Chapter 3

INFRASTRUCTURES FOR LATVIA'S DIGITAL ECONOMY

Communication policy objectives for Latvia's digital transformation

As part of their digital strategies, almost all OECD countries have established targets to foster access to and use of communication services. These national targets differ in terms of their end dates, speed and the proportion of the population or premises covered (Table 3.1).

Table 3.1. National broadband coverage targets in the OECD

Country	Year	Coverage
Australia	2020	90% of households and businesses with 50 Mbps/5 Mbps (download/upload)
Austria	2020	99% of households with 100 Mbps
Belgium	2020	100% of households with 30 Mbps
Canada	2021[1]	90% of households and businesses with 50 Mbps/10 Mbps and latest mobile technology available to all households, businesses and major roads
Chile	2020	90% of households with 10 Mbps
Colombia	2022	70% of households connected to the Internet, and 32 million subscriptions with speeds higher than 10 Mbps
Czech Republic	2020	100% of households and businesses with 30 Mbps
Denmark	2020	100% of households and businesses with 100 Mbps/30 Mbps
Estonia	2020	100% of households with 30 Mbps and 60% with 100 Mbps or faster
Finland	2015[2]	99% of households, businesses and public offices with 100 Mbps
France	2022	100% of households, businesses and public offices with 30 Mbps
Germany	2025	Full gigabit coverage of all households and businesses
Greece	2020	100% of households with 30 Mbps
Hungary	2018	100% of households with 30 Mbps
Iceland	2020	100% of households with 30 Mbps
Ireland	2020	100% of households with 30 Mbps
Israel	2022	100% of population with 30 Mbps
Italy	2020	100% of households with 30 Mbps; 100% of businesses and 85% of population with 100 Mbps
Korea	2022	Fixed internet with maximum 10 Gbps download speeds will be disseminated to 50% of urban households (85 cities) by 2022
Latvia	2020	100% of population with 30 Mbps mobile broadband and 100% of rural areas with optical backhaul
Luxembourg	2020	100% of households, businesses and public offices with 1 Gbps/500 Mbps
Netherlands	2020	100% of households with 30 Mbps
New Zealand	2025	99% of households with 50 Mbps and the remaining 1% with 10 Mbps
Norway	2020	90% of households with 100 Mbps
Poland	2020	100% of households and businesses with 30 Mbps
Portugal	2020	100% of households with 30 Mbps
Slovak Republic	2020	100% of households with 30 Mbps
Slovenia	2021	96% of households with 100 Mbps and the remaining 4% with 30 Mbps
Spain	2020	100% of households with 30 Mbps
Sweden	2025	98% of households and businesses with 1 Gbps
Switzerland	2020	100% of municipalities with 30 Mbps
United Kingdom	2020	95% of households and businesses with 25 Mbps
United States	2020	80% of households with 100 Mbps/50 Mbps

1. By the end of 2021, with the remaining 10% to be achieved within 10 to 15 years.

2. A national broadband strategy currently under development will define targets for the years 2025 and 2030.

Note: Mbps = megabits per second; Gbps = gigbits per second.

Sources: OECD (2018a), "Bridging the rural digital divide", *https://dx.doi.org/10.1787/852bd3b9-en*; DEO 2020 regulatory questionnaire.

Latvia aims to connect 100% of the population to 30 Mbps mobile broadband services and to deploy fibre backhaul in all rural areas by 2020. These targets are included in Latvia's 2018-2020 national policy plan for the communication sector and are aligned with the high-speed Internet coverage targets of the Digital Agenda for Europe for 2020. As for all other EU countries, the minimum common target is to achieve 100% coverage with 30 Mbps and 50% of households with broadband subscriptions of 100 Mbps by 2020 (European Commission, 2010).

The benchmark of 30 Mbps connectivity is now a common standard, though targets of at least 100 Mbps are becoming increasingly frequent. By 2020, the United States aims to have broadband of 100 Mbps or more available to 80% of households, while Norway and Austria have set targets of 90% and 99%, respectively. Some targets are even more ambitious, such as the 1 Gbps target of Luxembourg (98% by 2020) and (100% by 2025) and Korea's target of 10 Gbps download speeds for 50% of urban households by 2022 (OECD, 2018a).

OECD countries also have established connectivity targets related to public service providers and mobility. The gigabit society objectives of the European Commission (EC) are: 1) to ensure that all schools, transport hubs and main providers of public services, as well as digitally intensive enterprises, have access to Internet connections with download/upload speeds of 1 Gigabit of data per second; 2) all households, rural or urban, have access to networks offering a download speed of at least 100 Mbps, which can be upgraded to 1 Gigabit; and 3) all urban areas, as well as major roads and railways, have uninterrupted 5G wireless broadband coverage (European Commission, 2016).

Latvia's connectivity targets are based on its national broadband strategy, "Next Generation Access Network Development 2013–2020", which was approved by the Cabinet of Ministers of the Republic of Latvia in December 2012 and amended in 2016. The two major priorities of the plan are the development of a fibre backhaul infrastructure (middle-mile) for wholesale broadband services, including in rural areas, and the roll-out of 4G network services across the country. The national broadband strategy and its targets are monitored by the Ministry of Transport (MoT) and submitted for approval to the Cabinet of Ministers every two years. A key challenge affecting implementation of the strategy of Latvia relates to the expansion of connectivity in rural areas, as a result of low incomes in these areas and population density. An additional challenge is the lack of available funds for last-mile connectivity.

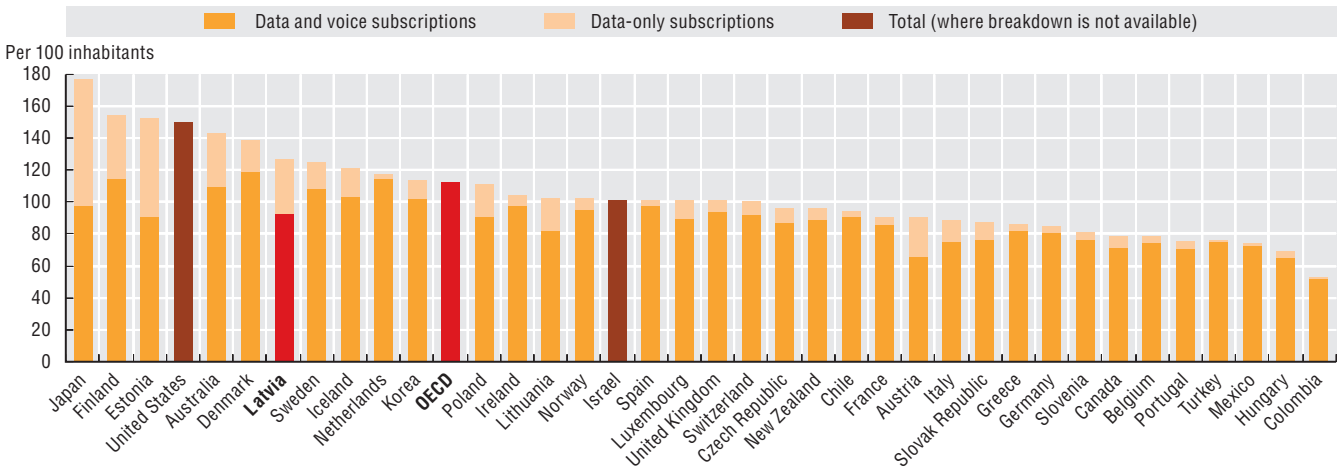
For its next broadband policy strategy covering the post-2020 period, the government plans to continue network deployment in rural areas, including by expanding middle and last-mile coverage. It is also expected that the post-2020 strategy will incorporate extensive mapping of communication networks and services to facilitate deployment of 5G networks and infrastructure sharing. The MoT is currently working to identify funding sources and the government plans to finalise the new strategy by end 2020.

State of connectivity in Latvia

Broadband penetration

Mobile broadband subscriptions have continued to grow in Latvia, as in most OECD countries. From December 2017 to December 2018, subscriptions grew by 11%, and in June 2019 reached 126.9 subscriptions per 100 inhabitants, which places Latvia 7th among OECD countries (Figure 3.1).

Figure 3.1. Mobile broadband subscriptions per 100 inhabitants in OECD countries, June 2019

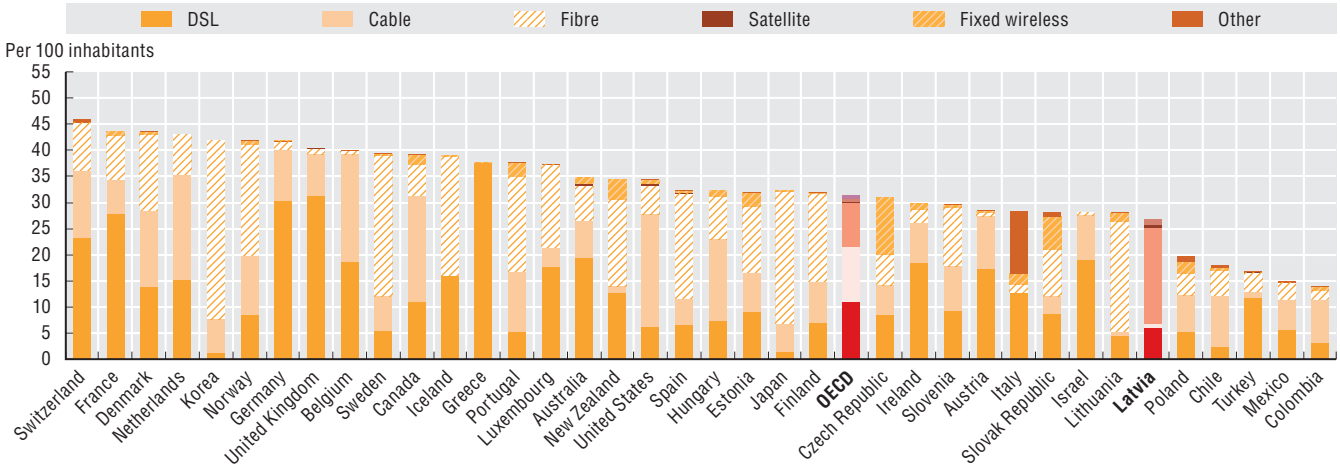


Note: Australia: Data reported for December 2018 and onwards are being collected by a new entity using a different methodology. Figures reported from December 2018 comprise a series break and are non-comparable with previous data for any broadband measures reported by Australia to the OECD.

Source: OECD (2020b), *OECD Broadband Portal* (database), *www.oecd.org/sti/broadband/oecdbroadbandportal.htm* (accessed on 6 May 2020).

In June 2019, Latvia reported 26.7 fixed broadband subscriptions per 100 inhabitants, close to the OECD average of 31.4. However, Latvia lags substantially behind leading OECD countries in terms of fixed broadband penetration, such as Switzerland with 46 and Denmark with 43 subscriptions per 100 inhabitants (Figure 3.2).

Figure 3.2. Fixed broadband subscriptions per 100 inhabitants in OECD countries, June 2019

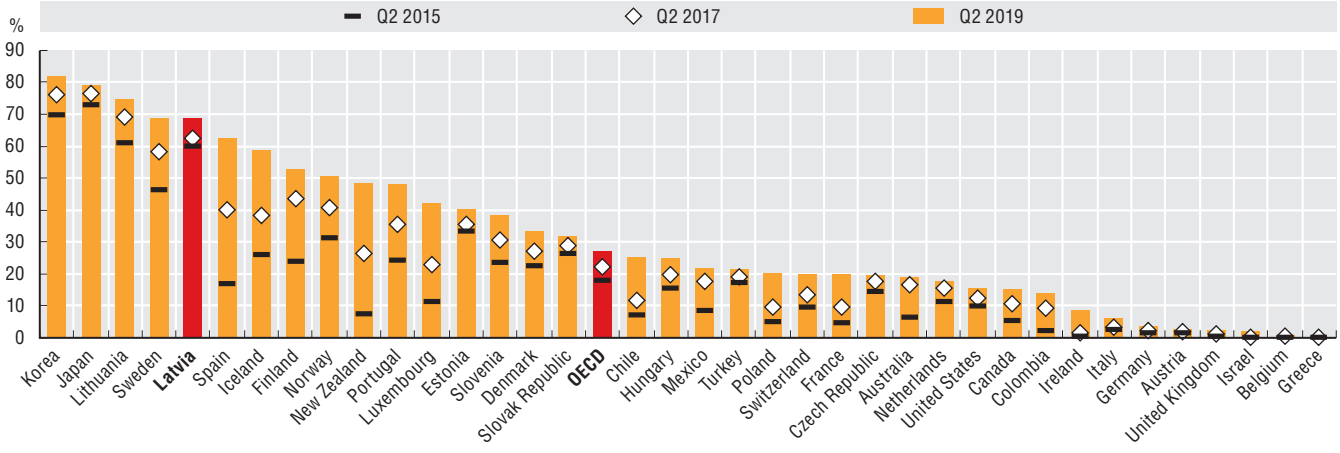


Notes: DSL = digital subscriber line. Australia: Data reported for December 2018 and onwards are being collected by a new entity using a different methodology. Figures reported from December 2018 comprise a series break and are non-comparable with previous data for any broadband measures reported by Australia to the OECD. The OECD definition of fibre differs substantially from fibre classifications commonly used in Australian reporting. These figures treat connections known in Australia as "fibre-to-the-node" and "fibre-to-the-curb" as DSL connections, while "fibre-to-the-premises" and "fibre-to-the-basement" are treated as fibre connections. Data on technology type prior to Q2 2016 should be treated as indicative until further notice.

Source: OECD (2020b), *OECD Broadband Portal* (database), *www.oecd.org/sti/broadband/oecdbroadbandportal.htm* (accessed on 6 May 2020).

The percentage of fibre connections in total fixed broadband reached 68.9% in Latvia in June 2019, much higher than the OECD average of 26.8% (Figure 3.3). From 2009 to June 2019, the share of fibre subscriptions among overall fixed broadband subscriptions in Latvia increased exponentially from 5% to 68.5%, (Figure 3.4). In June 2019, Latvia ranked fifth in terms of percentage of fibre connections in total fixed broadband, after Korea (81.6%), Japan (79.0%) and Lithuania (74.6%).

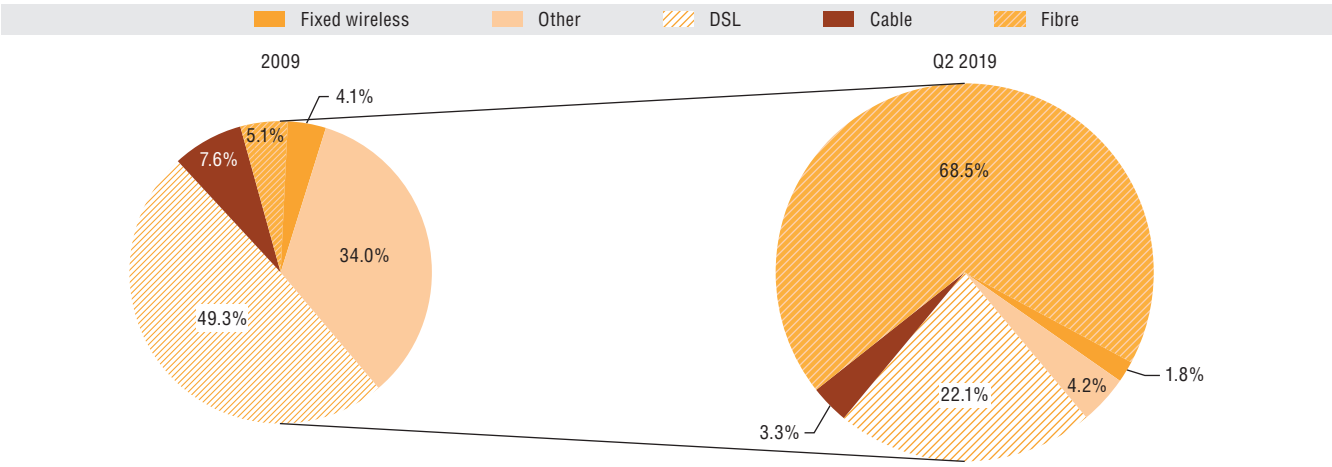
Figure 3.3. Percentage of fibre connections in total fixed broadband in OECD countries, Q2 2015 – Q2 2019



Notes: Australia: Data reported for December 2018 and onwards are being collected by a new entity using a different methodology. Figures reported from December 2018 comprise a series break and are non-comparable with previous data for any broadband measures reported by Australia to the OECD. The OECD definition of fibre differs substantially from fibre classifications commonly used in Australian reporting. These figures treat connections known in Australia as "fibre-to-the-node" and "fibre-to-the-curb" as DSL connections, while "fibre-to-the-premises" and "fibre-to-the-basement" are treated as fibre connections. Data on technology type prior to Q2 2016 should be treated as indicative until further notice. Data for Israel are OECD estimates. Data for Switzerland and United States are preliminary.

Source: OECD (2020b), *OECD Broadband Portal* (database), *www.oecd.org/sti/broadband/oecdbroadbandportal.htm* (accessed on 6 May 2020).

Figure 3.4. Fixed broadband subscriptions in Latvia, by technology, 2009 – Q2 2019

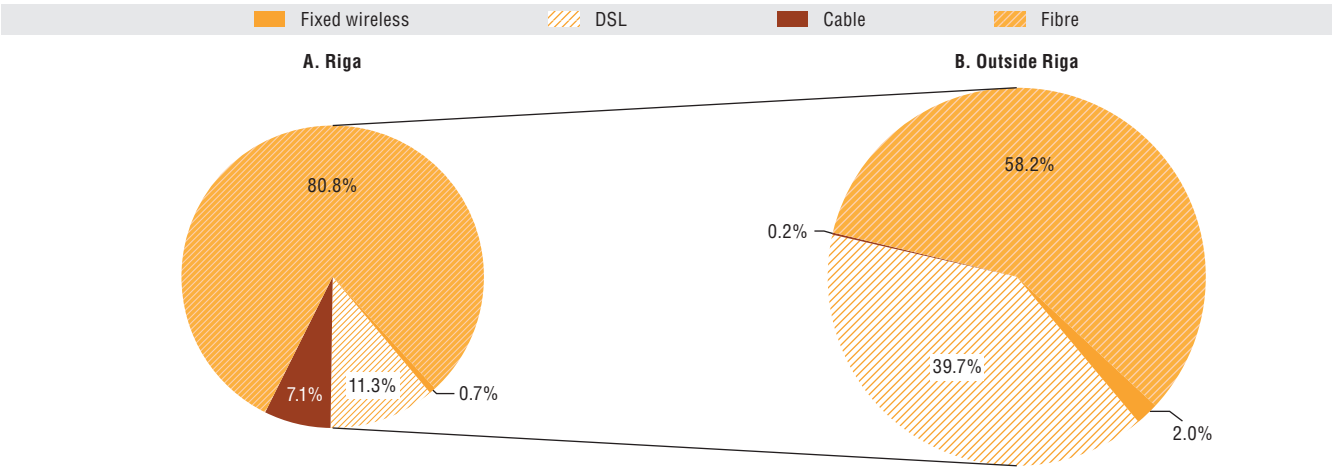


Notes: DSL = digital subscriber line. Satellite subscriptions were negligible in Latvia in 2009 (around 0.01% of the total) and non-existent as of June 2019.

Source: OECD (2020b), *OECD Broadband Portal* (database), *www.oecd.org/sti/broadband/oecdbroadbandportal.htm* (accessed on 6 May 2020).

However, differences persist between urban and rural areas in Latvia, particularly when comparing Riga to other regions. While fibre accounts for 80.8% of connections in Riga, the number falls to 58.2% outside the capital (Figure 3.5). Such regional variation, coupled with the fact that almost 20% of households in rural areas lack fixed broadband connections at speeds of over 30 Mbps (Figure 3.8), point to the substantial connectivity gap in high-quality communication services that still exists between urban and rural areas in Latvia. Bridging this gap will be critical to advance Latvia's digital transformation of the economy and society in an inclusive manner.

Figure 3.5. Fixed broadband subscriptions in Riga and outside Riga, by technology, 2018



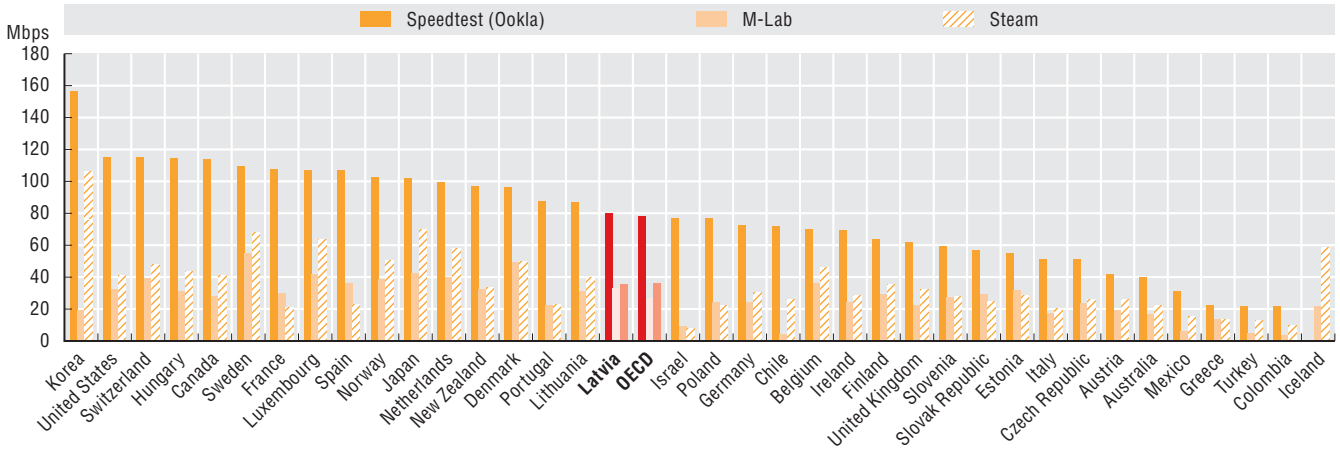
Notes: DSL = digital subscriberline. Data as of December 2018.

Source: OECD, based on SPRK information.

Broadband speeds

Multiple sources of speed tests allow for a range of measured download speeds of broadband services. Three different sources are used in this section: Ookla and M-Lab provide a broader view on networks, while the online gaming platform Steam measures the speeds of its users. According to Ookla, Latvia ranks 17th for broadband services among OECD countries, with an average actual download speed of 79.8 Mbps, compared to the OECD average of 78.3 Mbps in July 2019 (Ookla, 2019). Average download speeds of fixed broadband connections collected by M-Lab and Steam rank Latvia 12th and 16th among OECD countries, with 32.7 Mbps and 35.7 Mbps, respectively (Figure 3.6).

Figure 3.6. Average experienced download speeds of fixed broadband connections in OECD countries, July 2019

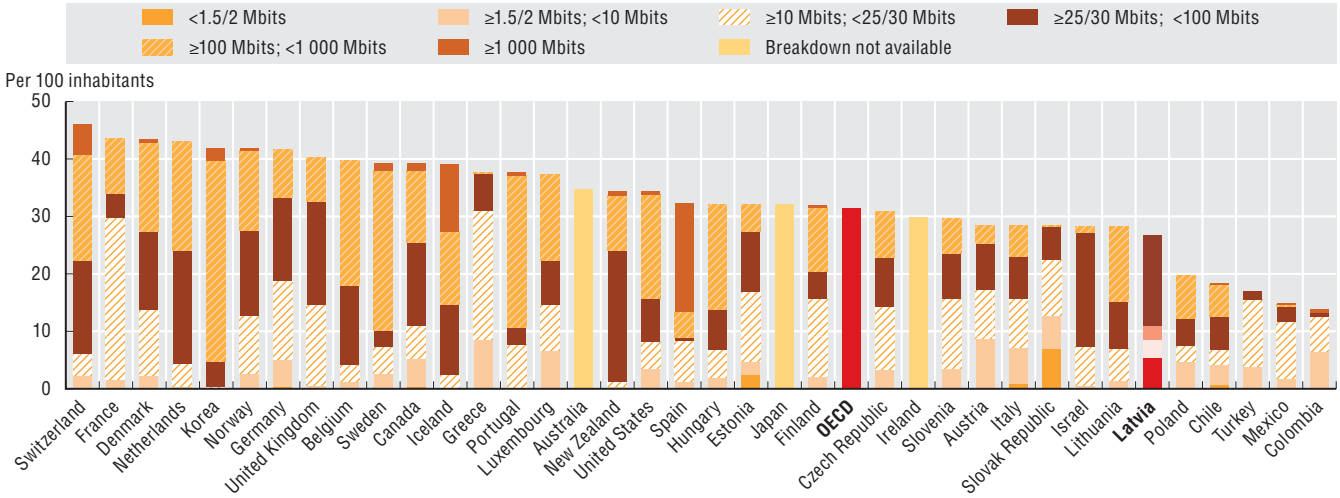


Notes: Mbps = megabits per second. Speedtest (Ookla) data are for July 2019. M-Lab speeds were measured over the period 9 May 2018 to 8 May 2019. Steam data are for July 2019.

Sources: Ookla (2019), "Speedtest", *www.speedtest.net/global-index* (accessed on 9 May 2020); M-Lab (2019), "Worldwide broadband speed league", *www.cable.co.uk/broadband/speed/worldwide-speed-league* (accessed on 9 May 2020); Steam (2019), "Steam download stats", *https://store.steampowered.com/stats/content* (accessed on 9 May 2020).

In terms of subscriptions per advertised speed tiers, Latvia shows a high proportion of fixed broadband subscriptions for contracted speeds of over 100 Mbps. These subscriptions represent 59% of total fixed broadband subscriptions, or 16 subscriptions per 100 inhabitants (Figure 3.7).

Figure 3.7. Fixed broadband subscriptions per 100 inhabitants in OECD countries, by speed tier, June 2019

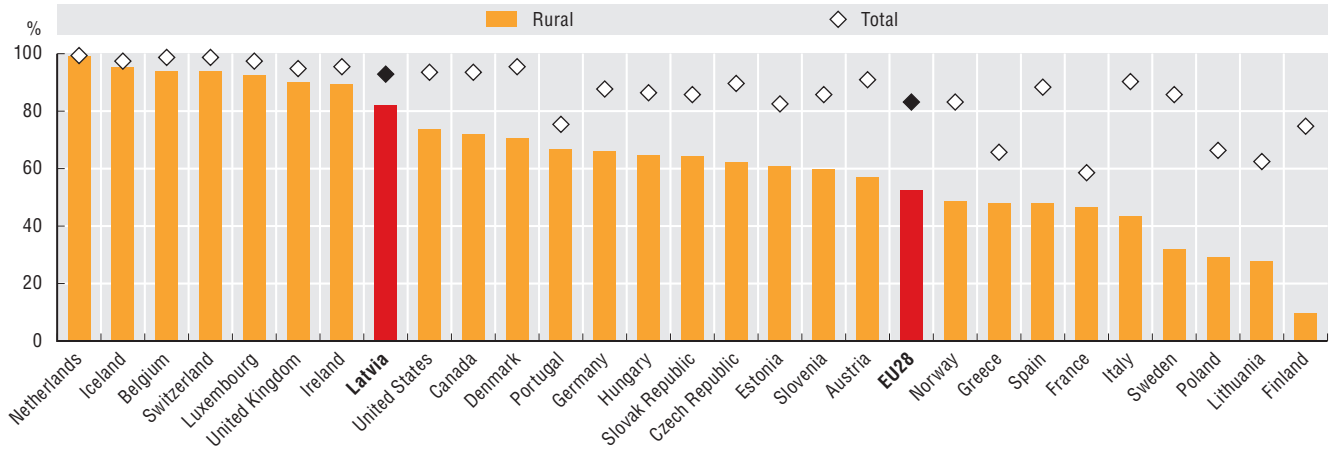


Notes: Mbit = megabits per second. Switzerland and United States: Data for June 2019 are estimates.

Source: OECD (2020c), *OECD Broadband Portal* (database), *www.oecd.org/sti/broadband/oecdbroadbandportal.htm* (accessed on 6 May 2020).

While Latvia has made progress in ensuring the availability of high-speed fixed broadband in its territory, gaps exists in terms of coverage (i.e. connections over 30 Mbps) in rural and remote areas in the country. In 2018, while 93% of Latvian households in the total territory were located in areas (i.e. including both rural and urban areas) with availability of fixed broadband connections of speeds above 30 Mbps, coverage in rural areas of similar services was 82.1%, a difference of about 11 percentage points. Coverage in Latvia of fixed broadband over 30 Mbps is well above the European average (EU28) of 83.2% in total territory and only 52.3% in rural areas, but lags behind leading OECD countries such as the Netherlands, Iceland, Belgium, Switzerland and the United Kingdom (Figure 3.8).

Figure 3.8. Percentage of households in total and rural areas[1] with minimum 30 Mbps of fixed broadband coverage[2] in selected OECD countries, June 2018

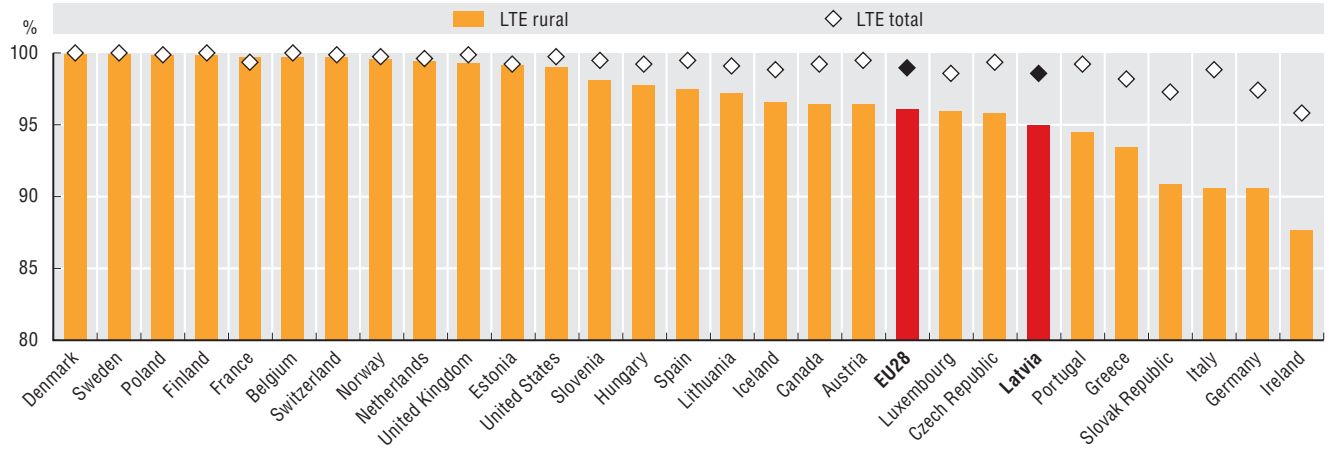


1. For EU countries, rural areas are those with a population density less than 100 per square kilometre. For Canada, rural areas are those with a population density less than 400 per square kilometre. For the United States, rural areas are those with a population density less than 1 000 per square mile or 386 people per square kilometre.
2. For EU countries, coverage of NGA technologies (VDSL, FTTP, DOCSIS 3.0) capable of delivering at least 30 Mbps download was used. For the United States, coverage of fixed terrestrial broadband capable of delivering 25 Mbps download and 3 Mbps upload services was used; data refer to 2016.

Source: OECD calculations based on CRTC (2019), *Communications Monitoring Report*, *https://crtc.gc.ca/eng/publications/reports/policymonitoring/2019/index.htm*; European Commission (2018a), *Study on Broadband Coverage in Europe*, *https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=62760*; FCC (2019), *Broadband Deployment Report*, *www.fcc.gov/reports-research/reports/broadband-progress-reports/2019-broadband-deployment-report*.

For high-speed, long-term evolution (LTE) mobile coverage in rural areas, however, Latvia's performance is below the European (EU28) average. The EU28 average for LTE coverage is 96.1% in rural areas, with leading countries such as Denmark and Sweden reporting 100% LTE coverage in these areas; however, only 95% of rural areas are covered by LTE in Latvia, in comparison to 98.6% of urban areas (Figure 3.9).

Figure 3.9. Percentage of households with LTE mobile coverage, total and rural areas[1] in selected OECD countries, June 2018



1. For EU countries, rural areas are those with a population density less than 100 per square kilometre. For Canada, rural areas are those with a population density less than 400 per square kilometre. For the United States, rural areas are those with a population density less than 1 000 per square mile or 386 people per square kilometre.

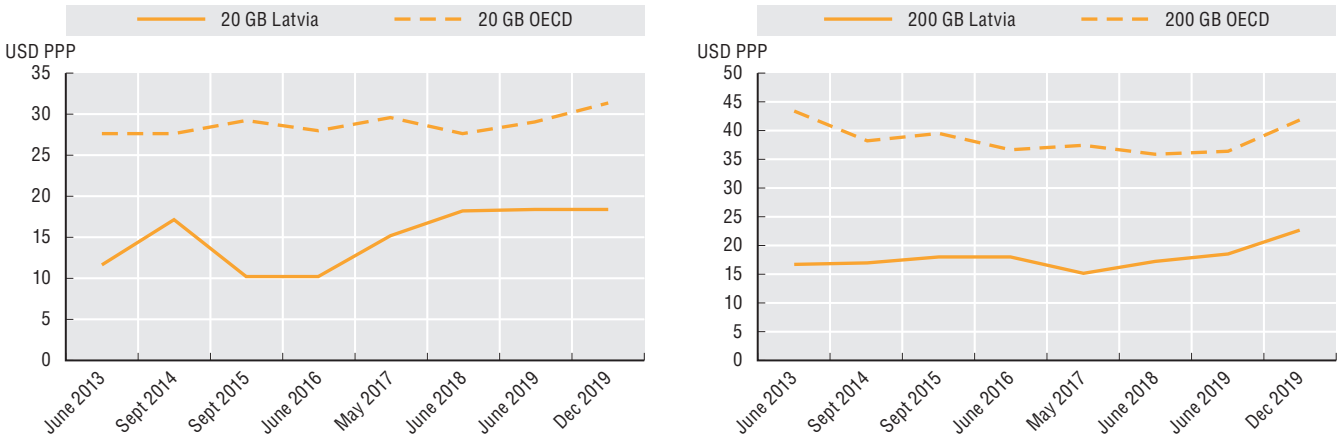
Note: LTE = long-term evolution.

Source: OECD calculations based on CRTC (2019), *Communications Monitoring Report*, *https://crtc.gc.ca/eng/publications/reports/policymonitoring/2019/index.htm* ; European Commission (2018a), *Study on Broadband Coverage in Europe*, *https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=62760*; FCC (2019), *Broadband Deployment Report*, *www.fcc.gov/reports-research/reports/broadband-progress-reports/2019-broadband-deployment-report*.

Prices of fixed and mobile broadband services

Prices for fixed broadband connectivity in Latvia are substantially lower than the OECD average in both "low-usage" (20 GB) and "high-usage" (200 GB) fixed broadband baskets. In December 2019, prices for both "low usage" (20 GB) and "high usage" (200 GB) levelled closely at USD PPP 18.38 and USD PPP 22.59, respectively, while the OECD averages were USD PPP 31.33 and USD PPP 41.80 for each basket. While average prices across the OECD for fixed broadband access appear to have declined between 2013 and 2019, the same trend was not observed in Latvia. During the same period, prices for "high-usage" baskets of fixed broadband offers increased slightly from USD PPP16.83 to the current level of USD PPP 22.89, whereas "low-usage" fixed broadband baskets have increased from USD PPP 11.71 to USD PPP 18.38 (Figure 3.10).

Figure 3.10. Trends in fixed broadband prices in Latvia and OECD countries, June 2013-December 2019

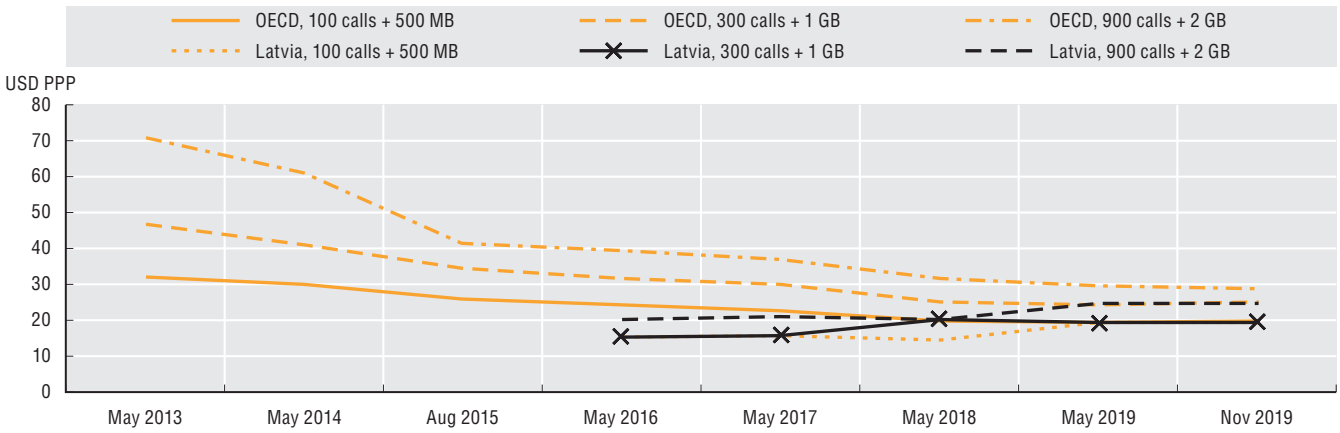


Notes: PPP = purchasing power parity; GB = gigabyte. Data as of December 2019.

Source: OECD calculations based on data provided by Strategy Analytics.

With regard to mobile connectivity, prices for mobile broadband services in Latvia for "low-usage" and "high-usage" baskets are also lower than the OECD averages, although the difference between Latvia's price levels and OECD averages is smaller than with respect to fixed broadband baskets. Available data from 2016 to 2019 show pronounced increases in prices for all baskets. For both the "low-usage" basket (100 calls + 500 MB) and "medium-usage" basket (300 calls + 1 GB), prices increased from USD PPP 15.37 in 2016 to USD PPP 19.32. For the "high-usage" basket (900 calls + 2 GB), prices increased from USD PPP 20.11 to USD PPP 24.58 (Figure 3.11).

Figure 3.11. Trends in mobile broadband prices in Latvia and OECD countries, May 2013-November 2019



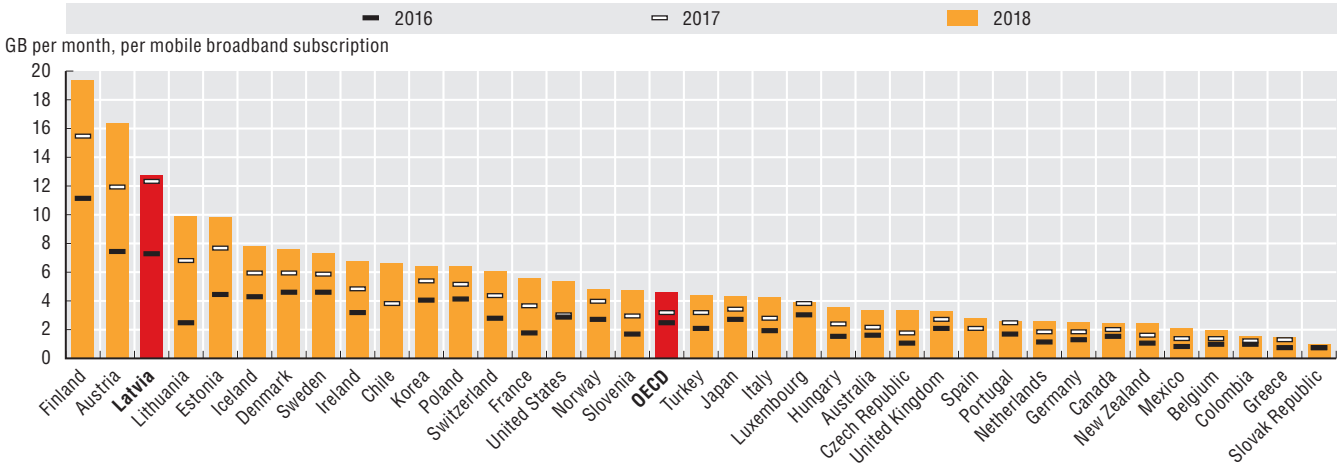
Notes: PPP = purchasing power parity; MB = megabyte; GB = gigabyte. Data as of November 2019.

Source: OECD calculations based on Strategy Analytics data.

Mobile data usage

In 2018, mobile data usage per mobile broadband subscription in Latvia was 12.8 GB per month. Latvia's average monthly mobile data usage is much higher than the OECD average of 4.7 GB per month and lags behind only Finland and Austria, where data usage per subscription each month amounts to 19.4 GB and 16.4 GB, respectively (Figure 3.12). Increases in mobile data usage reflect a growing demand for network capacity.

Figure 3.12. Mobile data usage per mobile broadband subscription in OECD countries, 2016-18



Notes: GB = gigabyte. Australia: Data reported for December 2018 and onwards are being collected by a new entity using a different methodology. Figures reported from December 2018 comprise a series break and are non-comparable with previous data for any broadband measures reported by Australia to the OECD. Data for Switzerland are preliminary.

Source: OECD (2020b), *OECD Broadband Portal* (database), *www.oecd.org/sti/broadband/oecdbroadbandportal.htm* (accessed on 6 May 2020).

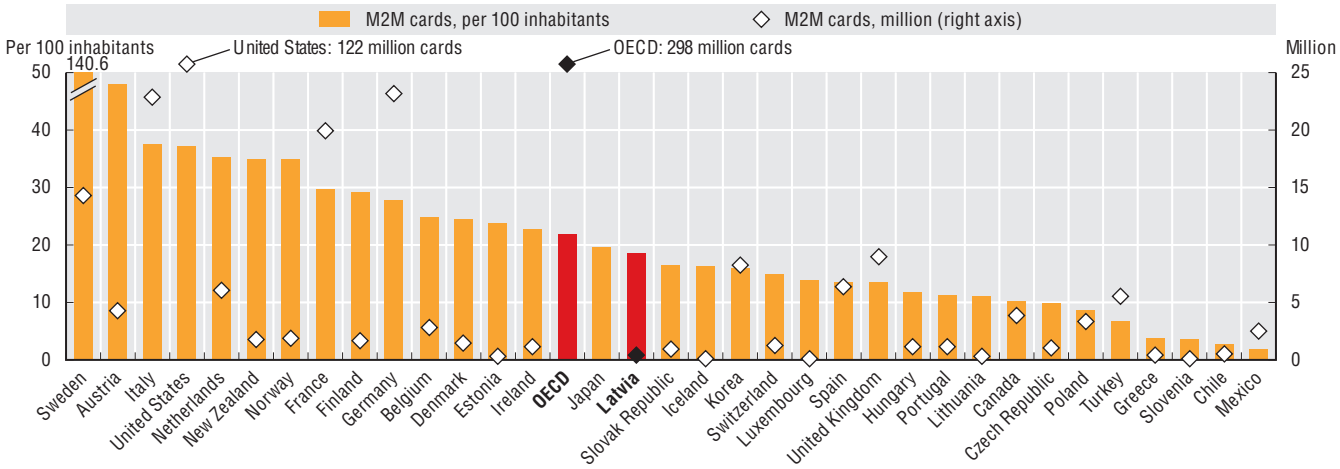
The Internet of Things

The Internet of Things (IoT) represents the next step in the convergence of information and communication technologies (ICTs), societies and the economy. While the effects of the IoT on growth and productivity is yet to be measured systematically across OECD countries (OECD, 2019a), the IoT has the potential to contribute to local and national goals of innovation and efficiency. In order to achieve those goals, communication technologies and other enablers must be available to support data flows.

In Latvia, three mobile and three fixed operators provide Machine-to-machine (M2M) subscriptions – a subset of the IoT. As of June 2019, in terms of M2M embedded devices, Latvia had 18.5 M2M cards per 100 inhabitants (i.e. 360 000 M2M cards in total). Latvia's performance in terms of M2M penetration is just below the OECD average of 22%; however, it lags behind OECD leaders such as Sweden (140.6%), Austria (48.2%), Italy, (37.7%), the United States (37.3%) and others (Figure 3.13). Nevertheless, it is important to note that M2M data in some OECD countries, such as Sweden, may include devices that might be located in other countries (e.g. SIM cards in automobiles). The regulator in Latvia (SPRK) does not collect information regarding operators' provision of M2M devices for foreign use.

In Latvia, discussions are underway regarding a new numbering range for M2M communications. Under the existing regulation, operators offer IoT/M2M services based on mobile numbering resources allocated to them. Although the current numbering plan states that the allocation of additional numbering resources for M2M services is unnecessary, a forthcoming MoT report suggests a change in the national numbering plan. This new proposal plans to allocate an 11-digit numbering resource for IoT/MSM for extraterritorial use as well as an 8-digit number for local use, and gradually implement a fee for all numbering resources, which are currently distributed without a charge.

Figure 3.13 M2M/embedded mobile cellular subscriptions in selected OECD countries, June 2019



Note: The OECD defines machine to machine (M2M) on mobile networks as "the number of SIM cards that are assigned for use in machines and devices (cars, smart meters and consumer electronics) and are not part of a consumer subscription". This means that dongles for mobile data and tablet subscriptions should be counted by countries under the mobile broadband definition, whereas SIM cards in personal navigation devices, smart meters, trains, automobiles and so on should be counted under the M2M category. Australia: Data reported for December 2018 and onwards are being collected by a new entity using a different methodology. Figures reported from December 2018 comprise a series break and are non-comparable with previous data for any broadband measures reported by Australia to the OECD. Data for Switzerland are preliminary. Data for the United States are OECD temporary estimates.

Source: OECD (2020b), *OECD Broadband Portal* (database), *www.oecd.org/sti/broadband/oecdbroadbandportal.htm* (accessed on 6 May 2020).

Going forward, it will be important to ensure proactive policy development for IoT in order to align different sectoral, national and subnational objectives in Latvia. The government will play a key role in engaging with the private sector and local stakeholders to develop solutions for local challenges and IoT capacity, and to help drive demand for IoT services, while also ensuring there is regulatory balance and that digital security and privacy risks are managed.

Internet exchange points

A well-functioning communication infrastructure includes efficient exchange of Internet traffic. Internet exchange points (IXPs) are important to keep traffic local (Weller and Woodcock, 2013). IXPs are also key for international Internet traffic, because they foster efficient traffics exchange domestically. Traffic originating and terminating domestically can and should be routed domestically. Routing this same traffic via other countries increases latency and costs and is often indicative of sub-optimal development of the Internet traffic exchange market in a given country.

Latvia has three IXPs: the Santa Monica Internet Local Exchange (SMILE, established in 2005), the Latvian Internet Exchange (LIX, established in 2007) and the most recently established, MSK-IX (established in 2018) in Riga. The largest IXP in terms of members is SMILE.

LIX is owned by three Internet service providers (ISPs): Tet (previously Lattelecom), Latnet and Telia Latvija. The management of this IXP does not seem to follow best international practices. For example, LIX limits traffic to Latvian prefixes, effectively preventing networks from optimising interconnections with international players. This rather closed design of the exchange hinders long-term traffic growth as well as the growth of entities exchanging traffic at this exchange. Moreover, LIX uses a layer 3 design (routing packets instead of switching frames) which is less cost effective and prevents networks from generating bilateral peering sessions. In contrast, competitive and dynamic IXP ecosystems provide the infrastructure for network operators to peer and exchange traffic at their own convenience.

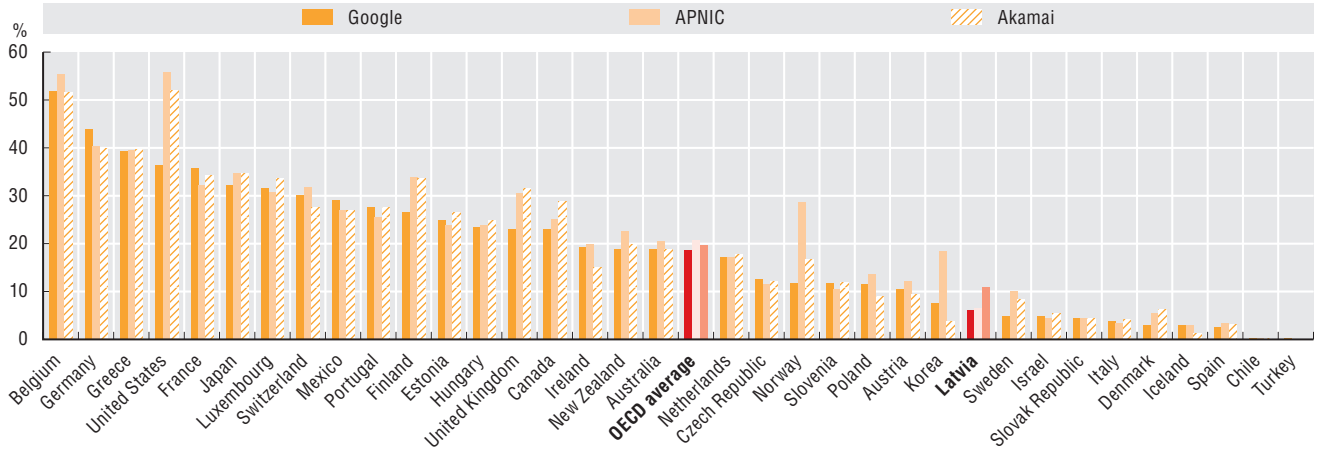
From a pricing perspective, the monthly cost for a 10 Gigabit port with LIX (i.e. the overhead costs of peering inherent to transit costs) is quite high in comparative terms. The price for 40% utilisation of a 10 Gigabit Ethernet link, per month, is EUR 0.53/Mbps. In comparison, the price in Amsterdam (AMS-IX) is EUR 0.18/Mbps, and the price in Moscow (MSK-IX) is EUR 0.29/Mbps.[1] Prices for SMILE and MSK-IX are not publicly available.

IXP performance is not monitored by SPRK as this task falls outside the mandate of the communication regulator. SPRK is responsible only for broadband quality measurements from network termination point up to IXPs, where the regulator's measurement servers have been collocated. A dedicated analysis of the state of traffic exchange in Latvia could help identify existing challenges and design potential solutions, and if conducted in partnership with stakeholders, could further improve IXP performance and increase the amount of traffic exchanged locally.

One potential challenge for the future of the Internet is the ability to connect tens of billions of devices. A key resource needed not only to ensure scalability, but also to increase security, is the new version of the Internet Protocol (IP), IPv6, which replaces its largely exhausted IP predecessor, IPv4, in terms of the distribution of unassigned addresses. Encouraging the deployment of IPv6 has been a long-standing goal for OECD countries. However, its adoption has been slower than expected, which may hinder the development of new applications and services (OECD, 2014; 2018b).

Regarding IPv6 adoption, multiple sources show that Latvia is significantly behind the OECD average. According to Google data, for example, IPv6 adoption reached 6.7% in June 2020, against the OECD average of 22.4%. In the same period, the rate in Belgium and Germany, both OECD leading countries in IPv6 adoption, was 55.7% and 49.7%, respectively (Figure 3.14). Data from APNIC and Akamai from June 2020 indicate that IPv6 adoption in Latvia was 6.9% and 10.3%, respectively, while OECD averages were 24.4% and 23.5%. In order to encourage the adoption of IPv6, the new Cybersecurity Strategy for 2019-2022 has set a target of the end of 2020 for the MoT and the Ministry of Environmental Protection and Regional Development (VARAM) to implement a set of measures fostering the use of IPv6 in ICT equipment used by the public sector.

Figure 3.14. IPv6 adoption in selected OECD countries, 2020



Sources: Google, 2020, "Per-country IPv6 adoption", *www.google.com/intl/en/ipv6* (accessed in June 2020); APNIC (2020), "IPv6 measurement maps", *http://stats.labs.apnic.net/ipv6* (accessed in June 2020); Akamai (2020), "IPv6 adoption visualization", *www.akamai.com/uk/en/our-thinking/state-of-the-internet-report/state-of-the-internet-ipv6-adoption-visualization.jsp* (accessed in June 2020).

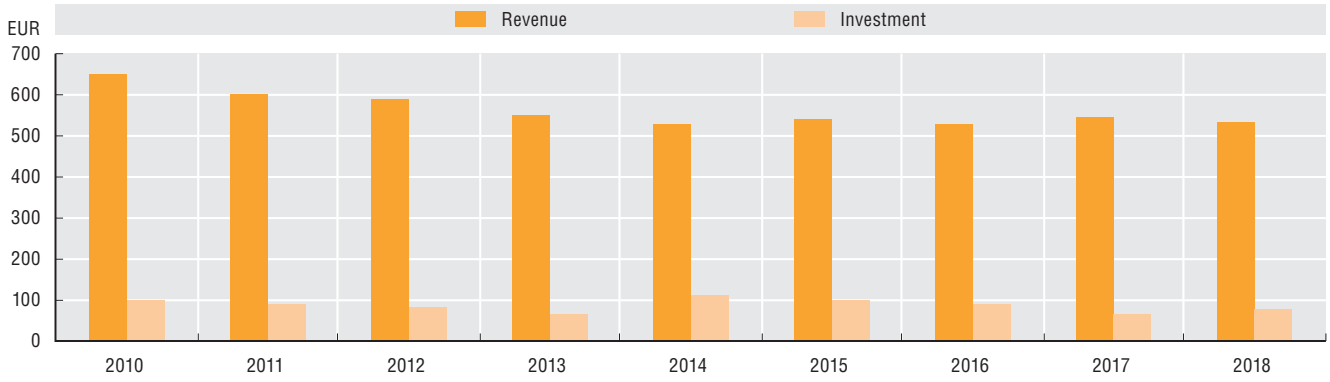
Developments in communication markets in Latvia

Since 2013, revenues in the communication sector have been stable. By 2018, total revenue and investment in the communication sector in Latvia amounted to EUR 532 million and EUR 78 million, respectively (Figure 3.15).

The communication sector in Latvia comprises a multitude of market players, offering services in both fixed and mobile markets. In the retail market, there are three main players in the fixed market and four different players in the mobile market (Table 3.2).

In the wholesale market, the fully state-owned operator, LVRTC, provides wholesale broadband services, as well as towers and masts. Beyond broadband services, LVRTC offers cloud, e-signature and digital security services. LVRTC is also responsible for registering and maintaining the "gov.lv" domain name.[2] Aside from LVRTC, four other wholesale-only operators in Latvia offer national and international gateway services to other companies in the market.

Figure 3.15. Trends in communication revenue and investment in Latvia, 2010-18



Source: OECD (2020a), *OECD Telecommunications and Internet Statistics* (database), *https://doi.org/10.1787/data-00170-en* (accessed on 9 July 2020).

Table 3.2. Main players in the Latvian communication markets

Communication player	Markets	Ownership structure
LVRTC	Wholesale-only broadband services and TV and radio broadcasting	Latvian government (100%)
Tet (previously Lattelecom)	Fixed incumbent offering fixed voice, fixed broadband, pay TV and electricity	Latvian government (51%) and Telia (49%)
Baltcom	Fixed voice, fixed broadband, pay TV and electricity	Rpax One S.A. (96.4%)
Balticom	Fixed voice, fixed broadband, pay TV	Privately owned
CSC	Fixed voice and fixed broadband	Privately owned
LMT	Mobile and fixed wireless services[1]	Sonera Holding (24.5%), Telia (24.5%), Tet (23%), LVRTC (23%) and Latvian government (5%)
Tele2	Mobile	Tele2 Sverige Aktiebolag (100%)
Bite	Mobile	BITE Lietuva UAB (100%)
Triatel	Mobile	Telekom Baltija
Zetcom (Amigo)[2]	Mobile	X

1. LMT is a mobile operator, which offers fixed-wireless services including voice and broadband services through mobile technologies.
2. The Amigo brand, operated by Zetcom, ceased operations in June 2019, and the customers were taken over by LMT.

Note: x = not applicable.

There were 278 communication operators registered by SPRK as of December 2018, indicating a reduction of 12% in comparison to 2017. Out of all service providers, 65% provide broadband access services (SPRK, 2018).

Fixed market developments

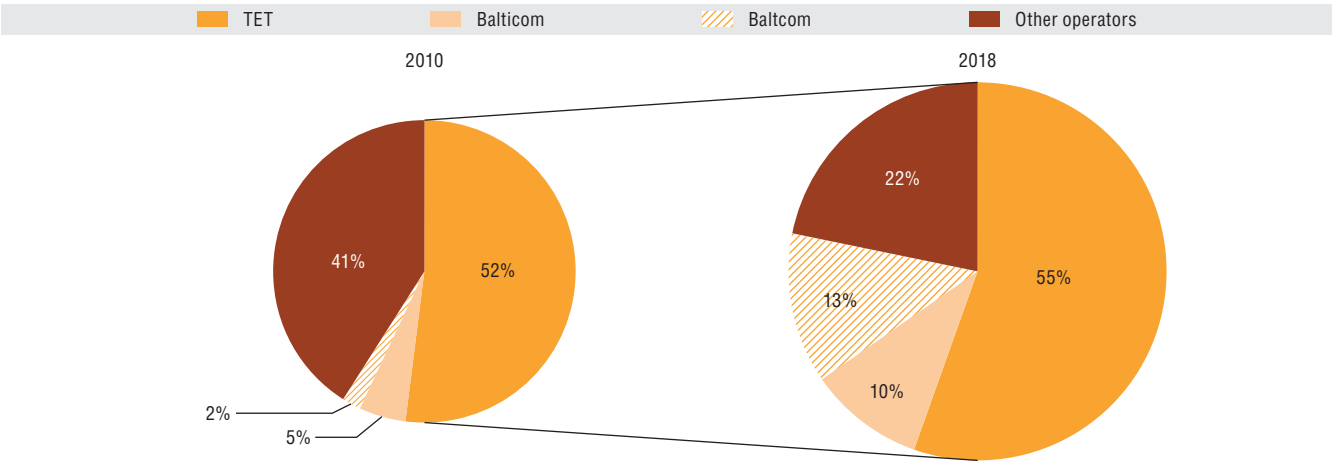
In Latvia, Tet (until April 2019 branded as Lattelecom) is the historical incumbent. The operator owns a nationwide infrastructure and is the largest fixed broadband provider. Alternative fixed broadband providers (cable operators and ISPs) started to deploy their own infrastructure following liberalisation in 2003, and have concentrated on fibre deployment, investing first in urban areas and focusing on fibre-to-the-building (FTTB). Fibre deployment has since expanded to less densely populated areas where a business case for investment has been identified.

In response, Tet started investing in fibre-to-the-home (FTTH) in 2006. Currently, Tet is the main FTTH provider competing with alternative FTTB providers. In 2014, Tet started to deploy VDSL2 vectoring technology to improve the performance of its copper network. Such infrastructure competition has been the main driver behind the development of fibre access networks in Latvia.

Entries and exits in the fixed market by very small operators are relatively frequent (European Commission, 2019). In December 2018, Tet accounted for 56% of fixed broadband subscriptions, while

Baltcom accounted for 13%, Balticom for 10% and other operators for 22%. This latter share includes 154 operators, the majority of which are small operators (Figure 3.16). Tet's market share has increased in relation to 2010, when it held 52%, but has decreased from 58.8% in July 2015. However, it is still higher than the average market share for incumbents in the European Union (40.3%) (European Commission, 2018b). Recently the number of "other operators" has been decreasing due to mergers. It should be noted, however, that Latvia does not have a defined criteria as to what constitutes a "small operator".

Figure 3.16. Fixed broadband market shares in Latvia, 2010 and 2018



Source: SPRK (2018a), *Elektronisko sakaru nozares: faktos un skaitlos 2018* [Electronic communications sectors: facts and figures 2018], *https://infogram.com/id-es_nozares_raditaji_2018-1hxj48qk0y154vg?live*.

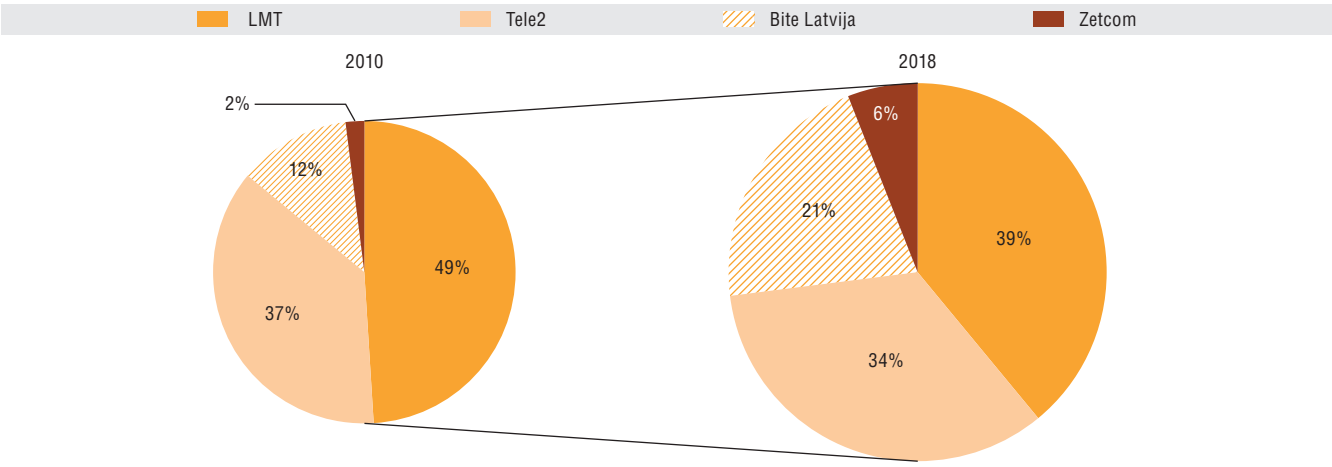
Mobile market developments

As of May 2020, there were three mobile network operators (MNOs) in Latvia: Latvijas Mobilais Telefons (LMT), Tele2 and Bite Latvija (Bite). Triatel, which offered CDMA services, exited the mobile market in 2020. All MNOs offer GSM/UMT/LTE services. In Latvia, 4G coverage is close to 100% of households and 4G is currently offered in parallel with 2G and 3G. As of mid-2019, there was no plan for operators to switch off their 2G and 3G networks in the near future.

Since 2010, the mobile market in Latvia has evolved and become less concentrated in comparison to December 2018. The largest MNO in terms of market shares since 2010 has been LMT, which experienced a reduction in market share from 49% to 39%, followed by Tele2 (increased from 37% to 34%) and Bite (grew from 12% to 21%) (Figure 3.17). However, Amigo, which is operated by Zetcom and the only mobile virtual network operator (MVNO) in the country, as well as being 100% owned by LMT, suspended its own operations and moved all customers to its host mobile network provider LMT, despite having experienced growth of mobile broadband subscriptions from 2% in 2010 to 6% in 2018.

Other positive developments in the Latvian mobile market include initiatives that may reduce the costs of network deployment by MNOs, such as network sharing. However, network sharing may also have effects on competitive dynamics in the market, which need to be closely monitored. In June 2019, for example, Tele2 and Bite signed a network sharing agreement for Latvia and Lithuania. The two operators' networks will form a joint shared network, which includes radio network and only excludes customer specific solutions. The partnership includes sharing of infrastructure for current networks, spectrum sharing and future 5G roll-out. This joint network will be deployed gradually starting in 2021, with the full network scheduled for completion by December 2023. Each party will hold 50% ownership in the joint venture (Tele2, 2019).

Figure 3.17. Mobile broadband market share in Latvia, 2010 and 2018

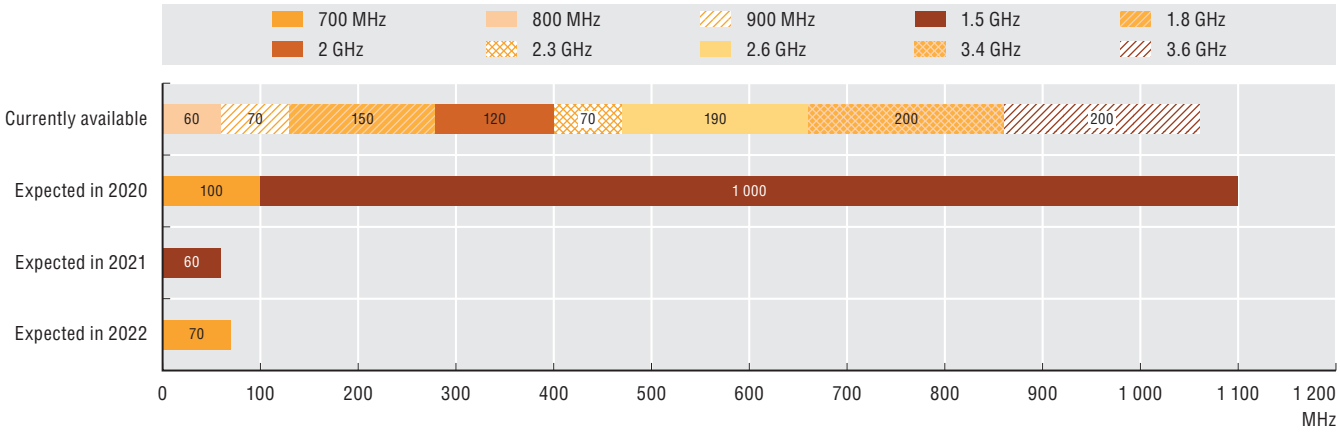


Source: SPRK (2018a), *Elektronisko sakaru nozares: faktos un skaitlos 2018* [Electronic communications sectors: facts and figures 2018], *https://infogram.com/id-es_nozares_raditaji_2018-1hxj48qk0y154vg?live*.

Spectrum allocation

One key resource and underlying condition of the mobile market is the availability of spectrum. Currently, the following frequency bands are assigned for wireless broadband in Latvia's national frequency plan: 450 MHz, 800 MHz, 900 MHz, 1.5 GHz, 1.8 GHz, 2 GHz, 2.3 GHz, 2.6 GHz, 3.4 GHz and 3.6 GHz (Figure 3.18). Despite advances in spectrum allocation, there is currently no secondary market for spectrum in Latvia. In addition to well-designed spectrum auctions, enabling a well-functioning secondary market could increase efficiency in the allocation of this scarce resource. Overall, five spectrum auctions have been held in Latvia since 2012 (Table 3.3).

Figure 3.18. Spectrum availability in Latvia, 2019



Note: As reported in December 2019.

Source: OECD, based on data from SPRK.

The 3.4-3.8 GHz band, which is suited for 5G deployment, is already fully assigned. Two mobile operators (LMT and Tele2) deployed the first 5G base stations in July 2019 in the 3.4-3.8 GHz band. The spectrum for wireless broadband services that remains to be assigned is mainly in the 700 MHz, 1.4-1.5 GHz and 26 GHz bands:

- The 700 MHz band is currently used for TV broadcasting (digital terrestrial television, DTT) by Tet, whose rights of use expire in 31 December 2021. The auction of the 700 MHz band is planned for the end of 2020 with commercial use from 2022 onwards.
- In January 2019, the use of the 1.4-1.5 GHz band (1427-1518 MHz) was allocated to communications services (European Commission, 2019). Assignment of the spectrum through an auction is planned for the end of 2020.

- Re-farming of the 26 GHz spectrum band is expected to be undertaken in 2020 with the auction anticipated for the end of 2020 or the beginning of 2021. While spectrum bands above 24 GHz are already used for 5G tests, realising the allocation of substantive frequency resources between 24.25 GHz and 27.5 GHz for 5G still requires co-ordination with the military (European Commission, 2019).
- Plans exist to make available 60 MHz of the 1.5 GHz bands in 2021, and around 80 MHz of the 700 MHz band in 2022 (a potential widening of available bands is under discussion).

Table 3.3. Spectrum auctions conducted in Latvia

Band	Year(s)	Proceeds (EUR million)	Auction result
791.0-821.0 MHz and 832.0-862.0 MHz	2013	4.7	Tele2, LMT and Bite
890.0-903.2 MHz and 935.0-948.2 MHz	1992	..	LMT
880.2-889.8 MHz and 925.2-934.8 MHz	2005	..	Bite
904.2-914.0 MHz and 949.2-959.0 MHz	2002	..	Tele2
903.3-904.1 MHz and 948.3-949.1 MHz	2008	..	Tele2
914-915 MHz and 959-960 MHz	2010	..	Tele2
1 710.0-1 734.8 MHz and 1 805.0-1 829.8 MHz	2001	..	LMT
1 735.2-1 759.8 MHz and 1 830.2-1 854.8 MHz	2000	..	Tele2
1 760-1785 MHz and 1 855-1 880 MHz	2005	..	Bite
1 920-1 940 MHz and 2 110-2 130 MHz; 1 960-1 980 MHz and 2 150-2 170 MHz	2002	..	LMT and Tele2
1 940-1 960 MHz and 2 130-2 150 MHz	2005	..	Bite
2 300-2 360MHz	2012	0.316	LMT and Bite
2 500-2 570 MHz and 2 620-2 690 MHz	2012	3.4	Four communications operators were granted rights of use from 1 January 2014 until 31 December 2028
2 570-2 620 MHz	2013	0.284	LMT
3 450-3 500 MHz, 3 600-3 650 MHz and 3 700-3 750 MHz	2002	..	Unistars (acquired in 2017 by Bite)
3 400-3 450 MHz and 3 650-3 700 MHz	2017	0.5	LMT
3 550-3 600 MHz	2018	6.53	Tele2

Notes: MHz = megahertz; .. = not available. Many spectrum blocks within the 900 MHz, 1.8 GHz and 2 GHz frequency bands were allocated and assigned by the Ministry of Transport (MoT) before the SPRK was established over different periods of time through the issuing of a licence, order or a decision. Some of the values on the fees paid on spectrum assignment previous to the establishment of SPRK are not available.

Source: SPRK (2018b), *Radiofrekvenču izsoles* [Radio frequency auctions], *www.sprk.gov.lv/content/radiofrekvencu-izsoles* (accessed on 6 May 2020).

In February 2002, the Cabinet of Ministers of Latvia approved the "Roadmap for the Deployment of Fifth generation (5G) Public Mobile electronic Communication Networks in Latvia". The document provides an overview of spectrum allocation, the deployment of commercial networks in large urban centres and coverage obligations for the allocation of 700 MHz related to railways and roads.

It should be noted that the national frequency plan of Latvia is technologically neutral with regard to frequency bands used for mobile communication services. As a result, operators can choose to deploy 5G using already assigned frequency bands if there are devices that allow them to do so. The results of the first 5G tests were shown during a regional conference – 5G Techritory, the 1st Baltic Sea Region 5G Ecosystem Forum – which took place in Riga in September 2018 (5G Techritory, 2019; European Commission, 2019).

In the same month, Estonia, Latvia and Lithuania signed a Memorandum of Understanding (MoU), agreeing to co-operate on the deployment of the 4G+, 4G ++ and 5G network along a section of the Via Baltica covering Tallinn, Riga and Kaunas (in Lithuania), in order to foster innovation in transportation systems and test autonomous vehicles (The Baltic Course, 2018). In November 2019, this MoU, now including Poland, evolved into a joint roadmap to establish a common approach to map existing infrastructure and determine funding gaps for infrastructure deployment and shared principles for infrastructure deployment along the Via Baltica.

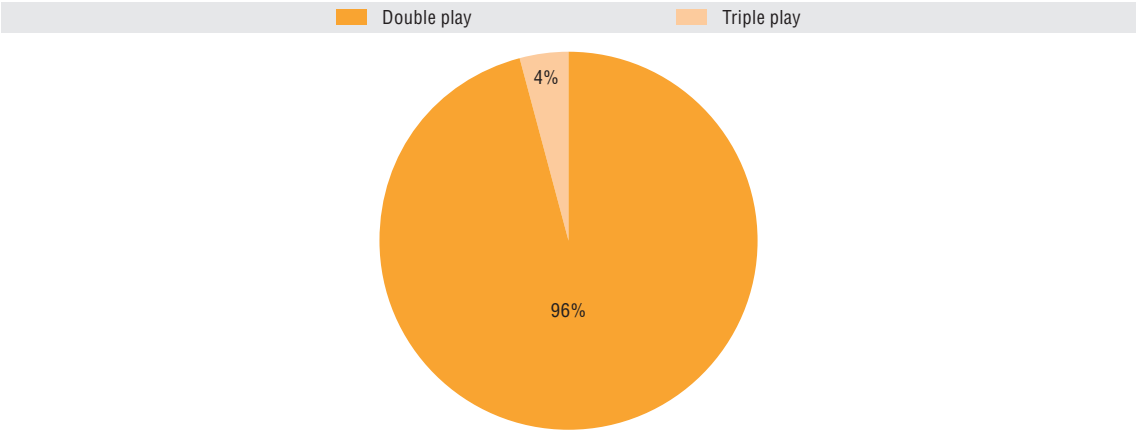
In order to foster 5G, the MoT is working on two pilot projects to deploy 5G-enabled passive infrastructure along both the Via Baltica and Rail Baltic routes, pending available funds. Measures to reduce deployment costs and administrative burdens through a lighter regime for small cell deployment, and to ease access to information on financial support mechanisms from the European Union, are also being envisioned.

Convergence

Trends related to the offer of bundled services, as well as the offering of audio-visual content through IP networks, are of particular importance, since bundles function as an indicator of the degree of convergence in consumer offers.

At present, the bundled services market in Latvia is characterised mainly by double-play offers: 96% of sold bundles are double-play bundles, with triple play accounting for only a small fraction of offers (4%) (Figure 3.19). Due to the absence of vertically integrated players in Latvia, there are currently no quadruple-play offers. The fixed incumbent, Tet, does not have a mobile operation and, in April 2016, the option of a merger between the fixed incumbent and the mobile incumbent (LMT) was rejected by the government (which owns 51% of Tet). Since then, the Telia Group (which holds 49% of Tet) changed its global governance and merged its fixed and mobile affiliates in Estonia, which could affect future merger discussions in Latvia (European Commission, 2019; Telecompaper, 2019).

Figure 3.19 Customers subscribing to bundled services in Latvia, 2018



Note: Double play can be voice + Internet, TV + Internet or voice + TV; triple play is voice + Internet + TV.

Source: OECD, based on data from SPRK.

SPRK has not defined a relevant market for bundled services. However, the impact of bundling practices on competition dynamics is perceived as positive, since infrastructure-based competition exists in Latvia and alternative operators are able to replicate the offers of the incumbent Tet.

Mobile operators are competing with the fixed incumbent through fixed-wireless offers by offering TV and Internet services using dedicated 4G routers at home. However, a study by SPRK concluded that mobile broadband cannot yet be considered a full substitute for fixed broadband in Latvia (European Commission, 2019). Nevertheless, unlimited mobile broadband services, including dedicated broadband services using 4G routers at home, may become a partial substitute in the future once mobile networks are further upgraded. Meanwhile, a convergence between fixed and mobile networks can be observed at the core of the networks through the deployment of fibre deeper into fixed, but increasingly also mobile networks, to meet the increasing demands of the digital transformation. For example, in 2017 about 54% of mobile cellular traffic around the world was offloaded to fixed networks through Wi-Fi or small, low-power cellular base stations (CISCO, 2018). In a way, wireless networks become extensions of fixed networks, and as the demand for mobile data traffic increases, wireless networks rely increasingly on fixed broadband infrastructure. This trend will continue and deepen with 5G networks.

In terms of provision of audio-visual services over IP networks, there are several IPTV offers in Latvia. IPTV providers have been authorised as communication providers and follow the same rules as operators who provide traditional pay TV or any other communication service (OECD, 2019b).

Another category for the provision of audio-visual content over IP networks is over-the-top (OTT) services, which may be provided by online companies or communication providers (e.g. Shortcut OTT provided by Tet). Currently, OTTs do not require an authorisation from the SPRK and do not need to meet quality of service (QoS) obligations. However, discussions are underway regarding treatment of this category in the context of the transposition of the new regulatory framework.

Interestingly, the Latvian telecommunication sector has also seen convergence trends with other utilities and services sectors. In 2017, following the liberalisation of electricity sector, the communication incumbent Tet entered the electricity market as a reseller, offering bundles with communication services. Tet also sells phones, TV sets, computers, drones and other equipment; offers smart home solutions; and provides data centres, cloud services, entertainment, different IT services, as well as different marketing tools. The incumbent also offers e-learning solutions for senior adults.

Finally, the mobile operator Bite also provides travel insurance, insurance for the screens of tablets and phones, and antivirus protection. LMT, in collaboration with Riga Technical University, is developing artificial intelligence (AI) solutions to provide rescue solutions with the help of drones in the event of forest fires and missing people.

Regulatory and policy developments in Latvia

Institutional framework and design

There are several authorities involved in communication markets in Latvia, some of which have regulatory functions, while others are responsible for policy formulation (e.g. broadband development policies).

The authority responsible for developing broadband policies is the Ministry of Transport (Satiksmes Ministrija). Among other responsibilities, the Ministry of Environmental Protection and Regional Development (Vides Aizsardzības un Reģionālās Attīstības Ministrija, VARAM) is responsible for the development of national frequency and numbering plans. The Public Utilities Commission (Sabiedrisko Pakalpojumu Regulēšanas Komisija, SPRK) is responsible for the regulation and supervision of the communication sector, and the National Electronic Mass Media Council (Nacionālā Elektronisko Plašsaziņas Līdzekļu Padome, NEPLP) is responsible for the regulation and supervision of the audio-visual sector. The Competition Council (Konkurences Padome) functions as the competition authority for all sectors.

Ministry of Transport

The MoT is responsible for implementing public policy in the fields of transport and communication. The Ministry has a broad mandate; however, only a limited number of staff are responsible for dealing with communication issues. The MoT co-operates with SPRK on issues related to broadband policy planning, recent developments and trends in the sector, frequency planning and the transposition of the European Union Directives into national legislation.

Ministry of Environment Protection and Regional Development

In addition to its digital government and strategy role, the Ministry of Environment Protection and Regional Development (VARAM) is responsible for the policy-level development of national frequency and numbering plans. The technical aspect of spectrum and numbering management, however, has been delegated to the Electronic Communications Office of Latvia (ECO) (VAS Elektroniskie Sakari, VASES), which is 100% state-owned. ECO was established under the MoT in 2004 and re-structured under VARAM in 2011, following a recommendation of the European Commission that considered the presence of LVRTC, the state-owned operator, and the technical role of spectrum management under the same ministry, to be problematic.

Two permanent working groups on frequencies and numbering issues exist to provide inter-institutional co-ordination. ECO is responsible for carrying out surveys with operators and consulting with other institutions, in co-ordination with VARAM and SPRK. ECO is also responsible for co-ordinating the

allocation of frequencies in accordance with international treaties, in co-operation with SPRK. ECO collects the fees for spectrum usage (following the Directive from the European Commission 2002/20) and uses the revenues to fund its operating costs, which include monitoring harmful interference.

Public Utilities Commission

The Public Utilities Commission (SPRK) is an independent multi-sectoral regulatory authority established in 2001, with regulatory responsibilities for the following sectors: communication services, energy, postal services, waste disposal and water management. The Law on Regulators of Public Utilities is the primary legislation governing its functions. Its aim is to ensure "the possibility of receiving continuous, safe and qualitative public utilities whose tariffs conform to economically substantiated costs, as well as to promote development and economically substantiated competition in regulated sectors" (SPRK, 2019). According to an OECD (2016) peer review of SPRK, the current multi-sector setup of SPRK is a distinguishing feature that allows the regulatory process – related specifically to tariffs, setting methodologies and registration of utilities – to be applied across the regulated sectors.

The *Regulations Regarding Types of Regulated Public Utilities* (Republic of Latvia, 2009) state that the distribution services of radio or television programmes in public communication networks shall be regulated and that, according to national legislation, SPRK is the responsible entity. SPRK, thus, is responsible for broadcasting related to signal transmission and broadcasting networks, but not the content or operations of mass media. The National Electronic Mass Media Council (NEPLP) supervises the compliance of operations of the electronic mass media. The role of both authorities does not overlap.

As mentioned above, the mandate of VARAM involves managing frequency and numbering planning, which is carried out through ECO in co-operation with SPRK.

National Electronic Mass Media Council

The NEPLP is an independent, autonomous institution that supervises the regulatory compliance of mass media operations in Latvia. The Council is responsible for issuing broadcasting and retransmission permits, authorising pay TV service providers and monitoring developments in the audio-visual sector in Latvia.

Policy and regulatory initiatives to enhance access

This section discusses policy and regulatory initiatives such as those aiming to reduce deployment costs, streamline administrative procedures and enhance access to resources by operators. It also assesses programmes to foster access and use of communication services and expand high-speed fixed broadband infrastructure in rural and remote areas.

Expanding access

In Latvia, the main programme for expanding access in rural and remote areas is the state aid programme "Next Generation Network for Rural Areas" (2012-2020), co-financed by the European Regional Development Fund (ERDF). The programme was established to improve the availability of communication networks in rural areas, by ensuring the deployment of middle-mile backbone infrastructure in areas where no service provider had infrastructure or had no plans to deploy fast broadband of at least 30 Mbps within the following three years. Within the framework of the rural broadband programme, the Latvia State Radio and Television Centre (Latvijas Valsts Radio un Televīzijas Centrs, LVRTC), the state-owned operator, is responsible for building an open access middle-mile infrastructure in identified "white areas", to which retail providers have wholesale access. The total funding made available for the rural broadband programme was EUR 72.7 million.

During the planning stage of the programme, an analysis requested by MoT was carried out in 2011 to evaluate stakeholder satisfaction regarding broadband speeds within municipalities in areas with low population density, and expectations of demand growth for broadband networks and services. On the basis of this analysis, a draft list of white areas was published and put forth for public consultation before approval by the Optical Network Monitoring Committee.

Project implementation was divided into two stages. The first stage, completed in August 2015, aimed to deploy 177 access points and 1 813 km of fibre, while enabling operators to connect to the network at any location along the route. LVRTC achieved all the objectives of the first phase.

Another analysis was conducted in 2014 to update the list of areas due to benefit from the rural broadband programme and to determine which areas most interested service providers. The findings identified a further 221 white areas in Latvia. The second stage, starting in 2015 and due to be finished by December 2021, was therefore designed with the objective of deploying a further 220 access points and 2 000 km of fibre. LVRTC signed contracts amounting to EUR 40.7 million for the deployment of a total of 1 950.6 km of the planned 2 000 km.

As of January 2019, 1 234 km of fibre and middle-mile service were available in 73 out of 220 access points in white areas. However, the interest of service providers, including mobile network operators, has been lower than initially expected. As of January 2019, LVRTC had signed leases for 78 rented sections with a total length of 1 648.3 km of fibre. Currently, the network is used by only 12 operators and the largest client is the fixed incumbent Tet. Out of the total fibre deployed in rural areas, around 930 km are leased to Tet, which provides fixed broadband services to end users.

Overall, the rural broadband project represents a positive step towards closing the digital divide in Latvia. A key challenge, however, is the dependence on last-mile infrastructure set up by operators. In order to fully benefit from the programme, the next phase should focus on ways to better provide last-mile connectivity. Approaches could include supply-side measures, including an analysis to identify ways to further reduce deployment costs and streamline administrative procedures for last-mile deployment, and demand-side measures aiming at driving broadband demand by individuals and businesses (in particular small and medium enterprises), as well as educational institutions, as currently planned through a partnership between the MoT and the Ministry of Education (Box 3.1).

Box 3.1. Broadband for schools in Latvia

The Ministry of Transport (MoT) plans to attract additional resources (2020-23) for broadband deployment and expansion of access points in educational institutions, in order to respond to the growing demand for connectivity in schools, assist with implementation of the new curriculum by the Ministry of Education and enable distance learning.

A survey conducted by the Latvian Municipal Union found that broadband infrastructure from the "Next Generation Network for Rural Areas" programme was available in the vicinity of around 70 educational institutions. Following these results, LVRTC conducted an initial assessment and found that, under the current rural programme, middle-mile connectivity could be deployed to 17 education institutions located in white areas. The amendment to the project was then expanded to accommodate 21 access points in educational institutions. However, even when approved, the project will not cover all educational institutions in the country. In April 2020, the MoT launched a procurement process to identify the actual needs of remaining educational institutions.

In addition to the rural broadband programme, Latvia has also put in place a universal service obligation (USO) which provides discounts for voice telephony and broadband services to people with disabilities. As of 2018, 3 790 users benefited from the USO reductions. Potential revisions of this obligation will be discussed in the context of the revision of Latvia's Electronic Communications Law, intended to transpose the provisions of the European Electronic Communications Code. The scope of the USO may change starting in 2022 and could include a minimum QoS level for broadband access to support applications requiring higher speeds. However, further efforts could be undertaken to reduce deployment costs for operators. In addition, supply-side measures could be complemented by demand-side measures.

Competition

SPRK co-operates closely with the Competition Council, with both bodies sharing information required to perform their tasks. SPRK gives the Competition Council the opportunity to comment on all draft market analyses (e.g. in the context of termination, local loop unbundling bitstream access, leased lines and others) based on the EU regulatory framework prior to its adoption. None of SPRK's decisions were appealed in 2018.

In Latvia, barriers to competition have historically been related to barriers to entry and network expansion, and are used by SPRK as relevant criteria to measure the market power of operators in Latvia. Barriers can differ in different markets (e.g. voice, broadband, leased lines, termination markets etc.).

Following liberalisation, barriers to entry, expansion and competition were very high, especially regarding network deployment. Over the years, competition and innovative solutions, as well as the capacity to adapt to the rapidly changing communication market, has enabled mobile and fixed operators to overcome some of those barriers, and deploy and maintain high-quality networks. The principle of technological neutrality applied by SPRK and the creation of proportionate circumstances for operators have been crucial to promoting competition.

The market entry of Bite in 2005 increased competition in the mobile voice market. Regulations in the areas of termination rates and portability further contributed to increased competition and, in turn, to enhanced quality of service and lower prices for consumers.

In 2018, SPRK conducted a market analysis and found that mobile voice could be considered a substitute for fixed voice. Given the assessment that competition in the voice market was effective, retail and wholesale voice markets were deregulated (with the exception of termination rates). As of mid-2019, only 3.5% of all voice traffic relates to fixed voice. Termination rates continue to be regulated in Latvia, given the characteristics of the wholesale voice call termination markets, which led to the conclusion that barriers to entry remain high in this market segment.

An issue raised by some industry players in the context of voice telephony, however, relates to the offers of certain operators that include unlimited calls to only a number of networks. One example is Bite's consumer offer. The offer for some tariff plans includes unlimited calls to Bite, LMT, Tele2 and Tet networks, but not to smaller fixed networks. Following SPRK decision No. 1/19 of January 2018 ("Regulations on notification of end users about premium rate calls"), customers receive a verbal notification whenever calls go to numbers not from the above-mentioned four largest communication providers in Latvia (three mobile providers and the incumbent Tet for fixed services). The issue may warrant detailed analysis by Latvian entities with respect to potential competition effects on certain networks in the country.

In terms of broadband services, SPRK found that mobile broadband services cannot yet be considered as full substitutes for fixed broadband services in Latvia, while recognising that fixed broadband operators face competition to some extent from mobile operators. It has been determined that the incumbent Tet has had significant market power (SMP) in the wholesale broadband access markets since 2007. Although barriers to entry are considered to be high, some alternative operators have deployed their own infrastructures in more densely populated areas in Latvia. Having analysed the competitive conditions against a set of criteria, SPRK concluded that the market cannot yet be considered effectively competitive and that regulation is still warranted.

The wholesale high-quality market, comprising leased lines, virtual private networks and high-quality broadband with guaranteed bandwidth used by business customers, itself is comparatively small in Latvia. Moreover, the number of leased lines and revenues has decreased significantly over the years. SPRK identified a trend reflecting migration from leased lines and VPNs (implemented and managed by network operators) to Internet connection with usage of cloud services or self-deployed software-based VPNs. Existing competition conditions, where not only Tet is present but also alternative operators, and the changing dynamics of the market, suggested the presence of effective competition and indicated that regulation was no longer necessary. Accordingly, SPRK deregulated the wholesale high-quality market in December 2019.

Wholesale regulation and infrastructure sharing

Termination rates are regulated in Latvia. Reductions in wholesale termination rates have resulted in positive implications for end-user prices as well as greater availability of number portability. Historically, termination rates have been considered too high in Latvia and a hindrance to new entrants. In order to avoid abuse, the list of SMP operators in Latvia is frequently updated and both Fixed Termination Rates (FTRs) and Mobile Termination Rates (MTRs) have been regulated (the maximum FTR was set at EUR 0.000701/minute and the maximum MTR at EUR 0.008868/minute in January 2018) (European Commission, 2019).

In Latvia, the most significant development in terms of wholesale regulation has been asymmetrical, applied to the ducts and poles of the incumbent Tet (designated as having SMP in several markets), and mandated in 2014 by SPRK. Historically, Tet has been regulated with respect to retail voice, leased lines, wholesale voice origination, transit, wholesale broadband access and wholesale leased lines. The majority of these markets have been gradually deregulated. Tet is currently regulated only in the context of unbundling and bitstream access including access to ducts and poles. Moreover, wholesale terminating segments of leased lines are soon to be deregulated.

While these SMP remedies do not include access to cables, SPRK has adopted other remedies such as local loop unbundling and wholesale bitstream access, so that other operators with limited coverage can use the network of Tet and compete at the retail level. Furthermore, Tet is subject to rules including non-discrimination, transparency, price control, cost accounting and accounting separation (European Commission, 2019).

In urban areas of Latvia, such as Riga, competition continues to be infrastructure-based, through the deployment of aerial cables from roof to roof (European Commission, 2019). However, this typically does not comply with regulations requiring the underground installation of cables to offer a safe, protected and hidden environment for communication networks. Urban guidelines and regulations of municipalities around the country, such as those in Riga, prohibit over-head cables in historical areas. Moreover, even though local loop and bitstream access have not been found to be widely used (since operators in densely populated areas compete with their own infrastructures), the SMP remedies lower barriers to expanding broadband service offers mainly at the retail level and, where feasible, promote service-based competition.

In 2017, the European Commission's Broadband Cost Reduction Directive (BCRD) was fully transposed on to national legislation. The Law on High-Speed Electronic Communications foresees mandatory provision of access to physical infrastructure (e.g. pipe, mast, duct, inspection chamber, manhole, cabinet, building or entry to a building, antenna installation, tower and pole) to operators authorised to provide communication services, as well as other utility providers (e.g. gas, electricity, heating, transport and sewage services). Such access should be provided under fair and reasonable terms and conditions, including the price, in order to deploy high-speed networks. SPRK is the Dispute Settlement Body (DSB) designated by the Directive.

While there is no mapping obligation, in order to improve co-ordination and bridge information gaps, communication operators can access a data portal for a fixed fee, through the Single Information Point of Latvia (*www.latvija.lv*). This portal includes existing information collected by the government on the physical infrastructure of any network operator (i.e. location, route, type, current use of the infrastructure and contact point). In the event of any missing information, access seekers can request data from the infrastructure owners or through a visit to the physical infrastructure. The 2017 law also foresees the co-ordination of civil works, mandating that communication providers and other infrastructure providers must co-ordinate to effectively deploy high-speed networks.

In order to avoid two-layer regulation, during the process of transposition of the BCRD, the provisions in the 2017 law were linked to provisions under the Electronic Communications Law of 2014, which regulates symmetrical access. Six operators (including Tet) currently provide access to their duct system to other operators. However, operators potentially interested in accessing the infrastructure of the incumbent claim that, in reality, they are refused access on the basis of insufficient capacity, due to the future capacity needs of the incumbent. Operators are also required to pay a fee each time they request an assessment of available capacity. Poles in rural areas, in particular, have not been used for these and other reasons, despite the evident interest in infrastructure sharing.

With regard to other utilities, companies providing energy (Latvenergo), railway (Latvijas Dzelzceļš), water, sewerage and gas services also have communication needs and have been installing fibre and upgrading their infrastructure (i.e. to support control systems, smart metering, signalling, rail track, safety management, etc.).

Some existing fibre installation projects using the infrastructures of other utilities in Latvia were negotiated based on mutual interest before the transposition of the BCRD. These include a collaboration between Latvenergo and Tet, established in 1994, which covers underground fibre cable installation and optical fibre ground wire (OPGW) cable technology in high-voltage aerial power lines. Due to safety standards, high-voltage aerial power lines must have lightning protection wire (i.e. shield wires) installed above power lines (mostly 110 kV), which were historically made of steel. These have been gradually replaced by OPGW cables, which provide grounding and communication capabilities, in addition to being more resistant (being surrounded by layers of steel and aluminium wire). Latvenergo and Tet have jointly deployed 1 847 km of OPGW cables and underground fibre under an arrangement where some fibre strands are allocated to Latvenergo and some to the core network of Tet.

In order to reduce deployment costs (including those concerning rights of way), a number of operators have capitalised on opportunities to deploy fibre networks along roads and railways. In 2019, seven operators in Latvia used the infrastructure along roads, and four operators used the infrastructure of Latvijas Dzelzceļš to install fibre along railways or used towers for mobile operators to install base stations. Operators in Latvia also make use of shared access to towers and masts. All mobile network operators provide access to their masts and five fixed operators provide access to their masts and towers.

Although infrastructure-sharing cases for the deployment of backhaul exist, infrastructure sharing in Latvia is still limited, particularly concerning the use of infrastructure of other utilities. Following the guidance of the BCRD, the 2017 Law on High-Speed Electronic Communications Network mandates that "upon receipt of a permit to build a new or re-build an existing residential house or non-residential building, the initiator of the construction shall ensure that the internal physical infrastructure is suitable for the high-speed electronic communications network" (Republic of Latvia, 2017). However, the law also provides some exceptions, notably, if there is already suitable infrastructure, if there are objective reasons for the failure of ensuring suitable infrastructure or if the intended use of the building does not require the use of high-speed networks.

However, certain existing multi-dwelling buildings in Latvia (under a specific form of ownership rare in other European countries, where each owner of the flat has partial ownership of shared premises of the building such as a stairway, basement, etc.) were excluded from this obligation in the 2017 law, on the basis that such an obligation would breach constitutional property rights. The extent to which these residencies constitute a substantial proportion of the buildings without suitable infrastructure for high-speed broadband remains to be assessed.

The measures foreseen in the BCRD fall under the purview of the MoT. Exceptions concern the Dispute Settlement Body (DSB), the functions of which are fulfilled by SPRK. No disputes have occurred in relation to application of the Directive.

Consumer protection

SPRK co-operates with the Authority for Consumer Rights Protection (PTAC) in order to protect consumer rights in the regulated sectors. SPRK's responsibilities concern terms of contracts, tariffs and QoS for communication services. PTAC's mandate relates to the application of contract rules. Up to November 2018, SPRK had received and replied to 45 consumer complaints regarding QoS (16%), tariffs (16%), bills (18%), terms of contracts (24%) and other (27%) non-competency cases. PTAC received 93 individual complaints on communications providers (European Commission, 2019).

SPRK supervises the compliance of operators regarding specific quality requirements and publishes the results of mobile broadband quality measurements. It performs two types of Internet quality measurements – serial measurements and sample measurements. Serial measurements are performed in specific locations over a full 24-hour day for at least one week. They provide an overview of mobile Internet performance during the day and show changes in Internet speed at different times. Sample

measurements are performed in different geographical locations throughout Latvia and give an overview of actual mobile Internet quality indicators. This tool has been especially useful for consumers to compare the quality of mobile broadband services of all mobile operators in different geographical areas. Moreover, an independent tariff comparison tool has been available online for several years (*www.gudriem.lv*).

In relation to advertisement practices of fixed broadband services in Latvia, the maximum (advertised) speed must be the average speed that the end user receives constantly during the day (except for peak hours), and the minimum guaranteed speed must be at least 20% of the maximum speed or the upper limit of a maximum speed range indicated in a contract. For mobile services, the minimum guaranteed speed must be at least the lower limit of a broadband connection speed (i.e. 256 kbit/s). SPRK also mandates that ISPs include maximum speeds within contracts.

SPRK quality measurements performed by SPRK are a useful tool to promote competition and encourage upgrades of mobile networks, since the results are publicly available. They also allow operators to monitor the performance of their networks. In Latvia, the number of consumer complaints regarding QoS are low, amounting to 7 out of 45 consumer complaints, as of November 2018. However, no specific consumer satisfaction survey on QoS has been conducted to date (European Commission, 2019).

Network neutrality

In Latvia, network neutrality rules are being implemented in accordance with European Union Regulation 2015/2120. In order to monitor compliance, SPRK requests information from ISPs, analyses end-user complaints, performs technical measurements (constantly for mobile networks and only in the event of complaints in fixed networks) and checks information on ISP webpages.

Regarding network neutrality issues, no breach of European Union regulation has been identified (European Commission, 2019). The main areas of SPRK with respect to network neutrality are: transparency (contract information), Internet speeds, monitoring mechanisms (to test non-conformity of performance) and traffic management (including port-blocking).

SPRK reported that in 2018, 19% of ISPs had been carrying out traffic management measures (i.e. to prevent malware, malicious applications and spam) (European Commission, 2019). One mobile operator (Bite) provides zero-rated offers. Applications such as social media, voice, short message service and geographical navigation service applications are zero-rated. Due to the lack of complaints regarding zero-rating practices, as well as the broad availability of subscriptions with unlimited Internet and competitive prices among all Latvian mobile operators, SPRK did not consider the zero-rated offers provided by Bite to be harmful. Moreover, as Bite is the smallest mobile operator in Latvia, its zero-rated offer is considered as an attempt to attract new customers and a tool to foster competition.

Policy recommendations

Overall, Latvia is performing well regarding the deployment of both fixed and mobile broadband high-speed networks. Nonetheless, a few weaknesses persist in the policy design and regulatory framework which may hinder efforts to bridge the digital divide, the efficient allocation of spectrum for wireless services, adoption of the IoT, the deployment of IPv6, attempts to foster convergence and preparation for emerging technologies (e.g. 5G).

- **Institutions**. Latvia would benefit from a holistic policy and regulatory approach towards connectivity. Consideration could be given to the creation of a converged regulator dealing with communication, broadcasting and media services. Currently, functions are divided between SPRK and the NEPLP. Developments in convergence over IP networks and potential convergence between fixed and mobile networks have and will increasingly effect market structures. A converged regulatory structure would enable those changes to be more efficiently addressed taking into account overarching challenges and trends. At the ministerial level, while roles are currently shared between the MoT and VARAM, the institutional design could benefit from the establishment of one clear focal point. Finally, limitations on hiring public sector staff, including experts with communication expertise, can hinder policy making and the acquisition of technical knowledge within institutions.
- **Civil works and rights of way**. The territory planning of municipalities could be improved by promoting dig-once policies, permitting new towers, planning new routes for fibre and grounding cables,

harmonising procedures (e.g. registration of network sites) and simplifying administrative processes for network deployment. Municipalities could also co-ordinate among each other and with the MoT to promote platforms where service providers can consult available sites to deploy base stations (e.g. rooftops of government buildings). Bottlenecks in fixed and mobile network deployment at the level of municipalities will become more pronounced with network densification as a result of 5G deployment. In addition, access to infrastructure will be crucial to install the large number of antennas required for 5G.

- **Infrastructure access and sharing**. Efforts should be made to reduce information asymmetries concerning available infrastructure and monitor potentially discriminatory practices concerning access to passive infrastructure, particularly by companies with significant market power.
- **Competition**. Despite positive developments in the mobile market, competition concerns still exist in the fixed broadband market in Latvia, with one company having a 56% market share. Monitoring of this situation should continue and should include implementation of infrastructure-sharing obligations.
- **Last-mile access**. Bridging the connectivity gap in isolated, less economically attractive areas will be the main infrastructure challenge going forward. The next phase of the rural broadband programme in Latvia should focus on last-mile solutions to close connectivity gaps. Measures could focus on further reducing deployment costs and streamlining administrative procedures, as well as fostering demand-side measures to drive demand by individuals, businesses (in particular, small and medium enterprises) and educational institutions.
- **Spectrum**. While Latvia is well advanced in terms of frequency allocation, there is currently no secondary market for spectrum. Updating the regulatory framework to allow such markets would enable more efficient use of spectrum.
- **IoT**. The IoT holds promise to increase innovation and efficiency in multiple sectors, such as energy or industry automation. However, Latvia is lagging behind in M2M and IoT take-up. While a new numbering plan is being considered respond to the needs of M2M and IoT, no broader plan exists to identify challenges and foster these services. Operators have also expressed concerns regarding the lack of demand from businesses and consumers for these services. Latvia should establish a broader IoT plan to identify existing challenges and foster a broader IoT ecosystem and adoption of IoT services in the country.
- **IPv6**. Latvia is lagging behind regarding adoption of IPv6. IPv6 is not only important because of the scalability of future Internet developments, but also crucial from a security perspective as IPv6 may be more conducive to end-to-end encryption. The latter factor may be favourable to the security of industrial IoT applications, among others. While Latvia has put in places measures to increase IPv6 adoption in the public sector, the implementation of a thorough IPv6 strategy is recommended, in order to foster ample deployment. This should be performed in co-ordination with civil society, the private sector and technical stakeholders, as was done in Sweden.
- **IXP**. Some of Latvia's Internet exchange points have only a limited number of participants. The design of the Latvian Internet exchange point LIX, in particular, hinders its potential for further growth, due to traffic limitation to Latvian prefixes. The regulator or ministry (either VARAM or MoT) should work with existing IXPs and networks in the country to improve the management and performance of IXPs based on international good practices, in order to increase the amount of traffic exchanged locally. An analysis of the state of traffic exchange in the country and the performance of existing IXPs could serve as a starting point for such an undertaking.

Box 3.2. Policy recommendations

To ensure that Latvia is prepared for forthcoming developments in communication technologies and markets, the government should:

- evaluate the benefits of creating a converged regulator for both communication and broadcasting services, particularly in relation to increasing convergence of services over IP networks
- establish a clear ministerial focal point for communication services, as competencies are currently dispersed between the Ministry of Transport (MoT) and the Ministry of Transport and the Ministry of Environmental Protection and Regional Development (VARAM)

Box 3.2. Policy recommendations *(cont.)*

- improve territorial planning in municipalities by promoting dig-once policies, granting permission for new towers, and planning new routes for fibre and cables, as well as harmonising and simplifying administrative procedures for network deployment
- increase co-ordination among municipalities and the MoT to overcome bottlenecks on fixed and mobile network deployment, and to prepare for network densification required by 5G
- reduce information asymmetries regarding available infrastructure and closely monitor the situation for potentially discriminatory practices regarding access to passive infrastructure
- monitor the state of competition in the fixed broadband market and implement infrastructure-sharing obligations as appropriate
- engage local stakeholders in the rural broadband programme on last-mile solutions and foster demand through targeted initiatives
- update the regulatory framework to allow for a secondary spectrum market to promote more efficient use
- develop and implement a national IoT plan to identify challenges and foster demand from businesses and consumers
- develop and implement a comprehensive IPv6 strategy in co-ordination with civil society, the private sector and technical stakeholders
- carry out an analysis of the state of traffic exchange and promote the deployment of neutral IXPs, based on good international practices, in order to improve traffic exchange and foster a well-functioning Internet ecosystem.

References

5G Techritory (2019), *5G Techritory*, *www.5gtechritory.com/story* (accessed on 9 November 2019).

Akamai (2020), "IPv6 adoption visualization", *www.akamai.com/uk/en/our-thinking/state-of-the-internet-report/state-of-the-internet-ipv6-adoption-visualization.jsp* (accessed in June 2020).

APNIC (2020), "IPv6 measurement maps", *http://stats.labs.apnic.net/ipv6* (accessed in June 2020).

CISCO (2018), *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017–2022 White Paper*, Cisco Systems, San Jose, CA, *www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-738429.html* (accessed on 20 September 2019).

CRCT (2019), *Communications Monitoring Report 2019*, Canadian Radio-television and Telecommunications Commission, Ottawa, *https://crtc.gc.ca/eng/publications/reports/policymonitoring/2019/index.htm*.

European Commission (2019), *DESI Report 2019 – Telecommunication Chapter of Latvia*, European Commission, Brussels, *https://ec.europa.eu/digital-single-market/en/news/2019-desi-report-electronic-communications-markets-overview-member-state-telecom-chapters*.

European Commission (2018a), *Study on Broadband Coverage in Europe 2018*, Brussels, *https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=62760*.

European Commission (2018b), *DESI Report 2018 – Telecommunication Chapter of Latvia*, Brussels, *https://ec.europa.eu/digital-single-market/en/scoreboard/latvia*.

European Commission (2016), *Connectivity for a Competitive Digital Single Market – Towards a European Gigabit*, Brussels, *https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=17182*.

European Commission (2010), *Digital Agenda for Europe*, Brussels, *https://ec.europa.eu/digital-single-market/en/digital-agenda-europe-key-publications*.

FCC (2019), *2019 Broadband Deployment Report*, Washington, DC, *www.fcc.gov/reports-research/reports/broadband-progress-reports/2019-broadband-deployment-report*.

Google (2020), "Per-country IPv6 adoption", *www.google.com/intl/en/ipv6* (accessed in June 2020).

M-Lab (2019), "Worldwide broadband speed league", *www.cable.co.uk/broadband/speed/worldwide-speed-league* (accessed on 9 May 2020).

OECD (2020a), *OECD Telecommunications and Internet Statistics* (database), *https://doi.org/10.1787/data-00170-en* (accessed on 9 July 2020).

OECD (2020b), *OECD Broadband Portal* (database), *www.oecd.org/sti/broadband/oecdbroadbandportal.htm* (accessed on 6 May 2020).

OECD (2019a), *Measuring the Digital Transformation: A Roadmap for the Future*, OECD Publishing, Paris, *https://dx.doi.org/10.1787/9789264311992-en*.

OECD (2019b), "The road to 5G networks: Experience to date and future developments", *OECD Digital Economy Papers*, No. 284, OECD Publishing, Paris, *https://dx.doi.org/10.1787/2f880843-en*.

OECD (2018a), "Bridging the rural digital divide", *OECD Digital Economy Papers*, No. 265, OECD Publishing, Paris, *https://dx.doi.org/10.1787/852bd3b9-en*.

OECD (2018b), *OECD Reviews of Digital Transformation: Going Digital in Sweden*, OECD Publishing, Paris, *https://dx.doi.org/10.1787/9789264302259-en*.

OECD (2016), "Driving performance at Latvia's Public Utilities Commission", *The Governance of Regulators*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264257962-en*.

OECD (2014), "The Internet in transition: The state of the transition to IPv6 in today's Internet and measures to support the continued use of IPv4", *OECD Digital Economy Papers*, No. 234, OECD Publishing, Paris, *https://dx.doi.org/10.1787/5jz5sq5d7cq2-en*.

Ookla (2019), "Speedtest", *www.speedtest.net/global-index* (accessed on 9 May 2020).

Republic of Latvia (2017), *Law on High-speed Electronic Communications Network*, Likumi, Riga, *https://likumi.lv/ta/en/en/id/289933-law-on-high-speed-electronic-communications-network*.

Republic of Latvia (2009), *Regulations Regarding Types of Regulated Public Utilities of 27 October 2009*, Riga, *www.vvc.gov.lv/export/sites/default/docs/LRTA/MK_Noteikumi/Cab._Reg._No._1227_-_Regarding_Types_of_Regulated_Public_Utilities.doc*.

SPRK (2019), *Mission, Objective and Functions*, Public Utilities Commission, Riga, *www.sprk.gov.lv/en/content/mission-objective-and-functions* (accessed on 12 December 2019).

SPRK (2018a), *Elektronisko sakaru nozares: faktos un skaitlos 2018* [Electronic communications sectors: facts and figures 2018], Public Utilities Commission, Riga, *https://infogram.com/id-es_nozares_raditaji_2018-1hxj48qk0y154vg?live*.

SPRK (2018b), *Radiofrekvenču izsoles* [Radio frequency auctions], Public Utilities Commission, Riga, *www.sprk.gov.lv/content/radiofrekvencu-izsoles* (accessed on 6 May 2020).

Steam (2019), "Steam download stats", *https://store.steampowered.com/stats/content* (accessed on 9 May 2020).

Tele2 (2019), "Tele2 and Bite sign agreement to share networks in Latvia and Lithuania", *Tele2*, *www.tele2.com/media/press-releases/2019/tele2-and-bite-sign-agreement-to-share-networks-in-latvia-and-lithuania#:~:text=Tele2%20and%20Bite%20have%20today,the%20upcoming%205G%20roll%2Dout*.

Telecompaper (2019), "Telia to re-assess position in Latvia after cooperation with govt stalls", *Telecompaper*, *www.telecompaper.com/news/telia-to-re-assess-position-in-latvia-after-cooperation-with-govt-stalls--1309230*.

The Baltic Course (2018), *Baltics Keen to Test Self-Driving Cars on Via Baltica*, The Baltic Course, *www.baltic-course.com/eng/good_for_business/?doc=143975*.

Weller, D. and B. Woodcock (2013), "Internet traffic exchange: Market developments and policy challenges", *OECD Digital Economy Papers*, No. 207, OECD Publishing, Paris, *http://dx.doi.org/10.1787/5k918gpt130q-en*.

Notes

Israel

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

1. Available at: *https://docs.google.com/spreadsheets/d/18ztPX_ysWYqEhJlf2SKQQsTNRbkwoxPSfaC6ScEZAG8/edit#gid=0*.
2. The Network Solutions Department (NIC) of the Institute of Mathematics and Computer Science, University of Latvia is the top-level domain .lv registry.