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2019 Quality Report on Electronic Communications Services

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TABLE OF CONTENTS

| | |
|---|-----------|
| LIST OF ABBREVIATIONS | 3 |
| LIST OF ABBREVIATIONS OF LAWS AND REGULATIONS | 4 |
| INTRODUCTION | 5 |
| I INTERNET SERVICE | 7 |
| 1.1. How Internet service measurements are performed | 7 |
| 1.2. Measurement results..... | 8 |
| 1.2.1. Connection speed | 8 |
| 1.2.2. Latency..... | 14 |
| 1.2.3. Jitter..... | 15 |
| 1.2.4. Packet loss ratio | 16 |
| 1.3. Summary | 17 |
| II VOICE TELEPHONY SERVICE..... | 19 |
| 2.1. How voice telephony service measurements are performed..... | 19 |
| 2.2. Measurement results..... | 19 |
| 2.2.1. Average call set-up time..... | 19 |
| 2.2.2. Speech transmission quality | 20 |
| 2.2.3. Unsuccessful call ratio..... | 21 |
| 2.3. Summary | 22 |
| Annex 1 | 23 |
| Annex 2 | 25 |

LIST OF ABBREVIATIONS

2G – second generation mobile electronic communications network

3G – third generation mobile electronic communications network

4G – fourth generation mobile electronic communications network

5G – fifth generation mobile electronic communications network

BITE Latvija – Limited Liability Company “BITE Latvija”

Contract – electronic communications service contract

Fixed Internet service – public Internet access service in the fixed electronic communications network

Fixed voice telephony service – domestic voice telephony service in the fixed electronic communications network

Internet control system – Internet access service quality control system <https://itest.sprk.gov.lv>

Internet service – public Internet access service in the fixed and mobile electronic communications network

Internet service measurements – Internet service quality parameter measurements

kbps – kilobits per second

LMT – Limited Liability Company “Latvijas Mobilais Telefons”

Mbps – megabits per second

Merchant – electronic communications merchant

Mobile Internet service – public Internet access service in the mobile electronic communications network

Mobile voice telephony service – domestic voice telephony service in the mobile electronic communications network

ms – milliseconds

Network – electronic communications network

Quality Report – Quality Report on Electronic Communications Services

Regulator – Public Utilities Commission

Service – public electronic communications service

SMS service – electronic message transmission service in the mobile electronic communications network

Tele2 – Limited Liability Company “Tele2”

Television service – television program distribution service

Tet – Limited Liability Company “Tet”; until 31 March 2019 Limited Liability Company “Lattelecom”

Voice control system – Telephone network quality control system

Voice telephony service – domestic voice telephony service in the fixed and mobile electronic communications network

Voice telephony service measurements – measurements of voice telephony service quality parameters

LIST OF ABBREVIATIONS OF LAWS AND REGULATIONS

[European Electronic Communications Code](#) – Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code.

[Open Internet Access Regulation](#) – Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 laying down measures concerning open Internet access and amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services and Regulation (EU) No. 531/2012 on roaming on public mobile communications networks within the Union.

[Regulations on Service Quality Requirements](#) – Regulator's Decision No 1/31 "Regulations on electronic communications service quality requirements and submission and public disclosure of quality reports" of 30 November 2017.

[General Authorisation Regulations](#) – Regulator's Decision No 1/35 "General authorisation regulations in the electronic communications sector" of 20 December 2018.

[Electronic communications services quality measurement methodology](#) – Regulator's Decision No. 1/30 "Electronic communications services quality measurement methodology" of 23 November 2017.

[Regulations on the submission of information in the electronic communications sector](#) – Regulator's Decision No 1/40 "Regulations on the submission of information in the electronic communications sector" of 21 December 2017.

INTRODUCTION

Voice telephony and Internet service is an integral part of everyday life, which provides communication, facilitates information retrieval, provides connectivity with other users, as well as with a wide range of equipment, promotes equal access to different services for the public, promotes the development and introduction of new services, etc. Some services, such as television, text messaging and voice telephony, are increasingly used via the Internet. However, although communication tools and trends are changing, the voice telephony service with guaranteed quality of service remains important to ensure an appropriate level of voice telephony service for continuous and high-quality communication. Meanwhile, the Internet service not only provides entertainment opportunities, but also plays an important role in the social and economic participation of the citizens. Access to the Internet service provides residents with an opportunity for access to education, to look for employment, use e-services, make purchases on the Internet, communicate with others, etc. Therefore, it is important to ensure the wide availability of the Internet service and its appropriate performance.

To supervise and promote the quality of the provided services at an appropriate level, the Regulator determines the quality requirements for voice telephony, television and Internet services by applying appropriate monitoring measures:



Evaluation of information submitted by merchants - merchants are obliged to regularly submit information on the provided services. Based on this information, the Regulator assesses various aspects related to the provision of services. In accordance with the Information Submission Regulations, the information submitted by merchants in the electronic communications sector on the indicators of the broadband Internet access service allows to assess the development and penetration of the Internet service in Latvia. The quality declarations submitted by merchants in accordance with the Regulations on the Service Quality Requirements provide general information on the provided service quality indicators. Meanwhile, the report on compliance with the requirements of an open Internet reflects the compliance of the activities of merchants with the requirements specified in the Regulation concerning open Internet access;



Protection of users' rights - Electronic Communications Law, Regulation concerning open Internet access, and General Authorisation Regulations lay down the requirements for the information to be included in the contract, including service quality values; if these values are not ensured, users are entitled to compensation. Moreover, the quality indicators included in the contract must be proportionate to the values indicated in the quality declaration of the merchant. With the entry into force of the European Electronic Communications Code, a new Electronic Communications Law and subordinate regulatory enactments are being developed which will include clarified service quality requirements in accordance with the current regulatory framework;



Quality measurements - in accordance with the Methodology on the Measurements of Electronic Communications Service Quality, the Regulator performs quality measurements of services provided by merchants. The Regulator constantly performs measurements and provides analytical representation of the results for the following services:

- fixed voice telephony service,
- mobile voice telephony service,
- mobile Internet service.

In addition, to ensure the protection of users' rights, in case of user complaints, the Regulator, if necessary, performs measurements for the above-mentioned services, as well as for fixed Internet, television and SMS services. Information on user complaints received by the Regulator in 2019 is available in the [infographics](#)¹.



Quality Report – in accordance with points 1, 6, 8 of the first paragraph of Article 9 and Article 13 of the law On Regulators of Public Utilities and Article 59 of the Electronic Communications Law, the Regulator supervises the quality of services provided by electronic communications merchants, and informs the public thereof. The Regulator draws up a Quality Report once a year, wherein it summarises the measurement results of service quality parameters, as well as provides general information on the duties of merchants and the regulatory supervision of the quality of services.

¹ On the Regulator's website: section "Publications and Analysis", subsection "Service Quality Reports and User Complaints"

I INTERNET SERVICE

The quality of Internet service has a significant impact on the development of technologies, services, and solutions for social and economic purposes. Given the growing role of Internet in everyday life, in 2016, the European Commission's strategy² for

the development of broadband and the introduction of 5G networks was developed. According to the strategy, all citizens must have access to broadband connection with a speed of at least 30 Mbps by 2020, and 5G connectivity must be available as a full-fledged commercial service in at least one of the largest cities in each Member State by the end of 2020. By 2025, all households in the European Union should have access to an Internet connection with a download speed of at least 100 Mbps, which can be upgraded to gigabits per second, as well as uninterrupted 5G coverage in all urban areas and on all major land transport routes. To ensure the implementation of the objectives defined in the strategy, the European Electronic Communications Code provides for a number of requirements that the Member States of the European Union must incorporate into their national laws and monitor compliance thereof.

To promote the implementation of the above-mentioned objectives and monitor the development of the Internet service and its quality indicators, in 2019, the Regulator evaluated the information submitted by merchants, as well as performed mobile Internet service measurements in BITE Latvija, LMT, and Tele2 mobile operator networks.

1.1. How Internet service measurements are performed

Internet service measurements are performed using terminals that provide measurements in 2G, 3G, and 4G networks with a theoretical data transfer rate of up to 300 Mbps. Tariff plans without data transmission speed restrictions are used for connections. Internet service measurements are performed at specific fixed locations, choosing the latest generation of available technologies in cases of stable mobile network coverage. In cases of atypically low-quality indicators for a particular technology, the Internet service measurements were repeated by choosing an older generation of technology. Internet service measurements reflect the level of quality available to users by creating a single connection session. The overall connection capacity indicators of mobile operators' networks are not assessed and may be higher.

The Regulator performs two types of Internet service measurements - random and serial.



Random measurements reflect the quality of Internet service available at a specific place and time, as well as the penetration of mobile networks and the development of technologies in Latvia. These measurements are performed in freely chosen predominantly populated geographical areas, covering the entire territory of Latvia as uniformly as possible. In the largest 20 cities of Latvia by the population size, the number of measurements was chosen in proportion to the population size. In 2019, random measurements were performed at 1,200 locations, including more than 200 locations in Riga, with a total of 18,000 measurements. Random sample measurements are carried out on working

² [Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions COM \(2016\) 587 "Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society" of 14 September 2016](#)

days, mostly during working hours, and are proportionally distributed between the first and second half of the day.



Serial measurements reflect the quality indicators available at a particular location and the dynamics of their changes during a 24-hour period. For serial measurements, the Regulator once a month moves and installs two measuring devices in certain freely chosen locations in Latvia. In total, more than 211,000 serial measurements were performed at 24 different locations in Latvia during 2019.

The following quality parameters are evaluated during Internet service measurements:

| | |
|---|-------------------|
| connection speed (download and upload) | latency |
| jitter | packet loss ratio |




Internet service measurement results, which characterize the values of measured parameters in Latvia as a whole, were obtained by performing mathematical processing of measurement data, ensuring that service quality indicator values characterize and cover 95% of the performed measurements, excluding individual high and critically low values, thus objectively describing the level of service quality available to users.

1.2. Measurement results

1.2.1. Connection speed

The connection speed is a parameter that indicates how much information is transmitted per unit of time. Depending on the direction of data transmission, a distinction is made between download speed and upload speed. The download speed is the speed at which information is transmitted from an Internet server to the user's device, while the upload speed is the other way round – from the user's device to the Internet server. Most downloadable content is much larger, such as streaming videos, visiting large websites, scrolling through social networking, etc. Therefore, high download speed values are more important for the user. The upload speed, on the other hand, is important, for example, when using interactive applications such as online games, video calls, etc., uploading large files to a web server, etc.

On average, the minimum required download speed is:

| | | |
|---|---|---|
|  |  |  |
| For streaming videos³ | For video calling⁴ | For online games³ |
| standard definition (SD) video: 1-3 Mbps | standard: 0.3 Mbps | approx. 3-6 Mbps |
| high-definition (HD) video: 3-8 Mbps | high definition (HD): at least 1.2 Mbps | |
| ultra-high-definition (UHD/4K) video: 25 Mbps | video conferences: approx. 1 Mbps for each participant | |

³ <https://www.highspeedinternet.com/resources/the-consumers-guide-to-internet-speed>

⁴ <https://www.lifewire.com/how-much-bandwidth-required-for-skype-hd-3426688>

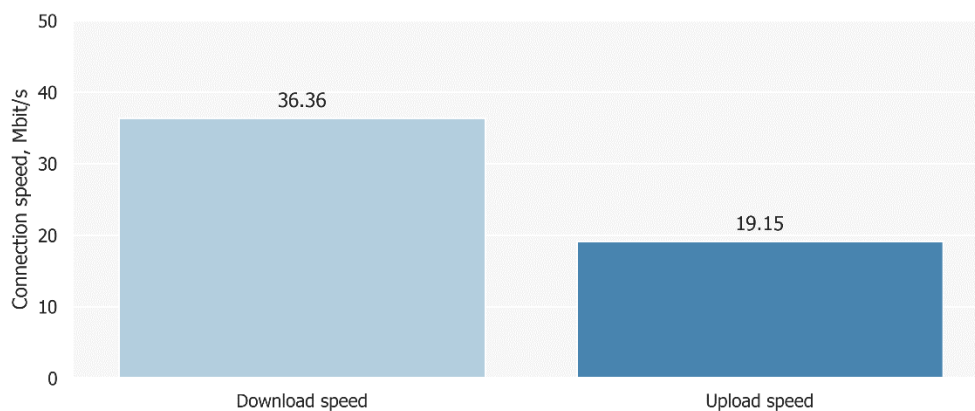
It should be noted that these indicators apply to a single connection, i.e. to stream video to only one device and use an Internet connection for that purpose at that time. If the Internet service is used for several purposes at the same time, this download speed may not be sufficient.

Results of connection speed in random sample measurements

Analysing the results of mobile Internet service measurements in 2019 and comparing them with the indicators of previous years, it can be concluded that the penetration of 4G technology and average connection speed values in the networks of all mobile operators have remained stable. More than 97% of all sample measurements in 2019 were performed using 4G connectivity which was available at all serial measurement locations during the measurements. However, to monitor the quality of the Internet service using 3G connectivity, the Regulator performed additional serial measurements in the 3G network⁵ at several locations.

Despite the widespread use of 4G networks and high connection speeds, in the 2019 measurements outside the cities⁶, there were still places (BITE Latvija - 1.08%, LMT - 0.08%, Tele2 - 0.58% of the measurement locations) where the Internet service was not available due to unstable or non-existent coverage. After evaluating the measurement results, it can be concluded that in locations where Internet service was not available in the network of one mobile operator, the Internet service in the networks of other mobile operators was detected with an average download speed of at least 2 Mbps, while in most cases – above 10 Mbps.

Figure 1. Average values of the connection speed in 95% of measurements using 4G data transmission technology in Latvia in 2019 in the networks of all mobile operators

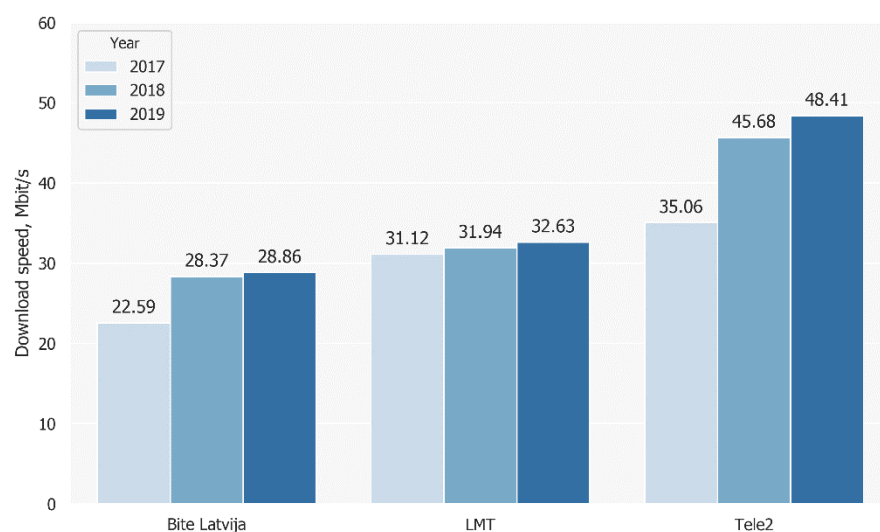


Comparing the average values of download speed over several years, it can be observed that the quality indicators of mobile Internet service are, on average, ensured at a stable good level.

⁵ In 2019, approximately 30,000 measurements were performed using a 3G connection

⁶ Nine republican cities and 67 municipal cities in accordance with the Law on Administrative Territories and Populated Areas

Figure 2. Comparison of average download speed by years and by mobile operators in 95% of measurements using 4G data transmission technology in Latvia



It should be taken into account that the average connection speed values characterise the general level of mobile Internet service quality and its development dynamics in Latvia. These indicators can vary widely in different places. Consequently, the average values cannot be considered as an actual evaluation of the Internet service at each connection point.

Average download speeds on all mobile operators' networks are provided at an appropriate level for the use of modern Internet service. At the same time, the Regulator has assessed the number of measurements in which the observed download speed values are considered insufficient (that is, less than 6 Mbps), as well as the number of measurement sites where Internet service was not available due to non-existent or unstable network coverage.

Table 1. Percentage distribution of measured download speeds below 6 Mbps* and measurement locations where Internet service was not available at the time of measurements due to non-existent or unstable network coverage**.

| | BITE Latvija | LMT | Tele2 |
|----------------|---------------------|------------|--------------|
| * Below 6 Mbps | 5.84% | 4.88% | 2.05% |
| ** No result | 1.08% | 0.08% | 0.58% |

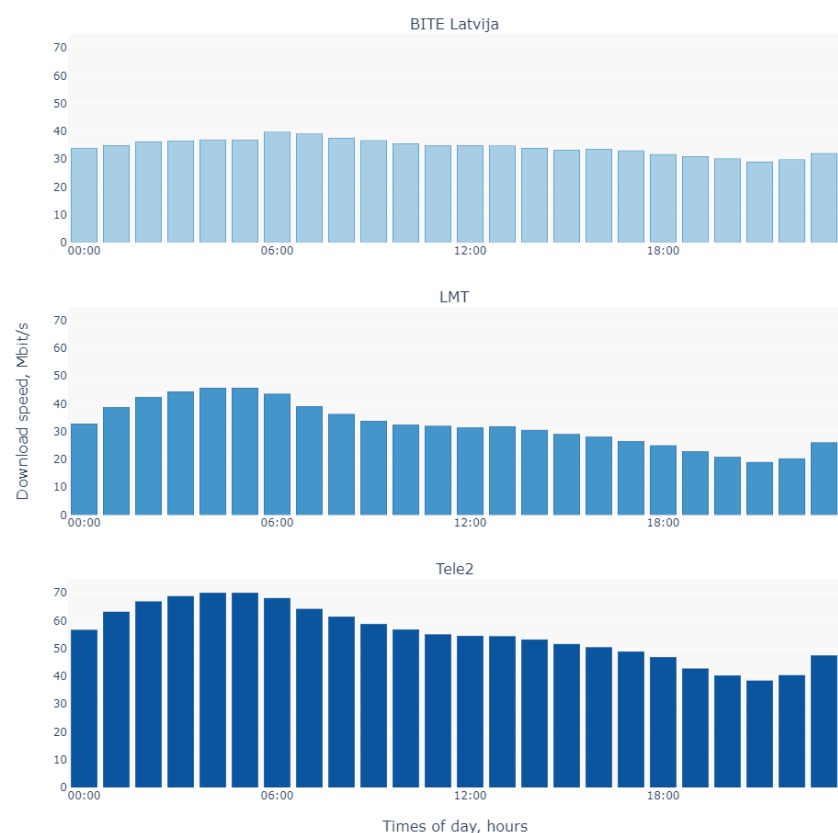
Annex 1 of the Quality Report summarises the average connection speed values in 2019 in the municipalities of Latvia. Annex 2 of the Quality Report summarises the average connection speed values in 2019 in Riga neighbourhoods. Meanwhile, the average connection speed values at each Internet service measurement location can be found on the Regulator's website, in the 2019 [sample measurement section](#). The assessment of quality parameters at specific measurement sites provides more information on the quality indicators that are actually provided, however, it should be noted that when performing measurements at other times or for longer periods, the connection speed values may differ.

Results of connection speed in serial measurements

By performing serial measurements, it is possible to assess changes in Internet service quality indicators over a 24-hour period and a week. As in previous years, the 2019 serial measurements often show a reduction in download speeds during evening hours. This can be explained by the fact that the speed values of the mobile Internet connection are subject

to various external influences and load changes. As a result, connection speeds can be significantly reduced during peak hours, usually in the evenings when the mobile Internet is simultaneously used by many customers. However, the dynamics and magnitude of changes depend on the specific location and the number of active users.

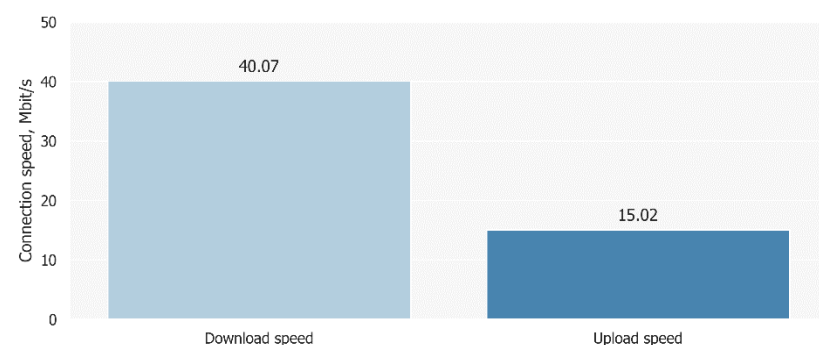
Figure 3. Average download speed values at all measurement locations by hour and by operator



Evaluating the results of the 2019 serial measurements, it can be concluded that although the values of mobile Internet connection speed decrease significantly in some places during peak hours compared to, for example, night hours, they are still sufficient for the use of most Internet services.

Summarising the average values of the connection speed of serial measurements in the networks of all mobile operators, it can be observed that the average values are equivalent to the connection speed values of random sample measurements.

Figure 4. Average connection speed values in 95% of random sample measurements using 4G data transmission technology in Latvia in 2019 in the networks of all mobile operators

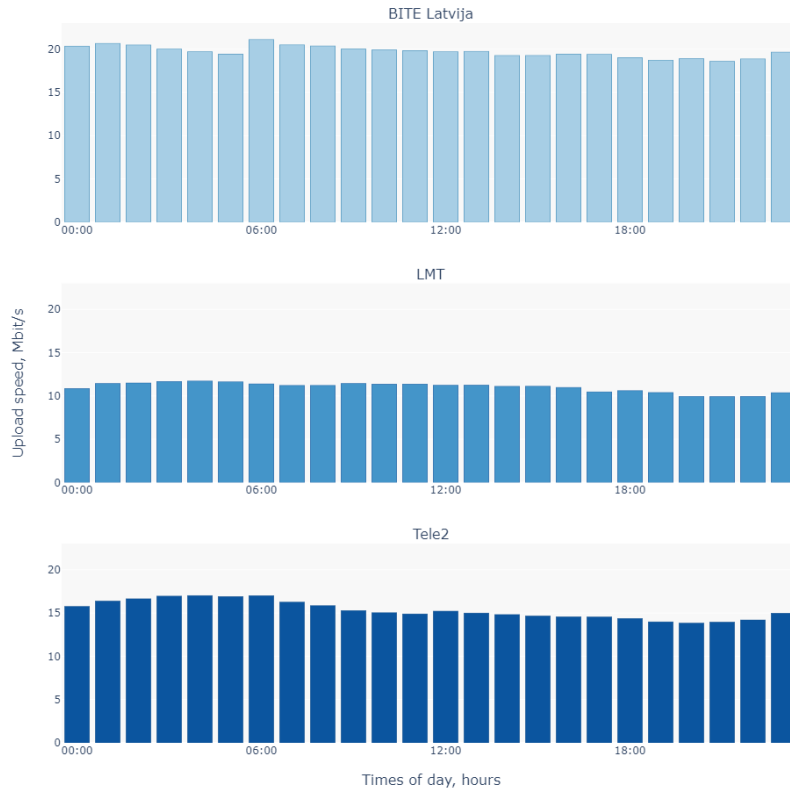


Evaluating the additional serial measurements performed using 3G connectivity, it can be concluded that in general the average download speed available in the 3G networks of all

three mobile operators is approximately 10 Mbps and the average upload speed is about 3 Mbps.

There were no significant changes in the indicators of upload speed measurements during a 24-hour period.

Figure 5. Average upload speed values at all measurement locations by hour and by operator



Distribution of connection speed by speed ranges

It has already been mentioned that all merchants, including mobile operators, must submit a quality declaration containing the parameters which characterise the Internet service. Among other things, merchants indicate in which speed ranges the Internet service is provided. The values of the parameters are determined between the termination point and the Latvian Internet exchange point.

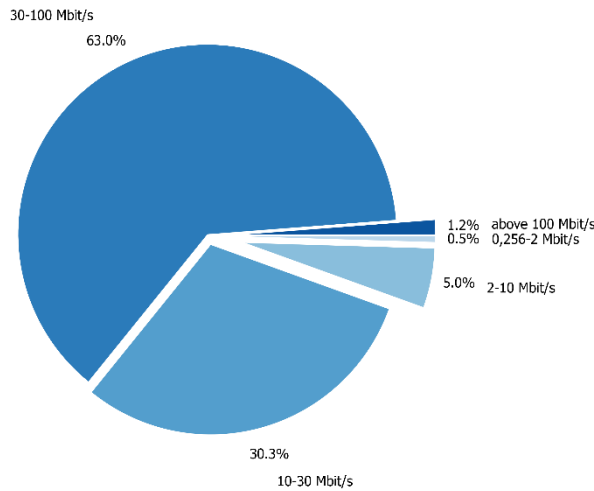
The Regulator compiled the information specified in the 2019 quality declarations of mobile operators and the percentage distribution of download speed values observed in the 2019 measurements by speed ranges.

Table 2. Distribution of download speed measurements by speed ranges

| Connection speed range | BITE Latvija | LMT | Tele2 |
|------------------------|--------------|----------|----------|
| ≥256kbps <2Mbps | ✓ 0.63% | ✓ 0.72% | ✓ 0.08% |
| ≥2Mbps <10Mbps | ✓ 6.32% | ✓ 6.68% | ✓ 2.23% |
| ≥10Mbps <30Mbps | ✓ 33.85% | ✓ 40.04% | ✓ 17.46% |
| ≥30Mbps <100Mbps | ✓ 59.12% | ✓ 52.54% | ✓ 76.73% |
| ≥100Mbps <200Mbps | ✓ 0.09% | ✓ 0.02% | ✓ 3.5% |
| ≥200Mbps <400Mbps | ✗ - | ✗ - | ✗ - |
| ≥400Mbps | ✗ - | ✗ - | ✗ - |

* Symbol ✓ designates the speed ranges declared by merchants

Figure 6. Percentage distribution of Internet service measurements' download speeds by speed groups in the networks of all mobile operators

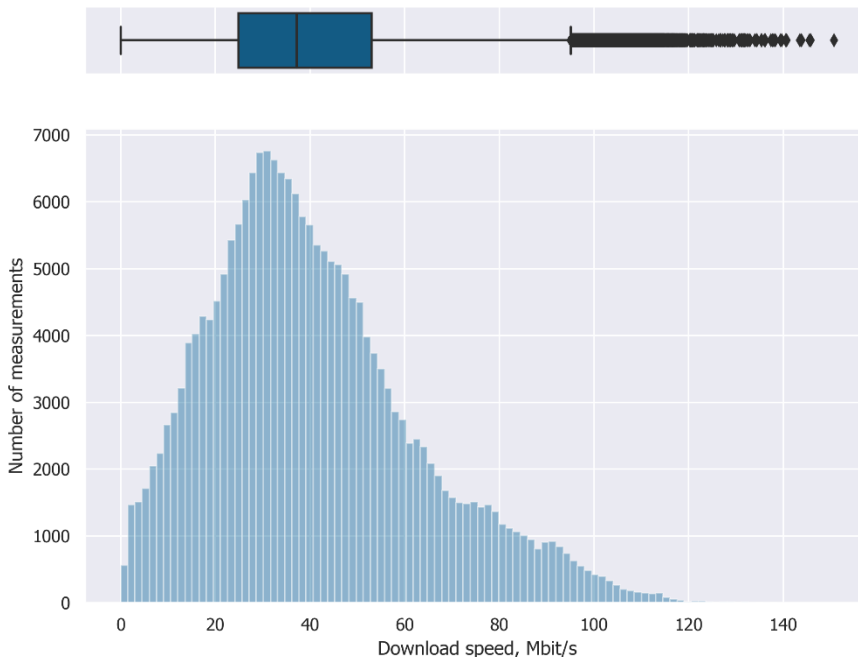


Out of all Internet service measurements performed in 2019, download speeds lower than 10 Mbps were observed in:

- BITE Latvija network: 6.95% of measurements (of which 2.67% during the evening hours⁷);
- LMT network: 7.4% of measurements (of which 4.23% in during the evening hours);
- In Tele2 network: 2.31% of measurements (of which 1.61% in during the evening hours).

Figure 7 shows the distribution of download speeds observed during the Internet service measurements. The box graph shows the distribution of download speed values by quartile, as well as outliers (indicated by diamonds) observed in approximately 2% of all measurements.

Figure 7. Distribution of Internet service measurement download speed values in the networks of all mobile operators



Up to 3.5% of measurements with download speeds above 100 Mbps were observed in the networks of individual mobile operators.

Maximum measured download speed:
 BITE Latvia - 118 Mbps;
 LMT - 122 Mbps;
 Tele2 - 150 Mbps.

⁷ From 18:00 to 24:00

According to the summary of the results of download speed measurements by speed ranges, it can be concluded that download speeds are mainly provided in the speed range from 10 to 30 Mbps and from 30 to 100 Mbps. In both ranges, more than 90% of the measurements were observed in the mobile networks of all operators. Moreover, most (more than 50%) measurements were observed in the speed range from 30 to 100 Mbps. When evaluating the measurement results, it can be concluded that the information indicated in the quality declarations corresponds to the actual situation; the mobile operators provide download speeds in all specified speed ranges. In the speed range above 100 Mbps, a relatively small number of measurements were provided, and most of them did not exceed 115 Mbps.

In the 2019 serial measurements, approximately 80% of the upload speed values were recorded in the speed range of 2 to 10 Mbps and 10 to 30 Mbps. More than a fifth or 22% of the upload speed values in the BITE Latvija network were observed in the speed range from 30 to 100 Mbps. Up to 10% of the measurements in this speed range were observed in the LMT and Tele2 networks. For users who do not upload large amounts of data, stream high-quality live videos on the web or use other similar services, the 2 Mbps upload speed values are also considered sufficient.

However, in some measurements, upload speed values below 256 kbps have been observed. At such moments, the use of the Internet service may be significantly disrupted. The minimum recorded upload speeds: BITE Latvija - 132 kbps; LMT - 57 kbps; Tele2 - 79 kbps.

Critically low upload speed values have been observed in rare cases - in less than 1% of all measurements.

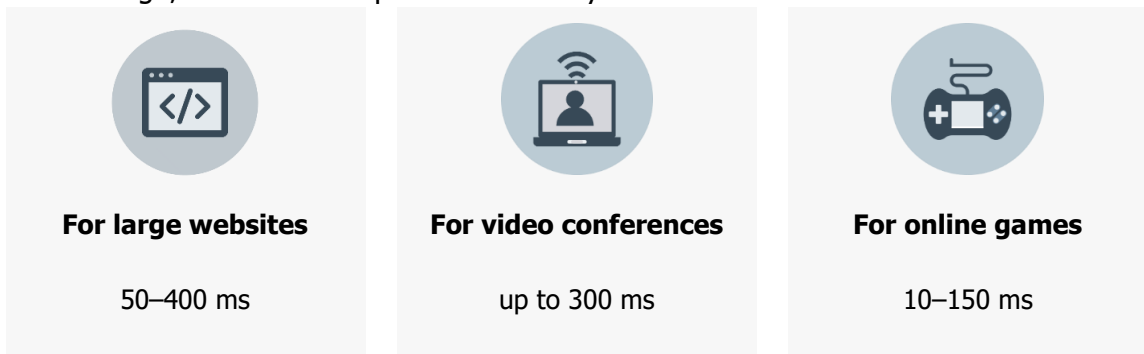
1.2.2. Latency

Latency is a parameter that indicates the time lag between requesting information and receiving information. In other words, it is the time required to transfer data packets from the user's device to the server and back. In the Regulator's measurements, the latency is evaluated in the section from the terminal connected to the network termination point to the measurement system connected to the Latvian Internet exchange point and back.

Low latency is important for applications that need to receive information with the least possible delay, such as video conferencing, online games, and other real-time services that provide a remote user with a presence effect. On the other hand, higher latency values have little direct effect on services for which a fast response is not significant, such as sending an e-mail or downloading a data file.

Latency is affected by various factors, including network throughput and the type of Internet connection, as well as the format of the information being transmitted, the encoding settings, and the transmission distance. For services the use of which is particularly affected by latency indicators, the location of the server and the latency assessment from the user terminal to the server are relevant.

On average, the maximum permitted latency is⁸:



Results of latency measurements

After compiling the measured latency values and comparing them with the information submitted by mobile operators in the 2019 quality declarations, we have concluded that all mobile operators provide average latency indicators in accordance with the values indicated in the quality declarations, and these indicators are provided at a sufficient level for smooth use of Internet services.

Table 3. Average latency in 95% of measurements in 2019 (in milliseconds)

| | Measurements in 4G network | Measurements in 3G network | Declared value |
|--------------|----------------------------|----------------------------|----------------|
| BITE Latvija | 25.01 | 28.72 | ≤100 |
| LMT | 17.51 | 31.30 | ≤400 |
| Tele2 | 25.99 | 36.60 | ≤100 |

It should be noted that the latency value indicated in the LMT quality declaration is much higher than for other mobile operators. Such a high latency rate may not be appropriate for the use of certain services, although in fact such high latency rates have not been observed in the LMT network.

In some cases, the latency values may be much higher than the average indicators. The maximum measured latencies: BITE Latvia - 74 ms; LMT - 94 ms; Tele2 - 198 ms.

In the 2019 measurements, latency values higher than 100 ms in the Tele2 network were observed in 0.07% of the measurements, while none were observed in the BITE Latvija and LMT networks.

1.2.3. Jitter

Jitter is a parameter that describes the variation of the time lag between sending and receiving data packets.

On the transmitting side, data packets are transmitted at a steady interval, but due to the limited throughput capacity of the networks, such as congestion, routing changes, packet loss, etc., this flow may become uneven and the time lag between data packets may vary. A low jitter indicator means that data packets are transmitted and delivered with a uniform time delay, while if the jitter indicators are high, the delay between data packets transmitted can vary significantly. As a result, data packets may be received in the wrong order or dropped, causing, for example, voice transmission interference, image distortion, and temporary interruptions. Low jitter is essential for real-time services whose exact performance depends on the data packet delivery sequence in a guaranteed time interval, such as real-time applications (video conferences, games, etc.), interactive services, live

⁸ <https://citycloud.com/city-cloud/some-interesting-bits-about-latency/>

video streaming, etc. For comparison - voice transmission quality deteriorates if jitter exceeds 30 ms.

Jitter measurement results

Analysing the measurement results, it can be concluded that the average jitter values in 95% of the measurements correspond to both the values indicated in the quality declarations of merchants and the indicators required for the use of different online services.

Table 4. Average jitter in 95% of measurements in 2019 (milliseconds)

| | Measurements in 4G network | Measurements in 3G network | Declared value |
|--------------|----------------------------|----------------------------|----------------|
| BITE Latvija | 2.63 | 18.22 | ≤50 |
| LMT | 2.95 | 22.51 | ≤260 |
| Tele2 | 1.71 | 7.17 | ≤50 |

Consequently, the average jitter values observed in the measurements correspond to the values indicated in the declarations of merchants.

However, in rare cases, such jitter values have been recorded in some measurements at which the use of the Internet service would be significantly affected. The maximum jitter value which was temporarily recorded in the networks of all three mobile operators was higher than 5000 ms. At such moments, the availability of the service is significantly impaired.

In general, jitter values higher than 30 ms were rarely observed - about 2% to 3.5% of measurements, depending on the mobile operator.

1.2.4. Packet loss ratio

Transmitted data unit or packet loss ratio is a parameter which describes the ratio of lost packets to the total amount of transmitted packets. Packet loss most commonly occurs due to overload of the electronic communications network or its individual pieces of equipment.

A low packet loss ratio indicator is significant for user applications, which are very sensitive to packet loss or sequence change, for example, voice transmission or data streaming (real time video viewing, gaming, video conferences) applications. For example, to ensure an online audio or video transmission without observable interference, the packet loss ratio must not exceed 1%.

Packet loss ratio measurement results

Evaluating the average packet loss ratio in 95% of measurements, it can be concluded that the provided Internet service quality values correspond to those indicated in the declarations.

Table 5. Average packet loss ratio in 95% of measurements in 2019

| | Measurements in 4G network | Measurements in 3G network | Declared value |
|--------------|----------------------------|----------------------------|----------------|
| BITE Latvija | 0 | 0 | ≤5 |
| LMT | 0 | 0 | ≤3 |
| Tele2 | 0 | 0 | ≤5 |

In some measurements, the indicators of this parameter also reach values, at which the use of the Internet service is impossible. Maximum recorded packet loss ratio: BITE Latvija network - 78%; LMT - 88%; Tele2 - 99%.

In more than 98% of overall measurements, packet losses were not observed at all in the networks of the three mobile operators.

1.3. Summary

The results of Internet service measurements in 2019 show that the mobile Internet quality indicators are maintained at a stable good level and the 4G connectivity is widespread in Latvia in the networks of all three mobile operators. In most cases, the values of quality indicators observed in both random sample and serial measurements can be assessed as appropriate and sufficient for the use of Internet services. When analysing the results of quality measurements, it can be observed that in all locations included in the 2019 measurements, where the Internet service is available and the coverage is stable, the recorded download speed values exceed 256 kbps. However, there may be situations when the Internet service quality indicators are much lower than average values. For example, in the 2019 upload speed measurements, the parameter values were below 256 kbps at some locations. It can therefore be concluded that all mobile operators comply with the requirement of a minimum guaranteed download speed of at least 256 kbps specified in General Authorisation Regulations, while this requirement was not always met for upload speeds. The user, using the mobile Internet service and recording a connection speed below 256 kbps, would have an option to terminate the contract without a penalty or receive compensation from the mobile operator for providing inadequate quality Internet service in accordance with the current provisions of the Electronic Communications Law.

In addition to monitoring the quality of the Internet service, various activities are carried out in Latvia to promote the implementation of the goals defined in the European Commission's strategy. With regard to the minimum connection speed values which must be available to the citizens, the Regulator plans to review and determine appropriate minimum service quality requirements, as well as to develop a compensation mechanism if the minimum requirements are not met⁹. To determine reasonable minimum quality requirements, the Regulator has assessed and will take into account the current situation in the country. According to the information submitted by merchants on broadband indicators in 2019, the Regulator has concluded that in general in Latvia the connection speed above 30 Mbps is provided by approximately 70% of the fixed Internet service providers (62% of them - above 100 Mbps) and 68% of mobile Internet service providers¹⁰. Also evaluating the information indicated in the quality declarations, it can be observed that most merchants provide download speeds above 30 Mbps.

Thus, based on the target defined in the European Commission's strategy for 2020 on connection speeds and the requirements of the General Authorisation Regulations for determining the minimum connection speed value in proportion to the maximum connection speed value¹¹, as well as taking into account the percentage distribution of connection speed values provided in Latvia, the Regulator has concluded that the minimum download speed of the fixed Internet and the mobile Internet provided at a fixed location¹², in accordance with the strategic objectives of the European Commission should correspond to at least

⁹ Article 10(7) of the Law "On Regulators of Public Utilities" stipulates that the Regulator shall determine the quality requirements for the provision of public utilities and the procedures for determining the compensation if a provider of public utilities has not ensured such quality of public utilities which meets the specific requirements. The Regulator shall determine economic or legal obligations or incentives to a provider of public utilities that promote the provision of public utilities in accordance with the determined quality requirements

¹⁰ More information is available in the 2019 summary of electronic communications indicators on the Regulator's website, in the section "[Sector Indicators](#)"

¹¹ Article 25(9)(3) of the General Authorisation Regulations stipulates that in the fixed network the minimum guaranteed connection speed (upload and download) must not be lower than 20 % of the numerical value of the maximum (advertised) connection speed indicated in the electronic communications services contract while the Internet service provided in the mobile network in accordance with Article 25(10)(2) - not lower than the lowest speed limit of a bandwidth connection

¹² Applies to a mobile Internet service provided at a specific location or "home Internet"

6 Mbps or 20% of 30 Mbps. After evaluating the results of the 2019 Internet service measurements in the networks of all three mobile operators, the Regulator found that download speeds below 6 Mbps were observed in less than 5% of the measurements. On the other hand, evaluating the upload speed measurements in 2019 in the networks of all three mobile operators, it was found that upload speed values below 6 Mbps were observed in less than 30% of the measurements. In view of the above, it is planned that with the introduction of the European Electronic Communications Code, a minimum guaranteed download speed of 6 Mbps will be required from merchants providing a fixed Internet service or a mobile Internet service at a fixed location.

Regarding the implementation of 5G technology in Latvia, the Ministry of Transport has prepared a roadmap¹³ in accordance with the recommendation of the European Commission, which summarises information related to the implementation of 5G mobile networks, including timetable for ensuring radio spectrum availability and infrastructure development aspects for the establishment of 5G network in cities along land transport routes. Currently, Latvian mobile operators are actively working on the development of 5G technology and its further expansion; however, in 2019, mobile operators in Latvia had not started providing commercial 5G services. According to the European 5G Observatory¹⁴ at the end of 2019, a total of 15 companies in Europe offered commercial 5G services in one third of the European Union Member States.

¹³ ["Guide to the implementation of fifth generation \(5G\) public mobile electronic communications networks in Latvia"](#)

¹⁴ [European 5G Observatory "5G Commercial Launch"](#)

II VOICE TELEPHONY SERVICE

To monitor the maintenance of the quality of voice telephony service at an appropriate level and to evaluate its quality indicators, the Regulator constantly performs fixed and mobile

voice telephony service measurements. In 2019, voice telephony service measurements were performed in the networks of Tet, BITE Latvija, LMT, and Tele2.

2.1. How voice telephony service measurements are performed

Voice telephony service measurements are performed by the Regulator using a voice control system. Measurements are performed in freely chosen populated areas, covering the territory of Latvia as uniformly as possible. Measuring equipment is mainly located in the post offices of the state joint-stock company "Latvijas Pasts", moving them between different post offices.

In 2019, a total of more than 98,000 voice telephony service measurements were performed, with fixed voice telephony service measurements at 10 measurement locations and mobile voice telephony service measurements at 42 locations.

The following voice telephony service quality indicators are evaluated in the measurements:

average call set-up time

speech transmission quality

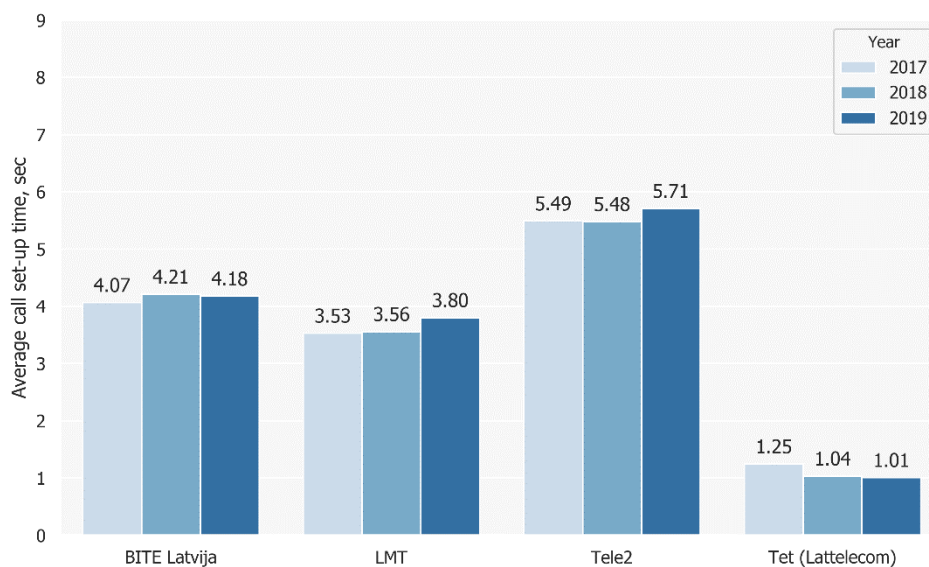
unsuccessful call ratio

2.2. Measurement results

2.2.1. Average call set-up time

The average call set-up time is a parameter, which expresses the period of time from sending the called number until a call control signal, busy signal or response is detected in seconds.

Figure 8. Average call set-up time in seconds over a three-year period



In the mobile network, the average call set-up time is from 3 to 6 seconds, while in the fixed network - on average from 1 to 2 seconds, thus fast connections are provided in both mobile and fixed networks. Compared to previous years, there have been no significant changes in

the average call set-up time. The results of the measurements show that the indicators of this parameter are being provided at a stable level over several years.

2.2.2. Speech transmission quality

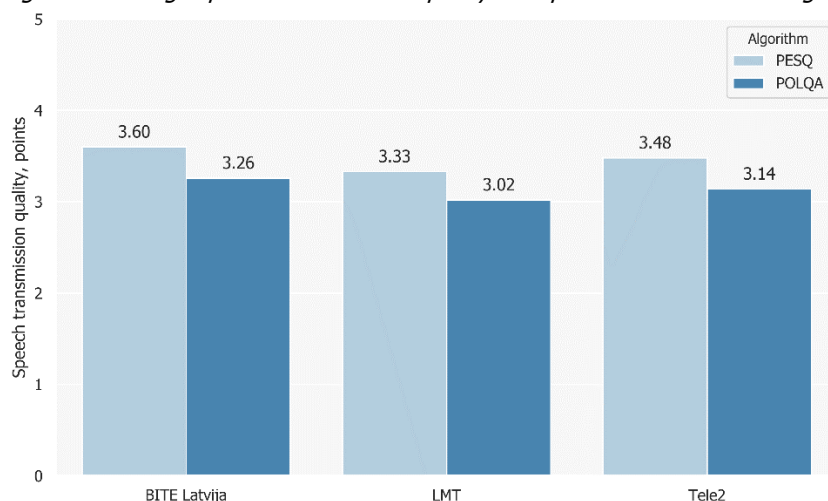
The speech transmission quality, which is assessed by simulating a two-way conversation and performing voice transmission, reflects the audibility and intelligibility of the conversation. The Regulator evaluates this indicator by using the PESQ¹⁵ and, since 2019, also the POLQA¹⁶ algorithm. The POLQA algorithm allows to evaluate voice transmission over a wider frequency range, which is typical for HD Voice¹⁷ technology. HD Voice technology is used to improve call quality, providing clearer sound quality, even in very noisy environments. In Latvia, voice transmission with HD Voice technology is provided by BITE Latvija and Tele2. Unlike the PESQ algorithm, POLQA allows to evaluate the measurements of speech transmission quality over a wider frequency range, thus providing a complete assessment of the voice transmission quality of HD Voice technology.

The evaluation of the speech transmission quality parameter is described according to the 5-point scale in Table 6.

Table 6. Speech transmission quality assessment scale

| Quality assessment | Value score | Explanation of the assessment |
|--------------------|-------------------|--|
| Excellent | ≥ 4 | Voices can be heard clearly, and no disturbing background noise can be heard |
| Good | ≥ 3 to < 4 | Conversation with a small noise background |
| Fair | ≥ 2 to < 3 | Due to insufficient hearing or temporary interruptions, certain words may not be heard clearly |
| Poor | ≥ 1 to < 2 | Due to high noise or interruptions, only certain words can be heard |
| Bad | < 1 | Communication is not possible |

Figure 9. Average speech transmission quality on a point-scale in 2019 using PESQ and POLQA algorithms



The Regulator points out that the POLQA and PESQ algorithms are not directly comparable, namely, numerically equal PESQ and POLQA evaluation does not describe the same speech transmission quality, which is due to different measurement methods of the two algorithms and a different range of the voice transmission frequencies. In addition, it should be noted

¹⁵ Perceptual Evaluation of Speech Quality

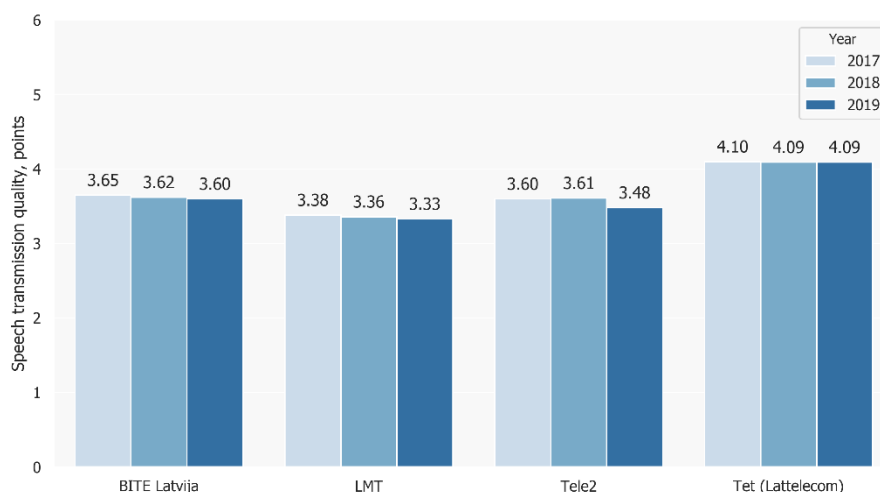
¹⁶ Perceptual Objective Listening Quality Analysis

¹⁷ High-definition voice transmission

that the evaluation of the speech transmission quality with the POLQA algorithm was performed regardless of whether the voice call established during the measurements was provided in the quality of HD Voice technology or not. Thus, the average speech transmission quality indicator estimated by the POLQA algorithm also includes voice calls without the application of HD Voice technology. Maximum observed speech transmission quality assessment with the POLQA algorithm: in BITE Latvija network - 3.5 points, LMT - 3.32 points, and Tele2 - 3.34 points.

The results of the 2019 measurements show that the speech transmission quality in both fixed and mobile networks is equivalent to the measurements of previous years and the conversations are provided in a clearly audible and perceptible manner - in good quality in mobile networks and in an excellent quality in fixed network.

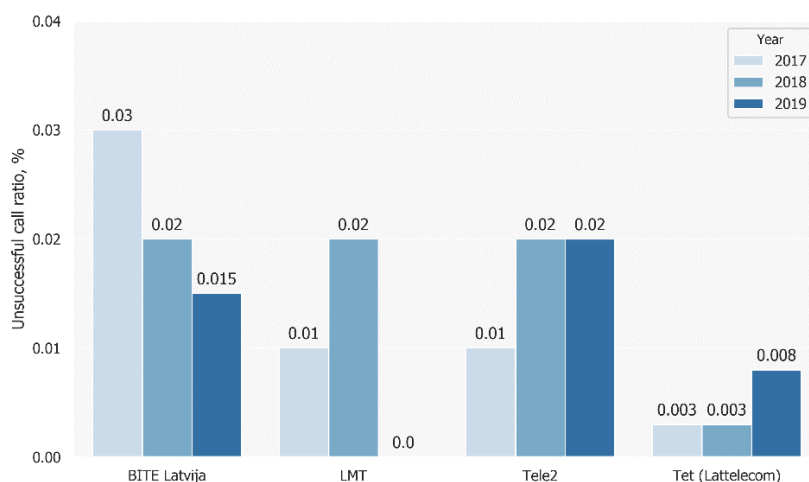
Figure 10. Results of average speech transmission quality measurements on a point-scale over a three-year period using PESQ algorithm



2.2.3. Unsuccessful call ratio

The unsuccessful call ratio describes the ratio of the number of unsuccessful calls to the total number of attempted calls as a percentage. Meanwhile, unsuccessful calls include calls that were not successful due to network problems, such as a failed call attempt, a call interruption, and so on. In 2019, as in previous years, unsuccessful calls were observed only in rare cases. No unsuccessful call was recorded in the LMT network during the 2019 voice telephony service measurements. Thus, low unsuccessful call ratios were ensured in the networks of all operators.

Figure 11. Measurement results of average unsuccessful call ratio over a three-year period, %



Compared to previous years, an increase in unsuccessful calls was detected in the Tet network in 2019 - from 0.003% in the previous year to 0.008%. However, the overall value of this parameter is still low, with only a few unsuccessful calls detected during the year, mainly call disruptions when using POTS¹⁸ technology.

2.3. Summary

Evaluating the measurements of the voice telephony service in 2019, the Regulator has not observed any significant changes in the provided quality indicators. In addition, when assessing the information indicated in the quality declarations of merchants, it can be concluded that the quality of the voice telephony service provided by both Tet and all three mobile operators corresponds to the information provided in the quality declarations.

Table 7. Summary of quality declarations and quality measurement results

| | Average call set-up time in seconds | | Average speech transmission quality | | Unsuccessful call ratio, % | |
|--------------|--|-----------------------|--|-----------------------|----------------------------|-----------------------|
| | Declared value | Measurement result | Declared value | Measurement result | Declared value | Measurement result |
| BITE Latvija | 10 | 4.18 | 3 | 3.60 | 2 | 0.015 |
| LMT | 9 | 3.80 | 2.70 | 3.33 | 2 | 0.00 |
| Tele2 | 10 | 5.71 | 3 | 3.48 | 2 | 0.02 |
| Tet | 1.90 | 1.01 | 3 | 4.09 | 0.85 | 0.008 |

The results of measurements of the voice telephony service performed in 2019 show that good quality voice telephony services are available to users, regardless of the technology used by the service provider. The average call set-up time values ensured by the operators show that calls are set up quickly and the caller does not feel the time lag between dialling and receiving a response signal as a nuisance. Speech transmission quality indicators are also good, providing users with good audible and perceptible voice communication in general. Due to technological differences, the fixed voice telephony service, compared to the mobile voice telephony service, can provide both much faster call connection with an average second delay between dialling and receiving a response signal, and a higher level of voice transmission quality with an average rating above 4 points. This assessment shows that the voice call is virtually uninterrupted. In addition, unsuccessful calls were observed only in rare cases in 2019.

Acting Chair

R. Šņuka

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¹⁸ Plain Old Telephone Service

Average connection speed in the municipalities and largest cities of Latvia

| | BITE Latvija | | LMT | | Tele2 | |
|---------------------------|----------------------|--------------------|----------------------|--------------------|----------------------|--------------------|
| | Download speed, Mbps | Upload speed, Mbps | Download speed, Mbps | Upload speed, Mbps | Download speed, Mbps | Upload speed, Mbps |
| Aglona Municipality | 22.78 | 19.67 | 41.62 | 15.86 | 58.25 | 15.72 |
| Aizkraukle Municipality | 21.52 | 13.36 | 28.78 | 22.07 | 66.55 | 15.79 |
| Aizpute Municipality | 43.09 | 20.80 | 28.62 | 17.27 | 40.58 | 17.91 |
| Aknīste Municipality | 41.31 | 21.78 | 26.59 | 25.07 | 73.98 | 34.91 |
| Aloja Municipality | 24.68 | 19.10 | 35.57 | 28.11 | 36.11 | 15.90 |
| Alsunga Municipality | 29.28 | 17.57 | 29.58 | 28.30 | 47.73 | 21.25 |
| Alūksne Municipality | 16.65 | 10.58 | 15.18 | 8.17 | 33.38 | 14.80 |
| Amata Municipality | 29.02 | 14.52 | 36.03 | 19.85 | 68.59 | 18.48 |
| Ape Municipality | 19.37 | 12.23 | 38.08 | 30.23 | 38.42 | 10.72 |
| Auce Municipality | 46.41 | 29.26 | 34.19 | 21.86 | 56.63 | 23.70 |
| Ādaži Municipality | 27.39 | 18.09 | 22.60 | 14.35 | 45.83 | 8.70 |
| Babīte Municipality | 33.70 | 21.11 | 39.39 | 20.90 | 51.41 | 15.85 |
| Baldone Municipality | 37.59 | 24.12 | 45.18 | 24.44 | 71.11 | 28.29 |
| Baltinava Municipality | 30.48 | 18.26 | 38.72 | 21.08 | 47.42 | 13.17 |
| Balvi Municipality | 36.89 | 21.02 | 29.01 | 14.28 | 56.29 | 16.60 |
| Bauska | 32.01 | 22.64 | 29.47 | 17.27 | 39.72 | 14.02 |
| Bauska Municipality | 16.64 | 11.63 | 25.35 | 17.04 | 43.96 | 10.84 |
| Beverīna Municipality | 12.33 | 8.27 | 27.58 | 22.90 | 21.18 | 1.61 |
| Brocēni Municipality | 36.92 | 19.52 | 39.38 | 24.41 | 45.15 | 11.21 |
| Burtnieki Municipality | 28.05 | 20.12 | 34.88 | 17.17 | 48.85 | 28.88 |
| Carnikava Municipality | 31.23 | 25.16 | 44.39 | 24.27 | 59.64 | 30.39 |
| Cesvaine Municipality | 44.89 | 32.93 | 24.56 | 15.63 | 52.37 | 7.74 |
| Cēsis | 38.45 | 22.25 | 40.00 | 18.43 | 61.34 | 14.74 |
| Cēsis Municipality | 10.98 | 5.57 | 23.35 | 1.27 | 41.97 | 1.87 |
| Cibla Municipality | 16.49 | 4.92 | 21.72 | 12.07 | 31.64 | 17.41 |
| Dagda Municipality | 12.50 | 13.82 | 37.85 | 21.02 | 45.97 | 10.77 |
| Daugavpils | 21.83 | 18.74 | 22.68 | 18.26 | 37.90 | 12.87 |
| Daugavpils Municipality | 25.85 | 15.04 | 27.49 | 17.38 | 43.73 | 11.47 |
| Dobele | 24.30 | 20.79 | 41.03 | 17.82 | 38.51 | 10.93 |
| Dobele Municipality | 10.16 | 8.16 | 36.01 | 24.33 | 51.73 | 10.49 |
| Dundaga Municipality | 37.05 | 25.21 | 38.81 | 18.61 | 78.73 | 37.15 |
| Durbe Municipality | 17.93 | 18.38 | 25.41 | 19.97 | 76.61 | 21.91 |
| Engure Municipality | 28.50 | 21.94 | 35.29 | 21.92 | 42.32 | 17.98 |
| Ērgļi Municipality | 6.46 | 3.32 | 13.79 | 8.93 | 20.10 | 2.68 |
| Garkalne Municipality | 36.21 | 17.36 | 33.29 | 18.78 | 61.77 | 25.91 |
| Grobiņa Municipality | 30.10 | 17.09 | 30.78 | 26.35 | 47.81 | 27.88 |
| Gulbene Municipality | 28.19 | 12.63 | 26.93 | 17.53 | 36.92 | 14.66 |
| Iecava Municipality | 30.49 | 6.17 | 28.15 | 10.45 | 47.86 | 13.24 |
| Ikšķile Municipality | 35.89 | 32.24 | 34.59 | 21.76 | 40.30 | 32.34 |
| Ilūkste Municipality | 39.84 | 17.64 | 31.14 | 31.31 | 43.82 | 21.89 |
| Inčukalns Municipality | 21.30 | 17.06 | 45.82 | 17.01 | 52.73 | 24.69 |
| Jaunjelgava Municipality | 19.09 | 14.76 | 23.23 | 23.28 | 35.54 | 7.95 |
| Jaunpiebalga Municipality | 40.28 | 19.42 | 32.38 | 29.84 | 100.46 | 21.96 |
| Jaunpils Municipality | 41.18 | 25.09 | 30.84 | 25.03 | 47.38 | 18.96 |
| Jelgava | 25.39 | 21.87 | 28.14 | 20.46 | 44.58 | 23.34 |
| Jelgava Municipality | 26.73 | 11.15 | 30.31 | 17.89 | 56.35 | 15.82 |
| Jēkabpils | 27.97 | 26.53 | 41.50 | 22.62 | 34.34 | 8.63 |
| Jēkabpils Municipality | 39.03 | 17.32 | 40.36 | 6.79 | 61.04 | 28.88 |
| Jūrmala | 36.85 | 27.63 | 41.67 | 21.23 | 53.67 | 20.81 |
| Kandava Municipality | 27.69 | 16.18 | 25.91 | 19.35 | 51.30 | 21.65 |
| Kārsava Municipality | 19.33 | 13.25 | 26.16 | 15.47 | 16.23 | 0.69 |
| Kocēni Municipality | 24.21 | 15.72 | 44.49 | 28.55 | 45.66 | 15.61 |
| Koknese Municipality | 33.14 | 22.94 | 27.20 | 11.01 | 52.65 | 14.71 |
| Krāslava Municipality | 30.51 | 12.38 | 44.77 | 20.78 | 35.38 | 18.38 |
| Krimulda Municipality | 35.49 | 30.67 | 37.71 | 22.29 | 87.31 | 30.06 |
| Krustpils Municipality | 33.16 | 21.02 | 23.84 | 6.39 | 52.13 | 23.63 |
| Kuldīga | 32.99 | 18.86 | 34.70 | 16.79 | 47.17 | 19.35 |
| Kuldīga Municipality | 29.71 | 21.06 | 30.33 | 14.49 | 44.94 | 14.30 |
| Ķeguma Municipality | 37.14 | 17.37 | 33.39 | 23.71 | 62.13 | 23.56 |
| Ķekava Municipality | 24.27 | 16.50 | 28.40 | 12.10 | 45.70 | 12.76 |
| Lielvārde Municipality | 25.05 | 19.67 | 40.03 | 22.32 | 59.34 | 19.32 |

| | | | | | | |
|--------------------------|-------|-------|-------|-------|-------|-------|
| Liepāja | 25.69 | 22.80 | 31.46 | 29.22 | 42.05 | 22.60 |
| Limbaži Municipality | 24.69 | 15.22 | 26.06 | 9.72 | 53.56 | 13.54 |
| Līgatne Municipality | 29.98 | 16.38 | 45.54 | 22.53 | 70.09 | 28.15 |
| Līvāni Municipality | 30.11 | 16.82 | 33.73 | 29.84 | 49.90 | 19.57 |
| Lubāna Municipality | 39.30 | 24.59 | 37.77 | 27.38 | 47.41 | 15.76 |
| Ludza Municipality | 39.56 | 18.67 | 21.15 | 10.83 | 70.31 | 25.49 |
| Madona Municipality | 30.66 | 21.88 | 29.85 | 14.58 | 49.68 | 19.96 |
| Mazsalaca Municipality | 18.83 | 17.16 | 35.70 | 15.36 | 26.79 | 12.63 |
| Mālpils Municipality | 33.96 | 19.44 | 38.98 | 24.84 | 67.09 | 29.55 |
| Mārupe Municipality | 35.53 | 23.25 | 28.16 | 23.70 | 52.51 | 15.75 |
| Mērsrags Municipality | 24.03 | 15.81 | 50.77 | 19.33 | 27.40 | 17.06 |
| Naukšēni Municipality | 32.84 | 23.28 | 32.50 | 25.77 | 52.62 | 14.62 |
| Nereta Municipality | 30.24 | 18.60 | 22.99 | 23.12 | 51.41 | 13.59 |
| Nīca Municipality | 13.60 | 13.21 | 48.65 | 16.38 | 62.56 | 34.66 |
| Ogre | 17.88 | 18.05 | 23.89 | 12.12 | 46.70 | 10.93 |
| Ogre Municipality | 30.42 | 15.32 | 36.18 | 19.90 | 33.54 | 17.03 |
| Olaine | 34.95 | 15.40 | 21.49 | 16.06 | 56.52 | 21.57 |
| Olaine Municipality | 36.52 | 26.54 | 31.55 | 16.23 | 52.68 | 23.77 |
| Ozolnieki Municipality | 35.97 | 23.93 | 26.30 | 20.79 | 33.43 | 12.68 |
| Pārgauja Municipality | 22.02 | 17.30 | 31.50 | 32.16 | 52.19 | 27.37 |
| Pāvilosta Municipality | 32.92 | 15.04 | 35.35 | 17.85 | 54.83 | 16.25 |
| Plaviņas Municipality | 33.44 | 13.83 | 27.92 | 5.28 | 45.21 | 17.27 |
| Preiļi Municipality | 25.92 | 12.47 | 41.55 | 20.82 | 57.99 | 16.15 |
| Priekule Municipality | 28.60 | 20.90 | 35.29 | 13.39 | 44.66 | 17.61 |
| Priekule Municipality | 24.43 | 4.64 | 36.50 | 26.37 | 66.72 | 36.95 |
| Rauna Municipality | 40.07 | 21.44 | 22.73 | 11.85 | 70.59 | 15.99 |
| Rēzekne | 26.55 | 26.98 | 33.34 | 21.64 | 47.57 | 15.69 |
| Rēzekne Municipality | 27.55 | 13.61 | 36.70 | 19.30 | 43.32 | 15.30 |
| Riebiņi Municipality | 25.99 | 11.15 | 28.70 | 25.47 | 55.47 | 15.46 |
| Rīga | 29.41 | 23.50 | 34.26 | 18.89 | 45.81 | 21.11 |
| Roja Municipality | 23.21 | 13.77 | 18.88 | 9.94 | 28.28 | 4.58 |
| Ropaži Municipality | 30.06 | 22.12 | 32.89 | 23.44 | 59.72 | 29.01 |
| Rucava Municipality | 15.79 | 10.16 | 30.79 | 39.35 | 34.61 | 3.64 |
| Rugāji Municipality | 49.33 | 45.00 | 40.42 | 29.23 | 21.90 | 21.40 |
| Rundāle Municipality | 23.10 | 20.83 | 20.31 | 15.31 | 44.38 | 15.82 |
| Rūjiena Municipality | 30.58 | 19.44 | 48.63 | 26.50 | 64.36 | 21.68 |
| Salacgrīva Municipality | 30.82 | 18.51 | 33.90 | 17.83 | 44.51 | 16.64 |
| Sala Municipality | 25.71 | 13.58 | 45.97 | 32.44 | 40.65 | 19.31 |
| Salaspils | 25.40 | 17.85 | 35.47 | 18.05 | 62.69 | 26.50 |
| Salaspils Municipality | 33.36 | 20.31 | 36.79 | 15.99 | 58.98 | 17.63 |
| Saldus | 33.62 | 32.40 | 35.97 | 20.30 | 61.29 | 19.51 |
| Saldus Municipality | 23.65 | 10.82 | 27.51 | 15.46 | 43.50 | 18.85 |
| Saulkrasti Municipality | 35.37 | 23.55 | 41.32 | 23.67 | 72.62 | 18.43 |
| Sēja Municipality | 19.14 | 13.31 | 41.09 | 13.13 | 59.16 | 14.70 |
| Sigulda | 31.04 | 18.77 | 29.26 | 15.49 | 51.45 | 16.80 |
| Sigulda Municipality | 26.85 | 19.85 | 35.66 | 28.31 | 35.96 | 23.18 |
| Skrīveri Municipality | 22.64 | 10.49 | 21.59 | 20.66 | 49.97 | 15.74 |
| Skrunda Municipality | 41.61 | 14.97 | 38.93 | 17.51 | 73.92 | 24.94 |
| Smiltene Municipality | 28.52 | 11.42 | 37.27 | 23.19 | 42.55 | 17.98 |
| Stopiņi Municipality | 32.16 | 16.99 | 30.98 | 20.17 | 49.87 | 19.90 |
| Strenči Municipality | 29.50 | 21.01 | 17.93 | 12.97 | 49.06 | 17.77 |
| Talsi | 20.10 | 18.40 | 29.67 | 20.50 | 61.91 | 16.27 |
| Talsi Municipality | 24.86 | 15.77 | 34.80 | 19.78 | 38.65 | 15.87 |
| Tērvete Municipality | 36.16 | 24.38 | 32.90 | 27.45 | 71.38 | 28.16 |
| Tukums Municipality | 20.05 | 10.97 | 28.25 | 18.74 | 49.38 | 16.23 |
| Tukums | 34.40 | 17.11 | 27.19 | 19.79 | 47.35 | 14.50 |
| Vainode Municipality | 26.88 | 5.50 | 8.01 | 4.30 | 17.71 | 0.75 |
| Valka Municipality | 31.09 | 23.02 | 29.05 | 19.85 | 47.62 | 20.67 |
| Valmiera | 23.19 | 11.65 | 28.78 | 14.37 | 48.19 | 16.08 |
| Varakļāni Municipality | 21.12 | 14.18 | 22.46 | 11.46 | 47.42 | 13.63 |
| Vārkava Municipality | 15.72 | 13.30 | 24.91 | 16.49 | 32.91 | 1.19 |
| Vecpiebalga Municipality | 32.20 | 28.16 | 33.12 | 23.57 | 52.74 | 27.63 |
| Vecumnieki Municipality | 33.80 | 19.85 | 32.87 | 24.44 | 46.77 | 20.43 |
| Ventspils | 24.36 | 17.51 | 29.27 | 23.22 | 46.04 | 24.83 |
| Ventspils Municipality | 35.59 | 21.77 | 39.24 | 24.97 | 38.73 | 22.54 |
| Viesīte Municipality | 27.64 | 17.49 | 35.40 | 30.59 | 62.83 | 24.49 |
| Vīlaka Municipality | 18.56 | 10.16 | 18.65 | 11.62 | 31.65 | 6.30 |
| Vijāni Municipality | 43.64 | 26.33 | 37.12 | 22.43 | 54.35 | 21.68 |
| Zīlupe Municipality | 32.13 | 18.70 | 14.26 | 5.19 | 55.91 | 27.32 |

Average connection speed in Riga neighbourhoods

| | BITE Latvija | | LMT | | Tele2 | |
|----------------------|----------------------|--------------------|----------------------|--------------------|----------------------|--------------------|
| | Download speed, Mbps | Upload speed, Mbps | Download speed, Mbps | Upload speed, Mbps | Download speed, Mbps | Upload speed, Mbps |
| Atgāzene | 26.23 | 34.04 | 37.24 | 17.58 | 43.66 | 31.41 |
| Avoti | 23.95 | 38.34 | 51.70 | 31.07 | 27.80 | 18.18 |
| Āgenskalns | 28.45 | 32.32 | 32.72 | 20.04 | 52.44 | 29.05 |
| Beberbeki | 48.41 | 29.13 | 10.58 | 0.92 | 68.33 | 19.46 |
| Bergi | 33.74 | 14.22 | 46.80 | 25.20 | 60.02 | 22.36 |
| Bieriņi | 20.99 | 16.11 | 33.90 | 13.73 | 24.66 | 4.38 |
| Bišumuiža | 20.13 | 21.34 | 33.51 | 21.86 | 56.97 | 22.65 |
| Bolderāja | 19.64 | 23.15 | 37.29 | 13.86 | 57.78 | 23.44 |
| Brasa | 15.48 | 17.36 | 33.28 | 22.50 | 51.37 | 40.50 |
| Brekši | 48.58 | 22.97 | 33.20 | 23.26 | 96.03 | 21.95 |
| Centrs | 31.43 | 33.15 | 26.43 | 19.85 | 57.93 | 30.70 |
| Čiekurkalns | 25.31 | 26.46 | 31.33 | 18.39 | 65.48 | 36.51 |
| Daugavgrīva | 32.03 | 17.01 | 35.29 | 18.47 | 36.22 | 15.80 |
| Dārzciems | 25.13 | 21.78 | 36.88 | 17.56 | 44.89 | 21.18 |
| Dārziņi | 32.55 | 13.64 | 32.77 | 15.55 | 58.84 | 19.10 |
| Dreiliņi | 28.77 | 20.09 | 34.40 | 31.39 | 43.35 | 13.05 |
| Dzirciems | 33.27 | 19.81 | 44.18 | 27.92 | 54.28 | 23.61 |
| Grīzinkalns | 16.40 | 17.45 | 31.65 | 28.23 | 41.65 | 26.79 |
| Iļģuciems | 42.22 | 32.06 | 37.77 | 20.47 | 56.17 | 27.17 |
| Imanta | 26.63 | 21.23 | 51.14 | 23.52 | 38.03 | 10.49 |
| Jaunciems | 25.92 | 22.75 | 39.53 | 24.25 | 36.08 | 16.50 |
| Jugla | 37.96 | 40.18 | 47.25 | 23.66 | 40.74 | 20.33 |
| Katlakalns | 29.88 | 23.47 | 42.78 | 20.68 | 43.59 | 28.85 |
| Kleisti | 33.20 | 16.77 | 32.57 | 4.40 | 56.06 | 17.43 |
| Kundziņšala | 40.99 | 44.62 | 31.54 | 24.46 | 61.42 | 38.10 |
| Ķengarags | 34.86 | 28.66 | 39.09 | 12.34 | 36.64 | 22.55 |
| Ķīpsala | 23.96 | 22.76 | 16.47 | 18.13 | 45.65 | 15.34 |
| Lucavsala | 8.91 | 2.60 | 26.08 | 18.09 | 21.12 | 5.69 |
| Mangaļsala | 43.67 | 22.51 | 23.08 | 14.05 | 22.41 | 17.63 |
| Maskavas forštate | 33.95 | 31.86 | 31.67 | 13.20 | 46.24 | 24.95 |
| Mežaparks | 35.40 | 25.93 | 31.51 | 17.58 | 50.00 | 17.61 |
| Mežciems | 35.04 | 30.87 | 39.02 | 25.43 | 36.23 | 24.74 |
| Mīlgrāvis | 47.83 | 16.27 | 31.22 | 8.01 | 36.36 | 20.36 |
| Mūkupurvs | 7.28 | 3.98 | 46.59 | 21.26 | 56.22 | 12.88 |
| Pētersala-Andrejsala | 17.07 | 14.15 | 41.39 | 20.62 | 65.90 | 29.45 |
| Pleskodāle | 28.48 | 20.31 | 39.50 | 20.47 | 42.69 | 15.39 |
| Pļavnieki | 35.31 | 25.13 | 35.75 | 14.63 | 46.55 | 16.65 |
| Purvciems | 32.51 | 37.56 | 29.69 | 20.56 | 44.86 | 23.88 |
| Rumbula | 16.59 | 7.74 | 31.80 | 25.36 | 47.06 | 12.49 |
| Sarkandaugava | 30.30 | 31.84 | 20.95 | 14.55 | 48.05 | 20.97 |
| Skante | 22.34 | 13.29 | 18.61 | 21.89 | 31.47 | 27.05 |
| Spilve | 18.51 | 22.94 | 21.98 | 15.81 | 50.31 | 24.83 |
| Suži | 37.43 | 4.10 | 37.95 | 16.33 | 88.67 | 31.78 |
| Šampēteris | 45.94 | 28.40 | 32.28 | 15.70 | 33.73 | 4.29 |
| Šķīrotava | 12.17 | 3.68 | 18.22 | 21.73 | 60.56 | 33.73 |
| Teika | 35.61 | 31.51 | 34.34 | 26.21 | 35.85 | 22.22 |
| Tornakalns | 18.19 | 11.32 | 30.59 | 26.62 | 40.20 | 17.46 |
| Trīsciems | 33.68 | 41.37 | 34.90 | 25.12 | 48.92 | 24.08 |
| Vakarbulļi | 22.37 | 3.78 | 29.18 | 2.77 | 26.54 | 2.27 |
| Vecāķi | 27.01 | 19.85 | 42.57 | 23.32 | 24.38 | 26.95 |
| Vecdaugava | 32.03 | 25.62 | 55.60 | 12.24 | 51.18 | 16.01 |
| Vecmīlgrāvis | 26.93 | 12.43 | 35.03 | 12.58 | 49.67 | 13.76 |
| Vecpilsēta | 64.05 | 38.96 | 40.92 | 25.19 | 69.97 | 35.60 |
| Voleri | 18.86 | 16.74 | 10.91 | 5.50 | 15.17 | 7.88 |
| Zaķusala | 22.22 | 7.35 | 17.20 | 9.59 | 30.00 | 13.26 |
| Zasulauks | 30.41 | 43.71 | 33.48 | 17.87 | 37.03 | 28.07 |
| Ziepniekkalns | 24.90 | 18.36 | 26.29 | 20.45 | 43.89 | 21.70 |
| Zolitūde | 29.66 | 22.70 | 36.69 | 16.86 | 55.05 | 23.94 |