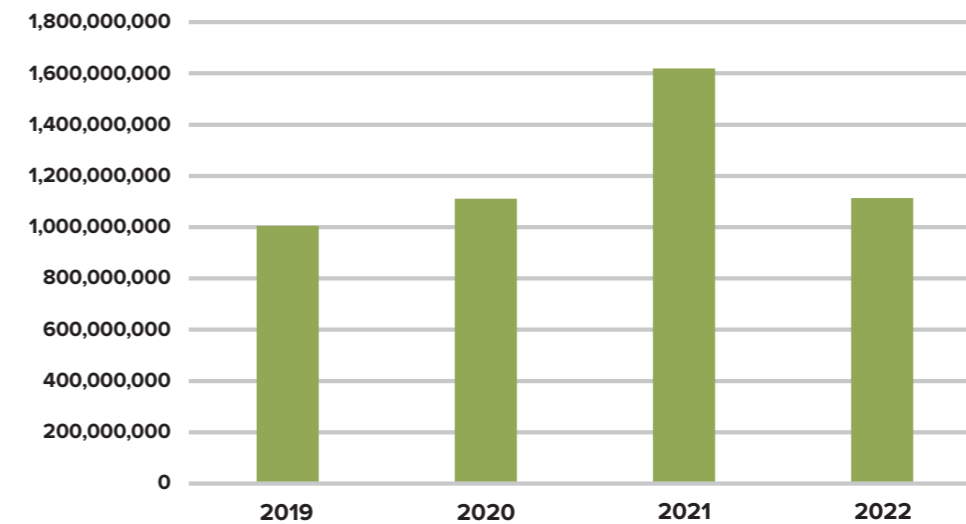
The Law on Electronic Communications and Rulebook on general terms and conditions for electronic communication activity ("Official Gazette of RS", No. 38/11) have created administrative possibility for messaging and value added service (VAS) providers to be registered in the register of operators managed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

In 2022, there were 38 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 services provided by the operators may be divided, according to purpose, into: televoting, advertising, entertainment, children entertainment, humanitarian aid, adult content, lottery, SMS notifications, marketing bulk messages, goods and services payment and other.

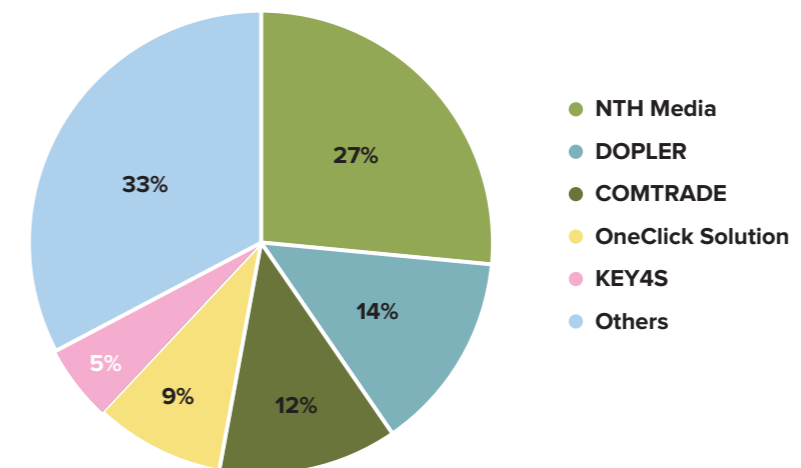
Annual revenues for the period 2019-2022 pertaining to the above services are given in Figure 10.1. The service provision accounts for the total income of 1.005 to 1.619 billion dinars annually. In 2022, the revenues in this market, according to the data collected by RATEL, amounted to approximately 1.114 billion dinars, which means that the operators' income has decreased by approximately 31% 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 network operators and messaging and value-added service providers.

Figure 10.1. Annual revenues 2019-2022



According to the available data provided by the operators to RATEL, there were three providers with the largest revenues from the messaging and value-added service provision in 2022: NTH Media, DOPLER and COMTRADE, taking up totally 53% of the VAS market share.

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

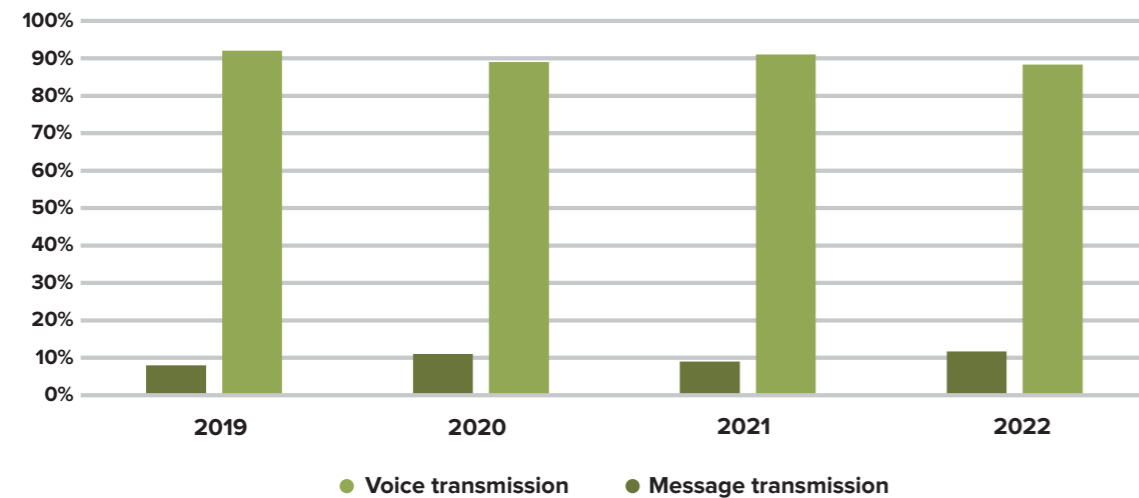


Value added service market is fully competitive. Figure 10.2 shows the market share of VAS providers (VASPs) according to revenues made. However, it should be noted that the revenues are divided between VASPs, network operators and content creators.

Around 88% of the total revenues made by the operators in 2022 are revenues from messaging service (SMS, MMS) and VAS messaging, and the rest of the income 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 but also to a simultaneous drop in the revenues from VAS voice transmission services, with the income share steadily setting in during the recent years. In addition, 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.

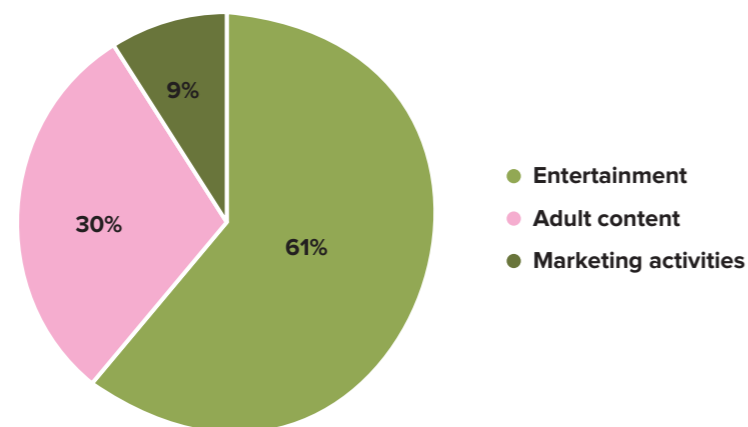
Figure 10.3. Market share by type of VAS and revenues made in 2019, 2020, 2021 and 2022



For the purpose of VAS voice transmission, the operators were assigned 380 numbers, which is 140 numbers less than the previous year.

In 2022, the voice value added service provision accounted for approximately 1.768 million minutes of traffic, and the share by type of voice VAS is given in Figure 10.4.

Figure 10.4. Share of realized minutes by type of voice VAS in 2022



In 2022, the volume of bulk message transmission and VAS message transmission was 743 million messages, 89% of which account for bulk messages, and 11% for VAS messages.

The share of realized VAS messages by purpose is shown in Figure 10.5, with 53% of the messages belonging to the category “Entertainment”, which is a change compared to the year before, resulting from the fact that messages from the “Other” category are more and more transferred via smartphone applications, rather than via SMS and MMS messages.

The share of realized bulk messages by purpose is shown in Figure 10.6, where it can be seen that 65% of the messages fall under the category “Banking transaction notifications”.

Figure 10.5. Share of realized VAS messages by purpose in 2022

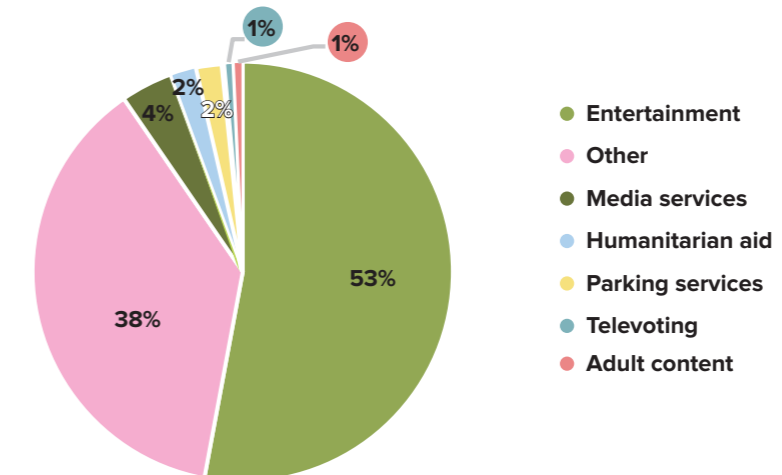
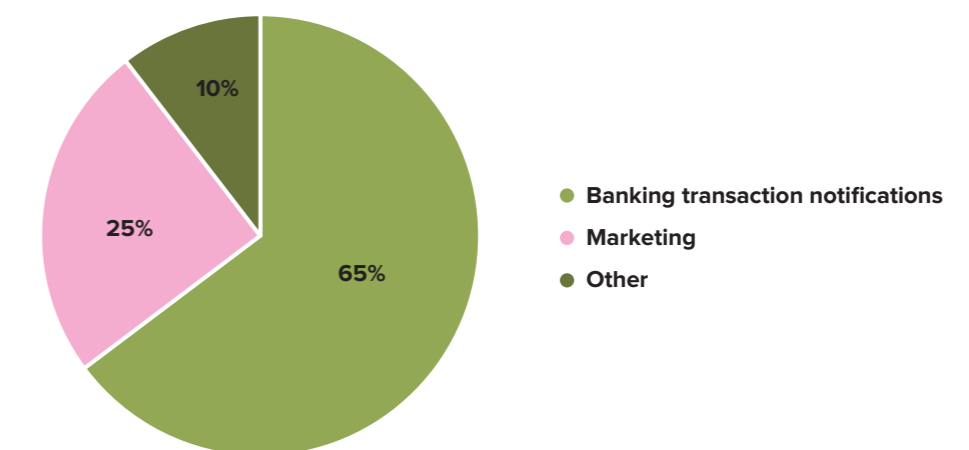


Figure 10.6. Share of realized messages by purpose for message transmission in 2022



Revenues from voice VAS transmission amount to approximately 130 million dinars, with the shares by purpose being shown in Figure 10.7.

Figure 10.7. Share of voice VAS revenues by purpose in 2022

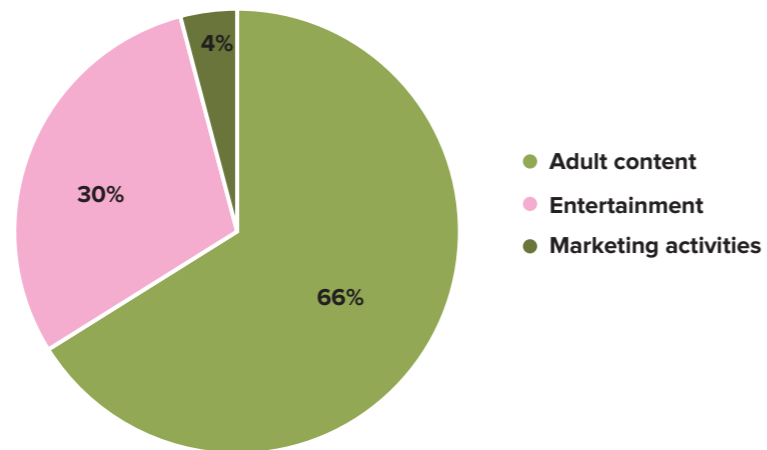
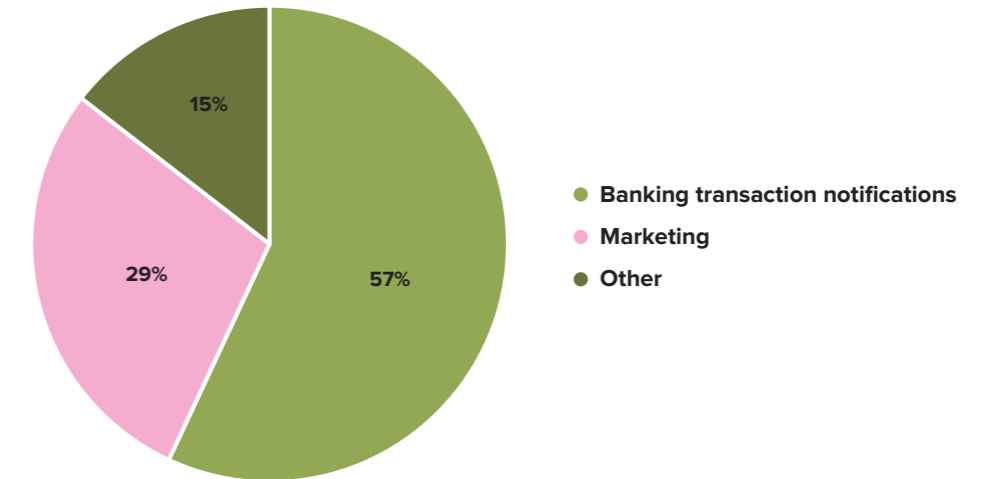


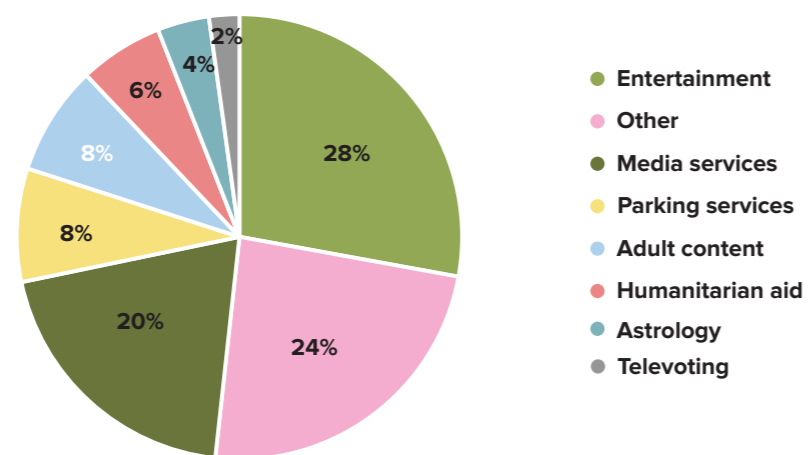
Figure 10.9. Share of message transmission revenues by purpose in 2022



Revenues from message service transmission (bulk messages) and VAS messages amount to more than 983 million dinars, 73% of which account for the income generated from VAS message transmission and the rest of the income from bulk message 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 2022



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, at 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, before March 15, 2023.

11.1. Average values of quality parameters for electronic communications services and networks for the period 2020 – 2022

A total of 124 operators submitted their reports for 2021. Further below is shown the value statistics of the selected electronic communication service/ mobile communication network quality parameters.

Average supply time for electronic communications services

For all electronic communications services, the average time from the moment of a valid service order being received to the moment a working service is made available for use, during last year was less than 3.5 days. The operators keep fulfilling the demands of users for electronic communications services more swiftly, so that, for the majority of services, the average supply time becomes shorter each year.

Table 11.1. Average supply time for service

	Prescribed value	2020	2021	2022
Voice service on the public telephone network at a fixed location	10 days for 50% new connections a year	3	3.5	3.3
Voice service provided via Internet (VoIP)	8 days for more than 95% requests	2.2	1.65	3.5
Broadband access service	8 days for more than 95% requests	2.2	3	3
Media content distribution service	8 days for more than 95% requests	2.2	2.6	2.6

Customer complaints about quality of electronic communications services

During 2022, the percentage of users' complaints about quality of electronic communications services was in average less than 5% for all types of services. The highest percentage of complaints (5%), but fairly lower than the previous years, was about the broadband access quality.

The time needed for the resolution of users' complaints (applicable for 80% of the complaints) was around 1 day for all services, with a significant improvement of resolution time for the voice service on the public telephone network at a fixed location, compared to the previous years. For all electronic communications services, the percentage of users' complaints about the correctness of bills was less than or equal to 1%, which is this parameter's maximum prescribed value. An increase in this parameter value has been observed in comparison to the previous years.

Table 11.2. Users' complaints and complaint resolution

	Prescribed value	2020	2021	2022	
Voice service on the public telephone network at a fixed location	Percentage of user complaints about quality of service	0.5%	3.7%	3%	1.25%
	Resolution time for user complaints for 80% of the complaints (days)	10.0	1.4	2.3	0.83
	Percentage of user complaints about bill correctness	≤ 1%	0.61%	0.22%	1.2%
Voice service provided via Internet (VoIP)	Percentage of user complaints about quality of service	/	1.2%	0.65%	1.7%
	Resolution time for user complaints for 80% of the complaints (days)	1.0	1	1	1
	Percentage of user complaints about bill correctness	≤ 1%	1%	0.4%	0.7%
Services on the public mobile communications network	Percentage of user complaints about quality of service	/	1.33%	1%	0.9%
	Percentage of user complaints about bill correctness	≤ 1%	0.12%	0.08%	0.2%
Broadband access service	Percentage of user complaints about quality of service	/	11%	10%	5%
	Resolution time for user complaints for 80% of the complaints (days)	1.0	1.65	1.3	1.15
	Percentage of user complaints about bill correctness	≤ 1%	0.5%	0.8%	0.9%
Media content distribution service	Percentage of user complaints about quality of service	/	6.5%	7.7%	3%
	Percentage of user complaints about bill correctness	≤ 1%	0.6%	0.8%	0.52%

Parameters of operator's contact services

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 better communication contact to the customers. Wait time at operators' call centres for all services has been reduced in comparison with the previous years.

Table 11.3. Response time for operator's contact services (Call Center) (in seconds)

	2020	2021	2022
Voice service on the public telephone network at a fixed location	45	63	38
Voice service provided via Internet (VoIP)	58	62	43
Services on the public mobile communications network	53.4	53	51
Broadband access service	45	43	34
Media content distribution service	49	42	32

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 0.66% in 2022, which is slightly lower than the value from the previous reporting cycle. The supply time for calls was extended.

Table 11.4. Quality parameters for voice service on the public telephone network at a fixed location

	Parameter definition	Prescribed value	2020	2021	2022
Unsuccessful call ratio (all calls)	Percentage of call attempts to an existing user which failed due to system failure or incorrectly dimensioned bundles. The case where the called party (B-Number) is busy or not responding is not regarded as a failed call	≤ 1%	0.7%	0.7%	0.66%
Supply time for call (average time for national calls)	Time between selecting the last digit of the subscriber's number and call verification signal	< 3s	2.32	4	5

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,
- YETTEL,
- A1 Srbija,
- GLOBALTEL,

whereby GLOBALTEL is 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 51st week of 2022, between the 19th and 25th of December 2022.

Table 11.5. Quality parameters for public mobile services

	Parameter definition	Prescribed value	2020	2021	2022
Call Setup Success Rate for GSM mobile network (Call Setup Success Rate)	CSSR=(successful call attempts/all call attempts)*100	> 98% at UMTS network level	99.55%	99.4%	99.29%
Call Setup Success Rate for GSM mobile network (Call Setup Success Rate)	CSSR=(successful call attempts/all call attempts)*100	> 98% at UMTS network level	99.9%	99.4%	99.5%
VoLTE Call Setup Success Rate (Call Setup Success Rate)	CSSR=(successful call attempts/all call attempts)*100	/	99.8%	99.8%	99.85%
Telephony Setup Time for GSM network	Time for connection setup from the moment user activates sending function	/	4.61s	6.6s	3.73s
Telephony Setup Time for UMTS network	Time for connection setup from the moment user activates sending function	/	2.78s	5.3s	3.3s
DL Throughput for Packet Interactive in GSM and UMTS mobile networks	Average throughput toward user (DL) for packet interactive	> 128 Kb/s	2.8Mb/s	2.6Mb/s	3Mb/s
DL Throughput for Packet Interactive in LTE mobile network	Average throughput toward user (DL) for packet interactive	/	43.7Mb/s	20Mb/s	40Mb/s

Call setup in 2G and 3G mobile communication networks is extended, however since the public voice service is provided largely via LTE network, so-called VoLTE, where the parameter "supply time for service" is on average up to 2s, this increase is of no particular importance. Telephony setup time for 4G networks is not prescribed by the Rulebook, and according to the measurement results it is less than 2s.

Network load for GSM 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 51st week of 2022, between the 19th and 25th of December 2022.

Table 11.6. Network load for voice traffic

		2020	2021	2022
GSM Voice traffic	Mean value of network load for GSM network voice traffic, Erlang/TRX	1.92	2.45	1.2
UMTS Voice traffic	Mean value of network load for UMTS network voice traffic, Erlang/TRX	3.35	3.24	3.3

A drop in the volume of GSM technology voice traffic has been observed, which is the result of the use of VoLTE technology for voice service.

The mean value of the LTE traffic volume in the week of measurement in 2022 amounted to 5,814,987.12 GB (previously 4,354,672 GB), demonstrating an increase in the network load by approximately 1,500,000 GB compared to the last year's monitoring period.

11.2. Benchmarking of mobile communications networks

(Comparative measurement and analysis of quality parameters of mobile communications network services)

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 the Republic of Serbia. For that reason, RATEL performs, on a yearly basis, comprehensive benchmarking of mobile communications networks belonging to the following operators: Telekom Srbija, Yettel and A1 Srbija.

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).

The manner of the commercial benchmarking measurement performance is dependent on the specific contractor. Specialized companies use their own scoring systems, whereas mobile operators carry out benchmarking campaigns based on their own criteria.

Over the last two years, RATEL's measurements were carried out in accordance with technical recommendation (ETSI) TR103 559 Annex A of ETSI (European Telecommunications Standards Institute), which is a new methodology, with RATEL being one of the first organizations to implement it.

The use of this methodology has enabled standardized measurement and scoring of the achieved results. The crucial KPIs pertaining to the most important mobile telephony services are measured, weighted and finally added into the result which realistically reflects how the end user experiences the network performance. Additionally, a new feature makes it possible for the measurements to be mutually comparable and for the results not to depend on the contractor performing the testing.

The benchmarking measurements were carried out in a drivetest form, using two vehicles moving on the pre-defined routes, and in a walktest form, at ten hot-spot locations in Belgrade, Novi Sad and Niš, as well as along main rail corridors X and XI.

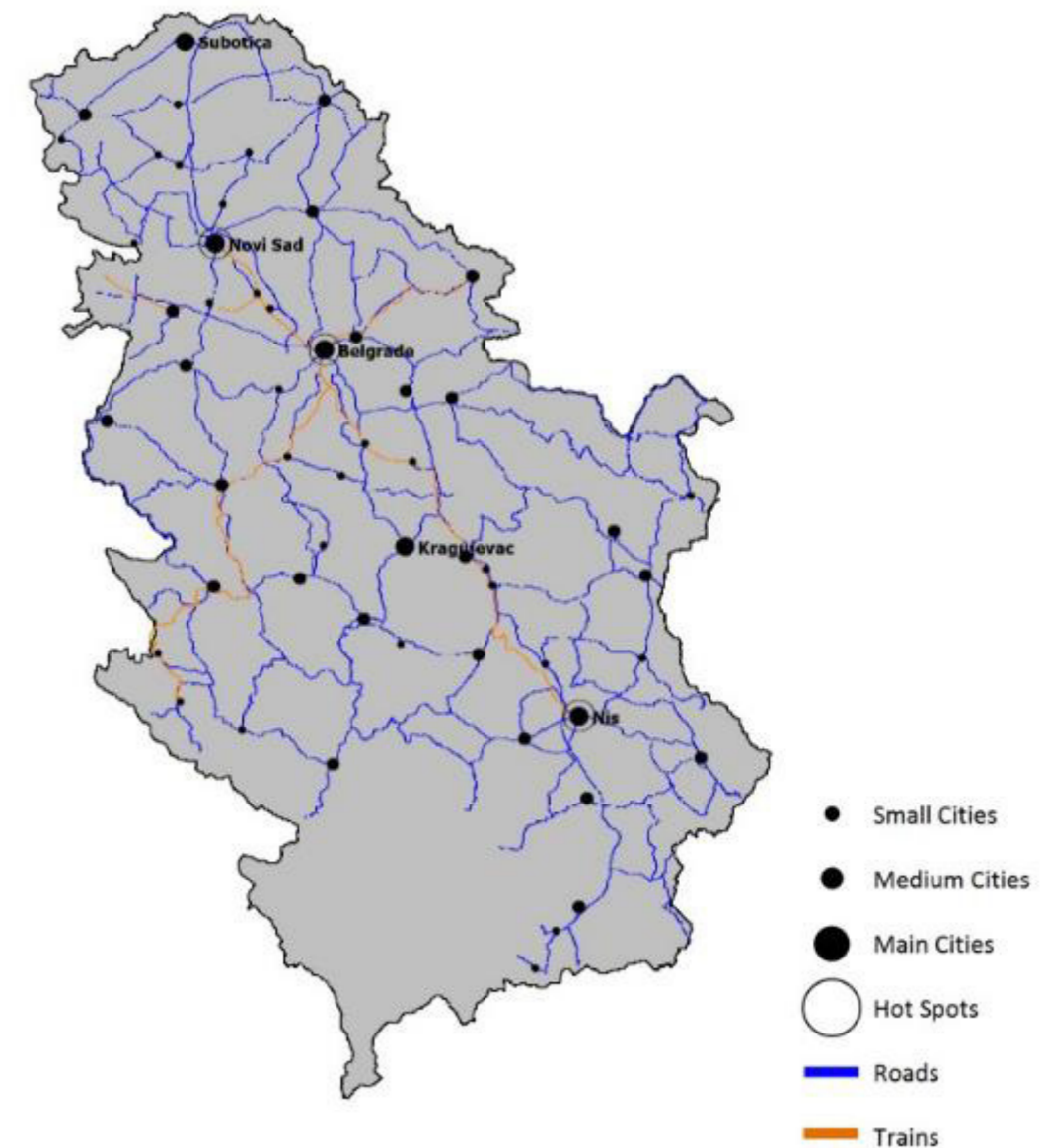
Benchmarking measurements were carried out in 55 cities, along 16,000 km of roads and 1400 km of railroads in the Republic of Serbia. During the campaign, more than 9,000 calls and 7,000 sessions for each of data transfer services on all mobile networks and using all available technologies (2G, 3G, 4G) were performed. The measurements included:

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

In the years-long mobile network benchmarking history carried out by RATEL in the Republic of Serbia, this year's project has been the largest so far. The benchmark comprised measurements in the form of drive tests, at hot-spot locations (such as squares, promenades, shopping malls, airport) and the railway, which made it the largest campaign to have ever been performed in the Republic of Serbia (without AP Kosovo and Metohija), with categorization strictly in line with recommendation ETSI 103 559 (Annex A). The map of routes used for measurements is shown in Figure 11.1.

Since the benchmarking of mobile networks was carried out in September, October and November of 2022, the measured and calculated values of quality parameters, including final results, refer only to that period.

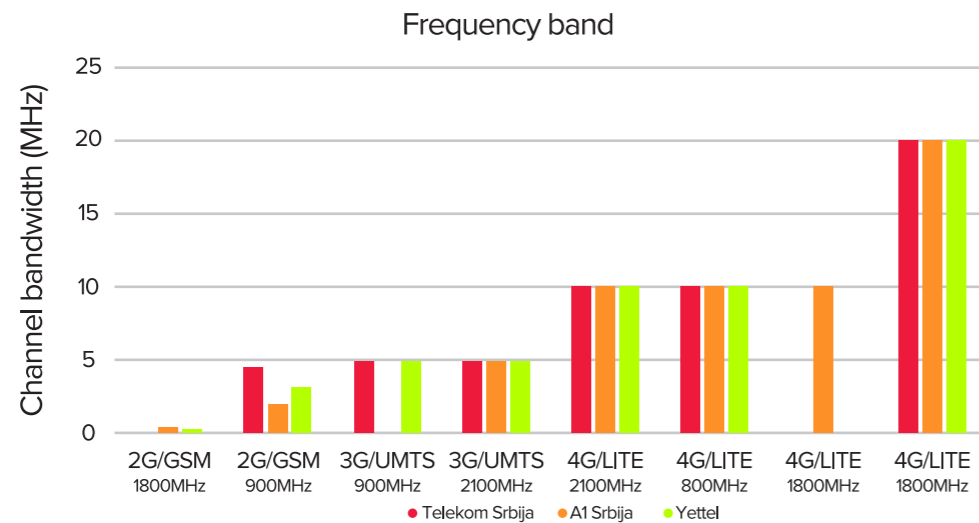
Figure 11.1. Map of measurement routes



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

Radio frequency bands (2G, 3G, 4G) used by operators during the benchmarking campaign are shown in Figure 11.2.

Figure 11.2. Radio frequency bands used by operators during benchmarking campaign



2G/GSM: All three operators used radio frequency band 900 MHz. Radio frequency band 1800 MHz was used by A1 Srbija, with Yettel using it to a slightly lesser extent.

3G/UMTS: Radio frequency band 900 MHz was used by Telekom Srbija and Yettel. All three operators also used radio frequency band 2100 MHz, this year with a reduced total bandwidth.

4G/LTE: Radio frequency bands 800 MHz, 1800 MHz and 2100 MHz were used by all three operators. In main and medium cities, all three operators mostly used LTE-3/4CA, with A1 Srbija using up to 4CA, which allowed for a total of 50 MHz of the available bandwidth for this operator. In small cities, A1 Srbija, like the previous year, was using LTE-4CA, whereas Telekom Srbija and Yettel used LTE-3CA with channel bandwidth 40 MHz. The least carrier aggregation areas along roads were detected in Yettel's network.

The use of Carrier Aggregation (CA) depends on the network configuration and quantity of sent data during the test. In main and medium cities, A1 Srbija and Telekom Srbija, in 98% of cases, used LTE CA, whereas Yettel used it in 97% of cases. On highways, LTE CA was most used by Telekom Srbija with 98%, A1 Srbija came in second with 96% and Yettel last with 80%. Along main roads, A1 Srbija, with 87%, used LTE CA most, Telekom Srbija came in second with 70% and Yettel last with 52%. Along rural roads, the LTE CA usage was the least, with 75% for A1 Srbija, 57% for Telekom Srbija and 42% for Yettel.

Mobile network benchmarking results 2022

Telekom Srbija had the best total score of 88.70 points (out of possible 100), followed by A1 Srbija with 86.98 points (out of possible 100) and Yettel with 84.06 points (out of possible 100).

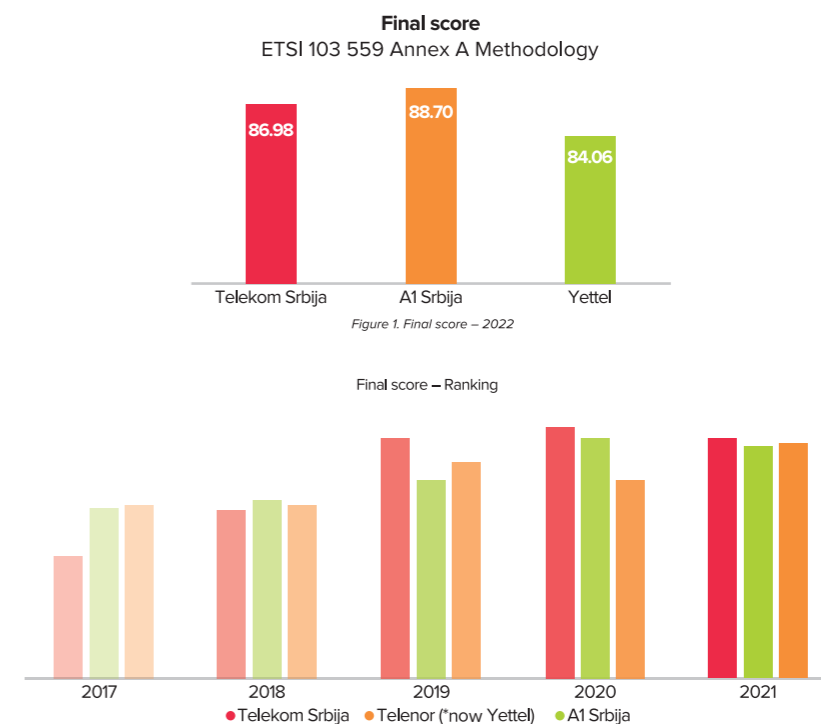
The slight difference in the final score values points to a similar level of the quality of services provided to users by these three operators.

All three of them reached satisfactory levels of KPI (Key Performance Indicator) during voice service testing in almost all aggregations. All three operators demonstrated lower level of voice service quality along railroad corridors compared to other aggregations, thus leaving room for improvement in the segment of voice service quality in this aggregation.

All operators showed similar voice service quality in almost all aggregations, except in the railway category, i.e. in trains. Yettel had the highest percentage of undesirable samples for the service of voice transmission along the roads.

Telekom Srbija achieved the best results for the majority of data transmission services. A1 Srbija had similar results, however excelled at data transmission tests (small and large files). Both operators scored between 50% and 55% of the maximum number of points on these tests. On account of achieved higher average speed of small file transmission, A1 Srbija arrived at the top of the three. Yettel did not perform so well, due to undesirable results during data transmission testing.

Figure 11.3. Comparison of final results by year



For the assessment of the overall performance and mobile network ranking, 5 main types of services were tested, namely:

- Voice service, accounting for 40% of the total result
- Data transmission services, accounting for 60% of the total result, divided in the following subcategories:
 - o Web browsing, accounting for 22.80% of the total result
 - o Data transfer service, accounting for 15% of the total result
 - o YouTube, accounting for 13.20% of the total result
 - o WhatsApp messages, accounting for 9% of the total result.

The tests are carried out in various categories. According to ETSI TR 103 559 Anex A, there are three main categories, divided further into subcategories:

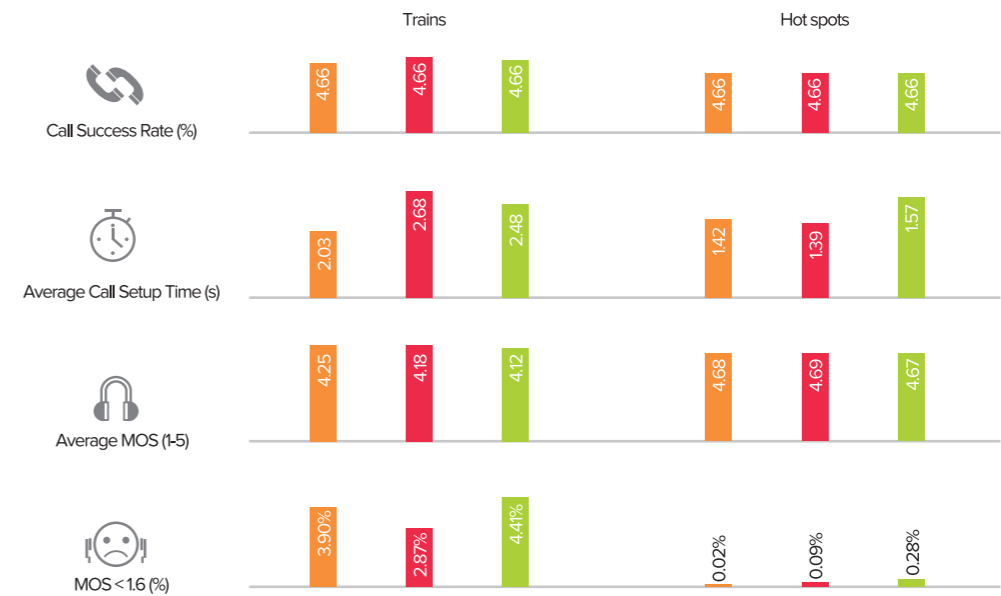
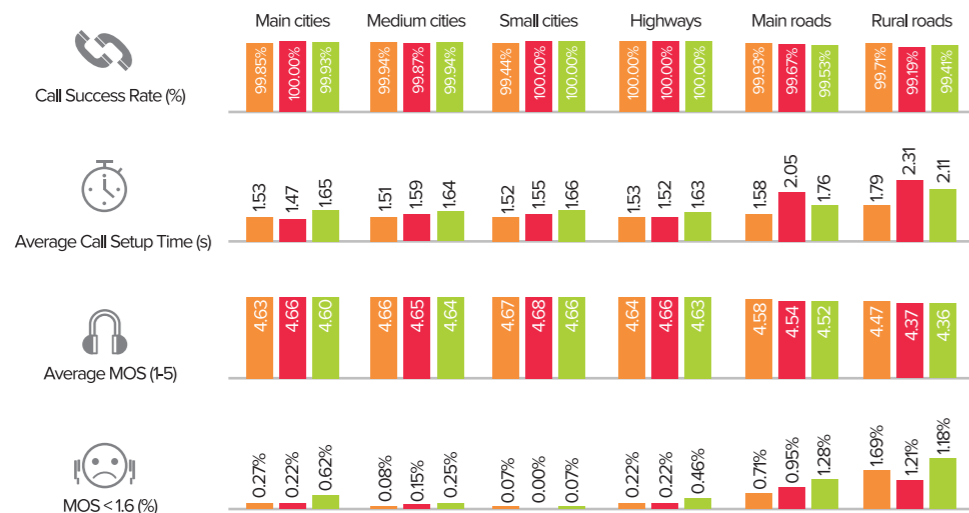
Cities: Roads: Complementary areas:

- Main cities
- Medium cities
- Small cities
- Main roads
- Rural roads
- Hotspots
- Highways
- Rail corridors

Voice service tests

The achieved KPI values for voice service tests are at the expected levels. The complete analysis and comparison of KPI parameters for voice service are shown in Figure 11.4.

Figure 11.4. Voice service testing results



In main cities, Telekom Srbija achieved 100% successful call rates, while other operators had slightly lower results. Telekom Srbija had the shortest average call setup time. All operators had similar, almost maximum level voice signal quality (MOS). A1 Srbija and Yettel achieved excellent successful call rates, with Telekom Srbija lagging slightly behind. A1 Srbija had the shortest average call setup time. All operators had similar, almost maximum level of voice signal quality (MOS).

In medium cities, A1 Srbija and Yettel both achieved excellent successful call rates, with Telekom Srbija lagging slightly behind. A1 had the shortest average call setup time. All operators had similar, almost maximum level of voice signal quality (MOS).

In small cities, Telekom Srbija and Yettel had excellent successful call rates, while A1 Srbija had an inferior result by 0.5%. A1 Srbija had the shortest average call setup time. All operators had similar, almost maximum level of voice signal quality (MOS).

On highways, successful call rate values were excellent for all three operators. Telekom Srbija had the shortest average call setup time, with A1 Srbija lagging slightly behind. All operators had similar, almost maximum level of voice signal quality (MOS). A1 Srbija achieved maximum score of successful calls along main roads. Telekom Srbija and Yettel were lagging behind. A1 Srbija had the shortest average call setup time, Yettel came in second, with Telekom Srbija being last. Yettel and A1 Srbija had similar voice signal quality (MOS), better than Telekom Srbija. On rural roads, A1 Srbija achieved maximum score of successful call rates. The weakest result was held by Telekom Srbija, with Yettel in the middle. As expected, MOS values were lower than in other aggregations. A1 Srbija had higher MOS parameter values and the shortest average call setup time compared to the competition.

Along rail corridors, Telekom Srbija had the highest incidence of successful call rates, Yettel came in second, whereas A1 Srbija had lower results. Altogether, this parameter was lower compared to other aggregations, due to tunnels and mountain areas.

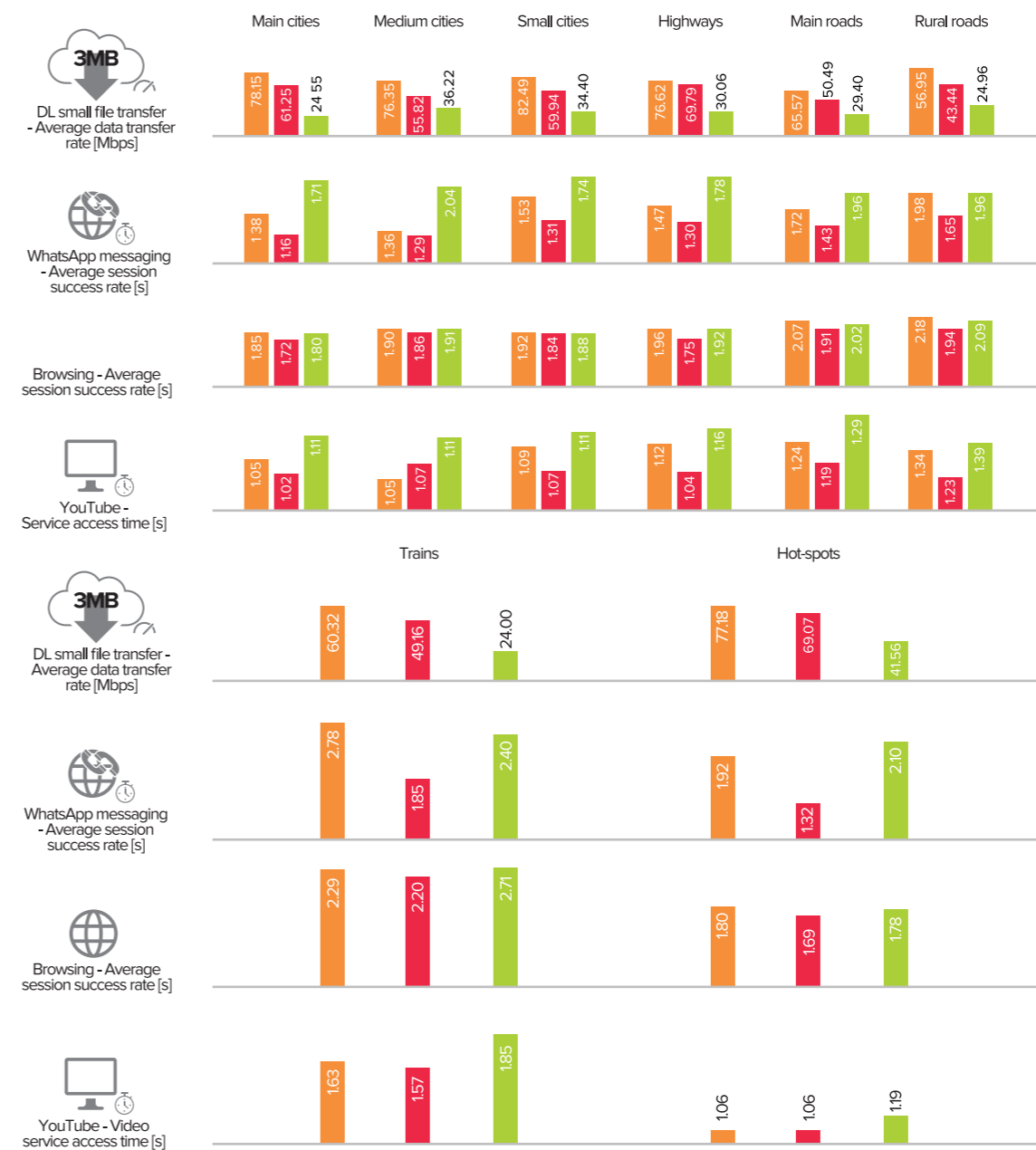
At hot-spot locations, all operators achieved excellent call success rates. Telekom Srbija had the shortest average call setup time, followed by A1 Srbija, and finally Yettel. All operators had similar level of voice signal quality (MOS). High percentage of samples with unsatisfactory MOS parameter values (MOS<1.6; voice signal quality considered unacceptable by users) is observable along the rural roads and rail corridors.

Data transfer tests

KPI test results regarding data transfer services, achieved by the operators in various categories are shown in Figure 11.5. Comparative data transfer values for WhatsApp messaging, browsing and YouTube video service are also shown below.

• *Small file transfer – Download*

Figure 11.5. Data transmission service testing results – Download



In main cities, all operators achieved high session success rate. A1 Srbija had the highest average data transfer rate. Telekom Srbija had the second best result, both according to the average data transfer rate and according to 10/90 data transfer rate. Yettel was behind its competition.

In medium cities, A1 Srbija and Telekom Srbija both had high session success rate. Yettel was behind the competition, with somewhat lower percentage of successful sessions. A1 Srbija had, once again, the highest average data transfer rate, while Telekom Srbija came in second and Yettel third. Both Telekom Srbija and A1 Srbija had high 10/90 data transfer rate.

In small cities, A1 Srbija and Telekom Srbija had, once again, a 100% session success rate, with Yettel lagging behind. A1 Srbija had the highest average data transfer rate, followed by Telekom Srbija and Yettel.

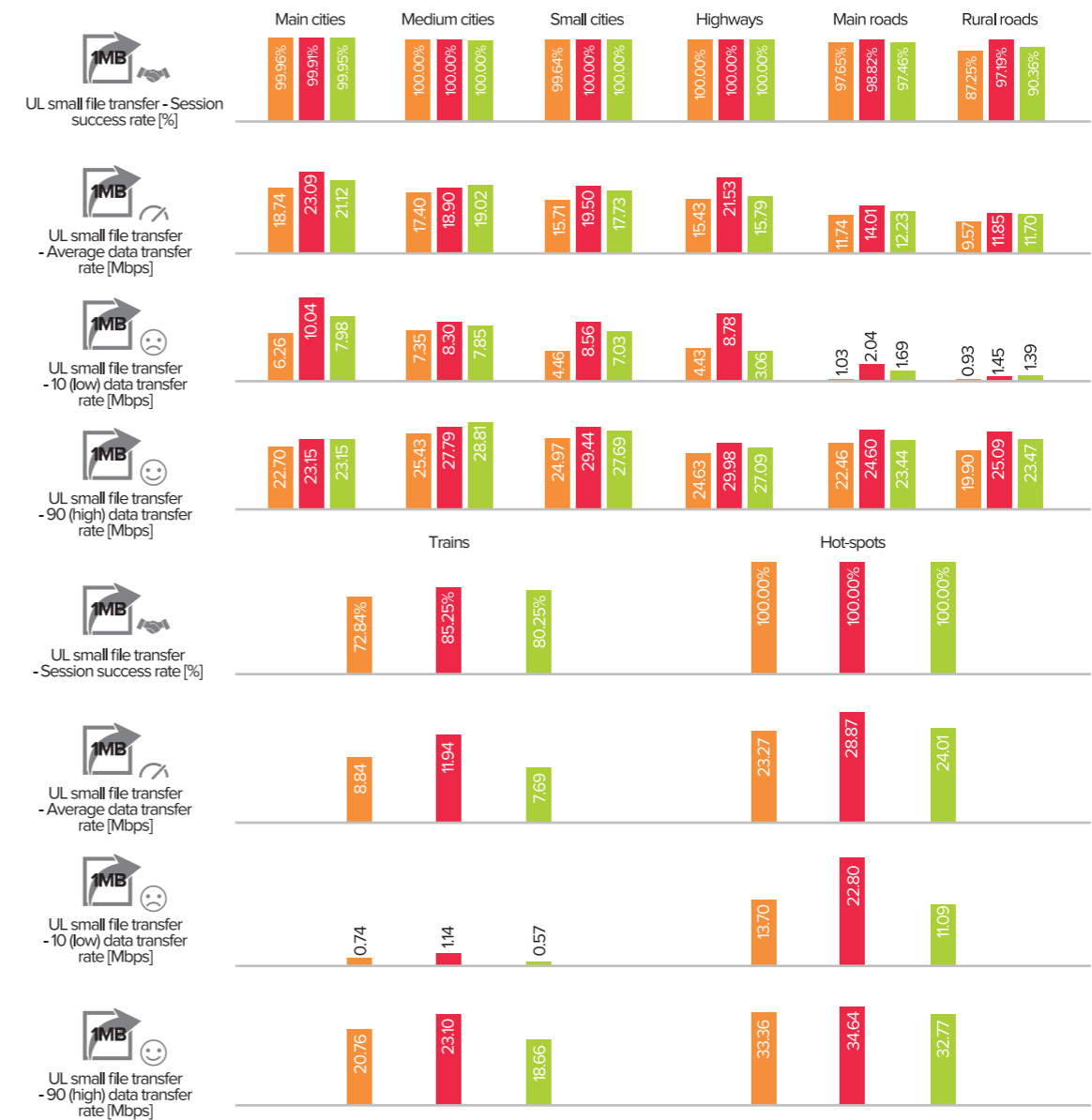
On highways, all operators had a very good score of successful sessions, reaching a high average data transfer rate. The difference between the A1 Srbija and Telekom Srbija average data transfer rates is lower than in the cities. Yettel was behind its competition. Along main roads, Telekom Srbija achieved the highest session success rate, followed by A1 Srbija and Yettel, with A1 Srbija having the advantage both according to the average data transfer rate and 10/90 data transfer rate. Telekom Srbija came in second and Yettel last. Along rural roads, Telekom Srbija had the highest session success rate, unlike A1 Srbija and Yettel, who achieved lower parameters. However, A1 Srbija managed to score the best results in data transfer rate, followed by Telekom Srbija and Yettel.

Along rail corridors, Telekom Srbija achieved high session success rate. A1 Srbija was behind the competition. Altogether, the rate of successful sessions was much lower than in other aggregations, due to tunnels and mountain areas, which contributed to the poor coverage. As for the average data transfer rate, A1 Srbija scored the best results.

At hot-spot locations, all operators had high session success rate. A1 Srbija achieved the highest average data transfer rate, followed by Telekom Srbija, with Yettel coming in third.

• Small file transfer – Upload

Figure 11.6. Small file transfer – Upload



In main cities, all operators had almost 100% successful sessions. The highest average data transfer rate was accomplished by Telekom Srbija, with Yettel coming in second, and A1 Srbija being slightly behind the competition.

Likewise, in medium cities, all operators achieved high session success rates. Telekom Srbija and Yettel had almost identical average data transfer rate, with A1 Srbija lagging behind. In small cities, all three operators had extremely high session success rate. Telekom Srbija had the highest average data transfer rate, Yettel came in second, with A1 Srbija being slightly behind the competition.

On highways, all operators had very good session success rates. Telekom Srbija achieved best results regarding both average data transfer rate and 10/90 percent data transfer rate, leaving A1 Srbija and Yettel behind. Telekom Srbija had the highest incidence of successful sessions, with A1 Srbija and Yettel slightly lagging behind. Along main roads, Telekom Srbija achieved best results regarding average data transfer rate again, compared to the competition. Along rural roads, Telekom Srbija had the highest percentage of successful sessions. For A1 Srbija and Yettel, this parameter was lower in rural areas. All operators demonstrated much lower data transfer rate, compared with other aggregations.

Along rail corridors, the rate of successful sessions was much lower than in other aggregations, due to tunnels and mountain areas, which contributed to the poor coverage. Telekom Srbija achieved the best result, while A1 Srbija had the lowest incidence of successful sessions.

At hot-spot locations, all operators achieved very high session success rates. Altogether, Telekom Srbija had the highest average data transfer rate.

Browsing

Figure 11.7. Browsing service testing results



In all categories of cities and roads, all three operators demonstrated high incidence of successful sessions for browsing service.

Along rail corridors, session success rates were lower compared to other aggregations, mainly because of hampered coverage due to tunnels and terrain configuration.

At hot-spot locations, all operators achieved extremely high rates of successfully realized sessions.

YouTube video service

Figure 11.8. YouTube video service testing results



In main, medium and small cities and along highways, the percentage of successful sessions was very high for all three operators.

Somewhat lower parameter values regarding YouTube were achieved along main roads, with even less favorable results along rural roads. In all categories for session success rate, VMOS quality was excellent. Quality parameter „video service access time“ was also very short, which is an excellent value for this parameter.

Along rail corridors, the rate of successfully realized sessions was lower compared to other aggregations, mainly because of hampered coverage due to tunnels and terrain configuration.

At hot-spot locations, all operators achieved exceptionally high quality parameters defining this type of service.

WhatsApp messaging

Figure 11.9. WhatsApp messaging testing results



In main cities, Telekom Srbija had an extremely high, almost maximum, incidence of successful sessions, followed by A1 Srbija and Yettel. Telekom Srbija achieved the shortest average session time, A1 Srbija came in second, while Yettel was behind the competition.

Likewise, in medium cities, Telekom Srbija had an extremely high percentage of successful sessions, followed by A1 Srbija and Yettel. Telekom Srbija once again had the shortest average session time, followed by A1 Srbija, whereas Yettel had longer average session time than the competition.

In small cities, Yettel and Telekom Srbija had almost maximum percentage of successful sessions, leaving A1 Srbija behind. Telekom Srbija achieved the shortest average session time, followed by A1 Srbija and Yettel.

On highways, Telekom had an almost maximum percentage of successful sessions, followed by A1 Srbija and Yettel. Telekom Srbija had the shortest average session time, A1 Srbija scored the second best result, while Yettel had longer average session time compared to its competition. Along main roads, Telekom Srbija achieved the highest incidence of successful sessions, Yettel came in second and A1 Srbija third. Telekom Srbija had the shortest average session time. On rural roads, Telekom Srbija had the highest incidence of successful sessions. For A1 Srbija and Yettel, this parameter was lower in rural areas. Both operators had longer average session time compared to Telekom Srbija.

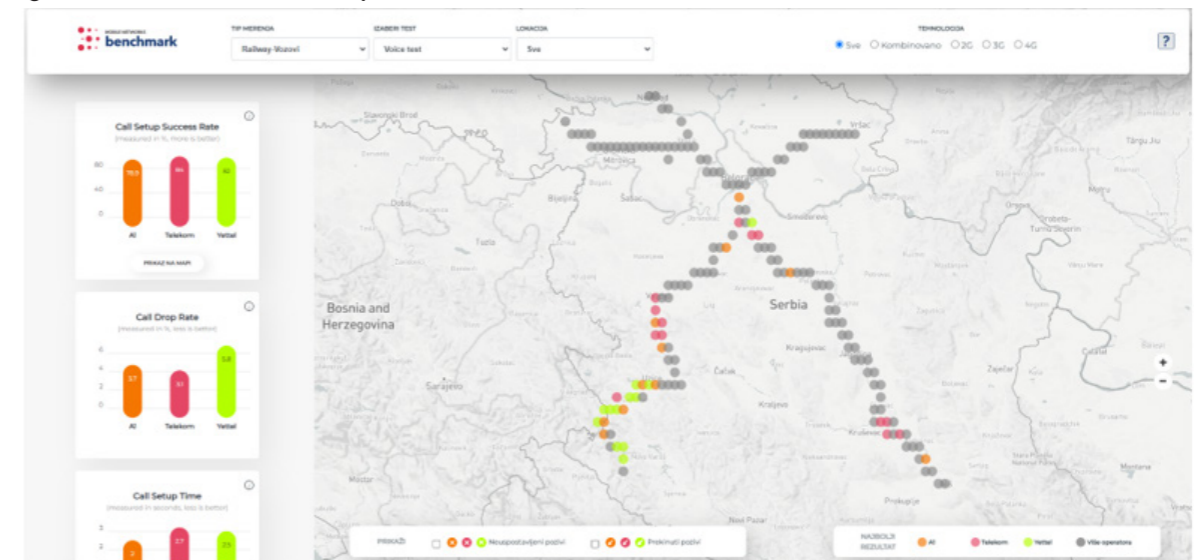
Along rail corridors, altogether, the session success rate was much lower than in other aggregations, mainly due to tunnels and mountain areas, which contributed to the poor coverage. Telekom Srbija had the highest incidence of successful sessions and shortest average session time, leaving A1 Srbija and Yettel behind.

At hot-spot locations, Telekom Srbija had a maximum percentage of successful sessions, followed by A1 Srbija and Yettel. Telekom Srbija had the shortest average session time, followed by A1 Srbija and Yettel, who had similar results.

Final results – Mobile Network Benchmark Portal

Upon the completion of the benchmarking measurements, followed by data processing and analysis of the results regarding mobile operators' network quality, the interactive portal for comparative mobile network quality in the Republic of Serbia was updated with the 2022 benchmark results. The portal is available in Serbian and English, at the following address: <http://benchmark.ratel.rs/en>.

Figure 11.10. Benchmark interactive portal



11.3. RATEL NetTest: testing of the Internet connection quality

RATEL enables the users of Internet access services in public fixed and public mobile communications networks to measure QoS of broadband Internet access by means of its application RATEL NetTest.

The purpose of RATEL NetTest application is to provide transparent and comprehensive information to the users. The application 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 favoring any of the connections.

In 2022, RATEL upgraded the application to perform web measurements and mobile device measurements, making it fit for new mobile network technologies, namely 5G measurements. RATEL NetTest portal was updated too, by changing the map display of results, due to the necessary adjustments to fulfill applicable regulations governing the area of personal data protection, i.e. GDPR in the EU. Mobile app visual solutions were changed as well.

The novelty in this project is the launch of Regulatory Portal for Measurement Management and Monitoring intended for users, via an application, and for the employees of the QoS monitoring unit, involving measurements with testing, intended for long-term measurements, for the purpose of Internet access quality assessment.

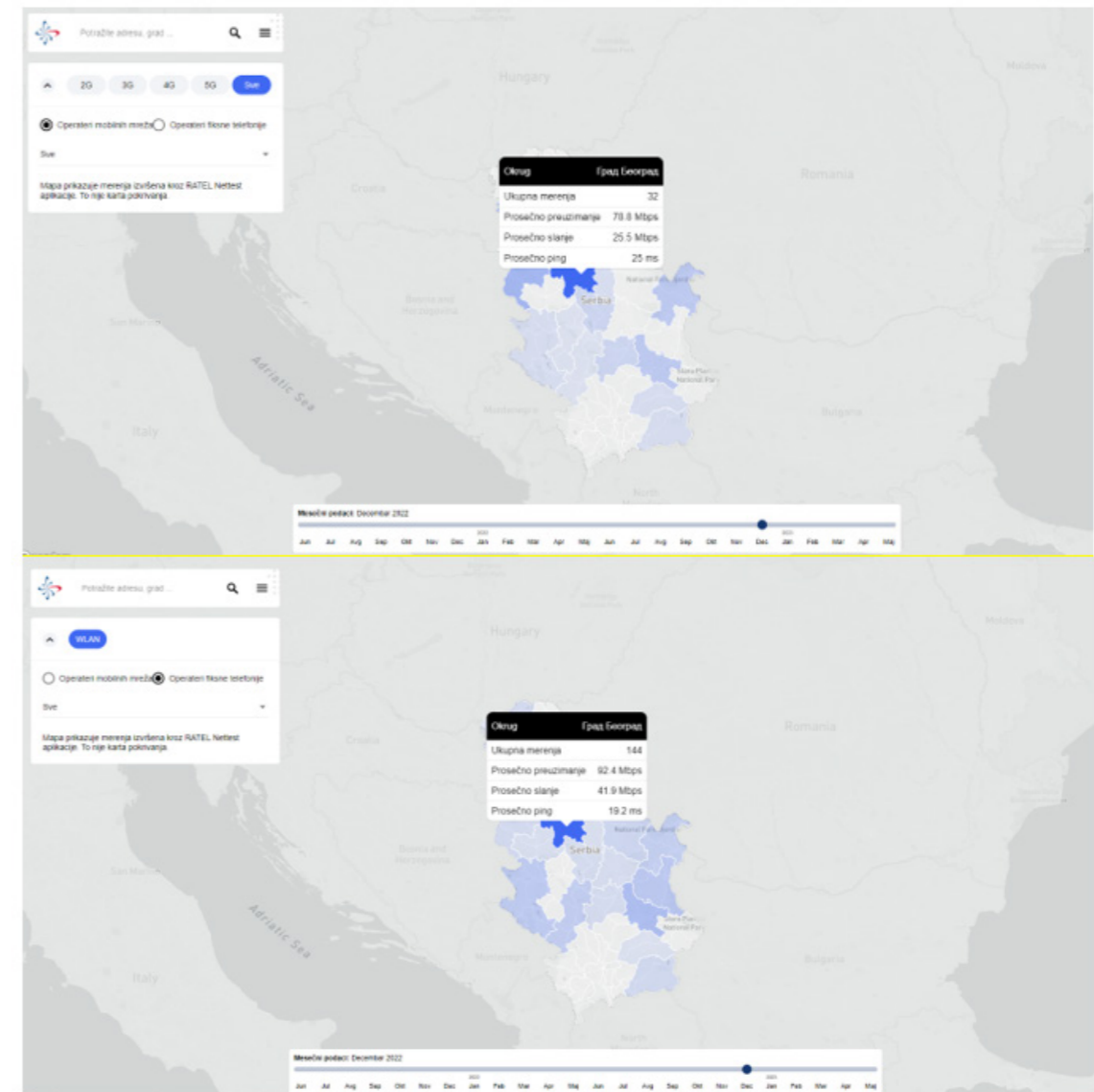
As a result of the above, the Ethernet throughput at the RATEL NetTest measurement server in SOX has been increased from 2Gb/s to 10Gb/s since some of the single users' speeds rose up to 2Gb/s, due to the use of optic Internet access.

The testing of Internet connection in public fixed and WiFi communications networks can be done using RATEL's application available on its website: <https://nettest.ratel.rs/en/test>.

Internet connection testing 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.

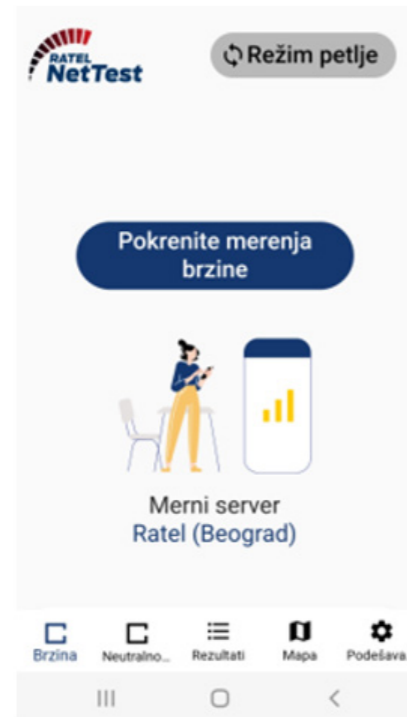
The app users are now able to view NetTest measurement results on the map of the Republic of Serbia, including all measurement results performed by other app users over the last two years, expressed as average values pertaining to districts or municipalities, with a possibility to filter the results according to operator, type of service and time of reading. Users can also view their own measurement logs in the measurement history. A loop measurement regime has also become available to users, which is a feature allowing a continuous quality check of Internet connection for a pre-selected interval and number of trials.

Figure 11.11. Map view of performed tests



All measurement results obtained through RATEL NetTest application are, except for the NetTest map of the Republic of Serbia, available in a machine readable format (CSV, XML and JSON) at a dedicated Internet address: <https://www.nettest.ratel.rs>.

Figure 11.12. Mobile application home page

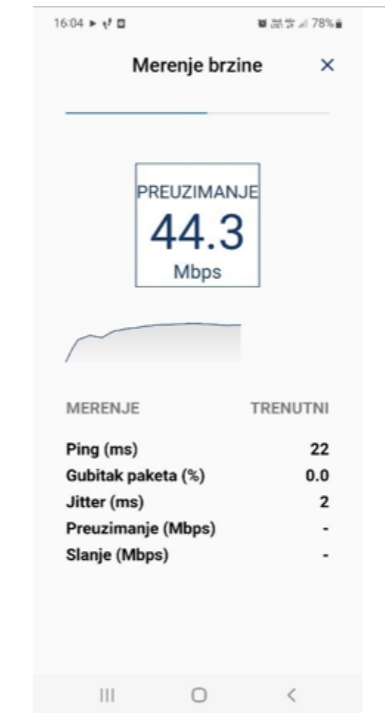


RATEL NetTest application offers its users the possibility to test the quality and speed of current Internet connection. This feature enables comparative analysis of Internet service providers, depending on the location or type of Internet access (fixed/mobile). Color scale red/yellow/green serves as a visual indicator of the connection quality level for the majority 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.

Figure 11.13. Testing of the Internet connection measurement and results



The application has been updated with „Instructions for the measurement of Internet data throughput using RATEL NetTest application“, in order to enable it to be used in the complaint process regarding the quality of service of Internet data throughput. In the complaint filing process, it is necessary to carry out several measurements during different parts of the day, in order to provide necessary measurement statistics for the purpose of proper assessment of the provided throughput.

12. ELECTRONIC COMMUNICATIONS INFRASTRUCTURE INTENDED FOR SHARED USE

The Agency maintains an updated database on the 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).

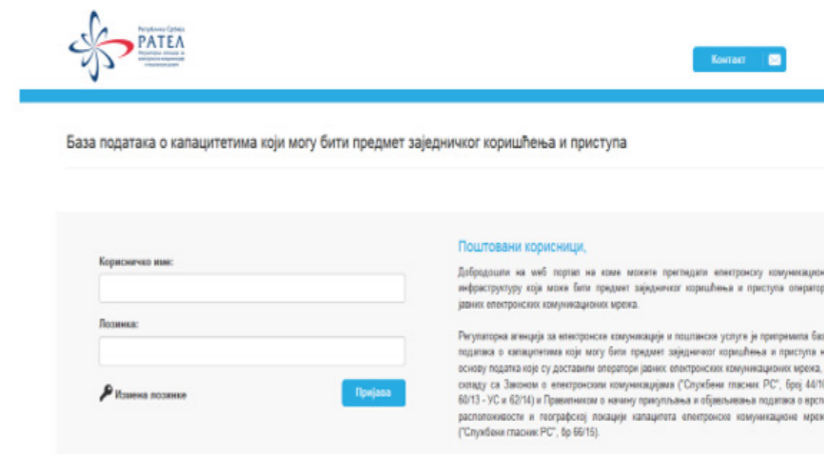
Pursuant to Article 52 of the Law, the Agency keeps an updated database on the type, availability and geographic location of capacities which may be subject to shared use and access (hereinafter: the Capacity Database). In July 2015, the Agency adopted the Rulebook on the manner of collection and publication of the data on type, availability and geographic location of the electronic communications network's capacities. 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 two-tier access to the Database – a read access mode and a read/record access mode. The read access mode is available to all registered electronic communications operators, whereas the read/record access mode is reserved only to electronic communications operators with recorded infrastructure lease service.

The users can access the application by providing a username/password combination, Figure 12.1.

Figure 12.1. Access to Web-GIS Capacity Database application



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 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)

Figure 12.2. Web-GIS Capacity Database application – Home page

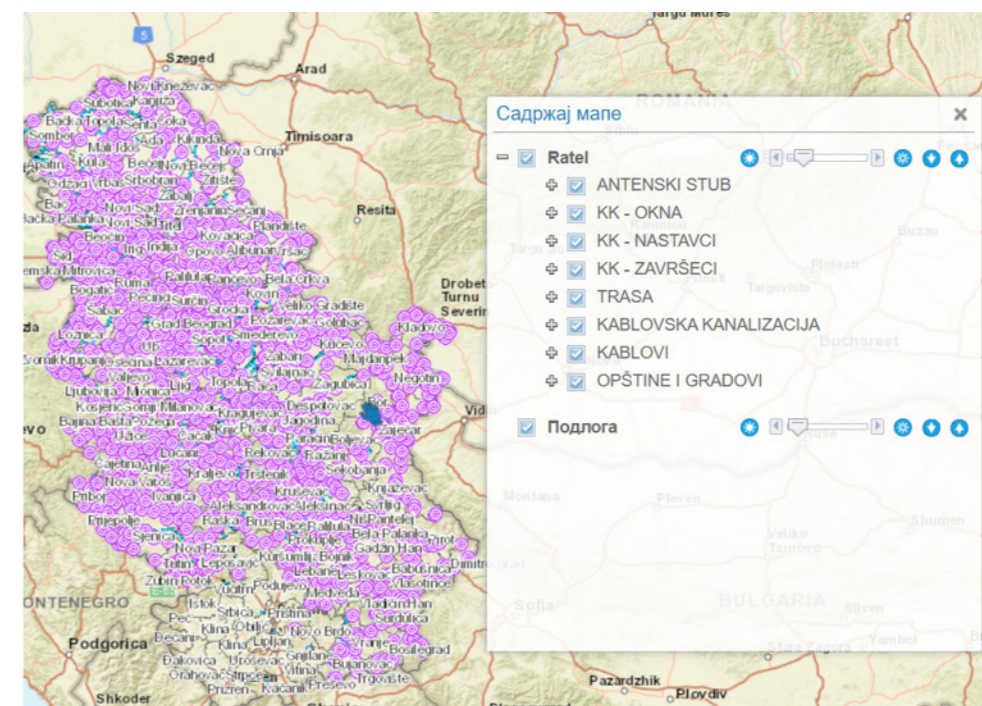
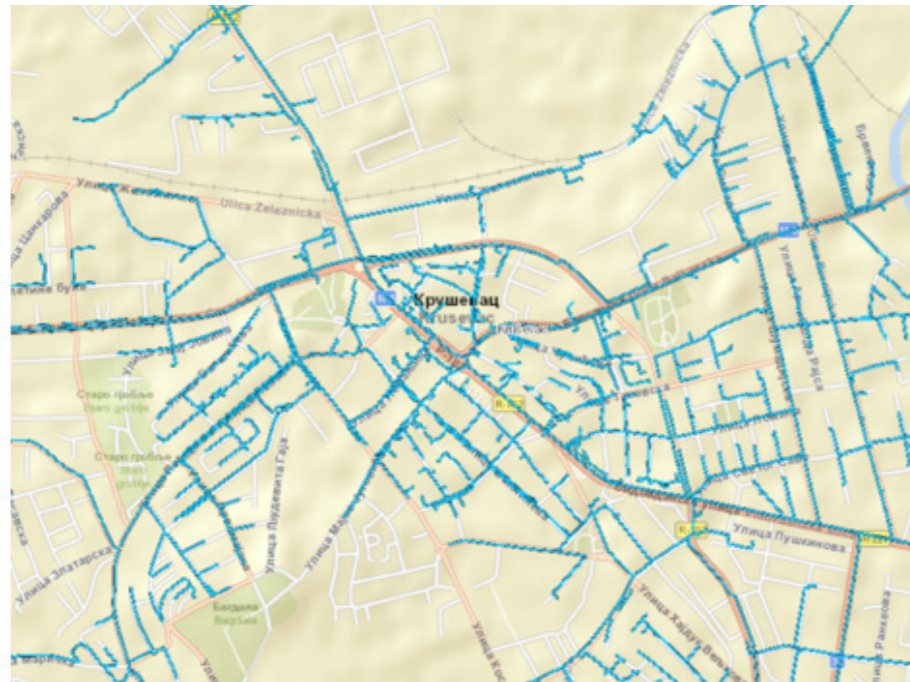


Figure 12.3. Web-GIS Capacity Database application – Enlarged detail



As of 31.12.2022, this Database includes data for 1755 antenna masts, data for 1486 optic cables and around 112.000 cable canalization elements. The Capacity Database for lease is available on the Agency's website to all interested operators of electronic communication networks in a Web – GIS application form. There are 27 operators registered with read access right and 16 operators with read/record access right. In 2022, there were 19,608 accesses to the Database.

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

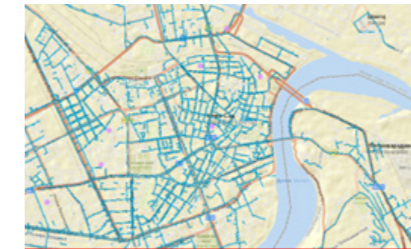


Figure 12.5. Use of standard tools – various surface types – satellite footage



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

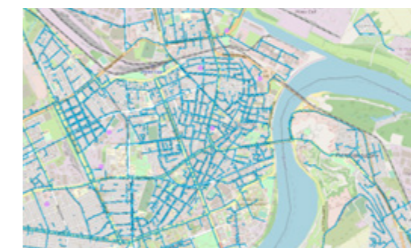
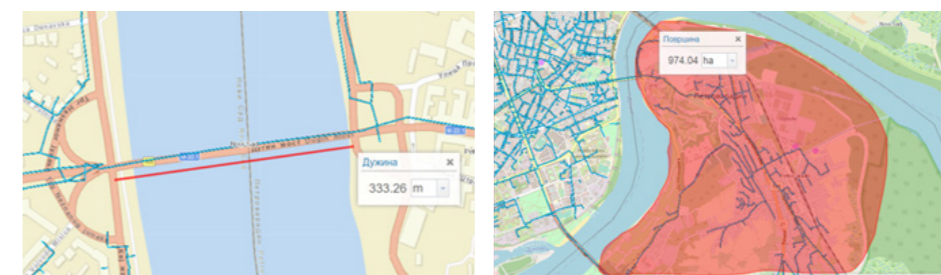


Figure 12.7. Use of standard tools – measurement of distance and surface



Electronic communications network cable ducts

Based on Annex 1 of the EKM1 Rulebook form, 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;
- 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).

Figure 12.8. Cable details

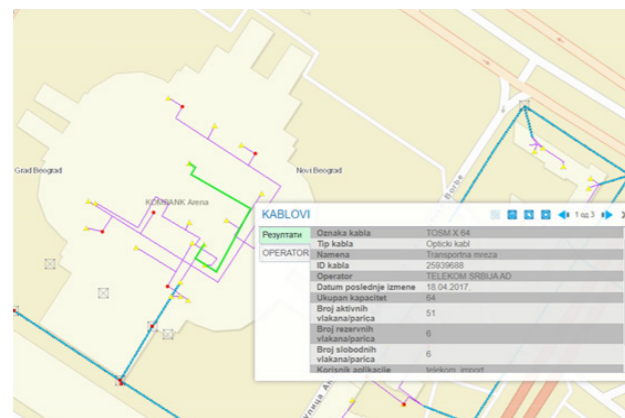
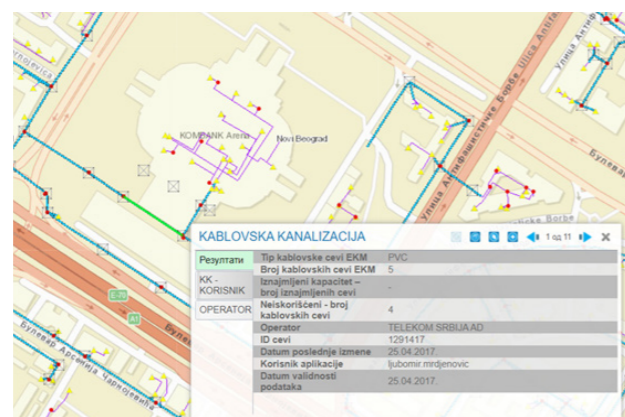


Figure 12.9. Cable duct segment details



Electronic communications network antenna masts

Based on Annex 2, of the EKM2 Rulebook form, 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

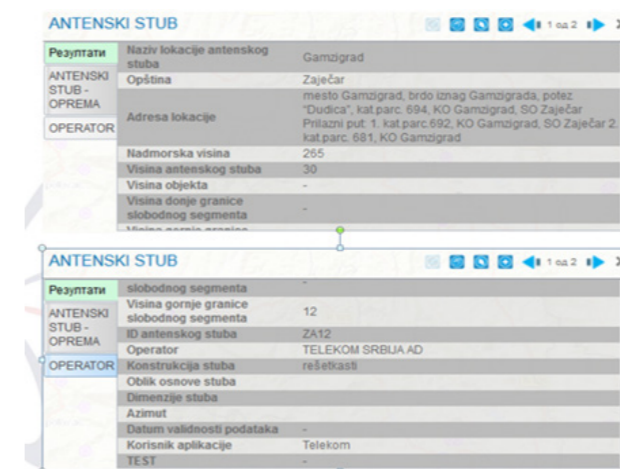
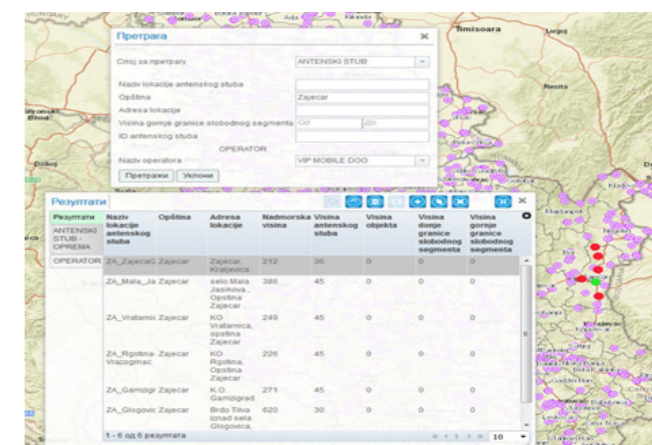


Figure 12.11. Antenna mast spatial query



13. POSTAL SERVICES MARKET

According to the public data¹ gathered and maintained by RATEL, there were 56 postal operators registered as postal service providers on the postal market of the Republic of Serbia. However, over the last year, the status of some of these providers has changed – in some cases, the authorization was revoked *ex officio* and some of them discontinued postal service provision at their own request.

An overview of RATEL’s regulatory activities regarding the dealings with postal operators during 2022 is given in Table 1.

Table 13.1. RATEL’s regulatory activities in 2022

Activity	Number of authorizations/ decisions
Issuance of authorization after expired validity of 10 years	4
Issuance of authorization to a new postal operator	9
Authorization change upon request	6
Authorization revoked	13
Cessation of authorization validity at holder’s request	5
Approval of General terms and conditions	21
Approval of the PPO pricelist for non-reserved postal services from the UPS scope	1
Approval of the OPS pricelist	42

In accordance with the Law on Postal Services², among the requirements for the revocation of license/authorization is the discontinuation of service during 12 months straight, therefore 8 authorizations were revoked under this provision in 2022, with an addition of another 5 authorizations being revoked for the absence of provision of postal services in accordance with the law, the manner and the conditions required by the authorization. Also, further 5 licenses ceased to be valid at the request of the license holder, with one authorization having expired, and with no applications by the operators for a renewal.

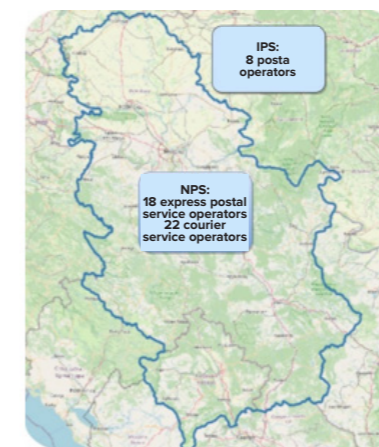
Since the beginning of market regulation, the postal regulator has issued 162 and revoked 53 authorizations, whereas the other operators have seen their license expired, with no applications for a renewal.

13.1. Postal market indicators

Postal market indicators are analyzed based on collected and processed data from annual reports submitted by postal operators.

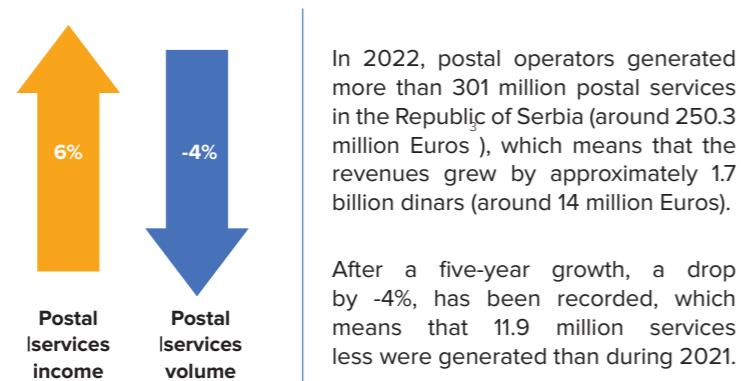
Out of 56 registered postal operators in 2022, on the market of the Republic of Serbia in 2022, postal services were provided by 42 postal operators (the rest of 14 postal operators did not provide postal services), 1 universal service provider (the Public Postal Operator, hereinafter: the PPO), 20 providers of express postal services and 22 operators of courier services. The Public Postal Operator is both a universal service provider (USP) and provider of other postal services (OPS).

Figure 13.1. Postal operators by area of postal service provision in 2022



In 2022, there were 18 postal operators, one of which a USP, that provided services in national postal traffic (hereinafter: NPT) on the market of the Republic of Serbia. In international traffic (IPT), there were 8 postal operators. Out of these 8, one is a USP, whereas two only provide services in IPT. There were 22 operators providing courier services.

Figure 13.2. Postal services volume and income in 2022



In 2022, an average of 121 postal items per household were delivered, which is 5 items less than the year before. A drop by 4 postal items has also been observed in the universal postal service (UPS) area, with 101 delivered items in 2022.

There were 42 items on average delivered per inhabitant in 2022. As for other postal services (OPS), their volume remained unchanged compared to the previous year (7 items per inhabitant) and 20 per household.

The share of the postal service income in the GDP in current prices was reduced from 0.44% to 0.41% compared to the year before.⁴

Postal industry employees

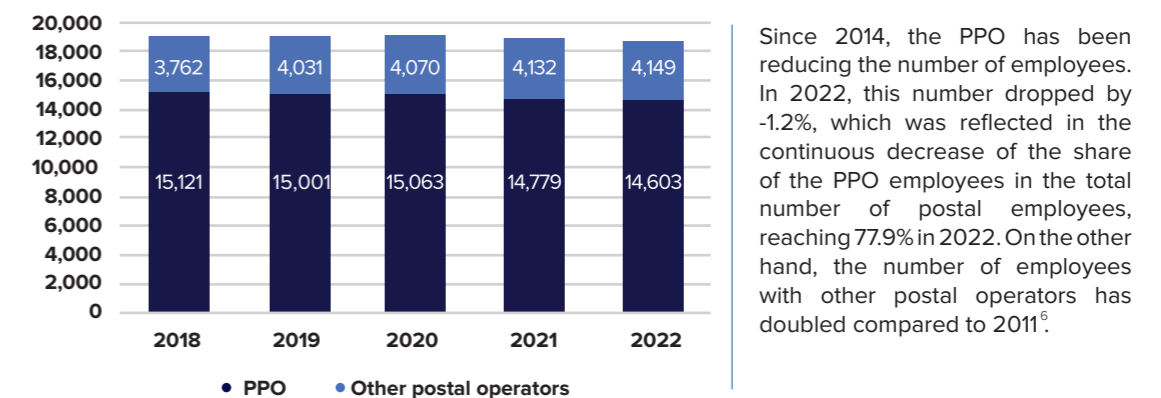
Total number of employees in the Republic of Serbia in 2022 was 2,310,355⁵, which is an increase by 1.6% in comparison to the year before. In the postal industry, an opposite effect has been observed, which caused a decrease in the share of postal employees in the total number of employees on the national level. Postal employees account for 0.81% of the economically active population, which is less compared to the year before, when the percentage was 0.85%.

For the second year in a row, the number of postal employees in the Republic of Serbia has been dropping, following a seven-year long growth. In 2022, the recorded decrease in the number of postal employees was -0.8% (Table 2, Figure 3).

Table 13.2. Postal industry employees in 2018-2022

Operators	Year				
	2018	2019	2020	2021	2022
PPO	15,121	15,121	15,121	15,121	15,121
Other postal operators	3,762	4,031	4,070	4,132	4,149
TOTAL	18,883	19,032	19,133	18,911	18,752

Figure 13.3. Share of postal employees with the PPO and other postal operators in 2018-2022



Postal service volume and revenues in 2022

Dominant category in the postal service volume is universal postal service (UPS), with realized approximately 251 million services in 2022, whereas within the scope of other postal services (OPS), 5 times less postal services were provided, namely over 50 million (Table 3).

Table 13.3. Postal service market in 2022

Type of service	VOLUME	INCOME	VOLUME	INCOME
	in thous.	in thous. din.	%	%
Universal postal service	250,971	10,972,432.00	83	37
Other postal services	50,133	18,418,716.93	17	63
TOTAL	301,104	29,391,148.93	100	100

³ National Bank of Serbia

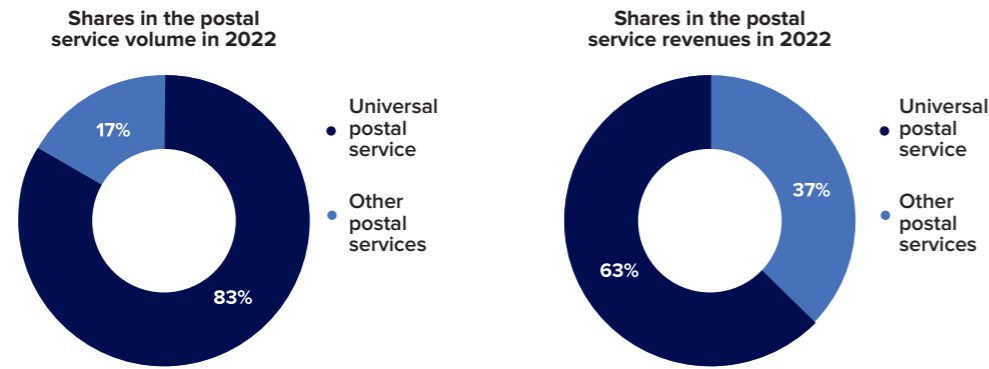
⁴ Statistical Office of the Republic of Serbia – Statistics Calendar of RS for 2023

⁵ Statistical Office of the Republic of Serbia – Statistics Calendar of RS for 2023

⁶ Neither the employees of transport companies (AD „Niš ekspres“ and „Autoprevoz Kikinda“), nor the employees of logistic companies (Gebrüder Weiss, M&M, InterEuropa etc.) were included in the analysis, since they perform primarily activities out of the scope of the postal sector.

UPS generated an income of approximately 11 billion dinars, whereas OPS earned over 18.4 billion dinars in revenues. (Figure 4).

Figure 13.4. UPS and OPS volume and income shares in 2022



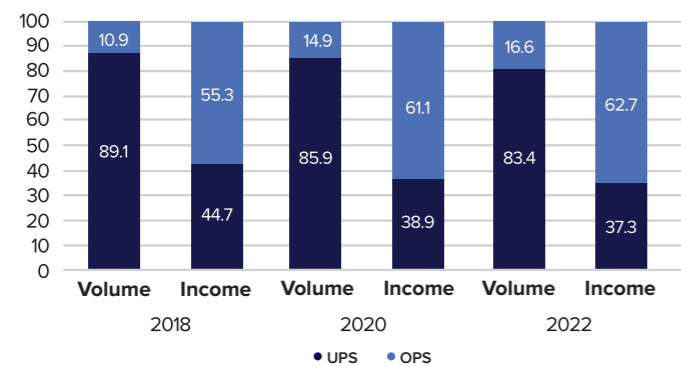
13.2. Postal market trends

UPS has been continuously marking a drop in the total volume share (Table 4). However, due to an overall decrease of the postal service volumes, one part of UPS, despite a modest drop, has remained on the same level as the year before.

Table 13.4. Postal service volume and income shares in 2018-2022

Type of service	2018		2019		2020		2021		2022	
	Vol.	Income	Vol.	Income	Vol.	Income	Vol.	Income	Vol.	Income
UPS	89.1	44.7	87.4	42.1	85.1	38.9	83.7	40.6	83.4	37.3
OPS	10.9	55.3	12.6	57.9	14.9	61.1	16.3	59.4	16.6	62.7
Total	100	100	100	100	100	100	100	100	100	100

Figure 13.5. UPS/OPS ratio in postal volume and income in 2018-2022



Since the beginning of postal market monitoring in 2010, a significant drop of the UPS share in the postal revenues has been recorded, while the OPS income has been constantly growing, reaching a 62.7% share in 2022.

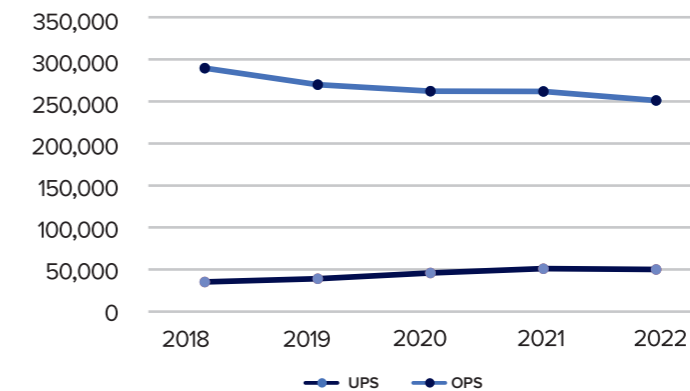
UPS volumes have been in a continuous decrease for the last 10 years, with the exception of year 2017, when a growth was recorded. In this period, the UPS volume has dropped by -19%.

Postal volumes over the last five years are shown in Table 5 and Figure 6.

Table 13.5. UPS and OPS volumes in 2018-2022

Type of service	VOLUME in thousand units					Positive/negative growth (%)			
	2018	2019	2020	2021	2022	19/18	20/19	21/20	22/21
UPS	289,512	269,715	262,139	261,833	250,971	-7%	-3%	-0.1%	-4.1%
OPS	35,314	39,005	45,997	51,143	50,133	10%	18%	11%	-2%
TOTAL	324,826	308,720	308,136	312,976	301,104	-5%	-0.2%	1.6%	-3.8%

Figure 13.6. UPS and OPS volumes five-year trends (in thousand) in 2018-2022



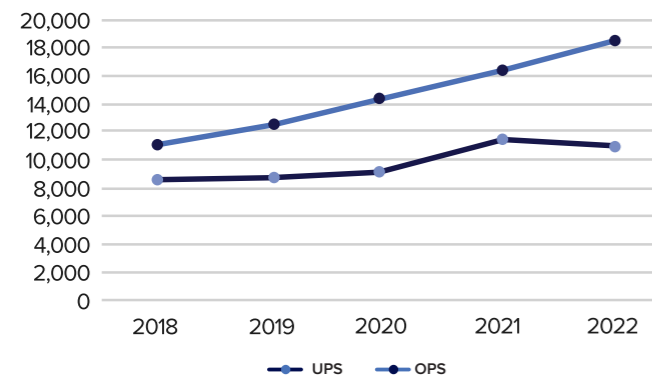
Postal services generated in 2022 an income by 6% larger than the one from 2021. (Table 6, Figure 7).

Table 13.6. UPS and OPS revenues in 2018-2022

Type of service	INCOME in million dinars					Positive/negative growth (%)			
	2018	2019	2020	2021	2022	19/18	20/19	21/20	22/21
UPS	8,756	8,916	9,111	11,258	10,972	1.8%	2.2%	23.6%	-2.5%
OPS	10,851	12,277	14,317	16,463	18,419	13.1%	16.6%	15%	11.9%
TOTAL	19,607	21,193	23,427	27,721	29,391	8.1%	10.5%	18.3%	6%

Figure 7 shows the trend of UPS and OPS revenues over the last five years.

Figure 13.7. UPS and OPS revenues five-year trends in 2018-2022

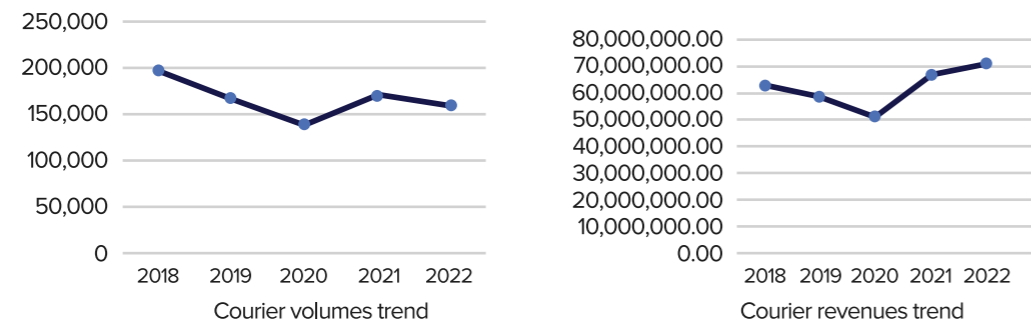


After a six-year income growth, a drop in UPS revenues by -2,5% has been recorded in 2022.

The OPS income has been constantly growing, by almost 12% in 2022, due to price augmentation of these services. The OPS income growth was recorded for the twelfth year in a row. All OPS providers raised their prices in 2022.

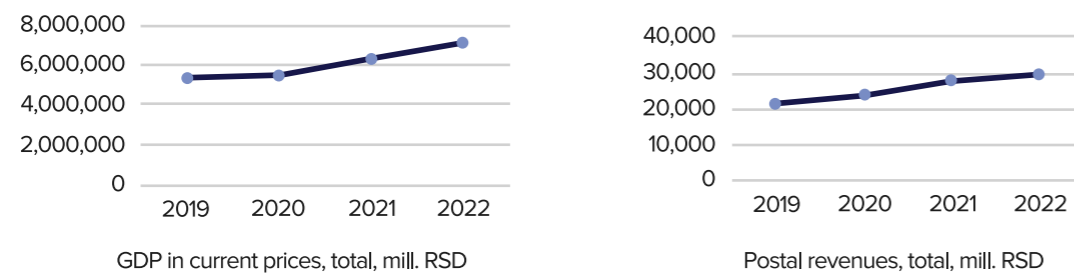
As for the courier services, after the volume growth in 2021, a drop in the same category occurred in 2022, with revenues steadily growing despite lower volumes (Figure 8).

Figure 13.8. Courier volume and income trends in 2018-2022



When comparing the GDP⁷ in current prices over the period 2019-2022 to the generated postal revenues, a constant growth can be observed (Figure 9), suggesting that the postal revenues follow the GDP growth in current prices.

Figure 13.9. Movement of GDP in current prices and postal service revenues in 2019-2022



13.3. Comparative overview of UPS and OPS volume and income trends

According to the Law on Postal Services, postal services comprise universal postal service and other postal services.

On the territory of the Republic of Serbia, UPS is solely provided by the PPO, the Public Enterprise „Post of Serbia“, Belgrade, designated by the Law on Postal Services, and a license holder since 2010. Even though the Law foresees that other postal operators may also perform UPS, so far none of the operators have expressed interest to provide UPS, while other postal services are provided by all postal operators, based on an authorization.

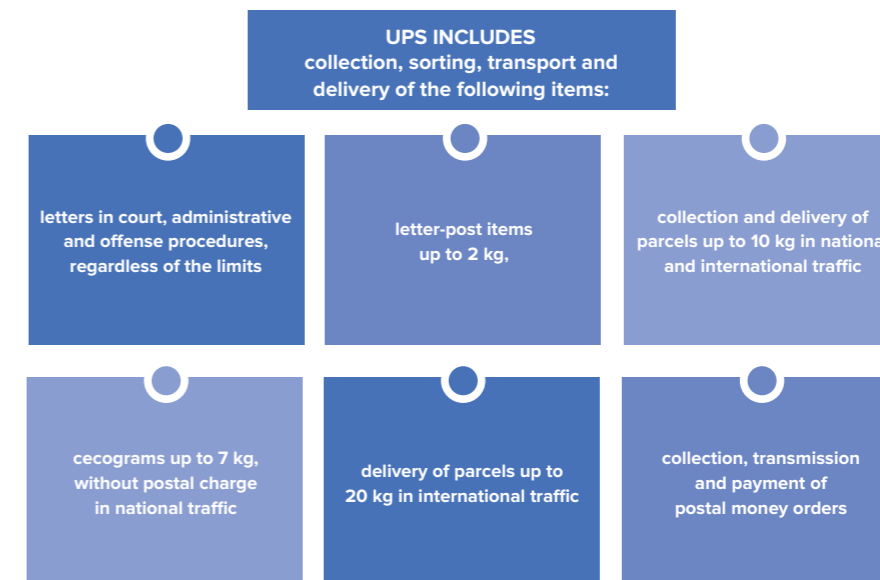
Universal postal service

Universal postal service (UPS) is 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 (continuously).

UPS is normally provided at affordable prices and under equal conditions for all users, without discrimination and according to a prescribed standard.

Universal service is set by the Law as a service of general interest, very important from the social and economic point of view and therefore the legislator is obliged to establish the mechanisms of provision of this service category.

Figure 13.10. UPS scope



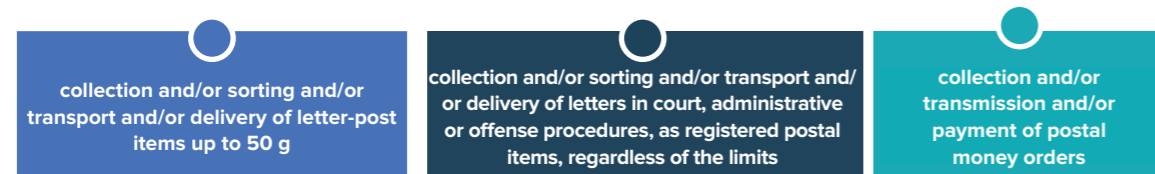
Taking into account the trend of reducing the traditional postal services on the global level, UPS has come to represent a burden to USPS, so an intensive search for new models of universal service provision has been under way over the recent years.

Until the accession of the Republic of Serbia to the European Union is finalized, the Law foresees the funding of UPS from the scope of reserved services, the provision of which is an exclusive right of the PPO. In the EU, market liberalization, along with abolition of the reserved area was completed in 2013.

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, for the reserved services (other postal services in 2022 were not allowed to cost below 112.5 dinars, VAT included).

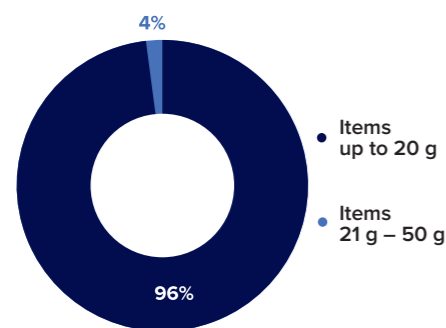
Reserved postal services are entrusted to the PPO and are part of UPS (Figure 11).

Figure 13.11. Scope of reserved area



The share of the reserved services in UPS in 2022 was approximately on the similar level as the year before, accounting for 96.7%. With regard to the total volume realized by the PPO, the reserved area makes 90.7% of the total volume.

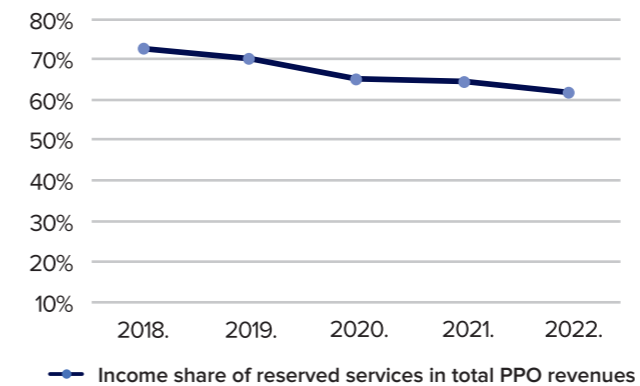
Figure 13.12. Volume of items by weight in the reserved area



Items up to 20g make more than 96% of the reserved services and are the most frequent UPS item category, covering 92.7% of the UPS volume. The most dominant part of this category are non-recorded letter-post items, accounting for 69% of UPS (their share has dropped compared to 2021). They are followed by items 21g-50g (4%), items 51g-100g (1%), with the rest of postal items accounting for a little over 2% of UPS.

Items sent by legal persons having contract with the PPO, account for 90% of the reserved services.

Figure 13.13. Reserved services revenues in the total PPO income in 2018-2022



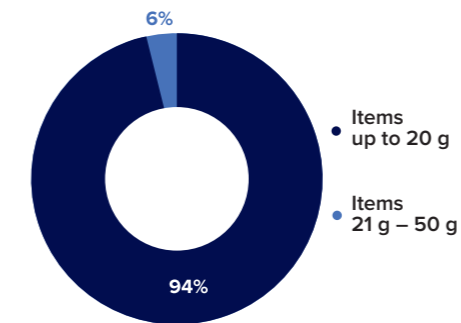
Unlike the reserved area volumes, accounting for the biggest part of the realized volumes, the income share from reserved services as the most dominant category in the totality of PPO's services has been decreasing continuously: at the beginning of market regulation (in 2011) it was 80%, in 2018 72%, and in 2022 61.7%. Additionally, a modest increase by 6.4% of the income share of non-recorded services in the total PPO postal revenues has been recorded.

The average UPS income per unit is 43.7 dinars, which is by 0.7 dinars more, compared to 2021.

The average income from reserved services is approximately 40.9 dinars and from services under special agreement 37 dinars.

The income from reserved services accounts for 91% of all UPS revenues, the same as the year before.

Figure 13.14. Income of items by weight in the reserved services



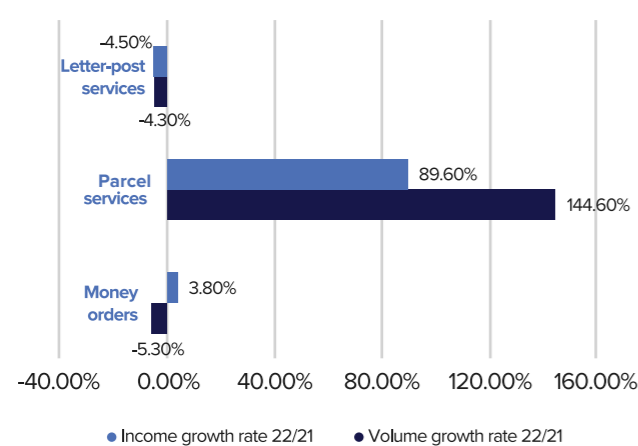
Items up to 20g account for 94% of the reserved services revenues. These items' revenues are dominant in the UPS income (86%) and have increased compared to their share in 2021 (85.5%).

When comparing positive and negative growth rates of letter-post, parcel and money order services within UPS, the volume usually follows the income, except for postal money orders, where, compared to 2021, the revenues have increased despite the drop in the volume of services (Table 7, Figure 15).

Figure 13.7. UPS volume and income growth rates in 2022/2021

UPS	Volume growth rate 22/21	Income growth rate 22/21
Letter-post services	-4.3%	-4.5%
Parcel services	144.6%	89.6%
Postal money orders	-5.3%	3.8%

Figure 13.15. UPS volume and income growth rates in 2022/2021



In 2022, there was a drop in the volume of letter-post items within the UPS scope, which is also a European and global occurrence, with similar trends being present in these markets for years. Also a dramatic growth in the volume of parcels within the UPS scope was recorded, with a notice that real parcel volumes are actually very small, but in 2022, the PPO introduced a new service called „common parcel“, i.e. an uninsured parcel.

The biggest UPS share is accounted for by the items (non-recorded, court letters and registered letters) transported by the PPO based on concluded contracts with legal entities. The share of these items is increasing on a yearly basis, reaching, during 2022, 88% of the volume and 80% of the income.

In 2022, UPS accounted for 7% of the volumes of international postal traffic (IPT) and 19% of the IPT revenues. During 2022, UPS in IPT was around 14 times less frequent compared to national postal traffic (NPT), and in 2021, around 32 less frequent.

Unlike the last two years, when IPT experienced somewhat hampered performance, during 2022, this market segment became stable and marked a big increase in the volume of inbound postal items (by 166% compared to 2021), so it became evident that inbound volumes had become significantly higher compared to 2019 (a year before the pandemic). On the other hand, a decrease by -15% in the outbound postal items has been observed in comparison to 2021. (Table 8).

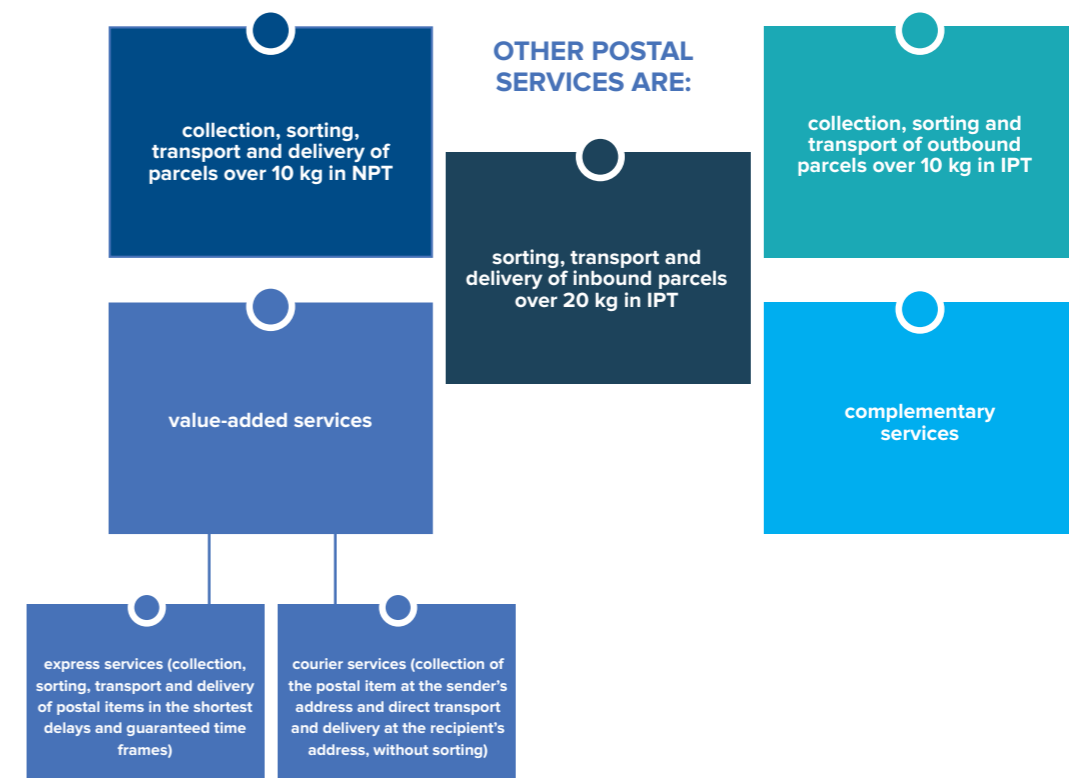
Table 13.8. UPS volumes in IPT in 2019-2022

	2019.	2020.	2021.	2022.	Growth rate 20/19	Growth rate 21/20	Growth rate 22/21
Outbound	1,998,343	1,952,999	1,671,889	1,418,833	-2	-14	-15
Inbound	9,622,409	4,879,559	6,163,074	16,429,411	-49	26	167
Total	11,620,752	6,832,558	7,834,963	17,848,244	-41	15	128

Inbound postal items to the Republic of Serbia in 2022 make approximately 92% of the total volume of UPS international items, accounting for 70% of the total UPS revenues in IPT.

Other postal services

Figure 13.16. Other postal services (OPS)



Other postal services (OPS) are provided by the postal operators and the PPO, based on the authorization for the OPS provision.

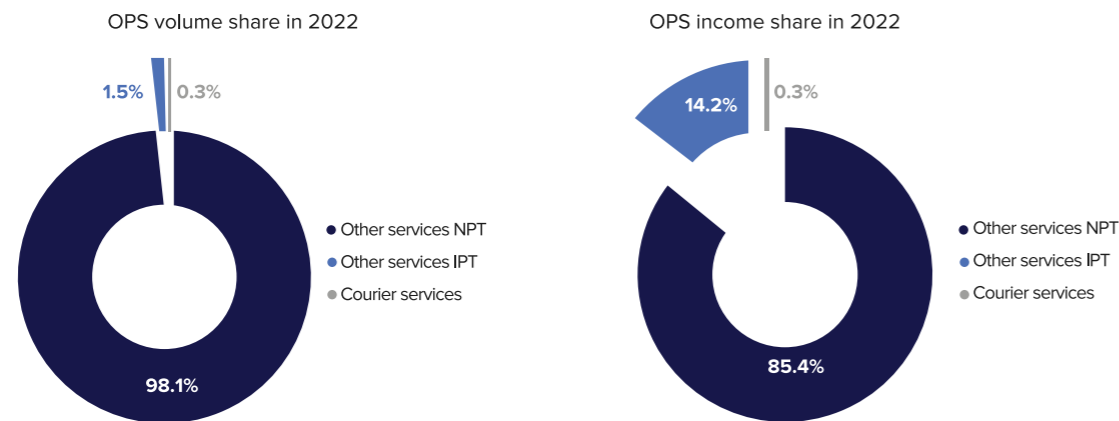
OPS in UPS, as the most dominant OPS category, marked a decrease in volumes of -2% for the first time, whereas its income continued to grow (Table 9, Figure 17).

In NPT, OPS are the most dominant OPS category, accounting for 98.14% of the volume and 85.4% of the revenues, which is approximately the same level as in 2021.

The average income per OPS item in NPT has continued its three-year growth trend, increasing by 37 dinars (13%) compared to 2021, reaching the value of around 320 dinars.

OPS in IPT, despite participating in the volume with only 1.5%, generate as much as 14.2% of the revenues (Figure 17). The 2022 volume and income shares have remained at the last year's levels, whereas the average income per item in IPT has increased by 21%, reaching approximately 3,390 dinars. Following the last year's growth, a drop in the volumes by -1% has been recorded in 2022, with income of this OPS category surging by 20%.

Figure 13.17. OPS volume and income shares in 2022



Courier services have marked a similar share in OPS of more than 0.3% of the volume, and over 0.4% of the income. The average income per courier service was 445 dinars which resulted in an increase in 2022 by around 53 dinars (14%). Courier services have been steadily dropping in volume, by -6% in 2022. On the other hand, the income has been on the rise, by around 6%. The income growth is due to the courier service price augmentation. 10 years ago, the OPS volume was 254,605 and ever since, these services have been constantly decreasing, with the exception of years 2012 and 2017. The volume of services in 2022 is by -24% lower than in 2017 (Table 9).

Table 13.9. OPS structure in 2022 and comparison to years 2017 and 2021

Type of OPS service	2017		2021		2022		Volume growth		Income growth	
	Volume in thous.	Income mill. RSD	Volume in thous.	Income mill. RSD	Volume in thous.	Income mill. RSD	2022-2017	2022-2021	2022-2017	2022-2021
OPS in NPT	30,123	7,877	50,192	14,214	49,203	15,733	63	-2	99	11
OPS in IPT	594	1,660	780	2,182	771	2,615	30	-1	58	20
Courier services	210	68	170	67	159	71	-24	-1	58	20
Total	30,928	9,605	51,143	16,462	50,133	18,419	62	-2	92	12

OPS volume and income growth rates in the Republic of Serbia, compared to years 2017 and 2021, are shown in Table 9. In comparison to reference year 2017, OPS grew in volume by 63% and by 99% in income during 2022. The biggest growth was marked by OPS in NPT, with their volume share being on the same level over the last three years, while the revenues grew continuously up to 2021. In 2022, the OPS income share in UPS slightly decreased. After a 10-year decline, the share of courier services settled on the same level for the last three years.

Figures 18 and 19 show OPS volume and income growth rates in the period 2018-2022.

Figure 13.18. OPS volume growth rate in 2017-2022

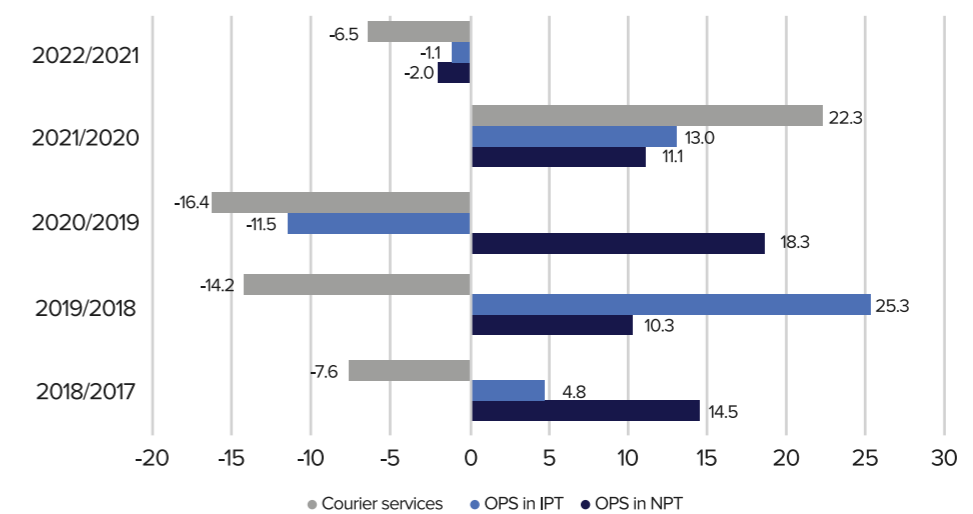
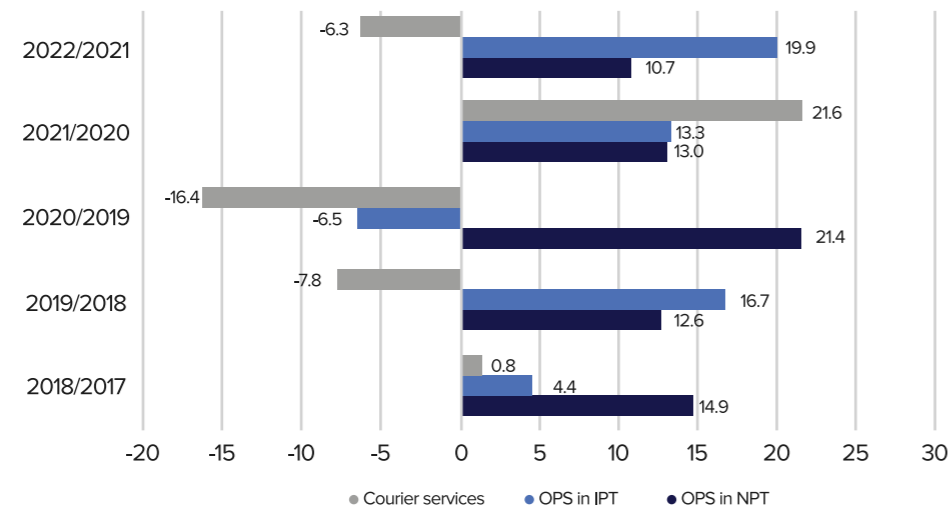


Figure 13.19. OPS income growth rate in 2017-2022



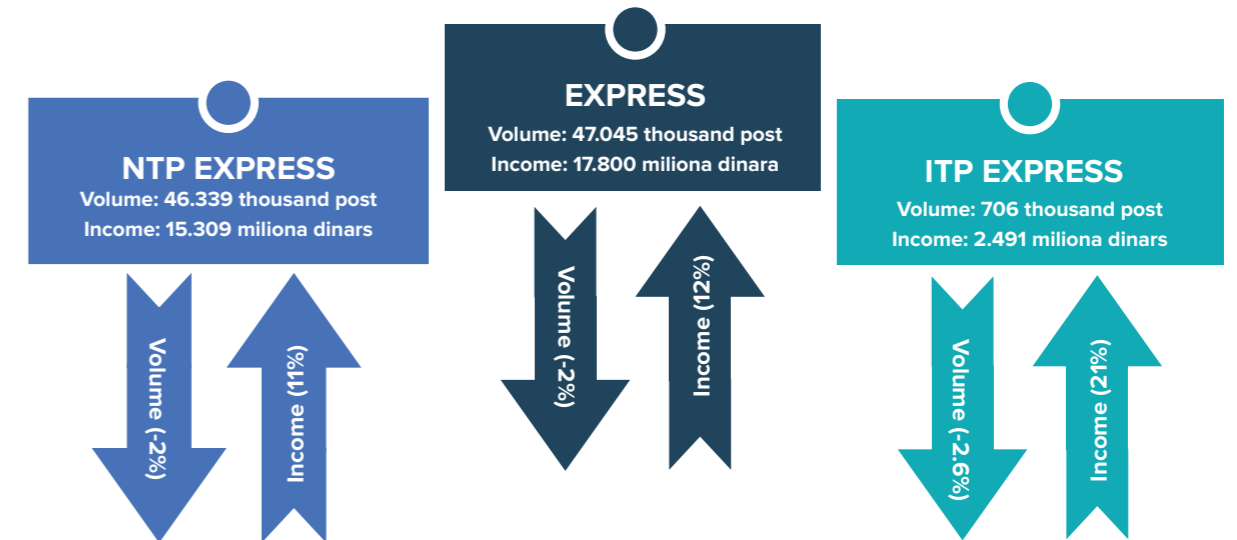
The OPS volume and income share growth trends in the Republic of Serbia over the last 5 years is shown in Table 10.

Table 13.10. OPS share trends in percent

Type of OPS service	2018		2019		2020		2021		2022	
	Volume	Income	Volume	Income	Volume	Income	Volume	Income	Volume	Income
OPS in NPT	97.6	83.4	97.6	83.0	98.2	86.4	98.1	86.4	98.1	85.4
OPS in IPT	1.8	16.0	2.00	16.5	1.5	13.2	1.5	13.2	1.5	14.2
Courier services	0.6	0.6	0.4	0.5	0.3	0.4	0.3	0.4	0.3	0.4
Total	100	100	100	100	100	100	100	100	100	100

13.4 Analysis of express services and impact of remote commerce
Express; NPT express; IPT express/ Volume; Income...

Figure 13.20. Main characteristics of express service market in 2022 and movement of volumes and revenues compared to 2021



Express postal services are the most dominant OPS category and, as previously said, these services generate a considerable part of revenues in the whole postal market.

Market shares in the total express service volume and income (both in NPT and IPT) of the most dominant postal market players are shown in Figure 21.

Figure 13.21. Market share of postal operators in total express service volume and income in 2022



On one hand, express services market is deemed oligopolistic¹⁴ due to five postal operators accounting for almost 98% of the express postal service volumes. On the other hand, the HHI index value suggests that the NPT express services market is concentrated.

The HHI index is one of the most reliable indicators of 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 value drops. The maximum HHI value is 10,000 (in case of a clear monopoly), while the minimum value is close to zero (the nearer the HHI value is to zero, the market is more competitive).

From the point of view of express services as a separate postal market compared to the UPS market, where the PPO holds a monopoly, and further consisting of express postal services in NPT and express services in IPT, HHI for 2022 in NPT is 2,203 suggesting that the NPT express market is concentrated. In IPT, HHI is slightly higher, amounting to 4,848 (Table 11).

In 2022, there are five postal operators participating with more than 1% in the NPT volumes. The HHI value is calculated based on these operators' share (these are the operators whose share in the express volumes is higher than 1%). Different economy sectors use different value intervals for HHI, however the HHI value of 2,203 corresponds in most of the cases to a competitive market. As for the IPT express market, there are five operators as well participating with more than 1%, producing however a higher HHI value, which suggests a lower level of competition in this market segment. It is important to note that there are eight operators providing express services in IPT, with postal volumes manyfold lower than those in NPT and a big disproportion of shares in these operators' total volumes.

Table 13.11. HHI values in 2021-2022 in NPT and IPT express postal services market

	NPT		IPT	
	2021	2022	2021	2022
HHI value	2,229	2,203	4,675	4,848
Operators with express volume share over 1%	5	5	5	5

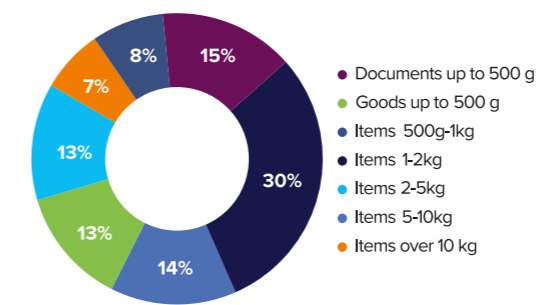
Characteristics of this postal market segment are shown in more detail with consideration to the changes in volumes, revenues, distribution according to the weight and content, share of remote selling in the generated volumes and taking into account the categories of outbound and inbound services in IPT.

In Table 12 and Figure 22, the structure of NPT express items according to the weight for 2022 (in thousand) is shown.

Table 13.12. Structure of NPT express services according to weight in 2022 (in thousand)

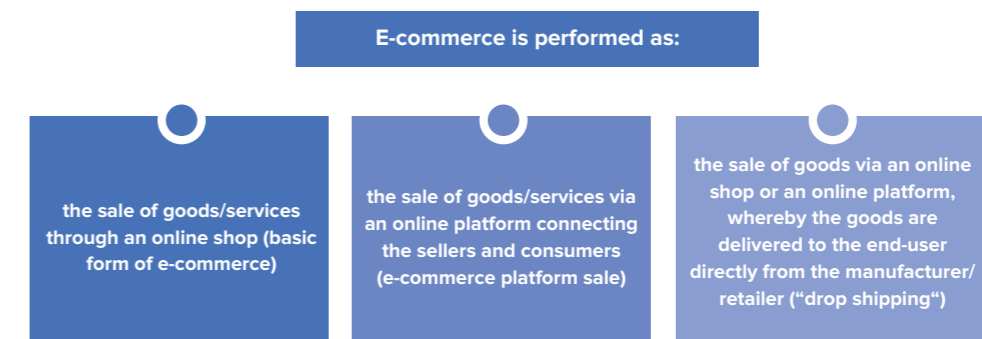
	NPT express items							Total express items		Total volume
	Items up to 500 g		Items 500 g-1 kg	Items 1 kg-2 kg	Items 2 kg-5 kg	Items 5 kg-10 kg	Items over 10 kg	Docs.	Goods	
	Docs.	Goods								
Volume	6,686	13,893	6,670	6,205	5,819	3,302	3,376	6,686	39,653	46,339
Share in total volume	14%	30%	15%	13%	13%	7%	8%	14%	86%	100%

Figure 13.22. Structure of NPT express items according to weight in 2022



In 2022, the items containing goods remain sixfold the number of those containing documents. The items of up to 500 g make up almost half of the total volume of NPT express items (44.4%), out of which 67% contain goods.

E-commerce is a type of remote commerce¹⁰ realized in such a way that the goods/services are offered, ordered and sold via the Internet.



⁸ <https://www.kzk.gov.rs/kzk/wp-content/uploads/2022/10/Sektorska-analiza-ostalih-postanskih-usluga-2019-2021.pdf>

⁹ [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Herfindahl-Hirschman_Index_\(HHI\)](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Herfindahl-Hirschman_Index_(HHI))

¹⁰ 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. (Commerce Law („Official Gazette of RS”, No. 52/2019))

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

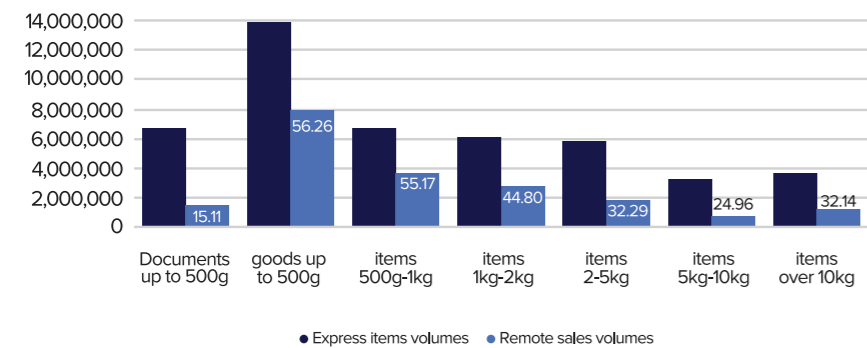
Items stemming from remote commerce account for almost 42% of the total volume of express postal items in 2022 in the market of the Republic of Serbia (Table 13).

Table 13 and Figure 23 show the share of items stemming from remote commerce in the total NPT express volumes.

Table 13.13. Share of remote commerce in total NPT express volumes in 2022 (in thousand)

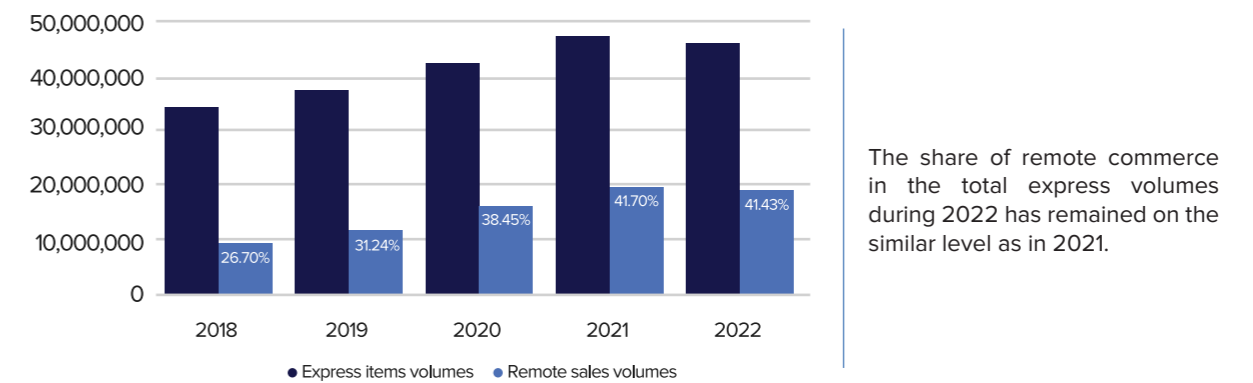
	Docs up to 500 g	Goods up to 500 g	Items 500 g-1 kg	Items 1 kg-2 kg	Items 2 kg-5 kg	Items 5 kg-10 kg	Items over 10 kg	Total
Express volumes	6,686	13,893	6,670	5,205	5,819	3,302	3,764	46,339
Remote commerce volumes	1,010	7,817	3,680	2,780	1,879	824	1,210	46,339
Remote commerce share by weight	15%	56%	55%	45%	32%	25%	32%	42%

Figure 13.23. Share of remote commerce in total NPT express volumes, by weight, in 2022



The trend of items containing goods up to 500 g being the most dominant remote commerce-generated items (41%) has continued in 2022 as well, followed by items weighing between 500 g and 1 kg (19%). 94% of the remote sale items contain goods, while the rest of them contain documents up to 500 g.

Figure 13.24. Share of remote commerce in total NPT express volumes in 2018-2022



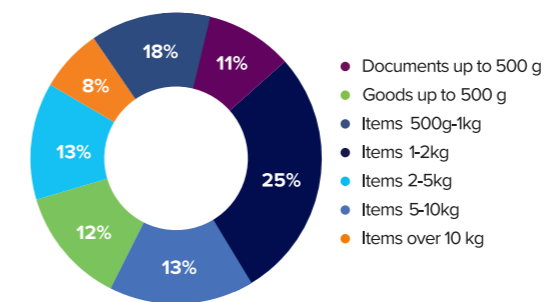
The share of remote commerce in the total express volumes during 2022 has remained on the similar level as in 2021.

Table 14 and Figure 25 show the share in the revenues from express services in NPT (in million dinars) by weight.

Table 13.14. Income share from express services in NPT (in million dinars) by weight, in 2022

	NPT express revenues in million dinars							Total express service revenues		Total income
	Items up to 500 g		Items 500 g-1 kg	Items 1kg-2 kg	Items 2 kg-5 kg	Items 5 kg-10 kg	Items over 10 kg	Docs.	Goods	
	Docs.	Goods								
Income	1,751	3,761	1,924	1,797	1,947	1,247	2,882	1,751	13,558	15,309
Share in total income	11%	25%	13%	12%	13%	8%	18%	11%	89%	100%

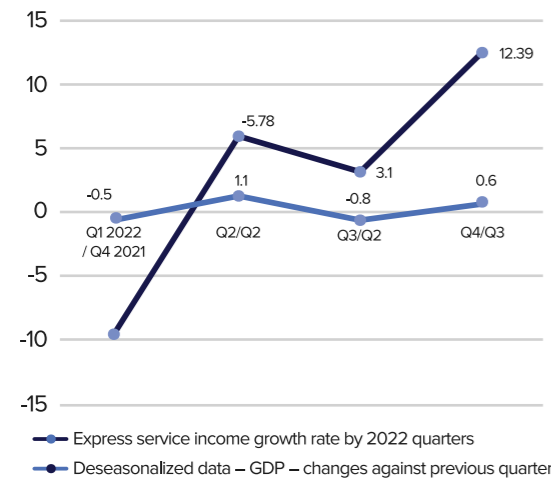
Figure 13.25. Income share from express services in NPT by weight, in 2022



Around 89% of the revenues are accounted for by the items containing goods, with the share of items containing documents being 8 times smaller. The biggest share in the income is accounted for by the items containing goods up to 500g, followed by the items with goods over 10 kg, which, despite being less represented in the volume, have a significantly bigger share in the income, since the postage fee depends on the weight as well.

Figure 26 shows the share of income generated by remote commerce, in the total NPT express service revenues (in million dinars).

Figure 13.26. Comparison of GDP and express postal service revenues by 2022 quarters



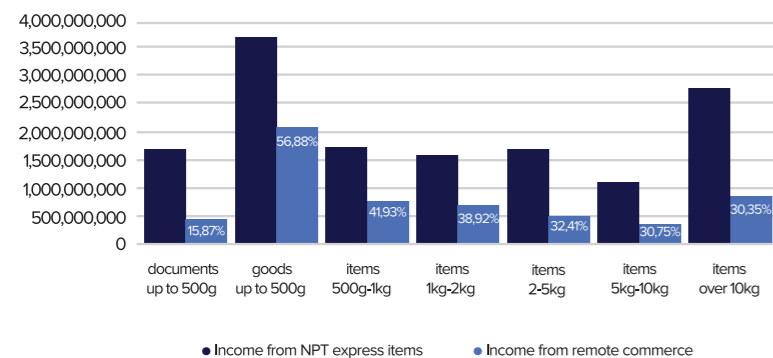
The express service income growth rate has been in the range from -9.64% for the first quarter of 2022 compared to the fourth quarter of 2021, to 12.39% for the fourth quarter of 2022 compared to the third quarter of 2022. One should obviously take into account specific features of the postal market, namely the fact that the last quarter of the year carries the highest growth rates, resulting in the above values. The growth rate of the GDP deseasonalized data (change against previous quarter) has been between -0.8% and 0.6%. As shown in the Figure, the express service income growth rate follows the growth rate of the GDP deseasonalized data, with more drastic rates resulting from the specific postal market features, such as the fact that the last quarter of the year is dominant in terms of the above values.

Table 15 and Figure 27 show the share of the income from remote commerce in the total NPT express service revenues (in million dinars).

Table 13.15. Share of remote commerce income in NPT express service revenues (in million dinars), by weight, in 2022

	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 service revenues	1,751	3,761	1,924	1,797	1,947	1,247	2,882	15,309
Remote commerce revenues	278	2,139	807	699	631	383	875	5,812
Remote commerce share	16%	57%	42%	39%	32%	31%	30%	38%

Figure 13.27. Share of remote commerce income in NPT express service revenues (in million dinars) in 2022



The revenues stemming from remote commerce make 38% of the total income from the express items in NPT. The dominant category of items, goods up to 500g, is the one generating most of the income. As for the revenues from items up to 500g, they account for 36% of the total NPT express service income. Items of up to 500g generate from remote commerce an income accounting for 41% of the total revenues from remote commerce.

Figures 28 and 29 show the volume/income ratio of all express services in 2022/2021 and also the volume/income ratio stemming from remote commerce for the same time period.

Figure 13.28. Changes in express items volume and income in 2022/2021

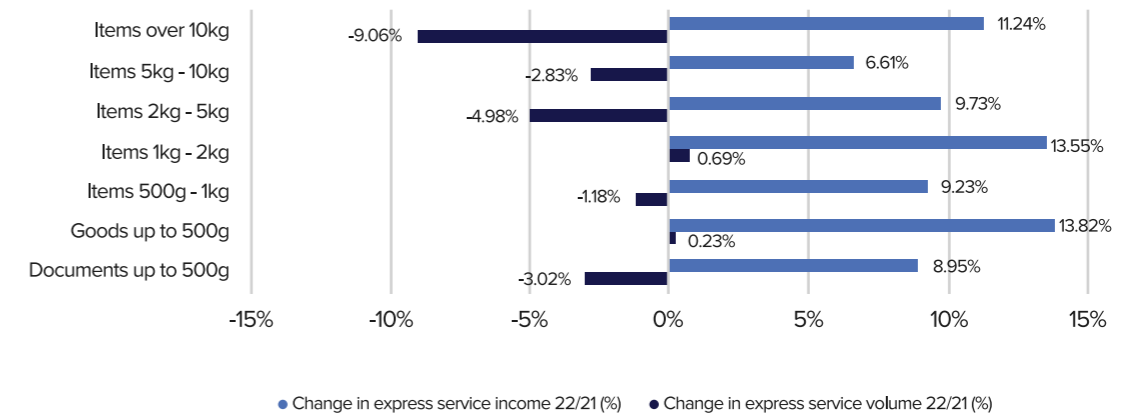
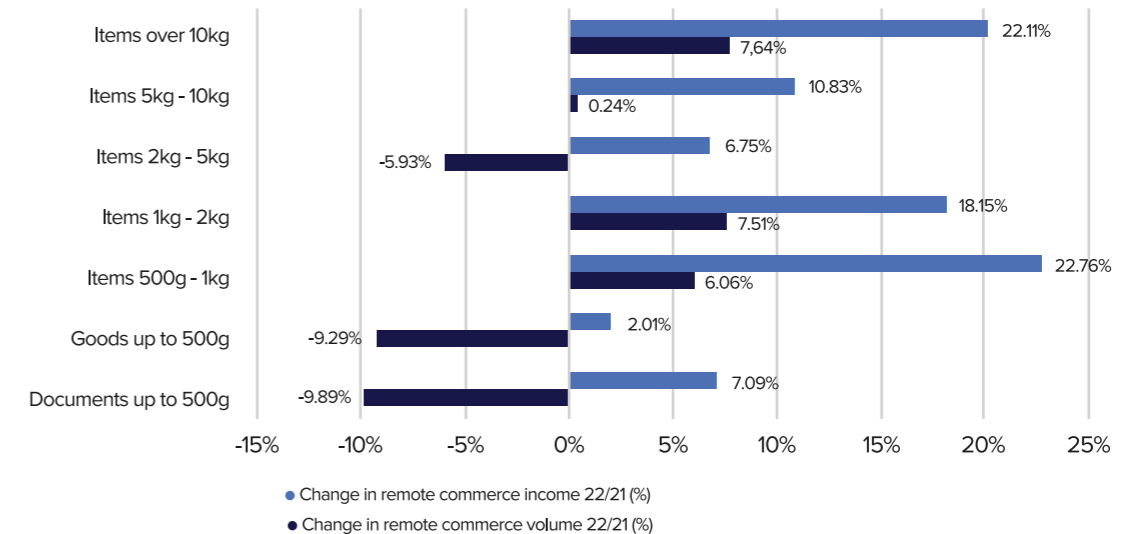
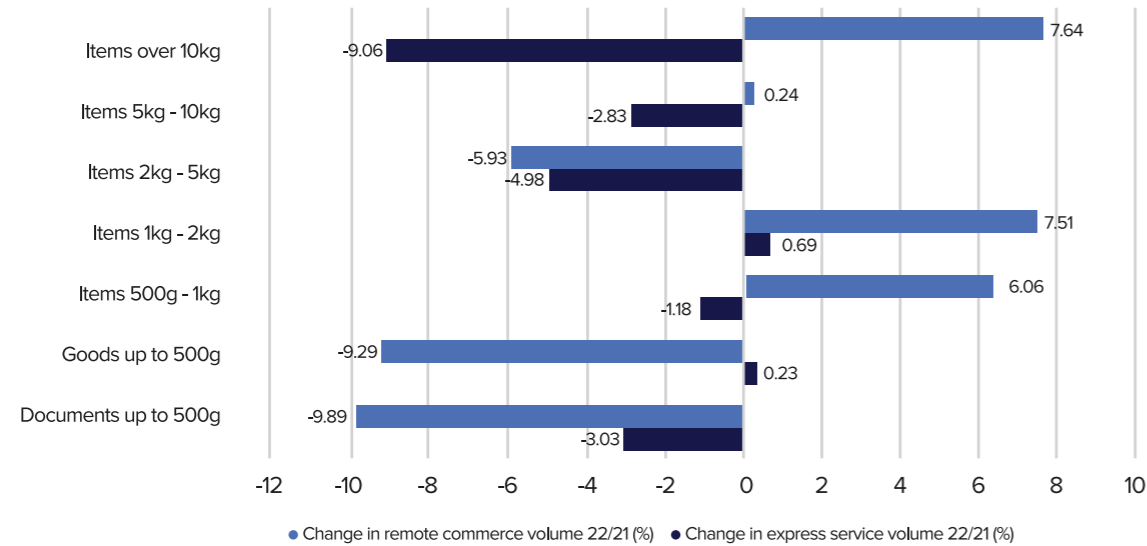


Figure 13.29. Changes in remote commerce items volume and income in 2022/2021



Unlike in previous years, when comparing the situation in express service market for 2021 and 2022, the latter marks a slight decrease both in express and remote commerce volumes (Figure 30). Compared to 2021, express volumes shrank by -2,09%, with similar values recorded with remote commerce items (-2,72%).

Figure 13.30. Changes in express and remote commerce items volumes in 2022/2021



However, despite the volume drop, an increase in express service revenues was recorded (Figure 31), with a growth rate of 11% in 2022. This income growth, recorded over 2022 with all leading postal operators, is explained by the price rise of express postal services.

Figure 13.31. Changes in express and remote commerce items revenues in 2022/2021

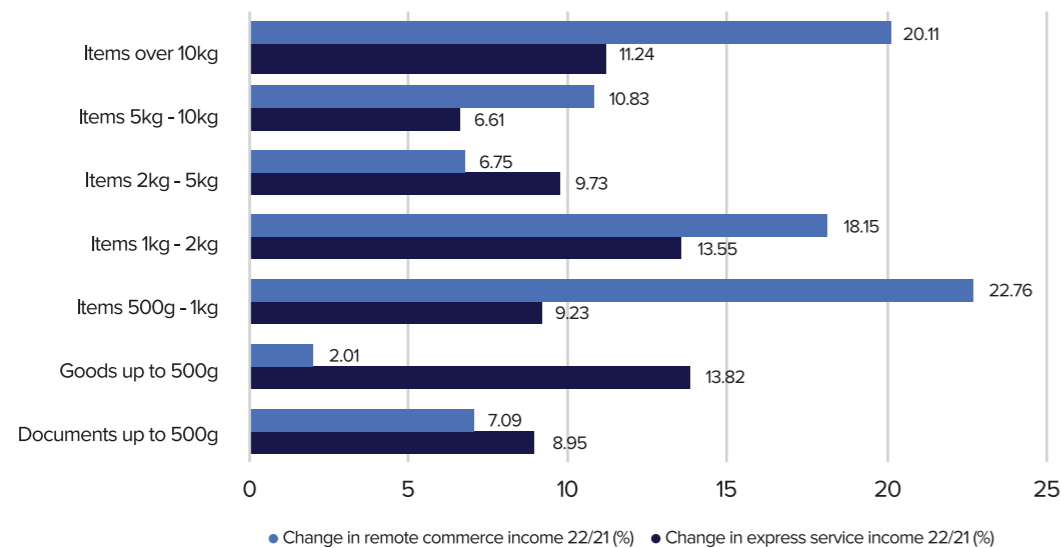
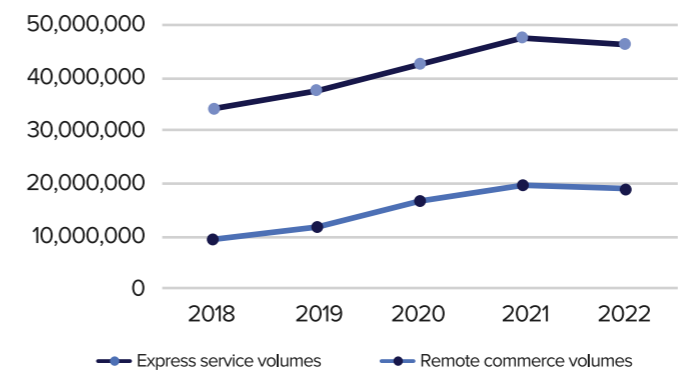


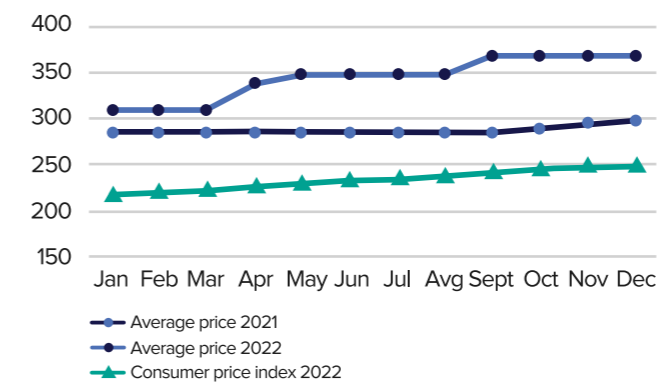
Figure 13.32. Movement of express and remote commerce volumes in 2018-2022



There is no doubt that remote commerce is one of the main motors of the NPT express service market development. This segment has, year after year, gradually grown, with a unique drop in the volume during 2022. It is assumed that one of the reasons for this situation is normalization of the population movement, following the COVID 19 pandemic, since the consumers' needs to order goods via the Internet also declined.

Over 2022, an average inter-annual augmentation of consumer prices and inflation rate measured by consumer price indexes (CPIs) was achieved.¹¹ Postal operators with significant market power followed this trend by raising the prices of their services in 2022 (Figure 33). Therefore, the average price of 0.5 kg postal items provided by the operators jointly accounting for 99% of the NPT express service market, saw, in December 2022 (compared to January 2022) an increase by approximately 19%.

Figure 13.33. Movement of express item average price up to 0.5kg in 2022 and 2021, and the 2022 consumer price index



The graph shows a constant average price during most of 2021 – but it started to rise at the end of 2021 and was continued further on through 2022. The CPI had a constant growth rate during 2022, as well.

Figure 13.34. Comparison of average prices for items up to 500 g and inflation

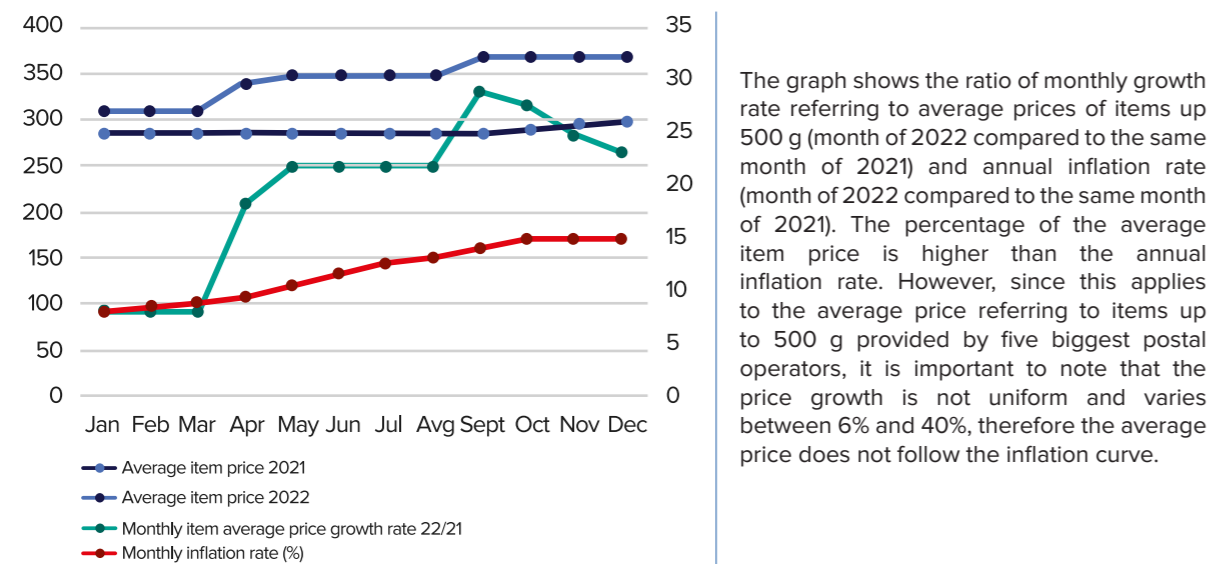
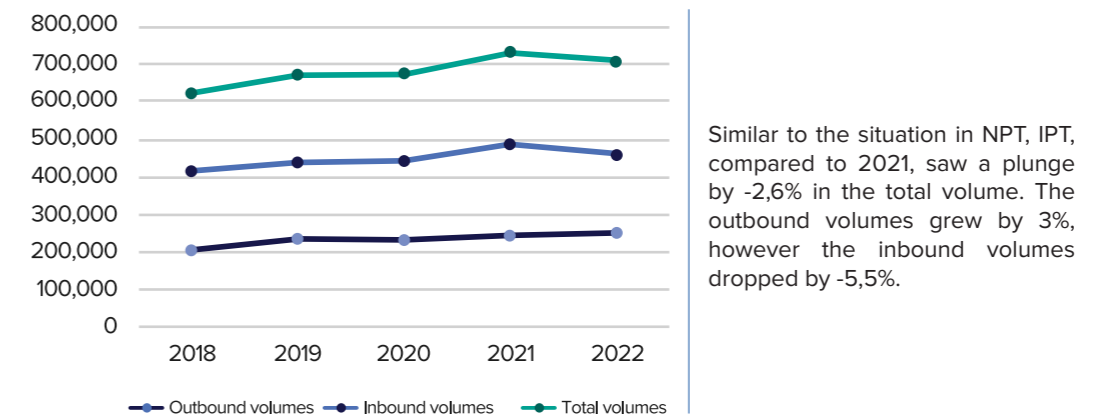


Figure 13.35. Movement of international express volumes in 2018-2022 (outbound, inbound and total)



Beside NPT express services, IPT express items were analyzed as well, based on the postal operators' data submitted through Annual Questionnaires for 2022. Table 16 shows IPT outbound and inbound express volumes in 2022, according to the weight.

Table 13.16. Volume of international express items in 2022

	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	132,756	23,697	18,716	18,433	26,474	12,806	8,482	8,013	249,377
Inbound volumes	141,882	44,852	46,387	49,233	64,114	38,621	27,595	44,076	456,760
Share of outbound items (%)	53%	10%	8%	7%	11%	5%	3%	3%	100%
Share of inbound items (%)	31%	10%	10%	11%	14%	8%	6%	10%	100%

Inbound items make 65% of the IPT total express volumes. In IPT, dominant items are documents up to 500 g (both outbound and inbound). These items are six times more frequent than outbound items with goods in the same category, and three times more frequent than inbound.

The Commission for Protection of Competition has performed a sector analysis of the OPS market (for 2019-2021), published it on their web page in 2022²², citing as a conclusion that the express market structure in the Republic of Serbia is oligopolistic, with 5 major operators controlling 99% of the market, without a dominant market player. It was also concluded that, in the observed period, the market had evolved from moderately concentrated to a highly concentrated market. It was noticed that, during certain time intervals, the prices of express service provision had been successively increased by 3 or more operators. These changes suggest a potential occurrence of price parallelism, or possible horizontal price agreements, which both have the same economic effect on the consumers.

In its analysis, the Commission did not find any evidence of market barriers. Despite the market being partly regulated, there are clear and concise requirements which need to be fulfilled by the companies in order to be able to perform the activity of postal operators. The Commission identified that certain postal service users also use digital platform delivery services. Since, unlike the postal industry, digital platform business activities are not regulated by the Law and postal bylaws, they compete with postal operators in the segment of goods and document delivery. The Commission has concluded that, in the express service market, competition conditions are not equal for all market players. The fact that the PPO (Post Express) is VAT exempt gives this company a considerable competitive advantage compared to other market players. On the other hand, the fact that other postal operators, unlike Post Express, lead a non-transparent and selective discount policy, makes it potentially harder for the competition to thrive.

13.5. Overview of postal markets from the study Main developments in the postal sector for 2017-2021¹³

In the aim of considering the movement of main postal market indicators, the European Commission prepared a study covering 27 European Union countries, United Kingdom and EFTA members (Iceland, Liechtenstein, Norway and Switzerland), with analyzed important developments in the postal sector between 2017 and 2021, including the following segments:

- development of universal service and user protection;
- postal sector competition in the European market;
- postal employees;
- impact of postal logistic chain on the environment;
- impact of Covid-19 pandemic on the postal sector;
- structure of costs, retail prices and parcel delivery discounts.

The study represents, describes and assesses major developments in the letter and parcel delivery markets in the 27 EU member countries, United Kingdom and EFTA member countries (Iceland, Liechtenstein, Norway and Switzerland), in the period 2017-2021 (4 years).

Postal services hold an important role in the EU economy. Over 2021, the postal sector earned an income of around 110 billion EUR (0.8% of the total GDP, with a growth rate of 21% compared to 2017) and employed around 1.5 million persons (0.7% of the total number of employees in the EU).

Postal operators have an important role of connection individuals and businesses both in rural and urban areas. During the the Covid-19 pandemic period, postal providers with their networks represented a vital infrastructure and were allowed to pursue their activities, whereas the shops remained closed.

Between 2017 and 2021, the EU letter-post volumes declined by -6.1%. This trend spread to all types of letter-post services, with the exception of delivery of „heavier“ letters, which was increasing (delivery of small goods purchased online). A growing number of postal providers tried to direct the consumers' attention toward slower (and more affordable) letter-post services, by adapting their pricing policies. The reduced demand for letter-post item delivery resulted in a price augmentation and decrease of the USP (Universal Service Provider) costs on the European level.

On the other hand, technological changes have enabled various possibilities of a more accessible and affordable electronic communication, such as mobile apps. The electronic communication between governmental bodies and citizens has quickly become a habit in the EU member countries, offering an advantageous speed and benefits, as

well as an added value to the users (for example: access to personal medical files and possibility to obtain a proof of delivery for important documents). Additionally, e-invoice and online banking apps have significantly reduced the need for hard-copy invoices and accompanying documents.

The postal Directive stipulates that the USPs can be compensated for the USO (Universal Service Obligation) costs if those are established to be an unjust financial burden. Based on the research, the majority, i.e. 25¹⁴ of the pooled countries, were found to have legally foreseen different modes of compensation, with almost 70% (16) of the countries providing some kind of compensation in practice.

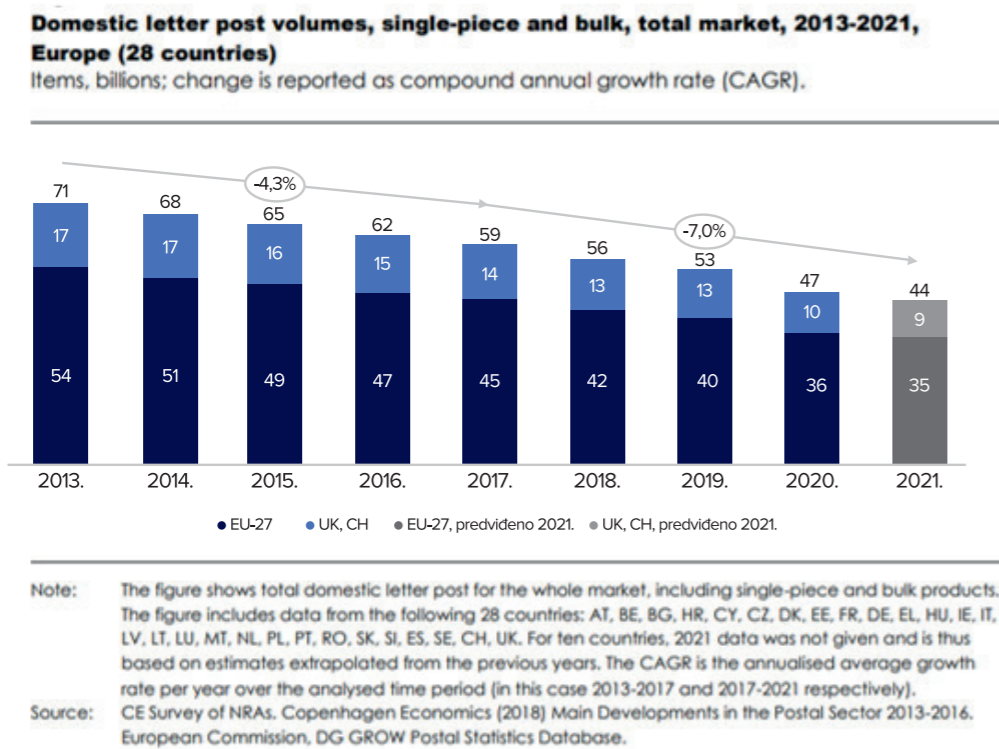
The state financial compensation is primarily justified through an USO net cost, a SGEI (Services of General Economic Interest) service provision compensation outside USO, or an ad hoc funding, such as the support to restructuring or payment of pensions. Even though certain countries have foreseen the possibility of a compensation fund in their postal law, this mechanism has not been widely applied. In some cases, the operators rather fund their USO costs themselves, in order to keep their commercial freedom and avoid any additional regulatory requirements. As an example, the USPs in Finland and Sweden (countries with highly developed digitization competencies and harsh geographic conditions) have not asked for a financial compensation of their USO costs, despite those representing an obvious financial burden.

Recently, six member countries (Belgium, Denmark, France, Italy, Poland and Spain) have asked the European Commission to assess if the possible state aid is compatible with national markets. It is assumed that the number of similar state aid cases will grow in the future, due to financial circumstances, but will also be denied on account of severe competition in the segment of parcel delivery.

The segment of letter-post services between 2017 and 2021 was marked by a volume decline.

Between 2017 and 2021, the volume of letter-post items in Europe was declining on average by -7% annually (based on the answers of 28 countries). In 2017, the addressed letter-post items' volume was more than 59 billion, however, by 2020, it shrank to approximately 47 billion. The negative growth trend continued during the whole period. From 2017 to 2019, there was an annual decrease of around 3 billion per year, after which a considerable yearly plunge occurred, of 7 billion items, between years 2019 and 2020 (Figure 36).

Figure 13.36. Letter-post volumes, single-piece and bulk, 2013-2021, Europe (28 countries)

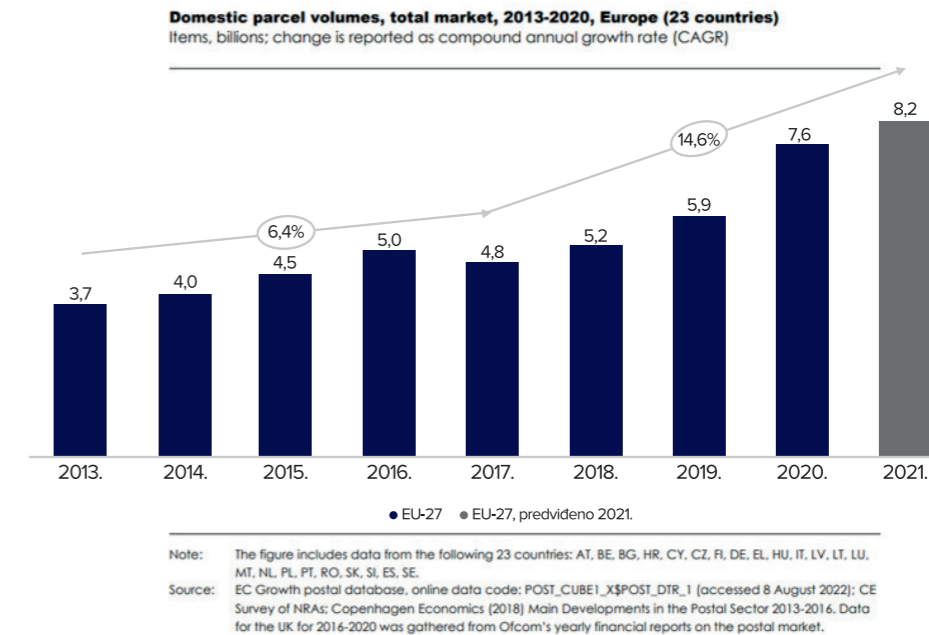


The drop of letter-post volumes was largely the result of digitization and electronic substitution. Another cause for the reduced letter-post item demand over this period was the Covid-19 pandemic, during which many companies shifted their work to homes, thus reducing their business communication through mail.

Between 2017 and 2021, single letters saw the highest plunge, by -11.9% on average per year. Other categories also marked reduced volumes, however to a lesser extent. Over the same period of time, direct addressed mail fell by -6.8% per year, and printed matter by -5.1% a year. Category with the lowest negative growth during this period was bulk mail, which decreased in volume only by -4.8% per year.

In the period 2017-2021, the expansion of e-commerce amplified the demand for parcel delivery throughout Europe. Unlike the declining letter-post volumes, parcel volumes grew by around 14.6% on a yearly basis. This growth trend was more intensive the one leading to 2017, when the average increase was only 6.4%, between 2013 and 2017.

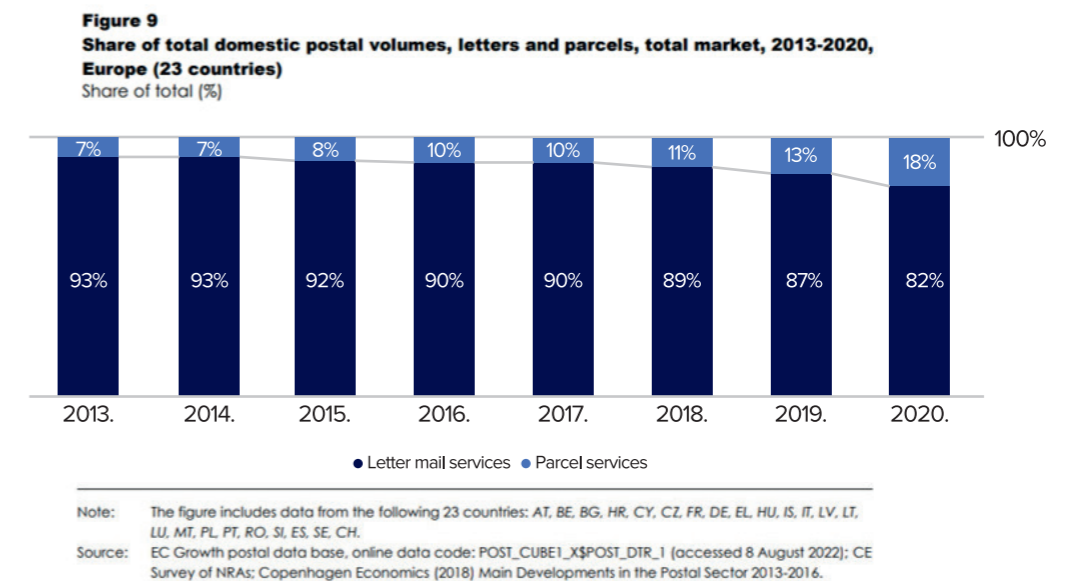
Figure 13.37. NPT parcel volumes, 2013-2020, Europe (23 countries)



The importance of parcel delivery has been on a constant rise, especially after the pandemic.

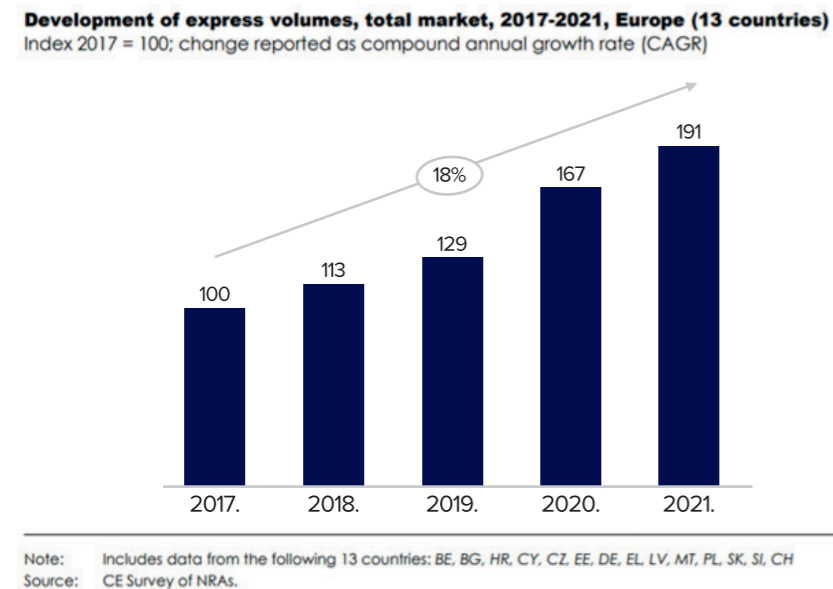
The effect of the letter-post volume decline and a simultaneous parcel volume growth is the operators' changed service assortment. In the period 2017-2020, the parcel service share in the total volumes increased from 10% to 18% (Figure 38).

Figure 13.38. Total NPT volume share, letters and parcels, 2013-2020, Europe (23 countries)



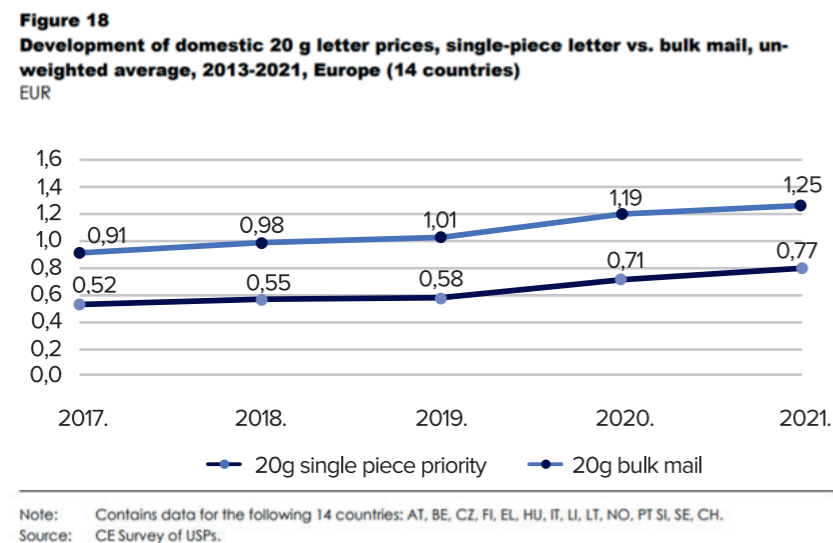
In the period 2017-2021, an increase in the OPS volumes was recorded, since the demand for express and courier services surged. Over that period, the express and courier service volumes grew by approximately 18% on a yearly basis, adding up to a total increase of 91% (Figure 39).

Figure 13.39. Development of express volumes, 2017-2021, Europe (13 countries)



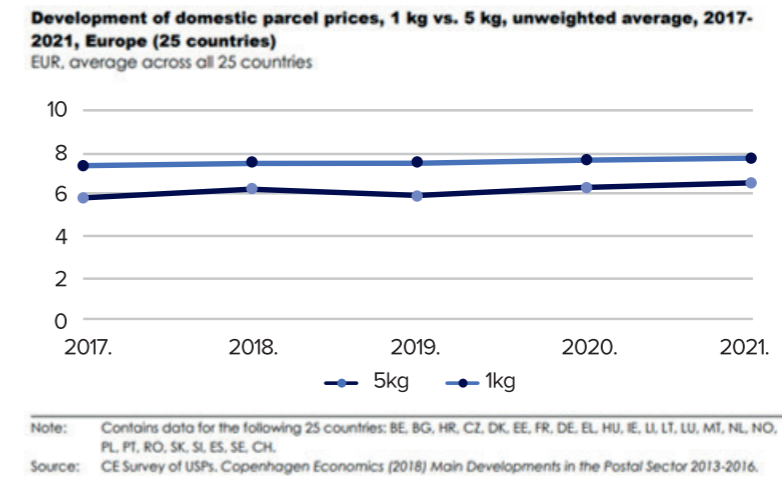
The decrease of the letter-post volumes has led to an increase of letter-post service prices in the EU. A constant surge of the single mail price has been observed, followed by the growth of bulk mail volumes (Figure 40).

Figure 13.40. Trend of single-piece average prices up to 20 g and bulk mail, 2013-2021, Europe (14 countries)



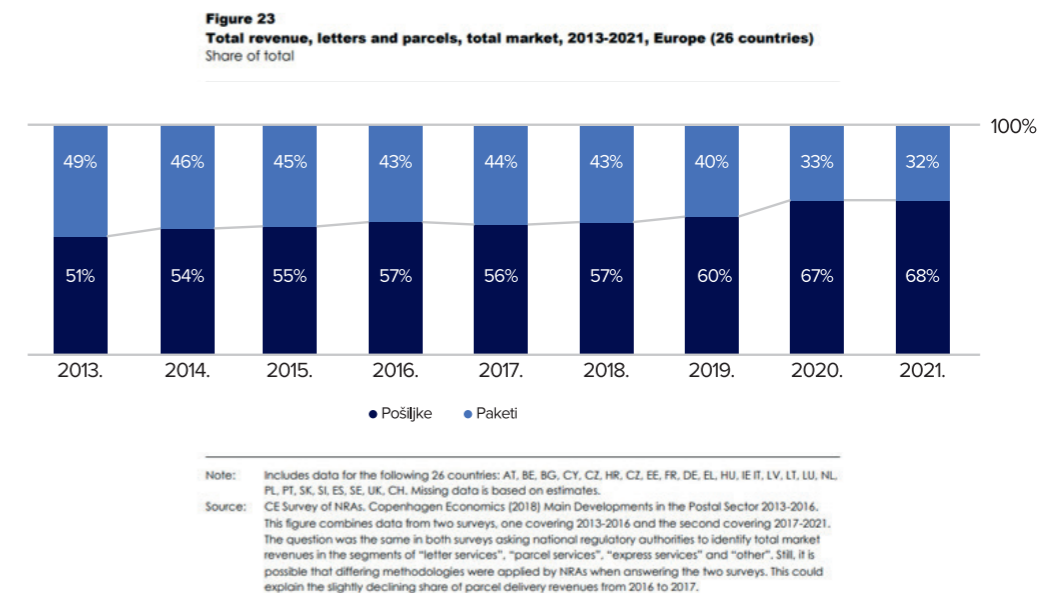
On the other hand, the price of parcels, despite a slight augmentation, remained roughly on the same level for the last five years.

Figure 13.41. Trend of parcel prices up 1 kg and 5 kg, 2017-2021, Europe (25 countries)



Over the research period, an increase of the total revenues (USP and non-USP) in Europe was recorded. The revenues grew by 21%, from 100 to 121 billion EUR. As for different service categories, letter-post revenues had negative growth, however, with 32% of the total letter and parcel revenues in 2021, still constituting an important role in the operators' income. All registered operators' parcel and express service revenues have augmented at such a rate, so as to compensate for the letter-post revenues decline. The income share from parcels and express services was increased as well, from 56% in 2017, to 68% in 2021 (Figure 42).

Figure 13.42. Total letter and parcel revenues, 2013-2021, Europe (26 countries)

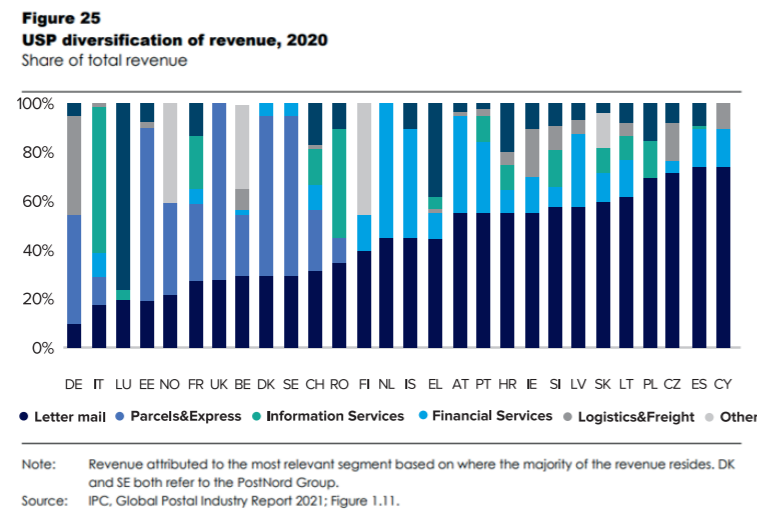


The decrease of letter-post volumes and big maintenance expenses of the USP network compelled the postal operators to adapt their business strategies in order to remain competitive in an ever-changing market, filled with challenges.

The operators react to environmental changes in several ways, such as by adapting the prices or service offers, or by business reorganization.

USPs are actively searching for the possibilities of development in new business areas, mainly in parcel and express service markets, logistics and freight transport, postal and financial services, retail business in post offices, information services and telecommunications, which generate the most revenue after that stemming from traditional letter-post and parcel services. Countries where the USPs earn most of their income from sources not affiliated with traditional postal items are: Germany, Italy, Luxembourg, Estonia, Norway, France, United Kingdom, Belgium, Denmark, Sweden, Switzerland, Romania, Finland, Netherlands, Iceland and Greece (Figure 43).

Figure 13.43. USP diversification of revenues, 2020



In the period 2017-2021, 19 out of 24 operators reorganized their network, by introducing an alternating day delivery schedule, performing network optimization by reducing the number of post offices and using the advantages of a new software-based sorting (Table 17).

Table 13.17. Operators who reorganized their postal network in 2017-2021

Have you carried out a major reorganisation of your logistics network in the 2017-2021 period?

COUNTRIES	
YES	19: BE, HR, CZ, DK, EE, FI, EL, IE, IT, LT, MT, NL, NO, PL, PT, SK, SI, SE, CH
NO	5: AT, BG, DE, LU, ES

Source: CE Survey of USPs.

One of the ways to reorganize network and reduce costs is to promote the merging of the letter-post delivery and parcel delivery networks into one more efficient network. The operators can opt to deliver and collect letters and parcels through two separate networks, on account of different physical features or patterns of demand for

letters and parcels, which require the use of specific sorting machines and/or rely on various modes of delivery (by vehicle or on foot). In urban areas, the providers use separate networks for letter and parcel delivery and collection. In rural areas, the majority of operators use a single letter and parcel delivery and collection network, so as to ensure economy of scale. Since the sustainability of two parallel networks has been challenged, six operators (bpost, Bulgarian Post, Estonian Post, Hellenic Post, An Post and Correos) have decided to continue using one single network for letter and parcel delivery.

Two operators (the Post of Lithuania and the Post of Slovenia), which used a single network in 2016, reported reverting to using separate networks in 2021, whereas 18 operators are still maintaining separate networks (Table 18).

Table 13.18. Operators who use different networks for letter and parcel delivery

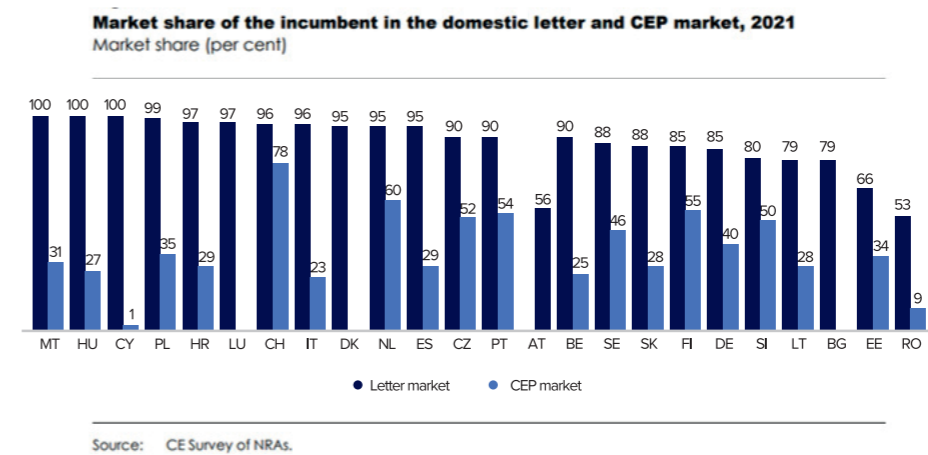
Do you use different networks for letters and parcels at collection, sorting, transportation or delivery levels?

COUNTRIES	
YES	18: AT, CZ, DK, FI, FR, DE, HU, IT, LI, LT, LU, MT, NL, PL, SK, SI, SE, CH
NO	6: BE, BG, EE, EL, IE, ES

Source: CE Survey of USPs.

The situation regarding parcel delivery is very different from the segment of letter-post delivery. Fast development of e-commerce, additionally accelerated by the Covid-19 pandemic, made the parcel segment very attractive to new entrants, and as a result of that, the USPs now have lower market share in the segment of parcel delivery than in the letter-post delivery segment (Figure 44).

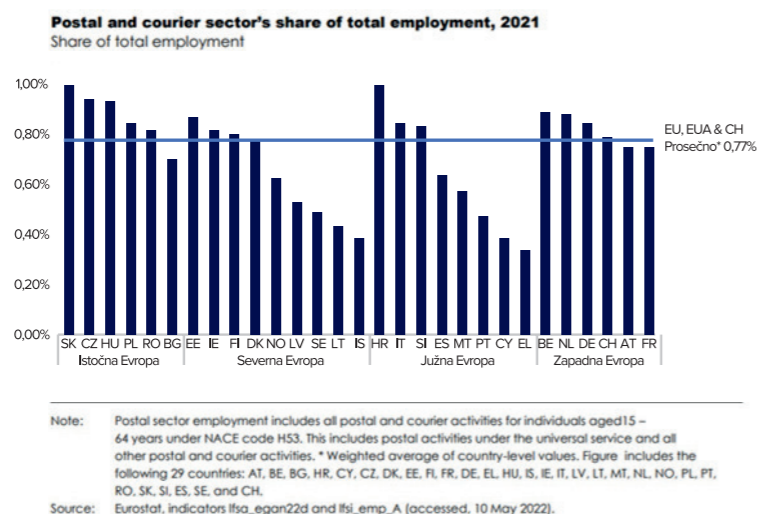
Figure 13.44. USP market share in letter-post, courier, express and parcel segments



Still, the USP market share in letter-post, courier, express and parcel segments differ significantly among member countries, ranging from 1% in Cyprus, to over 60% in the Netherlands or Switzerland.

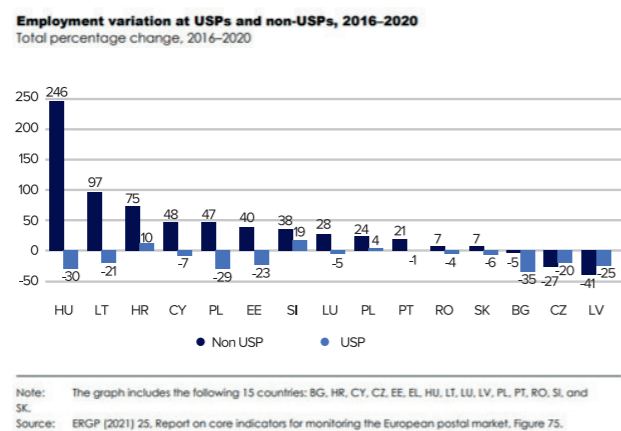
As for the number of employees, the postal sector is deemed an intensive industry. Traditionally, national postal operators have always been big national employers. While the postal sector has, for a long time, been marked by a declining workforce, the development of e-commerce has inverted this trajectory. The total employment in the postal sector, i.e. at the USP and other postal operators, surged by 7% between 2014 and 2021, and by 1.5 % between 2017 and 2021 (Figure 45).

Figure 13.45. Postal and courier shares of employment, 2021



The number of the USP employees has been declining. A significant rise in the workforce is recorded at other postal operators (exceeding the drop in the USP workforce numbers), a major contributing factor to the postal employee expansion in Europe.

Figure 13.46. Employment variation at USP and other operators, 2016-2020



Conclusion

In 2022, the postal market of the Republic of Serbia saw a drop in the postal volumes, coupled with a simultaneous rise of postal revenues, as a result of numerous economic and social factors.

Various factors such as the growth of inflation or consumer prices, price of postal services, freedom of movement of the population after the Covid-19 pandemic, caused the reduction in the volume of express services in the postal market. Letter-post services, as part of UPS, follow the European trends, decreasing in volume. Parcel services, on the other hand, along with the introduction of a category titled „ordinary parcel“ by the PPO in 2022, have contributed to a significant surge in the postal parcel volumes. Parcel services from the OPS scope are provided solely by the PPO, even though other postal operators are allowed to do so as well. In terms of the numbers, parcels are still unable to compensate for the drop in the letter-post volumes, therefore an overall decrease in the UPS volumes is recorded.

Despite the drop in the express service volumes, the rise of postal service prices has led to an increase both in the express service and gross OPS revenues. Despite the fact that the UPS income has dropped, the growth of the OPS revenues has resulted in an overall rise of the generated income in the postal service market.

Over 2022, RATEL, in accordance with its legal competences, undertook a set of activities in an aim to promote competition and enhance quality on the postal market, which included the establishment of a single GIS portal (postal service Geographic Information System), specialized portal „price of services“ for the comparison of express and courier prices in NPT, including the comparison of quality parameters for 5 express service providers jointly accounting, in 2021, for 99% of the postal market volumes.

According to the data of the Statistical Office of the Republic of Serbia¹⁵, despite an increased number of e-commerce users in 2022, the postal operators have recorded a drop in the volume of items stemming from remote commerce, for the first time in the monitored e-commerce market history. In the previous period, there was a rise in the number of Internet platforms serving as one of the main sales channels. Due to reduced costs, the big chains have lately been opting exclusively for online purchases. The expansion of this selling mode is likely to additionally amplify the importance of postal services in modern society, strongly marked by globalization at all levels. The postal industry follows the trends and adapts to the users' demands, overwhelmingly oriented towards online purchases.

Also, according to the data of the Statistical Office of the Republic of Serbia, during 2022, 27.1% of Internet subscribers never purchased online, leaving room for a further growth of the postal volumes, namely those stemming from e-commerce, above all in the category of express postal items in NPT. This is all very relevant in terms of the plan of enabling Internet access all over the country, especially in rural parts, as a measure of achieving social and economic connection among the population.

Since the goods purchased online are most commonly delivered as parcels, expansion and diversification of parcel services are expected in future. The ability to recognize users' needs and adapt services to users' demands will be of key importance for the further postal development. All these facts and features will be taken into consideration while redefining and modifying the UPS scope in the future, which is one of the main tasks to be undertaken both at the EU and national levels.

¹⁵ <https://data.stat.gov.rs/Home/Result/270207?languageCode=sr-Latn>

14. QUALITY OF POSTAL SERVICE PROVISION

In accordance with relevant legal obligations, quality parameters for the provision of postal services are prescribed by RATEL¹. The quality of universal postal service (hereinafter: UPS) is monitored by RATEL based on the results of an independent quality measurement carried out by the public postal operator (hereinafter: the PPO) as the sole universal service provider (USP) in the Republic of Serbia. As of 2021, the independent UPS quality screening, up to 2020 in the competence of the PPO, is handled by RATEL.

Up to 2020, the quality of other postal services (OPS) had been assessed exclusively based on the postal operators' available and submitted data. However, due to a staggering development of express postal services and their appeal to the postal users because of their potential in the delivery segment of online purchases, in 2022, RATEL organized a single independent screening and comparison of the NPT (national postal traffic) express service quality parameters (quality benchmark) for five operators with a dominant market share.

14.1. Quality of universal postal service provision

The quality of universal postal service provision is analyzed based on the data from an independent RATEL's measurement, internal PPO's measurement, international measurements with the participation of the PPO and RATEL's annual questionnaire data. For the assessment of the UPS quality, beside the transit time parameter, rating the speed of transmission, several other indicators are analyzed: reliability of transmission and delivery, UPS availability, efficiency of complaint resolution etc.

RATEL has set the dynamics of reaching the full targeted transit times prescribed by the standards for 2023.

It is also stipulated that the PPO, as the sole USP, be obliged to submit to RATEL an annual report on the state of the UPS quality. The annual report shall be made in accordance with standards: SRPS EN 13850:2014, SRPS EN 14508:2014 and SRPS EN 14012:2014.

Pursuant to legal provisions, in 2021, RATEL started a three-year long independent screening of transit times of non-recorded letter-post items in NPT, and has continued it throughout 2022.

In parallel with RATEL's independent measurement, the PPO carried out in 2022 AMQM screening² - a continuous measurement of non-recorded letter-post transit times with internal panellists, using RFID equipment. Additionally, the PPO also conducted a screening of parcel transit times in NPT over 2022, via an internal application, as well as monitoring of delivery, i.e. payment of postal money orders. The quality of services in international postal traffic (IPT) is measured by global systems for the measurement of transit times of both letter-post and parcel items.

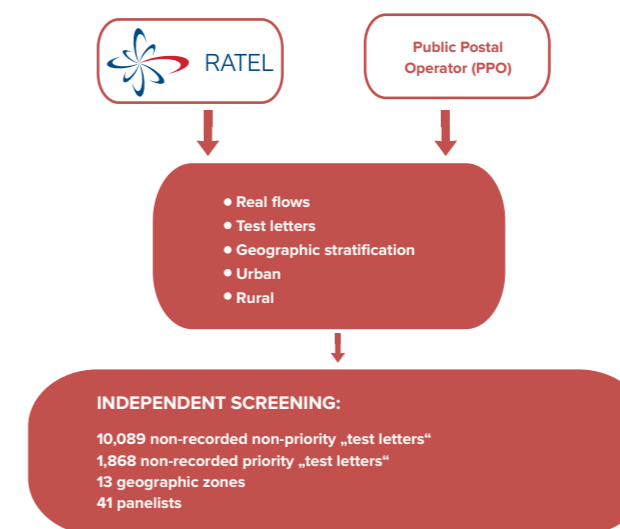
Speed and reliability of postal items transmission and delivery

Speed and reliability of transmission and delivery of postal items in the Republic of Serbia are measured by means of transit and delivery times for NPT non-recorded priority and non-priority letter-post items and IPT non-recorded priority and air letter-post items, in line with delivery standards prescribed by RATEL.

The undertaken three-year long independent screening of quality according to standard SRPS EN 13850:2014 has been continued throughout 2022, whereby transit times of the NPT non-recorded letter-post items, i.e. priority and non-priority items, were measured over the first two years.

In the aim of establishing measurement systems reflecting the real postal flows, RATEL, in cooperation with the PPO, has set necessary independent screening parameters (Figure 14.1)

Figure 14.1. Process of defining the screening transit times based on real postal flows



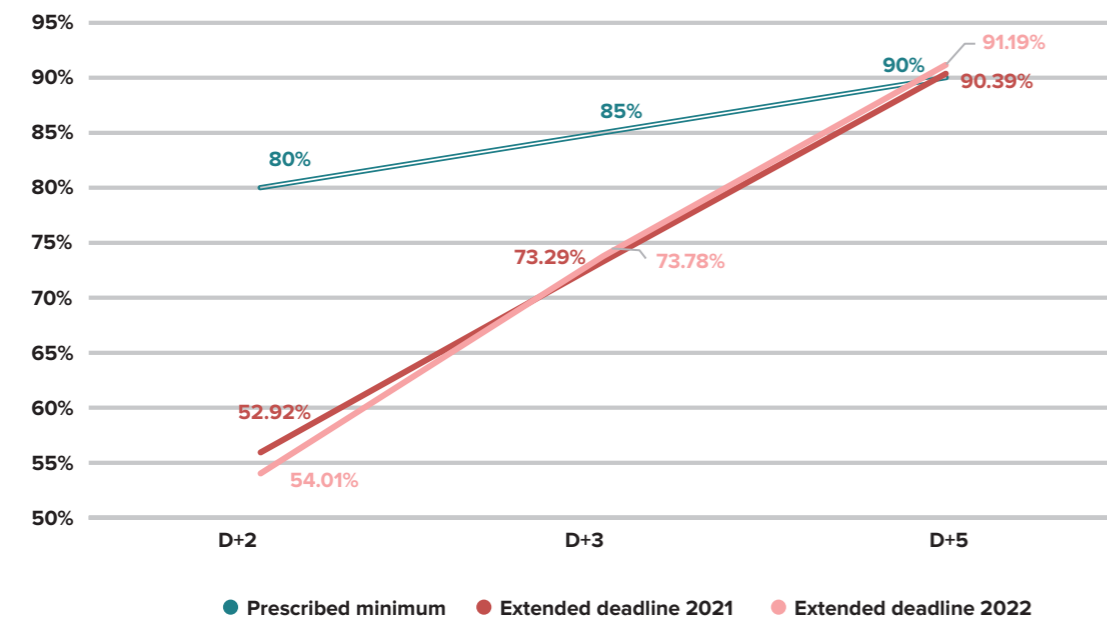
The measurement results were analyzed by RATEL on a monthly, quarterly and annual basis, and forwarded to the PPO, along with final conclusions and remarks.

However, the 2022 results are way beyond the required minimum values prescribed for non-priority non-recorded letter-post items (Table 14.1. and Figure 14.2.)

Table 14.1. Delivery times for NPT non-priority non-recorded letter-post items during 2021 and 2022

Deadline	Prescribed-minimum	Non-priority non-recorded items in 2021		Non-priority non-recorded items in 2022	
		Achieved result	Achieved result (extended deadline ³)	Achieved result	Achieved result (extended deadline)
D+2	80%	50.02%	55.92%	46.97%	54.01%
D+3	85%	69.97%	73.29%	68.38%	73.78%
D+5	90%	87.97%	90.39%	89.54%	91.19%

Figure 14.2. Comparison of corrected delivery times for NPT non-priority non-recorded letter-post items in 2021 and 2022



Based on the data from Table 14.1, it is clear that there were no improvements in the transmission time values, and also the achieved results for deadlines D+2 and D+3 have been lower during 2022, whereas for deadline D+5, a better result was achieved. The results were slightly better for the areas exempted from five-day delivery (Figure 14.2).

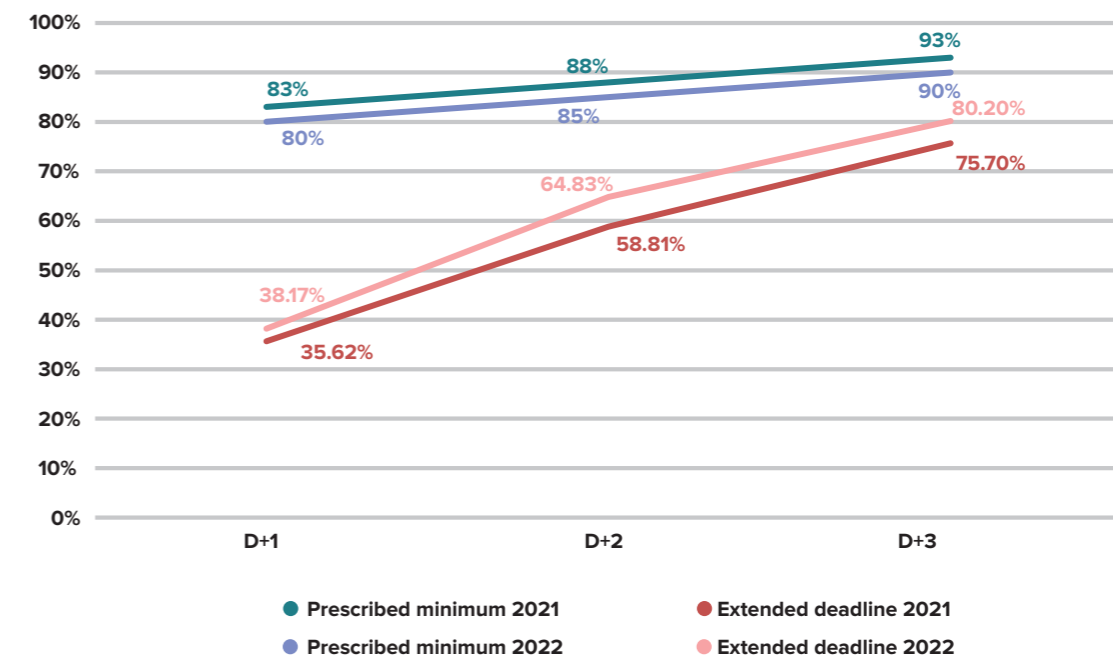
Despite priority letters being non-recorded items with priority of transport over non-recorded non-priority items, their results are also way beyond the prescribed standards for priority non-recorded letter post items (Table 14.2).

Table 14.2. Delivery times for priority letters (non-recorded letter-post items in NPT) during 2021 and 2022

Deadline	Priority letters in 2021			Priority letters in 2022		
	Prescribed minimum	Achieved result	Achieved result (extended deadline ⁴)	Prescribed minimum	Achieved result	Achieved result (extended deadline)
D+1	80%	29.74%	35.62%	83%	31.88%	38.17%
D+2	85%	56.51%	58.81%	88%	57.91%	64.83%
D+3	90%	73.23%	75.70%	93%	75.78%	80.20%

A comparative overview of the achieved results, including the corrected ones, shows that, after the deadline extension for the areas exempted from five-day delivery (in accordance with Article 15 of the Rulebook), the results are also beyond the prescribed values (Figure 14.3).

Figure 14.3. Comparison of corrected delivery times for NPT priority non-recorded letter-post items in 2021 and 2022



³ Deadline has been extended in accordance with Article 15 of the Rulebook on quality parameters for performing postal services in the areas exempted from five-day delivery.

⁴ Deadline has been extended in accordance with Article 15 of the Rulebook on quality parameters for performing postal services in the areas exempted from five-day delivery.

The achieved 2022 results were slightly better than the year before, however still beyond the prescribed values for priority non-recorded letter-post items in 2022. Significantly better results were recorded by the PPO, by means of an internal AMQM screening, on a sample of 13,669 priority letters (corrected results: D+1: 63.20%, D+2: 89.51%, D+3: 96.74%).

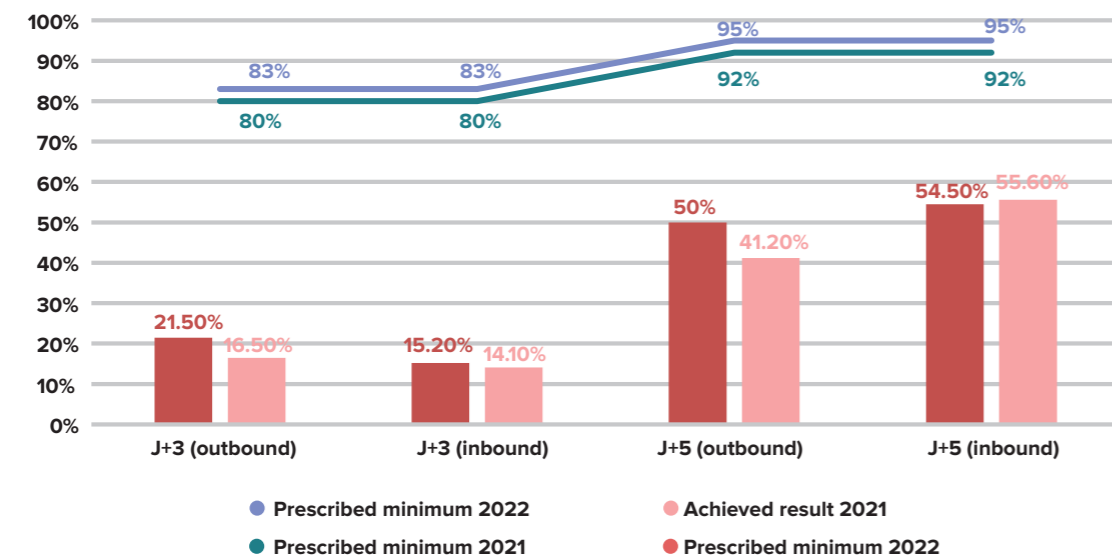
In international postal traffic (IPT), the European countries⁵ „end to end“ transmission times from collection to delivery are defined for priority non-recorded letter-post items. The „end to end“ transmission times for priority non-recorded letter-post items in IPT are set by the UPU measurement system GMS WORLD. The PPO was included in this international global screening in 2022 as well, and the measurement results are shown in Table 14.3. and Figure 14.4.

Table 14.3. Delivery times for IPT priority non-recorded letter-post items during 2021 and 2022

	Achieved result 2021	Prescribed minimum 2021	Achieved result 2022	Prescribed minimum 2022	Growth rate 22/21 (%)
J+3 (outbound)	21.50%	80%	16.50%	83%	-23.26%
J+3 (inbound)	15.20%		14.10%		-7.24%
J+5 (outbound)	50%	92%	41.20%	95%	-17.60%
J+5 (inbound)	54.50%		55.60%		2.02%

Based on the achieved 2022 results for the IPT priority non-recorded letter-post item transmission times, it is noticeable that no quality targets for any of the criteria were reached, furthermore they were even lower than 2021, except for inbound J+5 items, which marked a slight improvement.

Figure 14.4. Comparison of delivery times for IPT priority non-recorded letter-post items in 2021 and 2022



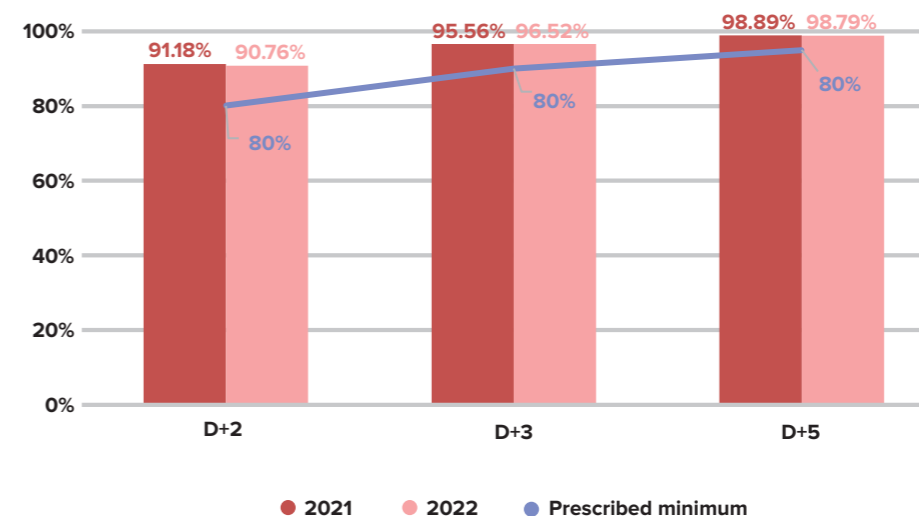
The Rulebook also prescribes the dynamics of reaching a minimum quality for the delivery of inbound priority non-recorded letter-post items in IPT. This quality must be fulfilled by the UPS from the arrival in the office of exchange until the delivery. However, this year as well, the PPO reported that, due to years-long problems lasting from as early as 2017 regarding the RFID equipment at the office of exchange, it was not possible to establish the deadlines and submit the results on the achieved delivery times for priority non-recorded letters in IPT to RATEL. The installation and the beginning of measurement using new equipment have been put off for the fourth quarter of 2023.

The PPO was measuring the NPT parcel transmission times by means of an internal application, on a sample of 36,917 parcels, throughout 2022. Based on the results of the performed screening, the 2022 quality targets were reached (Table 14.4, Figure 14.5).

Table 14.4. NPT parcel transmission times in 2021 and 2022

NPT	Prescribed minimum	Achieved result 2021	Achieved result 2022	Growth rate 22/21%
D+2	80%	91.18%	90.76%	-0.46%
D+3	90%	96.56%	96.52%	-0.04%
D+5	95%	98.89%	98.79%	-0.10%

Figure 14.5. Comparison of NPT parcel transmission times for 2021 and 2022



⁵ For other countries in the world, quality is measured using internationally recognized independent measurement systems organized by the Universal Postal Union (UPU) and the International Post Corporation (IPC), with a prescribed minimum quality for J+5 amounting to 80%.

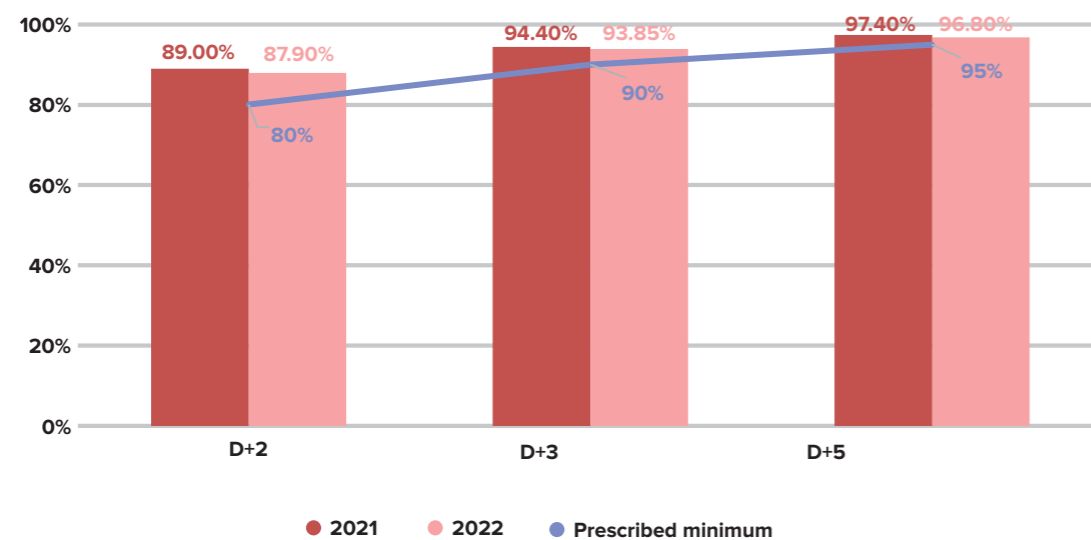
The IPT parcel transmission times are analyzed based on the data provided by the PPO, via the UPU international quality monitoring system QCS (Quality Control System). Delivery deadlines for inbound USO parcels in IPT are calculated from the moment of arrival in the office of exchange, not counting in the time spent at the customs. The measurement sample was 62,169 parcels, sent to the Republic of Serbia during 2022.

Much like NPT, inbound USO parcels in IPT fulfill the deadlines prescribed by the Rulebook on quality parameters for performing postal services (Table 14.5, Figure 14.6).

Table 14.5. IPT parcel transmission times in 2021 and 2022

Inbound IPT	Prescribed minimum	Achieved result 2021	Achieved result 2022	Growth rate 22/21 (%)
D+2	80%	89.00%	87.90%	-1.24%
D+3	90%	94.40%	93.85%	-0.58%
D+5	95%	97.40%	96.80%	-0.62%

Figure 14.6. Comparison of IPT parcel transmission times in 2021 and 2022



Transmission of USO parcels fulfills the defined deadlines, both for inbound and outbound IPT flows. Also, based on the PPO data, the share of postal money orders collected and sent for delivery on the first business day has remained 99.8% in 2022 as well, which is an extremely high value, exceeding the prescribed standard (90%).

However, the transmission times of non-recorded letter-post items (both priority and non-priority) do not meet the prescribed quality standards, thus continuing a negative trend. The results of RATEL's independent screening and analyses have once again shown that the PPO must undertake concrete effective measures in order to improve quality and achieve the prescribed deadlines.

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 postal items delivery.

After a four-year long declining period, the number of post offices in 2022 grew by 40 units (2.7%) (Table 14.6, Figure 14.7). Out of 1,540 post offices, 1,343 are corporate post offices and 197 contracted post offices, with a recorded increase in both categories. The number of post offices adapted to the needs of the persons with disabilities has been increased as well, amounting to 223 in 2022.

Table 14.6. Availability of post offices and letter boxes in 2018-2022

Postal network capacities	Year					Growth rate (%)			
	2018	2019	2020	2021	2022	19/18	20/19	21/20	22/21
Number of post offices	1,534	1,526	1,518	1,500	1,540	-0.52%	-0.52%	-1.19%	2.67%
Number of letter boxes	1,935	1,969	1,927	1,895	1,897	-1.75%	-2.13%	-1.66%	0.11%

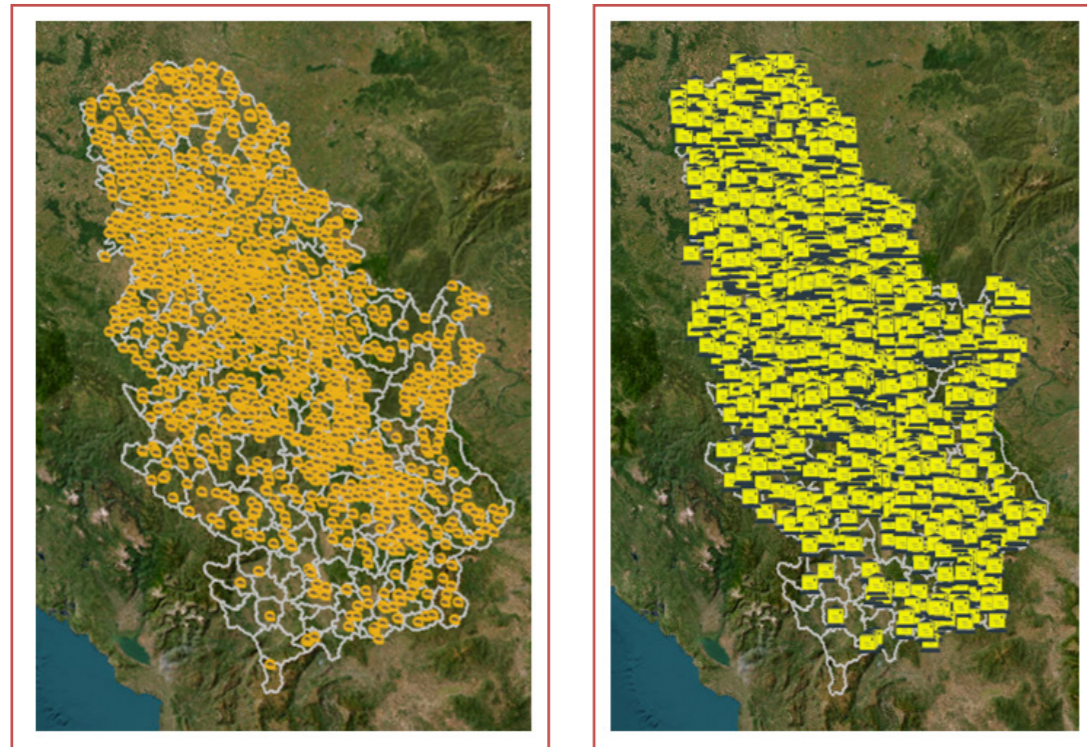


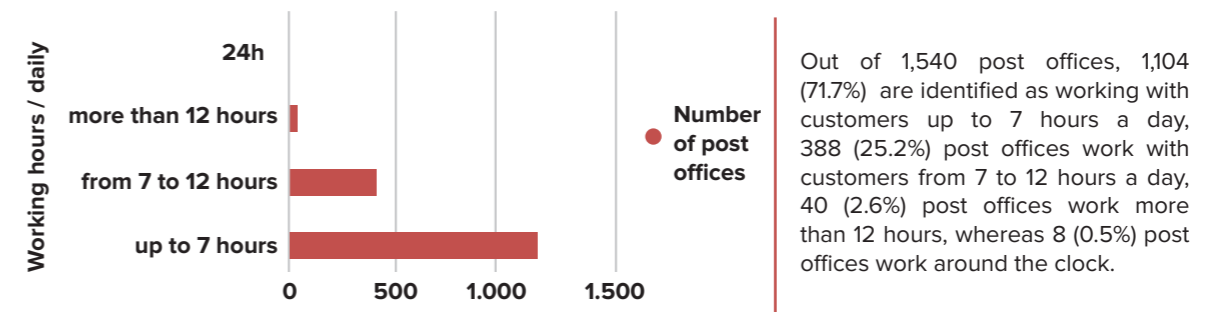
Figure 14.7. Network of the PPO post offices and letter boxes (Source: GIS portal)⁶

Based on a 2021 ERGP report,⁷ the European average number of postal network units (PNUs) per 10,000 inhabitants was 3.2, whereas in our country, according to the 2022 data, this number was 2.1. The lowest number of PNUs per inhabitant is in the capital area, where the population density is the highest, and the post offices have considerably bigger capacities (in terms of the counters) compared to other regions of the Republic of Serbia.

After a two-year decline in 2022, the number of postal letter boxes has remained on an approximately same level (an increase of 0.11%). Based on the results of an internal screening of the postal items volumes inserted in letter boxes during one month, the PPO establishes a daily average and analyzes the justifiability of postal letter boxes on specific locations.

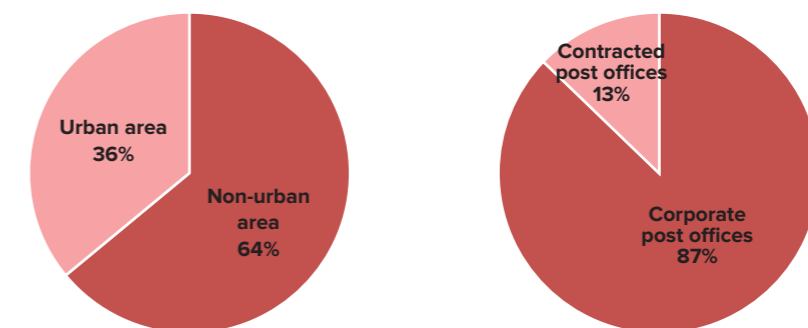
One of the criteria for the quality of postal service availability are working hours of post offices, indicating how many hours a day the post offices are available to customers. The post office structure in terms of working hours is shown in Figure 14.8.

Figure 14.8. Total number of post offices by working hours



Out of 1,343 corporate post offices, 349 units have working hours of less than 4 hours, a number that has more than doubled compared to 2021. Figure 14.9. shows the structure of post offices situated in urban and non-urban areas, and the PNU ownership structure.

Figure 14.9. Post offices area of business operation and ownership structure



One of the parameters of availability of USO provision postal counters is time of waiting in line for postal item collection, established by the PPO screening, and in 2022 it was 2.5 minutes, which is significantly shorter than in 2021, when it was 6.8 minutes.

Availability of postal delivery

The availability of postal items delivery is the accessibility of delivery to users at the address and the operators' business premises. 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 RATEL⁸. The prescribed exemptions primarily refer to the settlements with less than 1,000 households, which are allowed, depending on the number of households, to have their mail delivered less than five days a week (Table 14.7).

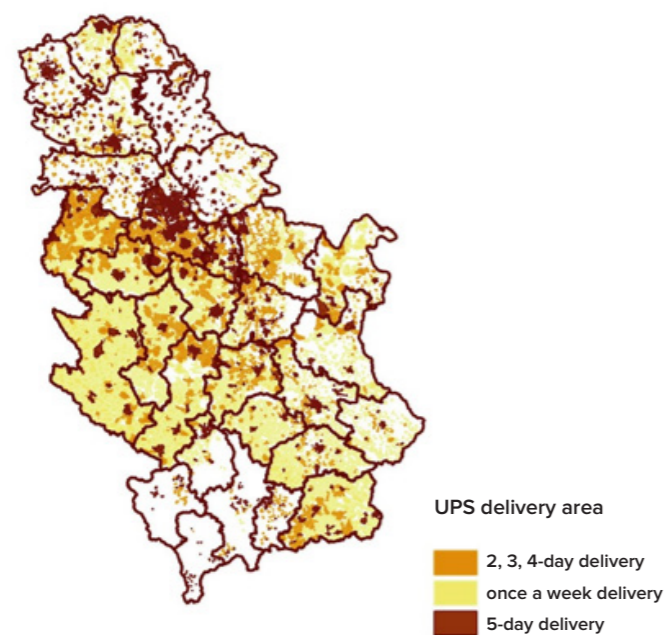
⁶ <https://gis.ratel.rs/smartPortal/postanskeUsluge>
⁷ ERGP (22) 12 Report on core indicators

⁸ Articles 11 and 12 of the Rulebook on the conditions for and the manner of provision of postal services (Official Gazette of RS, No. 115/2020)

Table 14.7. Inhabitants and households per delivery area

Settlement category	2021			2022		
	Number of inhabitants	Number of households	% of households	Number of inhabitants	Number of households	% of households
More than 1,000 households	5,009,736	2,066,297	71%	5,119,015	2,076,885	71%
From 250 to 1,000 households	1,433,451	552,260	19%	1,346,935	546,478	19%
Less than 250 households	734,704	301,815	10%	720,912	292,488	10%
Total	7,186,891	2,920,375	100%	7,186,891	2,915,851	100%

Over 2022, RATEL examined the fulfillment of these criteria and highlighted the PPO's deficiencies, following which the PPO reorganized its delivery service in line with the prescribed exemption criteria.

Figure 14.10. Map of UPS delivery coverage by weekly delivery frequency (Source: GIS portal⁹)

The analysis of the data regarding the delivery coverage of the inhabitants and households (Figure 14.10) according to the weekly delivery frequency revealed that 71% of the households have everyday or 5-day delivery. Around 20% of the households have delivery 2, 3 or 4 days a week, whereas 9% of the households have a once-a-week delivery.

The share of the inhabitants of the Republic of Serbia not covered by the 5-day UPS provision at the collection phase is 3.19%.

Security of postal items

The security of postal items is assessed based on the share of lost and damaged recorded items per 100,000 items of the respective category.

The number of lost and damaged registered items, court letters, insured letters, parcels and money orders for the period 2018-2022, based on the data provided by the PPO, is shown in Table 14.8.

Table 14.8. Lost and damaged recorded items in NPT

TYPE OF ITEM	2018	2019	2020	2021	2022
REGISTERED ITEMS					
- lost per 100,000 items	16	35	36	5	5
- damaged per 100,000 items	0	0	0	0	0
COURT LETTERS					
- lost per 100,000 items	11	12	14	13	16
- damaged per 100,000 items	0	0	0	0	0
INSURED LETTERS					
- lost per 100,000 items	0	0	6	1	1
- damaged per 100,000 items	0	0	1	0	1
PARCELS					
- lost per 100,000 parcels	0	2	2	2	4
- damaged per 100,000 parcels	2	1	6	4	2
MONEY ORDERS					
- lost per 100,000 items	0	0	0	0	0
Percentage of lost and damaged items	0.01	0.011	0.013	0.008	0.01

There was a modest increase in the number of lost court letters and parcels over 2022, as well as an increase in the number of damaged insured letters, but also a decrease in the number of damaged parcels per 100,000 collected items.

Also, the independent screening carried out by RATEL has pointed to the problem of a high number of non-recorded items in NPT on a defined sample. Table 14.9 shows the number of lost non-priority non-recorded letter-post items and priority letters compared to a measurement sample.

Table 14.9. Lost and damaged NPT non-recorded items in 2021 and 2022, RATEL's independent screening

Year	Non-priority items			Priority items		
	Non-priority sample	Number of lost items	%	Priority sample	Number of lost items	%
2021	10,094	629	6.23	581	42	7.23
2022	10,089	691	6.85	1,868	105	5.62

An approximately same percentage of lost non-priority „test letters“ was recorded in 2022, whereas the share of lost priority „test letters“ was reduced from 7.23% to 5.62%.

For a second year in a row, RATEL has been recording a great number of lost items during its independent screening. The PPO was informed and reminded to undertake more efficient measures in order to resolve the problem of postal items' security.

Users' satisfaction and availability of information

Every two years, RATEL undertakes an independent survey of the satisfaction of users' needs. Since this research was carried out in 2021, there was no such survey in 2022, so the level of users' satisfaction is assessed based on the PPO's annual report.

In its annual reports, the PPO informs RATEL about the results of an internal survey on the level of users' satisfaction and the availability of information. The PPO has conducted a survey on a sample of 208 legal entities. The users assessed different letter-post service parameters (such as speed, reliability, assortment, price and manner of service provision etc), based on which an extremely high average mark 4.49 was achieved.

The PPO made available to its users several channels for questions and complaints (by e-mail, telephone, via website, by physical mail, directly at post office counters), which complies with the requirements of standard SRPS EN 14012:2014.

UPS related complaints

The reasons for filing a complaint to the postal operator by the user are defined in the Law. If the sender believes that the recorded postal item has not been delivered to the recipient, or that it was delivered with delay, or is damaged or with reduced contents, he is entitled to make a complaint to the postal operator, along with a compensation based on a justified complaint. The user may also launch a complaint procedure, with a possibility to be indemnified, in case of not provided, partially provided or incorrectly provided postal services.

In NPT, out of 50,022,107 UPS items (belonging to categories: registered letters, insured letters, registered printed matter, court letters, postal money orders and parcels up to 10 kg), 57,838 complaints were filed, most of which were unfounded (91.3%). Despite a smaller volume of postal items being recorded in 2021, the number of complaints increased by 7%. The majority of filed complaints referred to court letters (92.4%).

Based on a justified complaint, the user is entitled to be indemnified. Out of the total number of paid damage compensation claims, the majority referred to lost items (90.1%), damaged items (4.7%), exceeded transmission deadline (3.3%) and other (1.9%) (Table 14.10).

Table 14.10. Structure of indemnified claims regarding UPS in NPT in 2022

Number of indemnified claims	Resolved on the basis of:				Indemnity payment
	Loss	Damage	Exceeded deadline	Other complaints	Amount (in dinars)
1=2+3+4+5	2	3	4	5	6
666	600	31	22	13	867,744.00

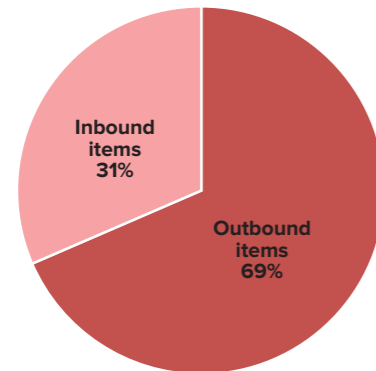
As for the complaint handling procedures in NPT, they were resolved in average in 6 days, twice as long as compared with three previous years, however still within legal prescriptions. Overall complaint realization and payout were increased from 11 days to 12 days (Table 14.11), which also complies with the prescribed deadlines.

Table 14.11. Average time for complaint resolution, realization and payment of indemnity in NPT

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
2018	4	10	5	15
2019	3	6	5	11
2020	3	9	5	14
2021	3	7	4	11
2022	6	7	5	12

For IPT items, the complaint procedures are more complicated, with considerably longer deadlines, due to complaint handling procedures being carried out in at least two countries (Figure 14.11).

Figure 14.11. Structure of complaints regarding inbound and outbound items in 2022



In IPT, there were 2,905 complaints regarding UPS, which is by -42.4% less than in 2021, when 5,051 were recorded. Outbound items account for 69% of the complaints and inbound for 31%. Out of the total number of complaints, more than 90% were deemed unfounded.

Table 14.12. shows an overview of paid indemnities, according to the types of recorded postal items in NPT, for the period 2018-2022.

Table 14.12. Paid indemnities by the type of postal items in NPT

NPT	2018		2019		2020		2021		2022	
	pcs.	din.	pcs.	din.	pcs.	din.	pcs.	din.	pcs.	din.
Registered items	946	805,151.00	2,313	983,195.00	1,604	937,539.50	549	485,237.00	585	600,655.00
Insured letters	5	4,980.00	2	8,085.00	10	64,982.00	4	5,361.00	7	28,645.00
Parcels	7	23,741.00	11	22,945.00	25	115,417.30	19	144,983.00	72	228,444.10
Money orders	1	3,000.00	1	2,000.00	2	1,371.00	2	40,460.00	2	10,000.00
TOTAL	959	836,872.00	2,327	1,016,225.00	1,641	1,119,309.80	574	676,041.00	666	867,744.10

Over 2022, a modest increase in the number of indemnity claims of 4.5% was recorded. In the total number of paid indemnities (666), the majority, of over 88%, referred to registered items (registered letter, court letter, registered printed matter). Still, despite the 2022 increase, the number of indemnity claims has considerably dropped compared to the previous years.

In IPT, the number of paid indemnities was reduced. At the expense of the PPO, 30 indemnity claims were paid, against 82 paid indemnities in 2021, with 86 indemnity claims, during 2022, being paid at the expense of other administrations. The decrease in the number of complaints is a direct consequence of smaller volumes in 2022, as well as a sign that the quality of postal operators' provision has improved.

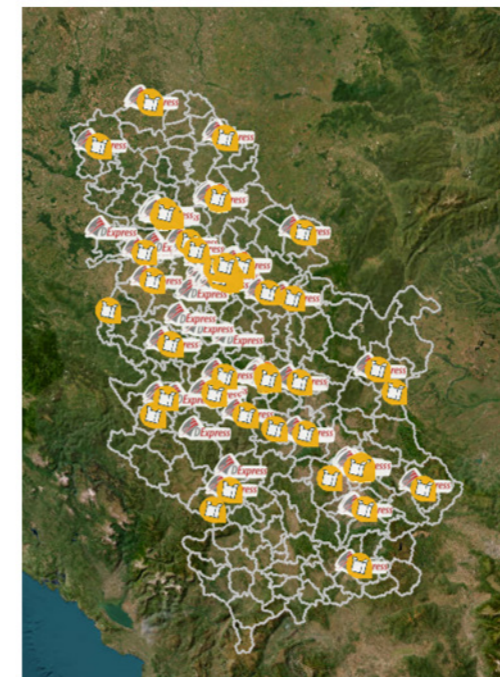
14.2. Quality of OPS provision

Quality of OPS provision is analyzed based on the data in annual questionnaires provided by postal operators.

Availability of postal operators' network

The total number of business units (1,505) through which postal operators provide OPS has been increased by 32 business units (2%) compared to 2021. The majority of business units is owned by the PPO, which is a sole USP, but also performing OPS. Business units adapted to the needs of disabled persons make up 20% of the total number of units. Six postal operators (postal express providers and the PPO) account for 305 business units adapted to disabled persons (Figure 14.12).

Figure 14.12. Parcel locker network in the Republic of Serbia (Source: GIS portal)



In the EU countries and throughout the world, an increasing trend of alternative means of postal delivery is present, which ensures a better service availability, such as parcel lockers. At most locations, the users can access parcel lockers round the clock and can set their own time of delivery, within the time frame foreseen by the operator. Over 2022, the parcel locker network in the Republic of Serbia has almost doubled in size (196 parcel lockers), with the popularity of this postal network means being expected to rise further. Three postal operators (PE „Post of Serbia“, D Express and Ananas E-Commerce) owned parcel locker networks in 2022.

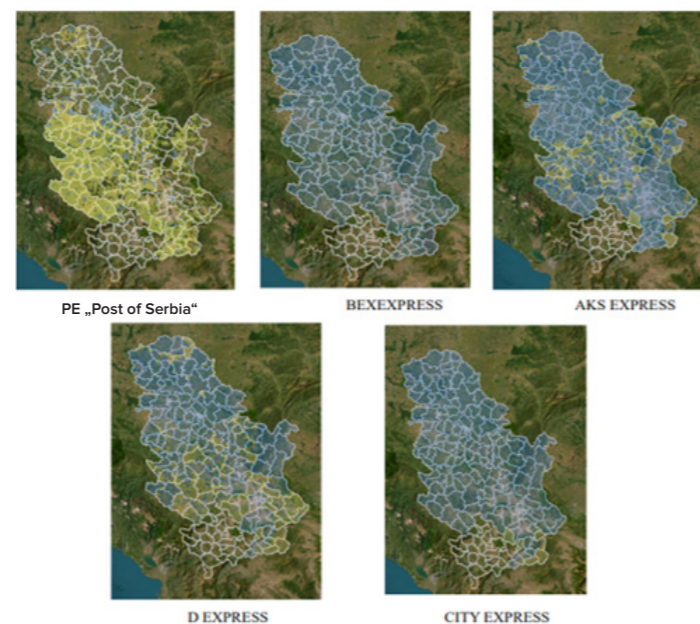
Yet another parameter showing that Serbian postal operators follow the European and global trends is switching to electric vehicles, which becomes very important bearing in mind that the EU green agenda is trying to reduce carbon footprint by 50% by the year 2030 and reach climate neutrality by 2050. Over the recent years, with global imperative concentrating on the environmental protection, postal operators throughout Europe started to undertake adequate measures (such as the use of electric vehicles, recyclable wrapping materials, postal sorting centers powered by solar energy, other green energy sources etc).

Major Serbian postal providers, especially during last couple of years, are also doing their best to adapt their business operations to the global trends. Compared to 2021, the number of electric vehicles has almost doubled, reaching the number of 138 vehicles in 2022.

As for the monitoring of transmission times and other QoS indicators, pursuant to the Strategy for the development of postal services in the Republic of Serbia for the period 2021-2025¹⁰, RATEL organized an independent screening of OPS quality of service, according to 4 main criteria and 13 subcriteria, for five major postal operators (AKS EXPRESS KURIR, BEXEXPRESS, CITY EXPRESS, D EXPRESS and PE „Post of Serbia“). This type of quality monitoring is unique in Europe and is very important from the point of view of the user but also from the operator’s point of view, because the providers will now be able to assess their business operations and undertake measures to improve quality related to the underserved criteria. The measurement data and results will be publicly available in 2023.

In order to ensure better reach of information to the users regarding the availability of postal networks, RATEL has developed a GIS tool for postal services¹¹. GIS portal offers a centralized service for verification of business unit or parcel locker locations, as well as details of express service and UPS delivery at any location in the Republic of Serbia (Figure 14.13).

Figure 14.13. RS territory coverage¹² of express service „next day/special day delivery“ offered by operators with biggest share in OPS market (Source:GIS portal)



Complaints regarding other postal services

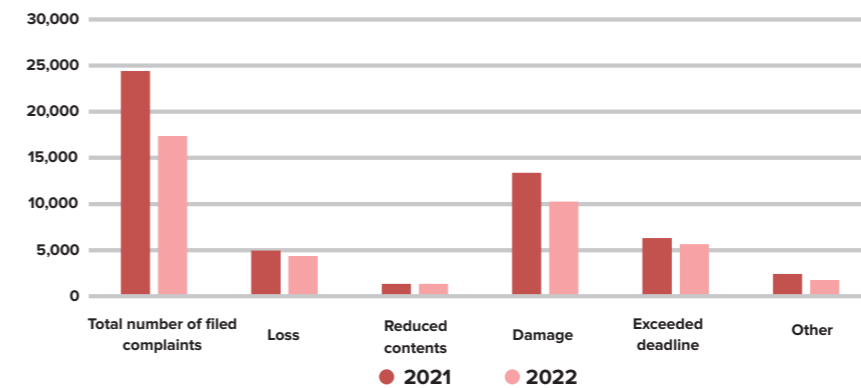
The structure of complaints about other postal services (OPS) in UPS, based on the data provided by nine postal operators providing express services, is shown in Table 14.13.

The negative growth trend of OPS complaints has continued. Over 2022, partly due to a decline in the OPS volumes but also to the provision of services of better quality, the number of complaints dropped by -23%.

Table 14.13. OPS complaints in NPT during 2021 and 2022

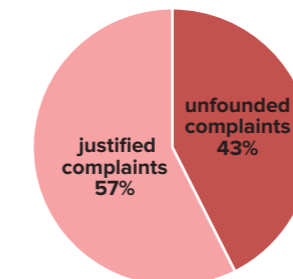
Year	Total number of filed complaints	Unfounded	Resolved on the basis of:					Indemnity Amount (thous. din.)
			Loss	Reduced contents	Damage	Exceeded deadline	Other	
1	2=3+4+5+6+7+8	3	4	5	6	7	8	9
2021	52,829	24,413	4,944	1,343	13,400	6,296	2,433	133,161
2022	40,774	17,367	4,375	1,329	40,774	5,664	1,774	127,917
Growth rate %	-23%	-29%	-12%	-1%	-23%	-10%	-27%	-4%

Figure 14.14. OPS complaint structure in NPT in 2021 and 2022



Like in previous years, most of the complaints (43%) in 2022 were unfounded. A general decrease in the number of complaints in all categories has been recorded.

Figure 14.15. Ratio of justified and unfounded OPS complaints in 2022



Around 43% of complaints were unfounded, while 23,407 (57%) were justified, a slightly better result compared to 2021, when their share was 54%.

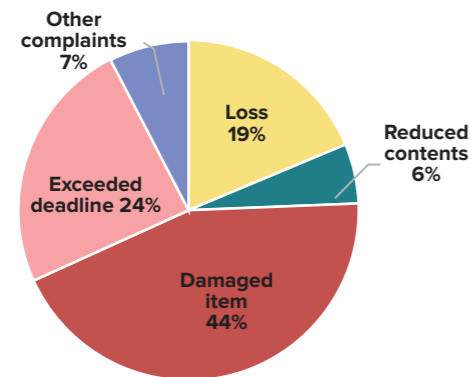
¹¹ Official Gazette of RS, No. 68/21

¹² <https://gis.ratel.rs/smartPortal/postanskeUsluge>

¹³ Blue shade – every day delivery, Yellow shade – special day delivery

The structure of justified complaints recorded over 2022 is shown in Figure 14.16.

Figure 14.16. Structure of justified OPS complaints in NPT in 2022

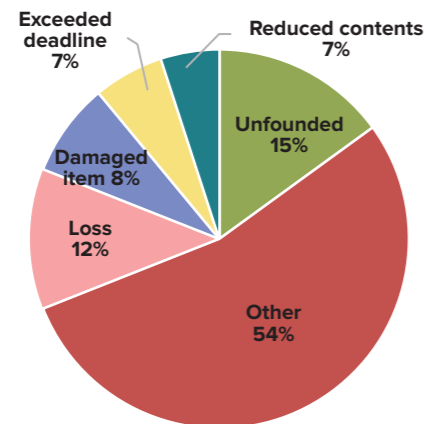


Complaints related to postal item damage remain dominant, followed by complaints regarding exceeded deadlines and loss of items, and the least frequent complaints, regarding reduced contents.

Since the number of complaints regarding damaged items has decreased considerably, the conclusion is that postal operators had strongly implemented RATEL's suggestions given during expert monitoring over the two previous years. The education of the employees was obviously carried out, as well as the instructions given to users regarding the correct packaging of postal items.

Also, a drop in the number of complaints in IPT by -7% has been recorded. Over 2022, 942 OPS complaints were filed. The structure of OPS complaints in IPT during 2022 is shown in Figure 14.17.

Figure 14.17. OPS complaint structure in IPT during 2022



More than 15% of complaints in IPT were unfounded, the majority of them being uncategorized and described as other complaints (54%). 12% of justified complaints were filed for the loss of item, followed by 8% for damaged items, 6% for exceeded deadline and 5% for reduced contents.

Postal operators providing courier services, since the beginning of postal market monitoring (2010), have had no complaints, which was also confirmed during expert monitoring in 2021 and 2022.

RATEL's competence in respect of complaints



The Law on Postal Services stipulates RATEL's competence in respect of users' complaints. RATEL 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 law also foresees that the user may lodge a complaint/ objection with RATEL against the decision of the postal operator on the rejection of the complaint.

The postal operator is obliged to release a statement 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 deciding on the merits of the complaint.

The objection may be filed by the user within 15 days from the day of receiving the operator's decision on rejection of the complaint. The user may also lodge a complaint/ objection to RATEL against the operator for not submitting a decision on the merits of the complaint.

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.

Over 2022, there were significantly less objections against the operator's decision on the merits of the complaint or absence of provision thereof. RATEL only had to act upon 52 objections in 2022, with those being submitted only by email (Table 14.14).

Table 14.14. Complaints/ objections submitted to RATEL in 2022

Manner of submitting the objections	2021	2022	Difference 2022-2021 %
Electronically	39	29	-25.6
In writing	52	23	-55.8
Total	91	52	-42.9

Out of 48 objections for which RATEL requested the operators to reconsider previously submitted complaints, 23 objections (over 48%) were resolved in favor of the applicant. Most of objections (90%) refer to OPS – express postal services, while UPS-related issues received only 5 objections (Table 14.15).

Table 14.15. Objections by the type of service submitted to RATEL in 2021 and 2022

Type of service	2021	%	2022	%		Difference 2022-2021
UPS	13	14.3%	5	9.6%	-8	-61.5%
OPS	78	85.7%	47	90.4%	-31	-39.7%
Total	91	100%	52	100%	-39	-42.9%

Table 14.16. Structure of objections filed with RATEL in 2022

Type of objection	2021	2022
Exceeded deadline	42%	27%
Damaged item	39%	42%
Lost item	/	10%
Non-delivery	12%	6%
Overpaid postage fee	2%	4%
Other	5%	11%

In 2022, RATEL acted upon 39 complaints less than in 2021. Also, unlike the previous year, where the majority of objections were regarding exceeded deadlines, in 2022, the most common complaint was damage of items (42%) (Table 14.16).

14.3. Quality of service, user protection and complaint handling in the EU¹³

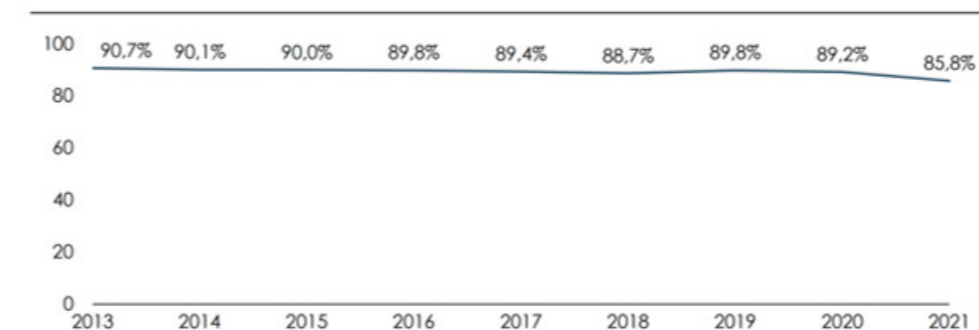
For the purpose of monitoring the postal service market and preparing for the adoption of regulatory frameworks, the European Commission has hired an independent consultant for the elaboration of a study on main developments in the postal sector, for the period 2017-2021, published on the EC official page. The study represents, describes and assesses the main developments on the letter and parcel delivery markets in 27 EU member countries, including United Kingdom and EFTA countries (Iceland, Liechtenstein, Norway and Switzerland).

In the study, the quality of all three types of postal services: priority letter, non-priority letter and parcel delivery has been analyzed. The decision on the level of quality to be reached in service provision is an important operational decision for each postal operator, since it affects the costs, revenues and profit, while the provision of services in the circumstances of declining postal volumes and a demand for high quality of service is costly.

Figure 14.18. shows the trend of achieved D+1 transmission times for priority letters during an 8-year period, where a continuous moderate drop ranging from 90.7% in 2013 to 85.8% in 2021 has been recorded. Most of the countries have reached the prescribed level of quality, except: Bulgaria, Cyprus, Ireland, Lithuania, Poland and Portugal, which remained below the prescribed limits during the observed period.

Figure 14.18. Measurement performance D+1, 2017-2021, Europe (19 countries)

D+1 delivery performance, 2017-2021, Europe (19 countries)
% of D+1 letters that arrived in D+1, median across all 19 countries



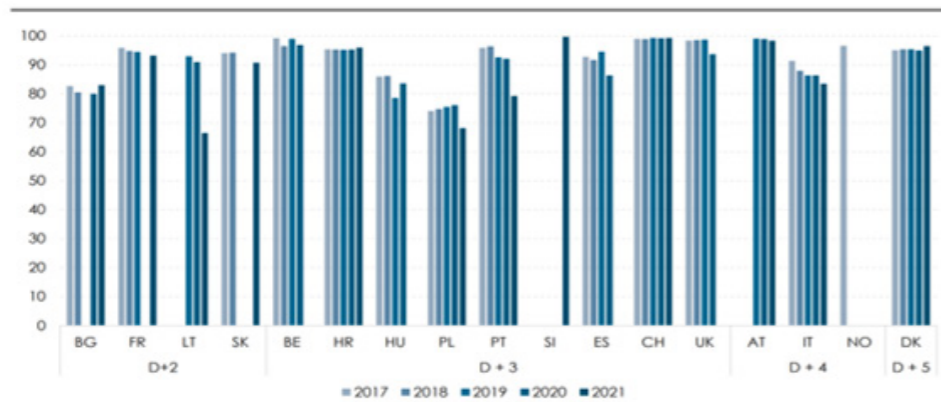
Note: Includes data from the following 19 countries: AT, BG, HR, CY, CZ, EE, FR, DE, EL, HU, IE, IT, LT, NL, PL, SI, SK, CH. No D+1 FSC measurement was taken for Croatia in 2019, France in 2020, or Greece in 2021. The median is over all 19 countries, excluding the previously mentioned countries in years where no measurement was taken.

Source: CE Survey of NRAs. Copenhagen Economics (2018) Main Developments in the Postal Sector 2013-2016 European Commission.

Considering a constant decrease in the volume of letter-post items, most of the countries assigned second-class postal items (non-priority items) with D+3 deadlines, and these standards were usually fulfilled, except for Italy and Poland. The Covid-19 pandemic had a major impact on the fulfillment of quality standards in 2020 and 2021. As for the second-class letters delivery D+2 deadlines, most of the countries, except Bulgaria, have recorded moderate decrease in quality performance during the observed period (Figure 14.19).

Figure 14.19. Non-priority letter performance for D+2, D+3, D+4, 2017-2021, Europe (18 countries)

Non-priority letter delivery performance, 2017-2021, Europe (18 countries)
% of letters delivered in D+2, D+3, D+4, D+5, depending on product speed



Note: Includes data from the following 17 countries: AT, BE, BG, HR, DK, FR, HU, IT, LT, NO, PL, PT, SK, SI, ES, CH, UK. For some countries, data was not available for all years. AT - started measuring a non-priority target in 2019. LT - non-priority letter targets were not enforced in 2017 and 2018. SI - added a non-priority target in 2021.
Source: CE Survey of NRAs.

Parcel delivery regulatory targets have been established by 17 out of 31 countries (Table 14.17.)

Table 14.17. Countries with established parcel delivery regulatory targets

Is the USP subject to regulatory objectives for transit time for single-piece parcels?

	COUNTRIES
YES	17: AT, BG, DK, FR, HU, IT, LV, LT, MT, NO, PL, PT, SK, SI, ES, CH, UK
NO	11: BE, HR, CZ, EE, FI, EL, IE, LU, NL, RO, SE
NO ANSWER	3: CY, IS, LI

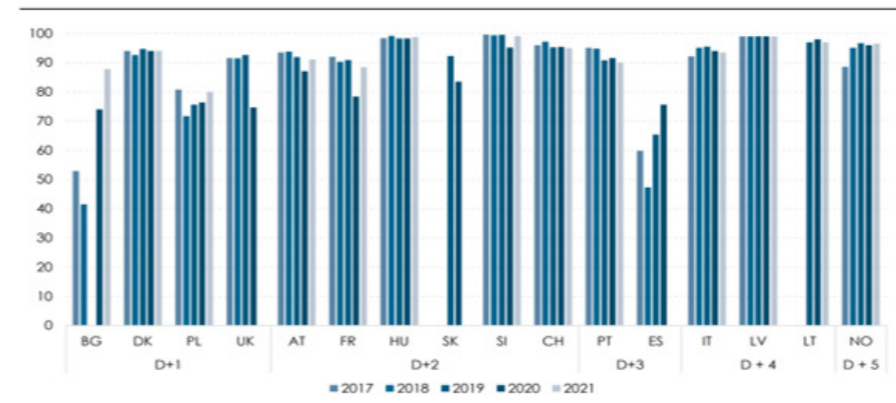
Source: CE Survey of NRAs.

A great number of countries have fulfilled the prescribed parcel delivery standards (Figure 14.20).

Many countries saw a drop in quality over 2020, most probably due to the factors linked to the pandemic, when the operators were experiencing numerous problems with both the delivery and lack of work force, which all impacted the speed of postal delivery.

Figure 14.20. Single parcel performance, 2017-2021, Europe (16 countries)

Single-piece parcel delivery performance, 2017-2021, Europe (16 countries)
% of parcels delivered in D+1, D+2, D+3, D+4, depending on product speed



Note: Includes data from the following 16 countries: AT, BG, DK, FR, HU, IT, LV, LT, NO, PL, PT, SK, SI, CH, UK. For some countries, data was not available for all years. LT - parcel delivery targets were not enforced in 2017 and 2018.
Source: CE Survey of NRAs.

Most of regulators in the European countries included in the study are tasked with transmission times standardization and reliability of service (such as the share of lost postal items).

The research has shown that 16 NRAs (National Regulatory Authorities) define quality targets and/or minimum USP standards, whereas 15 NRAs perform annual quality screenings.

There are no regulators monitoring the quality of services not provided by a designated USP. The majority of NRAs also report being equipped with the competence to sanction or impose other legal institutes to an USP not reaching the quality targets.

As for the frequency of the letter delivery, virtually all countries impose the minimum requirement stipulated under the Directive, which is a five-day delivery. The total of 23 NRAs reported that a five-day minimum standard of UPS delivery has been established in their countries, with the exception of France, Germany, Malta and United Kingdom, where the USP is obligated to deliver postal items six days a week.

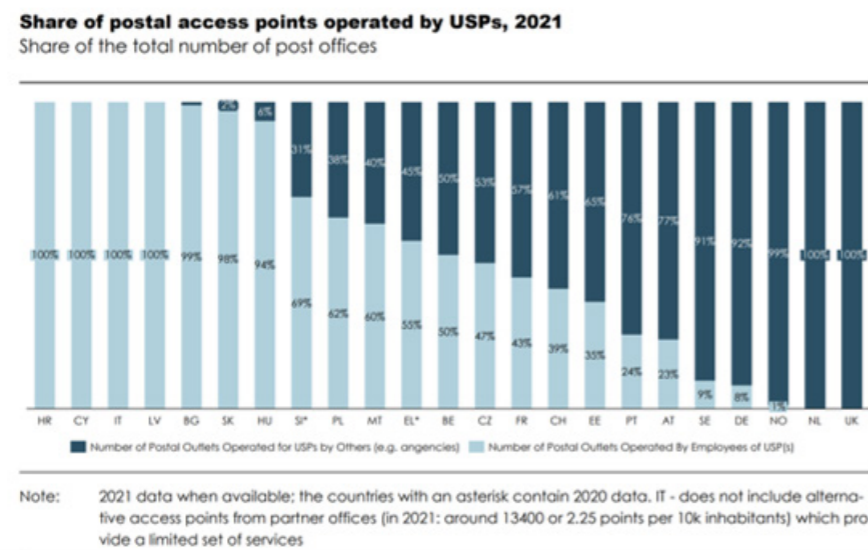
Certain countries, such as Denmark and Norway, have introduced alternative delivery modes. In Denmark, the delivery frequency in 2018 was reduced to one day a week for standard letters, with a new parcel delivery model consisting of five days a week and standard letters one day a week. As of June 1 2020, in Norway the NRA allowed the PPO to implement an alternate-day delivery model, meaning that letters are delivered to households twice a week (on Tuesday and Thursday) and three times the following week (Monday, Wednesday, Friday).

The majority of countries maintain the five-day delivery for non-priority items as well, with the exception of Austria, Belgium, Greece, Italy and Sweden, which use a more relaxed model. The same goes for parcels, only a small percentage of population has not been covered by the five-day delivery.

As for the availability, the number of postal access points has dropped for 19 countries in the period 2013-2021, with seven countries seeing the number of postal access points grow. The surge in the number of postal access points is most probably due to the expansion of a new access point model Pick up and drop on – PUDO, as a response to an increased demand for parcel delivery.

The trend of externalization of operators' customer point business operations has continued over the period 2017-2021 (Figure 14.21). In 2021, only the postal access points in Croatia, Cyprus, Italy and Latvia were fully owned by the USP. In Norway, the USP owns but 1% of the postal access point network, in the Netherlands and the United Kingdom 0%.

Figure 14.21. Ownership structure of post offices managed by USPs in 2021



Another important trend over the period 2017-2021 is an increase in the number of parcel lockers. Between 2017 and 2021, their number grew by 71% in 16 countries. There were on average 50 parcel lockers per 1 million of inhabitants in 2021. Countries that saw a considerable surge in the number of parcel lockers during 2017-2021 are: Denmark, Finland, Germany, Norway and Sweden.

The focus of the research was the significance of understanding the users' needs, in the context of a continuous growth of parcel services and simultaneous decrease of letter-post volumes. Electronic substitution of traditional services has accelerated the considerations regarding users' needs in the UPS domain for the next five or even ten years. The analysis of postal service users' needs, elaborated for the General Directorate for the EC Development (DG GROW) in 2019, highlights the aspects of UPS that will be important in the future and should be taken into account when defining the scope and obligation of UPS. Primarily and above all, the delivery was singled out, and divided according to the following types of items:

- delivery of items containing goods purchased through e-commerce;
- delivery of medical samples, pharmaceutical products etc;
- delivery of bank and credit cards;
- delivery of election materials;
- delivery of court documents, execution orders and similar.

On the other hand, the users also expressed their opinion regarding possible UPS features that could be reduced, such as: transmission speed, density of access points and frequency of item collection and delivery. These observations are to be explored by countries nationally and taken into account when adopting national regulations.

Conclusion

In 2022, RATEL continued with independent measurement of transmission times of postal items in NPT, by applying standard SRPS EN 13850 and according to the PPO plan foreseeing implementation of adequate measures of quality improvement. However, since the results revealed no significant development, to which RATEL pointed to the PPO during 2022, it has become necessary to undertake urgent far-reaching measures in order to ensure the fulfillment of the prescribed quality standards.

Based on the results of the second year of screening, it has been concluded that all measured deadlines were beyond the prescribed values, except for deadline D+5 for non-priority items achieved during both years of screening. Quality standards have not been met for priority letters for any of the prescribed deadlines, with a negligible increase compared to 2021.

Since the prescribed deadlines for NPT were not met, the situation was consequently reflected in IPT as well. A significant drop for transmission times J+3 i J+5 both for inbound and outbound items, which were well beyond the prescribed deadlines.

On the other hand, the PPO has been continuously fulfilling the prescribed standard for postal money orders, as well as parcel transmission deadlines in NPT and IPT, which are above the European average for parcels. The problem of lost items (non-priority non-recorded letter-post items and priority letters) remained in 2022 as well, despite RATEL throughout 2021 demanding that the PPO set out a detailed plan for improving the quality of

service and security of postal items. Despite the first effects of these activities having been expected in 2022, the number of lost items has not significantly decreased.

In 2022, more complaints regarding UPS in NPT were recorded, while the number of complaints in IPT was reduced.

OPS saw a dramatic drop in the number of complaints (-23%), among them the category of damaged items being the least frequent.

It can be concluded that OPS providers have improved their postal service quality and implemented RATEL's recommendations during the expert monitoring, by educating their employees and making available clear information to postal users about the correct way to package various postal item contents, which ultimately led to a reduced number of damaged items.

A detailed overview of the OPS quality is expected during 2023, when RATEL will have published the results of its Benchmark study, where the operators will be compared according to 13 key criteria from the users' point of view. During 2022, RATEL undertook a set of activities enabling better availability of information to the users and transparency for all market players. Namely, that same year RATEL launched two tools intended for the users and operators – portal Price of Services¹⁴ and GIS portal, both accessible at RATEL's web page.

By means of the Price of Services tool, the users can check and compare prices of NPT express services „today for today“ and „today for tomorrow“, while for the operators providing services only in B2C (business-to-consumer) and B2B (business-to-business) express service and courier service segment, the search of price lists and general terms and conditions is available at one place.

On the other hand, GIS portal, which represents a unique digital geographic atlas of postal services, enables the search of the PPO post offices availability, OPS business offices availability, parcel lockers as well as the territorial coverage of UPS delivery and OPS delivery for each operator.

This way, the users acquired yet another dimension based on which they can choose their most adequate provider and access all important information at one place.

By means of these tools, the postal operators are able to compare their performances and use the available information in the process of business decision making.

SECURITY RISKS IN ICT SYSTEMS

15.

Cyber security worldwide

1. Statistics of attacks by different types of malware

Figure 15.1. shows the shares of different malware (malicious software) types worldwide in 2022 (as reported by Check Point). The highest incidence of attacks comes from multipurpose malware. It is followed by malware type Infostealer, used by the attackers in early phases of the attack to collect data about the target. The next in the ranking is a malware type overtaking the victim's device resources in order to "mine" cryptocurrencies (Cryptominers). Next in the ranking are malicious software types developed for attacking mobile devices, with Ransomware at the bottom of the list, marking a slight drop in the number of attacks compared to the year before.

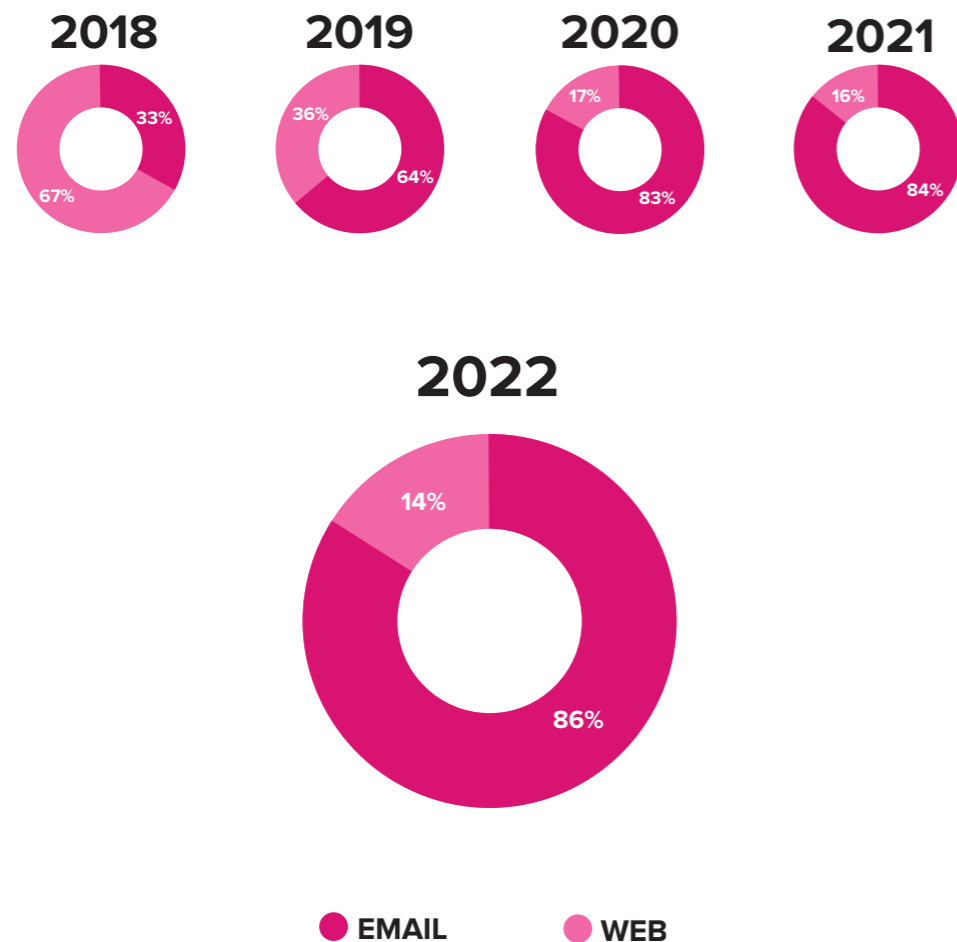
Figure 15.1. Shares of different malware types at global level



2. Ways of malware distribution

While in 2018 the dominant way of malware distribution was through the web pages, the following year the situation changed, making the e-mail the primary way of malware distribution. This trend survived over the following years, growing in percentage year after year. Compared to 2021, the e-mail distributed malware is slightly higher (by 2% in 2022).

Figure 15.2. Comparative view of attacks using e-mail and web pages for malware distribution (2018 - 2022)



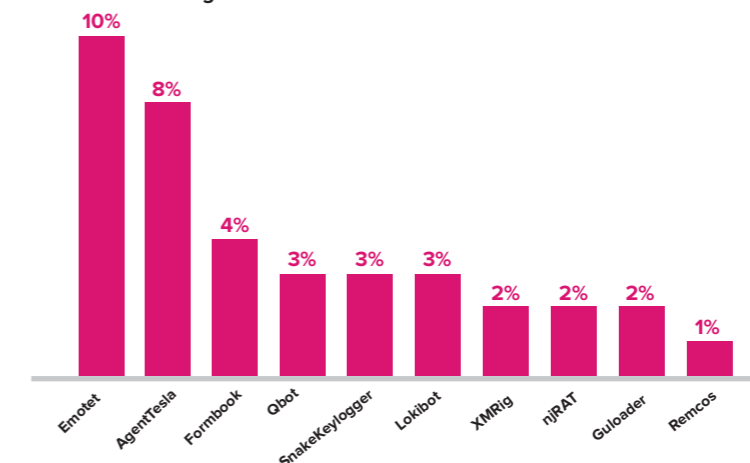
3. Statistics of attacks by different malware families

The percentage of organizations worldwide infected by a specific malware family is shown in Figure 15.3.

Some of the observable changes compared to the last year's malware ranking is that *Emotet* re-emerged at the first place, instead of *TrickBot* malware, which hit 10% of corporate networks during 2022. *Emotet* was initially discovered in 2014 as a banking trojan, and with time it evolved into a multipurpose malware, intended primarily for acquiring initial access. By getting back to the top of the list, *Emotet* was distributed with the assistance of *Trickbot*, while developing later by means of widely present spam campaigns, using malicious *Office* documents, most usually Excel files exploiting malicious macros. *Emotet* continues to be distributed via electronic mail, with content of the message being adapted to specific countries. *Emotet* campaigns were targeting over 2022 the IKEA employees, and were being used for phishing campaigns involved in the mimicking of the US federal IRS and other organizations.

Among the malware used for data theft (*Infostealers*) over 2022, the four most frequent malware of this type were: *AgentTesla*, *Formbook*, *SnakeKeylogger* and *LokiBot*. The growing popularity of this malware program is explained by an increasing demand for stolen credentials and their accessibility at low prices.

Figure 15.3. Distribution of malware on a global scale

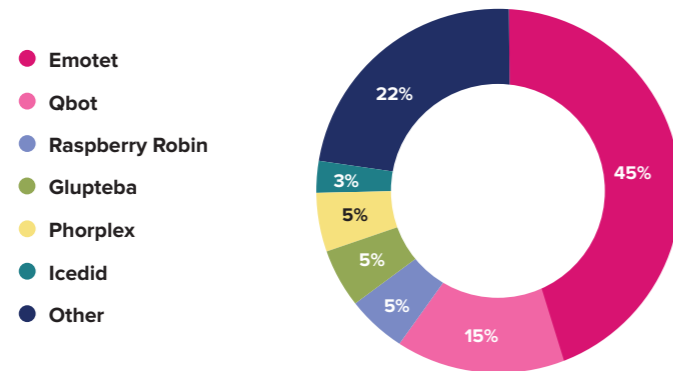


4. Statistics of attacks by different multipurpose malware families

The most frequent attacks in 2022 were those using multipurpose malware as initial vector to gain access to the system. For these attacks the following malware tools were used: *Emotet* (45%), *Qbot* (15%), *Raspberry Robin* (5%), *Phorpiex* (5%), *Glupteba* (5%) and other malwares. *Emotet* and *Qbot* had an increased activity during 2022, making up more than 60% of the total number of attacks by using multipurpose malware. *Raspberry Robin* is a new type of this malware and was first detected in September 2021, by means of an infected USB device, with worm-like distribution characteristics, which later on became one of the most frequently used ways of malware

distribution. *Phorpiex* botnet has become known for propagation of other malware families through various spam campaigns. *Glupteba* is a malware type capable of stealing credentials, crypto mining and other.

Figure 15.4 Share of different multipurpose malware families at global level



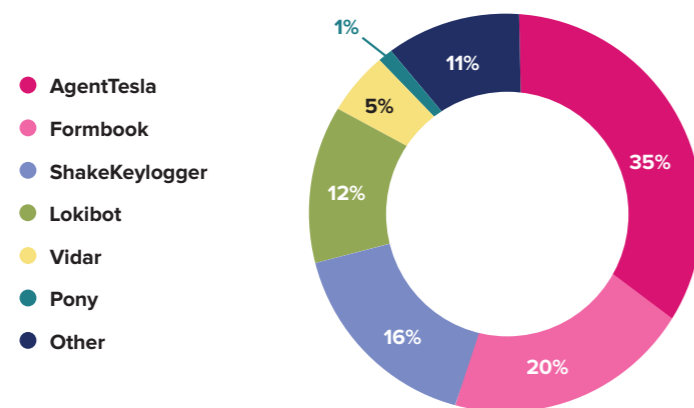
5. Statistics of attacks by different malware families designed for theft of user data

This family is dominated by several malware types, most notably *AgentTesla* (35%), *Formbook* (20%) and *SnakeKeylogger* (16%), jointly responsible for 71% of the observed credential theft attacks.

Formbook was created to collect keyboard input data, to search and access files, to make screenshots, to collect user search data and download and execute additional malicious scripts. It is often distributed via e-mail attachments, such as pdf, doc, RTF documents, exe, zip, rar and other.

SnakeKeylogger appeared for the first time at the end of 2020, and has so far, according to the most frequently used malware statistics for 2021, tripled its ranking. The main functionalities include collection of keyboard input data, screenshot making, collection of user data, as part of data theft via *HTTP* and *SMTP* protocols.

Figure 15.5. Share of different malware families designed for user data theft

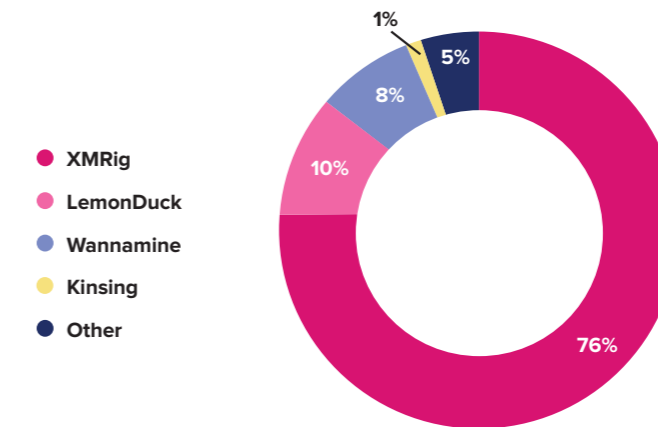


6. Statistics of attacks by different malware families designed for cryptocurrency theft

Market cryptocurrency capitalization plummeted in 2022, since the low cryptocurrency prices, coupled with increased mining costs, affected crypto mining profitability and motivation. This explains the reduction in cryptocurrency visibility from 21% during 2021, to 16% over 2022, at a global level. For the same reasons, *XMRig* remained the only legitimate open-source mining tool available to be used for malicious purposes. *XMRig* was utilized in 76% crypto mining attacks during 2022.

LemonDuck is a relatively new cryptocurrency mining malware, without a legitimate use, and since its discovery in 2019, it has added numerous functionalities that can be utilized for malicious purposes, including credential theft and lateral movement capabilities.

Figure 15.6. Share of different malware families designed for cryptocurrency theft

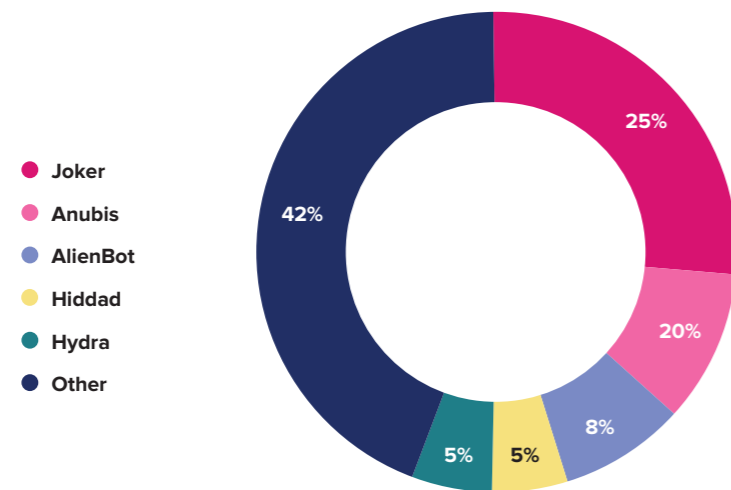


7. Statistics of attacks on mobile devices by different malware families

Joker, an android mobile malware, is a program capable of accessing SMS messages, contact lists and device information, mostly generating revenues by unauthorized subscriptions for value-added services. *Joker* uses SMS message access for request authentication and payment authorization. First identified in 2017, this malware appears in 2022, hidden in at least 8 applications on *Google Play*, with more than 3 million downloads, ascending to the top of the global mobile malware list.

Anubis is a banking trojan designed to attack Android mobile devices. Since its discovery in 2017, it acquired additional functionalities, including remote access feature, *keylogging* and sound recording. It was detected in hundreds of various apps available at *Google Play* store, thus earning a place on the most frequent mobile malware list.

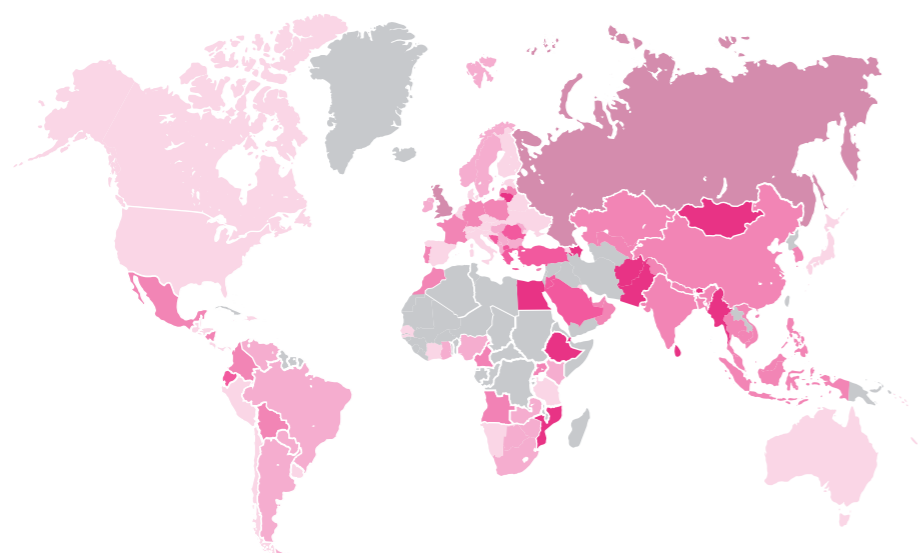
Figure 15.7. Share of different malware families designed to attack mobile devices



8. Check Point Global Threat Index

Figure 15.8 illustrates Check Point Global Threat Index values by country, in 2022. This index is calculated based on the data on attacks collected 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. It has been observed that different countries have different levels of probability of infection. Darker shades indicate higher probability of malware infection, while grey shades represent areas that did not provide enough data for analysis.

Figure 15.8. Graphical display of Check Point Global Threat Index values by country



Information security in the Republic of Serbia

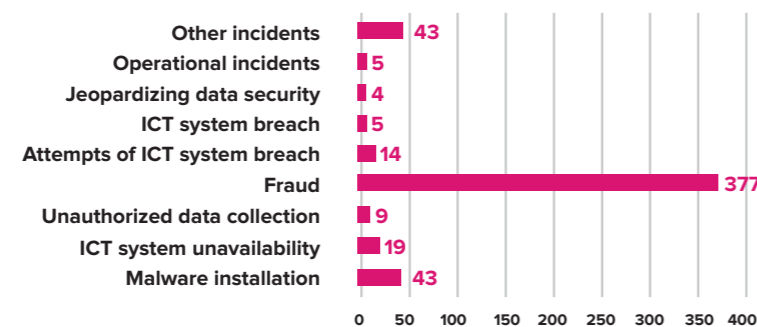
Pursuant to the Law on Information Security („Official Gazette RS“, Nos. 6/16, 94/17 and 77/19), all ICT systems operators are obligated to inform the competent authorized body on the incidents in ICT systems that could severely disrupt the information security.

During 2022, 519 such incidents, including those detected by the International CERTs, were reported to the National CERT. Incidents breaching the ICT security, pertaining to a criminal act, are reported in accordance with legal and by-law provisions or forwarded to the Special Prosecutor’s Office for High-Tech Crime.

Figure 15.10. features reported incidents by incident group. Most of the reports relate to fraudulent activities such as phishing attacks, unauthorized use of resources and other types of fraud.

Considerable number of this type of reports suggest that attacks have become more sophisticated so that users find it more difficult to discern a legitimate sender from a fake one, since most of the attackers use social engineering to collect information about the victim, to better plan the attack. Bank Internet domains are often plagiarized (with one letter changed, for example), official logos are abused and fraudulent content that looks like a legitimate one is presented. The authenticity of phishing e-mails is supported by new modern technologies such as ChatGPT, offering a possibility for the attacker to generate grammatically and semantically flawless e-mail messages. Sometimes, the attackers use various communication channels, for example when targeting the e-commerce platform users. The advertizers or sellers are contacted by the supposed buyers, most frequently in Serbian language, through applications such as WhatsApp or Viber, providing them with a link along with an explanation that a payment has been made via the app. By clicking on the link, the seller is contacted by a fake e-commerce platform administrator who then tells them to enter their credit card details, to supposedly finalize the payment. Another example of phishing attack targets postal service users (an intruder posing as the PPO or a private operator). The malicious attacker sends an info to the user (by means of an SMS, e-mail or *WhatsApp* or *Viber* app) about an inbound order/postal item whose delivery supposedly must be paid by the recipient. The link in the sent message leads to a fake page where the user is asked to fill in their bank or credit card account details, which then enables the attacker to clear the user’s account. In both cases, the aim of the attacker is unlawful acquisition of funds.

Figure 15.10: Reported incidents in 2022 by incident group



Top five reported incidents in 2022 are shown in Figure 15.11.

Phishing is the top reported cyber attack in 2022. It is carried out via e-mail, social networks, telephone calls or text messages, along with a request to click on a link or open a document. The attacker uses social engineering to appear as a known or familiar sender and make the victim wilfully disclose their personal information or download a malicious software. This type of attack is often involved with the cases of malware, botnets and cyber espionage. There were 311 reports of phishing forwarded to the National CERT in 2022.

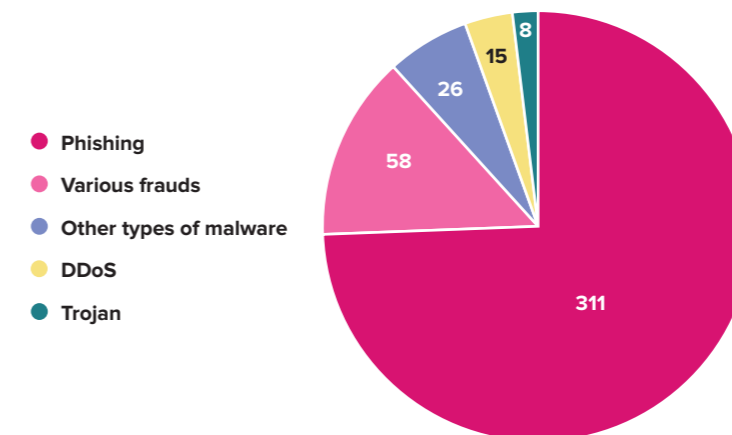
Other fraud types mean fraudulent activities on the Internet, whereby the attacker uses IT technology and devices to contact the victim and force them to engage in an unsafe online behaviour, or to extort money in favour of the attacker. The National CERT received 58 reports on these kinds of threats.

Malware (malicious software) is any software created for malicious purposes, or with an aim to cause damage to computer systems or networks. These programs include computer viruses, computer worms, ransomware, computer trojans, spyware and rootkits. A total of 26 malicious programs that did not qualify to be classified under any of the above categories were reported to the National CERT.

DDoS – (Distributed Denial-of-Service Attack) is an attack targeting the normal functioning of server traffic, services or network, by submerging the targeted infrastructure with a huge quantity of Internet traffic. DDoS attacks reach efficiency by using several compromised computer systems as a source of traffic. There were 15 DDoS attacks reported to the National CERT in 2022.

Trojan – Computer trojan (trojan horse) is a threat whereby the attacker tries to present the malicious software as a convenient tool, tricking the user into launching it. These programs can download other Internet threats, infect vulnerable computers with other types of malware, communicate with remote attackers, record everything typed on the keyboard and send it to the attackers. There were 8 trojan attacks reported to the National CERT in 2022.

Figure 15.11: Top five reported incidents in 2022



Criminal offenses against computer and data security

Over 2022, 5,630 investigations were opened by the Special Prosecutor's Office for High-Tech Crime, namely:

- 525 cases against known adult perpetrators
- 2,452 cases against unknown perpetrators and
- 2,653 cases related to various criminal offenses.

The total number of cases was increased by 6.75% compared to 2021, when 5,274 cases were formed.

The following data refer only to criminal charges pressed against known adult perpetrators in 2022, and actions undertaken during that period by the Special Prosecutor's Office for High-Tech Crime, and represent the number of persons and not the number of cases or proceedings:

- Reported individuals – 614
- Individuals requested to provide necessary information – 196
- Individuals under investigation – 39
- Individuals against whom evidence was demonstrated – 206
- Individuals with bills of indictment – 103
- Individuals officially indicted – 5
- Plea agreements – 57



RATEL



2022