Luxembourg

	Luxembourg				EU
	DESI 2017	DESI 2018	DESI 2019		DESI 2019
	value	value	value	rank	value
1a1 Fixed broadband coverage % households	**>99.5%** 2016	**>99.5%** 2017	**100%** 2018	***1***	**97%** 2018
1a2 Fixed broadband take-up % households	**96%** 2016	**94%** 2017	**88%**[1] 2018	***3***	**77%** 2018
1b1 4G coverage % households (average of operators)	**95%** 2016	**98%** 2017	**99%** 2018	***6***	**94%** 2018
1b2 Mobile broadband take-up Subscriptions per 100 people	**116** 2016	**123** 2017	**139** 2018	***4***	**96** 2018
1b3 5G readiness Assigned spectrum as a % of total harmonised 5G spectrum	**NA**	**NA**	**0%** 2018	***13***	**14%** 2018
1c1 Fast broadband (NGA) coverage % households	**94%** 2016	**95%** 2017	**98%** 2018	***4***	**83%** 2018
1c2 Fast broadband take-up % households	**47%** 2016	**52%** 2017	**62%** 2018	***4***	**41%** 2018
1d1 Ultrafast broadband coverage % households	**NA**	**87%** 2017	**92%** 2018	***5***	**60%** 2018
1d2 Ultrafast broadband take-up % households	**15%** 2016	**22%** 2017	**33%** 2018	***6***	**20%** 2017
1e1 Broadband price index Score (0 to 100)	**89** 2016	**89** 2017	**90** 2018	***7***	**87** 2017

1. Progress towards a gigabit society

Luxembourg will miss its national policy target of having everyone connected by the end of 2020 with coverage of 1 Gbps. Full coverage is not achievable by 2020 through the fixed network only, but 5G could further improve coverage. So far, the country has relied mainly on market-driven broadband rollout based on competition among operators. In the future, it is intended to address the digital divide by also using national and EU funding. Further details are still to be determined, but co-financing by the State of 5G pilots is planned. Using EU funding for 5G is also an option for the future.

In 2018, new fibre was rolled out to another 3 % of households not previously connected, thanks to infrastructure works by the incumbent operator POST. POST’s fibre network now covers 65 % of residential customers, and this figure is expected to increase to at least 75 % by 2023. POST’s fibre network already covers all business customers. Competitors increasingly use fibre unbundling, and uptake of fibre has progressed significantly. The largest cable operator, Eltrona, has upgraded its cable network to DOCSIS 3.1.

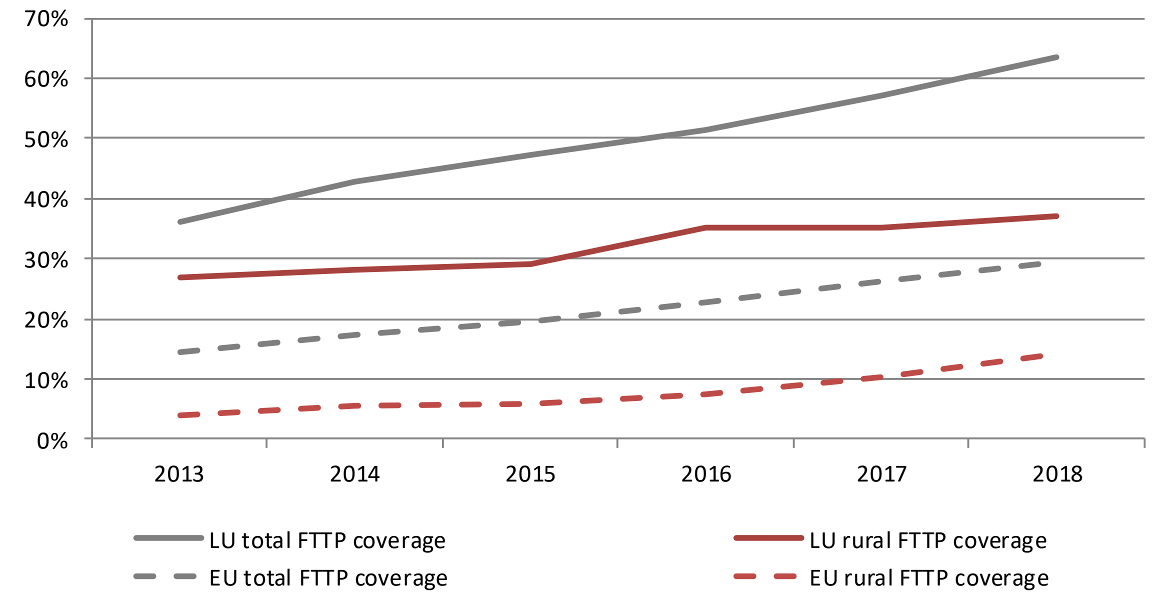
Luxembourg is one of the leaders in the ‘Connectivity’ dimension of the Digital Economy and Society Index (DESI) and has improved its score almost at the same pace as the EU average. Luxembourg is fully covered by broadband networks, including fixed, mobile and satellite networks. Next generation access (NGA) coverage is 98 %. As fibre rollout continues, fibre to the premises (FTTP) coverage has reached more than 63 %.

While the coverage of fixed broadband networks remains at 100 % of households (both total and rural), above the EU average (97 % total, 87 % rural), next generation access (NGA) fast broadband networks capable of providing at least 30 Mbps are available to 98 % of homes (total, 93 % rural). This is significantly above the EU average of 83 % total and 52 % rural. As fibre rollout continues,

[1] Break in series.

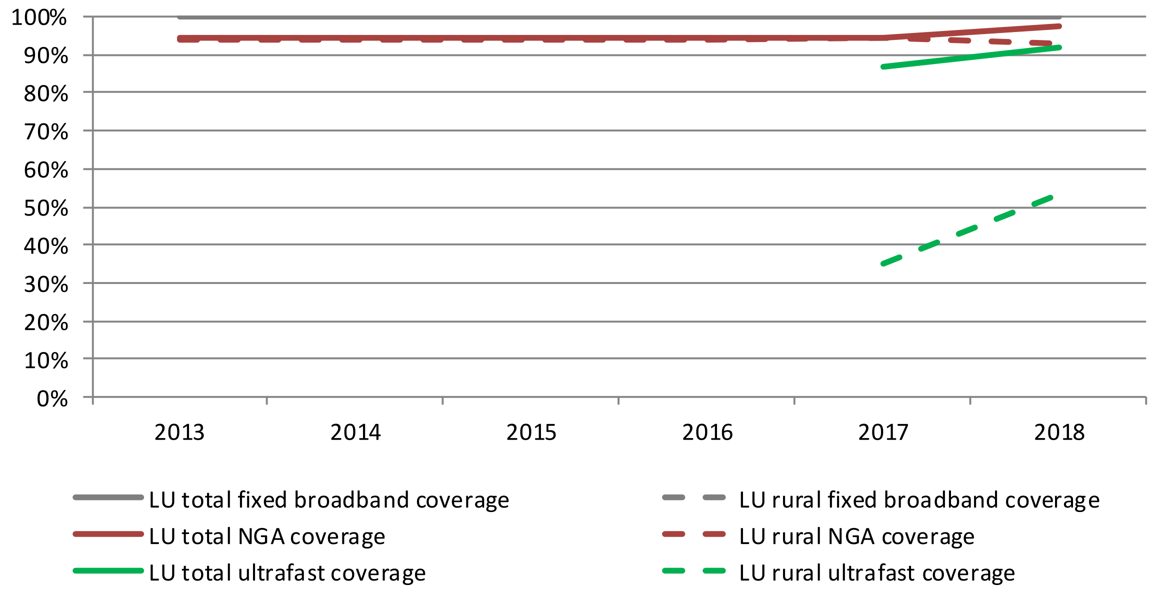
ultrafast coverage now stands at 92 % (total, rural 53 %). This is significantly above the EU average of 60 % total and 29 % rural. Residential customers increasingly buy products with download speeds of 100 Mbps or more.

Fibre-to-the-premises (FTTP) coverage, total and rural at Member State level (% of households), 2013-2018



Source: Commission services, Broadband coverage in Europe Study, commissioned to IHS and Point Topic. 2013-2014 data as of end of December; 2015-2018 data as of end of June.

Fixed, NGA and ultrafast coverage, total and rural at Member State level (% of households), 2013-2018



Source: Commission services, Broadband coverage in Europe Study, commissioned to IHS and Point Topic. 2013-2014 data as of end of December; 2015-2018 data as of end of June. Ultrafast coverage metrics are available for 2017 and 2018.

A trial with participants from Germany, Luxembourg and France is running for automated driving on the motorway from Merzig (DE) through LU to Metz (FR) using 5G technology. This includes support from the automotive industry (VW and PSA). POST provides the mobile infrastructure on the territory of Luxembourg. Luxembourg City is set to be a 5G-city; the inner city and the main business district on the Kirchberg plateau will be covered by the country's first 5G network. The process of identifying the applications and the verticals involved has started. Launch of commercial service is expected before end 2020.

Work on transposing the European Electronic Communications Code (EECC) started in February 2019. First consultations have already been initiated with operators and with the regulatory authority, the Institut Luxembourgeois de Régulation (ILR).

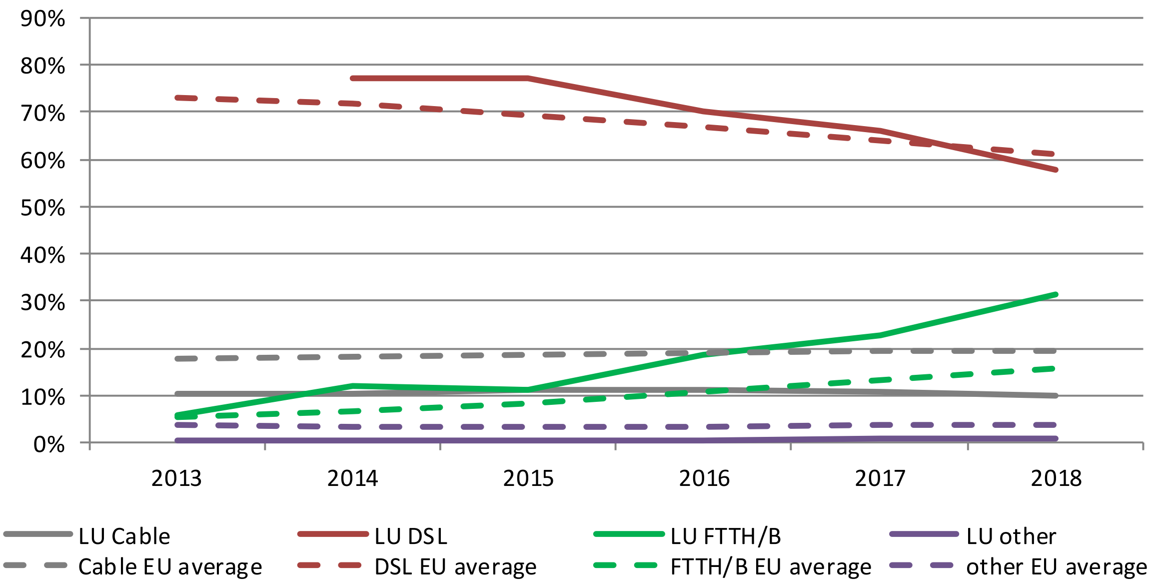
2. Market developments

Competitive environment

The MVNO JOIN Experience has closed down its operations in Belgium where customers had been transferred to Base. Offers with two numbers, a Belgian and a Luxembourgish one, are no longer maintained, and JOIN Wireless has given back its spectrum in the 2.6 GHz band in Luxembourg where also staff and operational equipment have been transferred to POST, which now has full control (100 % of shares).

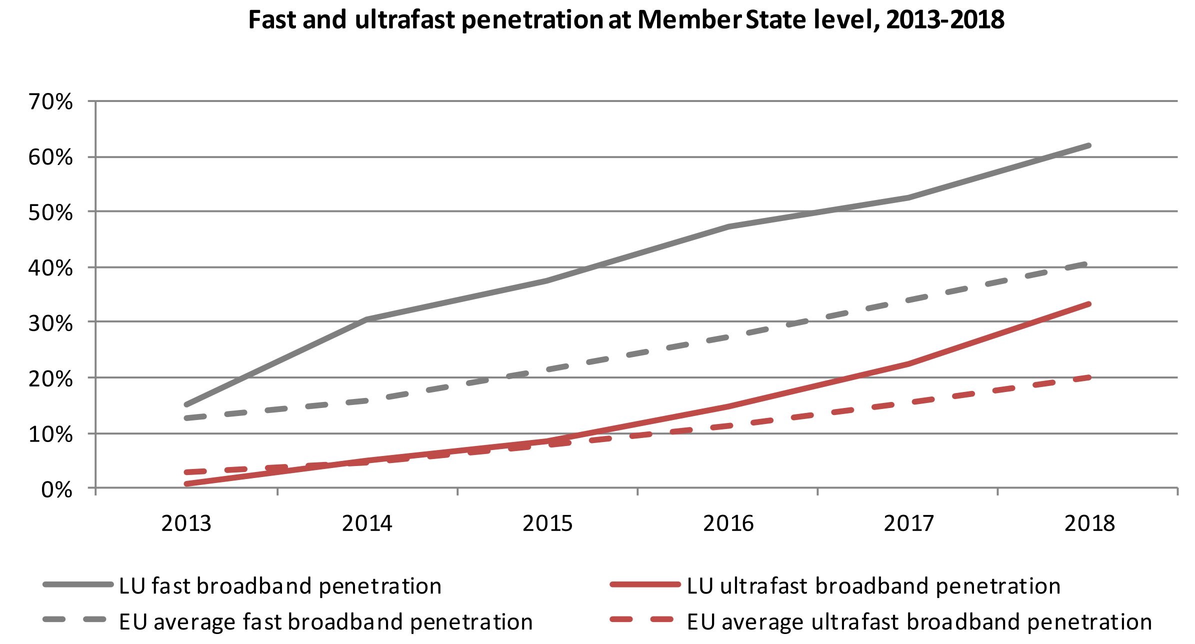
2.1. Fixed markets

Broadband market shares at Member State level by technology, % of fixed broadband lines, 2013-2018

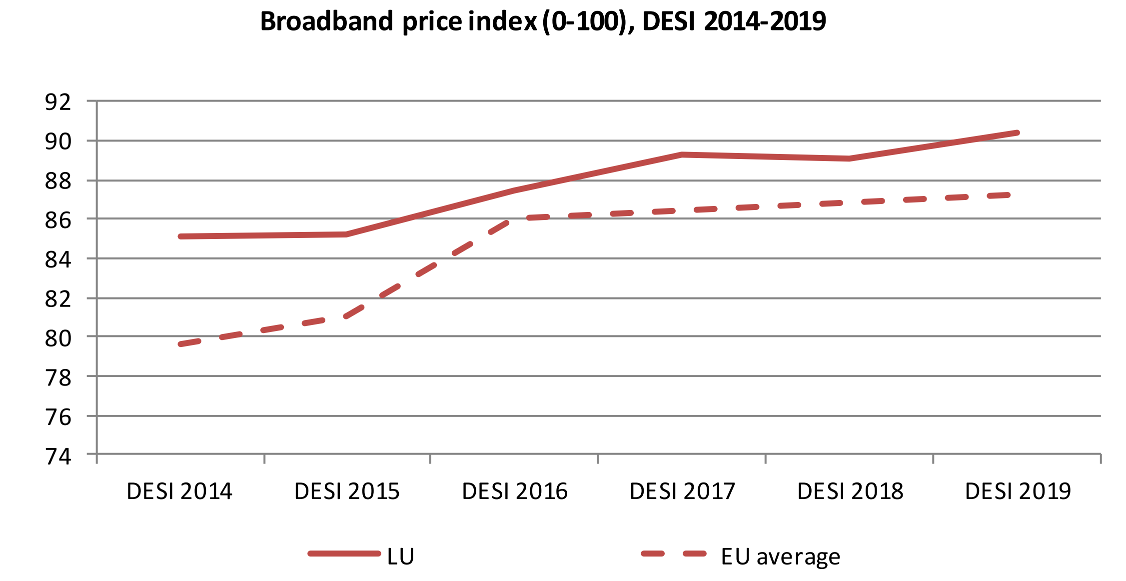


Source: Communications Committee (COCOM). Annual data as of 1st of July.

Between July 2017 and July 2018, fixed broadband subscribers in Luxembourg continued to migrate to higher bandwidths and replace DSL (and to a limited extent also cable subscriptions) by fixed broadband subscriptions based on fibre (+8.7 percentage points of market share). The market share of broadband subscriptions based on coax cable has slightly decreased (-0.7 percentage points of market share). Luxembourg performs very well in the uptake of fast broadband (increased from 52.5 % in July 2017 to 61.8 % in 2018) and ultrafast broadband (increased from 22.5 % to 33.4 % over the same period). Penetration is significantly above the EU average of 41 % for fast broadband and 20 % for ultrafast broadband. The fixed broadband price index[2] in the DESI increased by 1.3 index points in 2018, meaning that Luxembourg has improved its performance in terms of fixed broadband prices and performs well above the EU average.



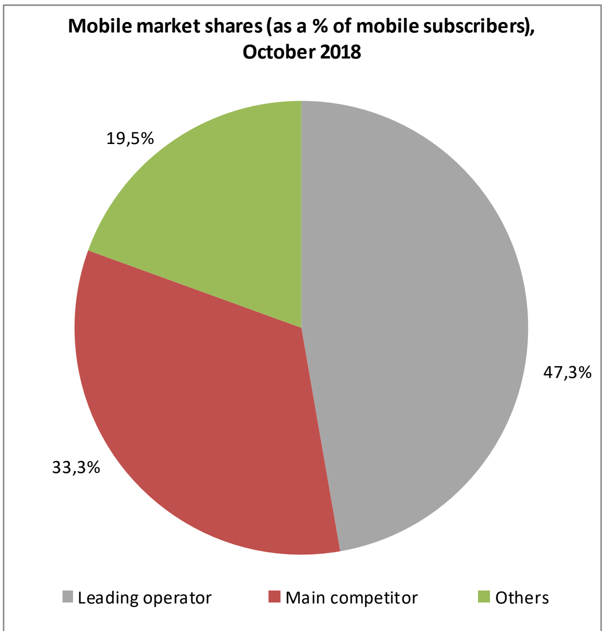
Source: Communications Committee (COCOM). Annual data as of 1st of July.



Source: Commission services based on Fixed Broadband Prices in Europe (Empirica). Data of each DESI report as of October-November of the previous year.

[2] The fixed broadband price index weighs the cheapest retail offers from: standalone, double play (BB + TV, BB + fixed telephony) and triple play (BB+TV+fixed telephony) and three speeds categories - 12-30 Mbps, 30-100 Mbps and +100 Mbps. This indicator presents values from 0 to 100 (which should not be read as prices) and the higher the values, the better the country performs in terms of affordability of prices relative to purchasing power.

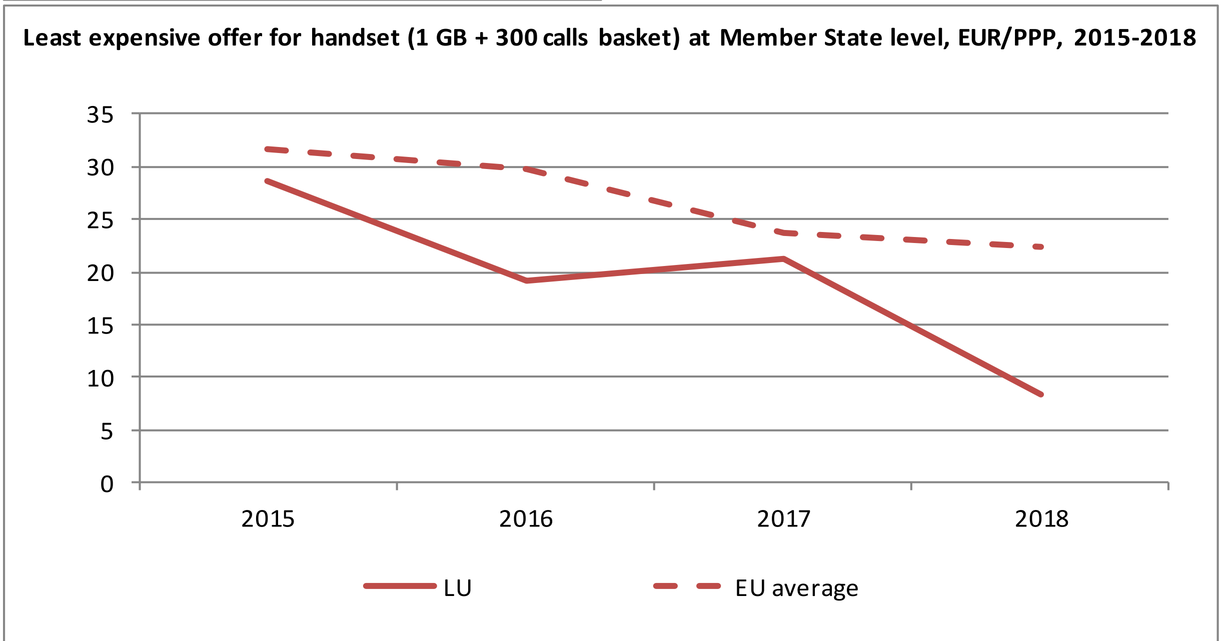
2.2. Mobile markets



Source: Communications Committee (COCOM). Data as of 1st of October 2018.

Coverage of mobile networks is good and individual complaints are addressed swiftly by MNOs with short delays. Nevertheless, congestion can cause interruptions to voice calls and there have been complaints on this. On 1 October 2018, the mobile market share of the leading operator was 47.3 %, the market share of the main competitor was 33.3 % and the market share of all other operators was 19.5 %.

The price index for the least expensive mobile broadband offer including a handset, 1 GB of data and 300 call minutes per month dropped significantly from February 2017 to February 2018 and is significantly below the EU average[3].



Source: Mobile Broadband Price Study (Van Dijk and Empirica). Prices expressed in EUR/(Purchase parity power - PPP), VAT included. Annual data as of February.

3. Regulatory developments

3.1. Spectrum

In Luxembourg, 25 % of the spectrum harmonised at EU level for wireless broadband has been assigned[4]. This low percentage is mainly due to the lack of assignment procedure for the 700 MHz, the

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[3] This comparison is adjusted for differences in purchasing power across Member States.

[4] The 5G spectrum readiness indicator is based on the amount of spectrum already assigned and available for use for 5G by 2020 within the '5G pioneer bands' in each EU Member State. For the 3.4-3.8 band this means that only licences aligned with the technical conditions annexed to Commission Decision (EU)2019/235 are considered 5G-ready. However, the percentage of harmonised spectrum takes into account all assignments in all harmonised bands for electronic communications services (including 5G pioneer bands), even if this does not meet the conditions of the 5G readiness indicator.

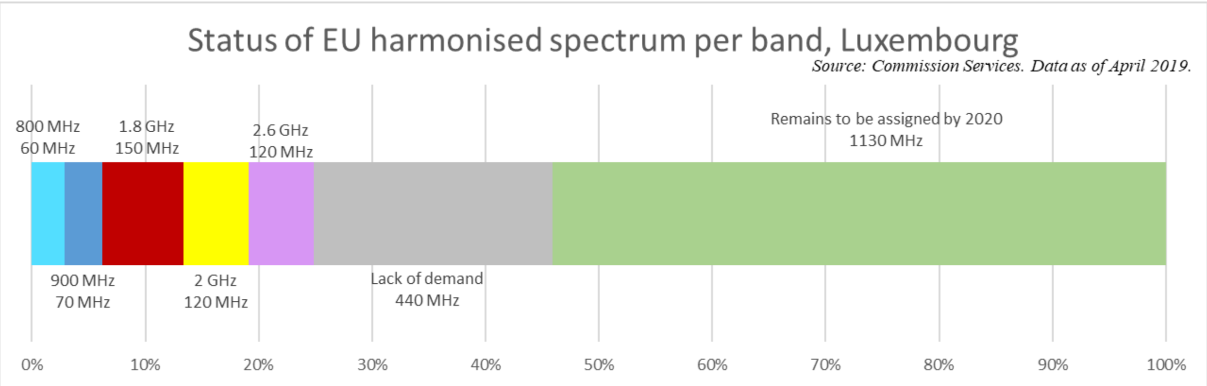
3.6 GHz and the 26 GHz bands. The ILR is preparing the award procedures for the 700 MHz and 3.6 GHz bands and the public consultation has been launched on 7 May 2019;. As the 700 MHz band has never been used for terrestrial digital broadcasting (DVB-T) in Luxembourg, at national level, there is no issue which could delay the process. On the other hand, there could be a delay in deploying parts of the band for one operator once the licence has been granted, as the switch-off date in Belgium for one specific DVB-T channel is not yet set (according to information available to the ILR, switch-off is expected at the latest in mid-2020).

Studies and measurement campaigns are ongoing with regard to the 3.6 GHz band to take into account existing earth stations for fixed satellite services (FSS). The goal is to set conditions of use for future utilisation of this band for both FSS and 5G services.

The public consultation and issuing of the licences in the 26 GHz band is planned for the second half of 2020. Luxembourg has to protect other primary services in this band (i.e. those already deployed and those for future use), mainly some fixed service links and FSS uplink. In general, according to the ILR it should be feasible to make available 1GHz for mobile broadband by the end of 2020.

Join Wireless returned its frequencies in the 2.6 GHz band (2x10 MHz FDD and 40 MHz TDD).

The Commission Implementing Decision (EU) 2018/661 on the harmonisation of the 1 452-1 492 MHz frequency band requires Member States to designate and make available by 1 October 2018 the harmonised 1427-1452 MHz and 1492-1517 MHz extension bands. Designation and availability would be for wireless broadband electronic communication services[5].



The ILR started negotiations with some neighbouring countries in order to define field strengths at the border taking into account the existence of current services in these extension bands[6]. As these limits might impact considerably the deployment of electronic communications services on the territory of Luxembourg, or in worst case, even prevent a reasonable deployment, the ILR currently does not plan to launch a public consultation in this band as long as these negotiations have not been finalised.

The ILR believes that the general interests of mobile operators currently focus on the two bands 700 MHz and 3.6 GHz band.

3.2. Regulated access

In 2018, the ILR has fixed the maximum price levels for access to civil engineering infrastructures, local loops and sub-loops of twisted copper lines (Market 4/2007).

[5] If only a portion of these bands is made available, existing services can be continued until end-2022 or longer if there is no national demand for wireless electronic communication services, see Articles 3 and 6 of Decision 243/2012/EU.
[6] The ILR conducted a public consultation in 2016 with regard to the centre part of L-Band (1452-1492 MHz) according to Decision (EU) 2015/750. The main outcome from the operators was that there was no imminent interest/need for this band at that time.

February 2019 saw the completion of the analysis of the wholesale markets for local access provided at a fixed location (Market 3a of the 2014 Recommendation on relevant markets[7]) and for central access provided at a fixed location for mass-market products (Market 3b of the 2014 Recommendation on relevant markets). In cases where both copper and FTTP/H access are available to the customer, POST would only be required to provide access on fibre, in order to further encourage the use of fibre. This limitation of access supports the ongoing process of phasing out the copper network. Whether the condition of reaching the customer with FTTP/H is fulfilled depends (besides the connection to the premises) on the quality of in-house cabling. In Markets 3a and 3b, equivalence of input (EoI) considerations have been applied comprehensively and to a high level of detail.

In 2019, the ILR intends to review the market for wholesale high-quality access provided at a fixed location (Market 4 of the 2014 Recommendation on relevant markets).

Luxembourg has rate of about 20 % of intra-EU calls, due to the small size of the country and the large number of multinational companies. The small size of operators in Luxembourg also gives them comparative disadvantages in terms of per unit costs when using the necessary (e.g. numbering) databases and for related processing.

As to the uptake of the regulatory remedies, there had been no demand from the operators for regulated duct access. Dark fibre is not regulated. Fibre local loop unbundling is used more and more by two access seekers. The incumbent has the obligation to provide virtual unbundled local access (VULA) where sub-loop unbundling is not available, but until now there was no need and no demand for it. Bitstream access is still an important wholesale product. There is almost no commercial wholesale access on cable TV networks in place.

ILR has established the technical specifications for VoIP interconnection (already in 2017, Règlement ILR/T17/9 du 09 août 2017).

4. End-user matters

As to overall market performance from a consumer perspective, in Luxembourg the market for mobile telephony ranks 16th out of the 25 service markets assessed, 7.2 points higher with respect to the market's EU average score[8][1]. The market for Internet provision ranks 12th out of 25 services markets assessed, 8.1 points higher than the EU average score.

In 2018, the ILR received 117 requests for mediation and 47 written complaints. Some 36 cases related to pricing and billing, 38 to the terms of contract and termination of contracts, 31 to availability and quality of service, 3 to roaming and 9 to premium services, while 28 complaints related to bundled services. A total of 45 cases were resolved through mediation and 20 cases may have been resolved outside of the procedure and without the knowledge of the ILR.

Information sheets ('Fiches signalétiques') are required for transparency of offers made by operators and service providers to end-users. For fixed and mobile broadband, the ILR's 'CheckMyNet.lu' application provides a survey on quality of service, including a speed test. It is available both as an iOS/Android app and as a browser-based tool.

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[7] Commission Recommendation of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to *ex ante* regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, OJ L 295, 11.10.2014, p. 79-84.

[8] The market performance index (MPI) is a composite indicator ranging from 0 to 100 which measures how well a given market performs according to consumers. See Consumer Markets Scoreboard 2018, p 12 and p 142, available at https://ec.europa.eu/info/files/consumer-markets-scoreboard-making-markets-work-consumers_en

a. Net neutrality

ILR introduced an internet access quality control mechanism, www.checkmynet.lu, to increase transparency for end-users and to increase compatibility of offers with the legislation. The ILR continuously makes use of its power to send requests for information to internet service providers (ISPs), in particular regarding traffic management practices and certain new commercial offers[9].

b. Roaming

Price increases for mobile services at national level have been exceptional cases subsequent to the introduction of 'roam like at home' (RLAH). Consumers in Luxembourg benefit in general from the new rules. Roaming usage (data and calls) has increased considerably compared to the situation prior to the introduction of RLAH. End-users with subscriptions in Luxembourg consumed 4.3 times more roaming data and 36 % more call minutes in Q4-2017 (under RLAH rules) than in Q4-2016 (before introduction of RLAH). For the subsequent three-month period the figures are largely similar: end-users with subscriptions in Luxembourg consumed 5.3 times more roaming data and 32 % more call minutes in Q1-2018 (under RLAH rules) than in Q1-2017 (before introduction of RLAH) [10].

c. Emergency communications — 112

Between 1 July 2017 and 30 June 2018, 62 % of emergency calls were made to the emergency number 112. A total of 448,449 calls were made to 112. Average response time was 5 seconds, and 68 % of the calls were answered within 10 seconds. For public warnings, an SMS alert system is deployed in Luxembourg[11].

5. Institutional issues

As long as 'over-the-top' providers do not use Luxembourgish numbering resources, they are not required to be notified. Mobile network operators and service providers have returned the second mobile subscriber number previously used for calling the voicemail. There were no appeals against ILR decisions in 2018.

6. Conclusion

Luxembourg is well on track to achieve the EU fixed broadband targets at EU level for 2020, namely to supply every European with access to at least 30 Mbps connectivity and to provide half of EU households with connectivity rates of 100 Mbps. However, it will most probably not meet the more ambitious targets set by national policy by 2020. The ILR's preparations to assign additional spectrum which can be used for 5G services are crucial for meeting the EU target for 5G.

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[9] See Net Neutrality Report by Bird &Bird & Ecorys, 2019, https://ec.europa.eu/digital-single-market/en/news/study-implementation-open-internet.

[10] See 'International Roaming BEREC Benchmark Data Report October 2017 - March 2018' available at https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8251-international-roaming-berec-benchmark-data-report-october-2017-march-2018.

[11] See Communications Committee, Working Document: 'Implementation of the single European emergency number 112', available at https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=57476 .