European Commission

Broadband Coverage in Europe 2017

FINAL REPORT

A study prepared for the European Commission
DG Communications Networks, Content & Technology
by:

IHS Markit™ POINT topic

Digital Single Market

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Internal identification

Contract number: 30-CE-0809995/00-22

SMART number 2016/0043

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ISBN 978-92-79-81287-3

doi:10.2759/358688

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Executive Summary

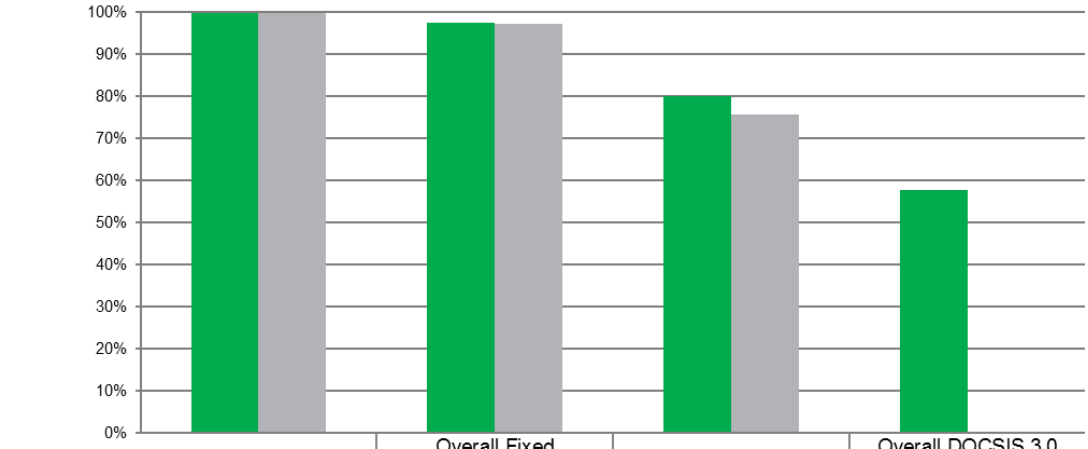
- The Broadband Coverage in Europe study is designed to monitor the progress of EU Member States toward their specific broadband coverage objectives – namely: 'Universal Broadband Coverage with speeds at least 30 Mbps by 2020' and 'Broadband Coverage of 50% of households with speeds at least 100 Mbps by 2020'.

- In 2016, DG Connect selected IHS Markit in partnership with Point Topic to run the three-year project. The research team surveyed NRAs and telecommunications groups across each participating state to compile the requisite information. Both IHS Markit as well as Point Topic have previously conducted the broadband coverage research. Point Topic was the incumbent provider introducing the original research methodology in the period 2010-2012. IHS Markit (in cooperation with VVA) delivered the study from 2013-2015 and adopted similar data collection and analysis methods to those implemented by Point Topic in order to ensure comparability of datasets for the purposes of time-series assessment.

- The collected data reflects the situation at the end of June 2017 compared to the situation at the end of June 2016. In editions of the study prior to 2015, the collected data reflected the situation at the end-of-year (i.e. end of December). The timeline of the data collection for the 2015 edition of the BCE study was moved forward in order to align reporting of the broadband coverage data with the publications of the Digital Economy and Society Index and the European Semester related country assessments.

- This report covers 31 countries across Europe – the EU28, plus Norway, Iceland and Switzerland, and analyses the availability of nine broadband access technologies (DSL, VDSL, cable modem, DOCSIS 3.0, FTTP, WiMAX, HSPA, LTE and satellite) across each market, at national and rural levels. In addition, three combination categories indicating the availability of one or more forms of broadband coverage are also published. These cover overall fixed and mobile broadband availability, fixed broadband availability and next generation access (NGA) availability. In 2017, DG Connect also requested a fourth combination coverage category to be estimated on a national level, establishing overall coverage of FTTP and DOCSIS 3.0 technologies.

EU28: Coverage by technology combination, 2017



	Overall Broadband	Overall Fixed Broadband	Overall NGA	Overall DOCSIS 3.0 and FTTP
EU28 2017	99.9%	97.4%	80.1%	57.8%
EU28 2016	99.9%	97.4%	75.8%	

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Note: Overall DOCSIS 3.0 & FTTP data was not collected in 2016

- The collected data shows that over 219 million EU households (99.9%) had access to at least one of the main fixed or mobile broadband access technologies at the end of June 2017 (excluding satellite). Due to the growth in the number of EU households during the period, the percentage of homes passed by broadband increased by less than 0.1 percentage points.

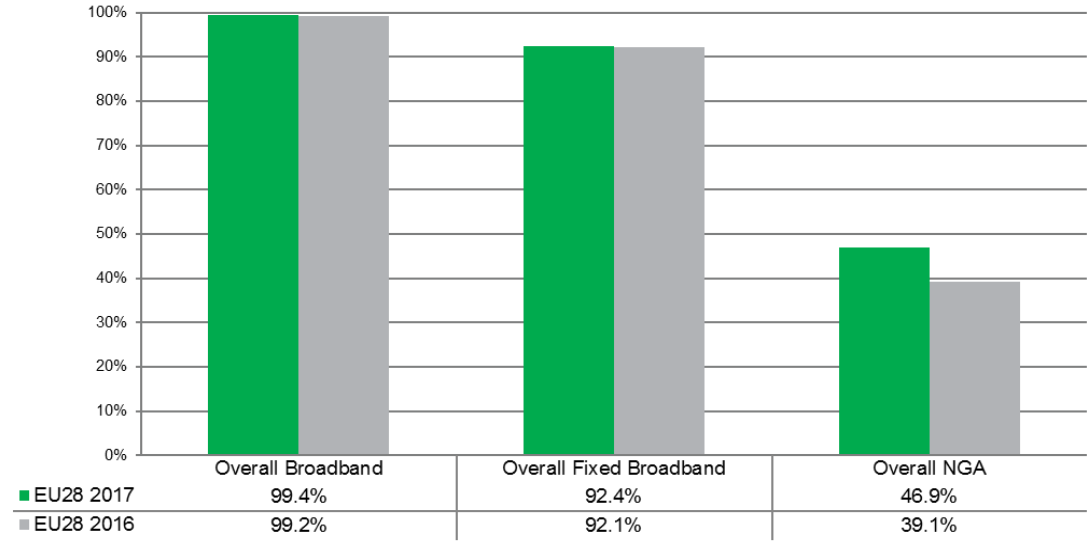
Nevertheless, 880,000 additional households had access to broadband services compared to the end of June 2016.

- By mid-2017, fixed broadband services reached 97.4% of EU households. During the period, fixed broadband coverage expanded by 860,000 households, with 214 million EU households reached by fixed broadband access technologies at the end of June 2017.

- Next generation access services (VDSL, DOCSIS 3.0 and FTTP) reached 80.1% of EU households by mid-2017. This equates to a 4.3 percentage point increase, or 9.9 million additional households, compared to the end of June 2016. In total, 176 million households had access to next generation broadband in mid-2017.

- Rural broadband coverage continued to be lower than national coverage across EU Member States. Although 92.4% of rural EU homes were passed by at least one fixed broadband technology in mid-2017, less than 50% (46.9%) had access to high-speed next generation services.

EU28: Coverage by technology combination in rural areas, 2017



	Overall Broadband	Overall Fixed Broadband	Overall NGA
EU28 2017	99.4%	92.4%	46.9%
EU28 2016	99.2%	92.1%	39.1%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

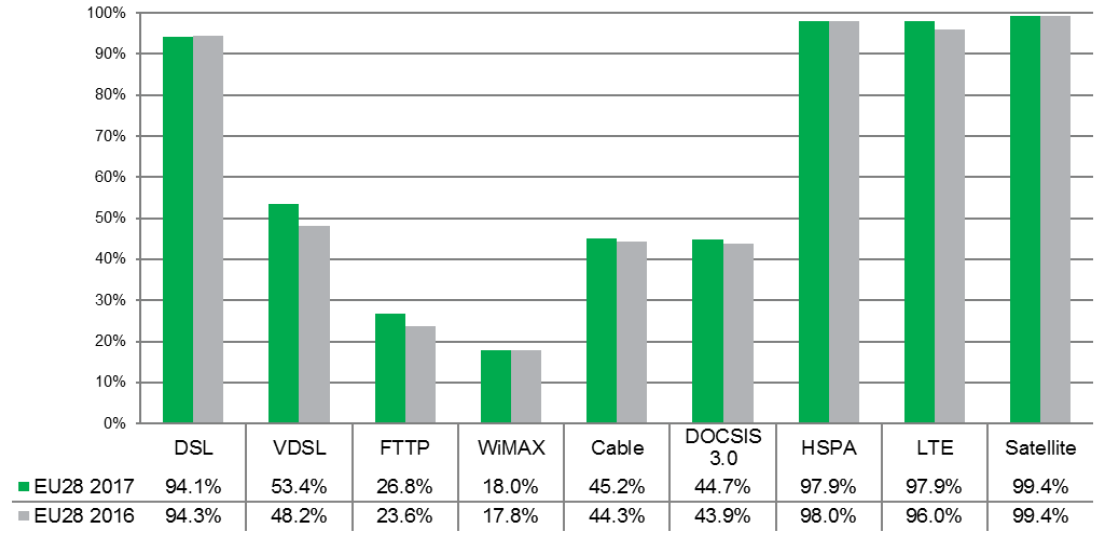
- Satellite broadband remained the most pervasive technology in Europe in terms of overall coverage. However, satellite coverage is still limited in the Baltic countries and is absent in Iceland.

- By mid-2017, DSL remained the dominant fixed access technology in the EU28, passing 94.1% of homes. This equates to a decline of 0.2 percentage points compared to mid-2016, as household growth exceeded DSL deployment. Cable networks continued to be the second most widespread fixed access technology, reaching 45.1% of EU households. Following a decline in the previous year, WiMAX coverage improved slightly by 0.2 percentage points in the twelve months to mid-2017, reaching 18.0% of EU households.

- At the end of June 2017, VDSL services reached 53.4% of EU households, an increase of 5.2 percentage points during the twelve-month period. As a result, VDSL was the fastest growing fixed broadband technology for the sixth consecutive year and remained the key driver of NGA coverage growth across the EU.

- FTTP service availability continued to increase at a similar rate as in the previous year, rising by 3.4 percentage points to pass 26.8% of EU homes at the end of June 2017. This constituted slower growth compared to VDSL networks, but was considerably higher than the growth in DOCSIS 3.0 availability, which expanded by 0.8 percentage points to reach 44.7% of EU households.

EU28: Coverage by technology, total



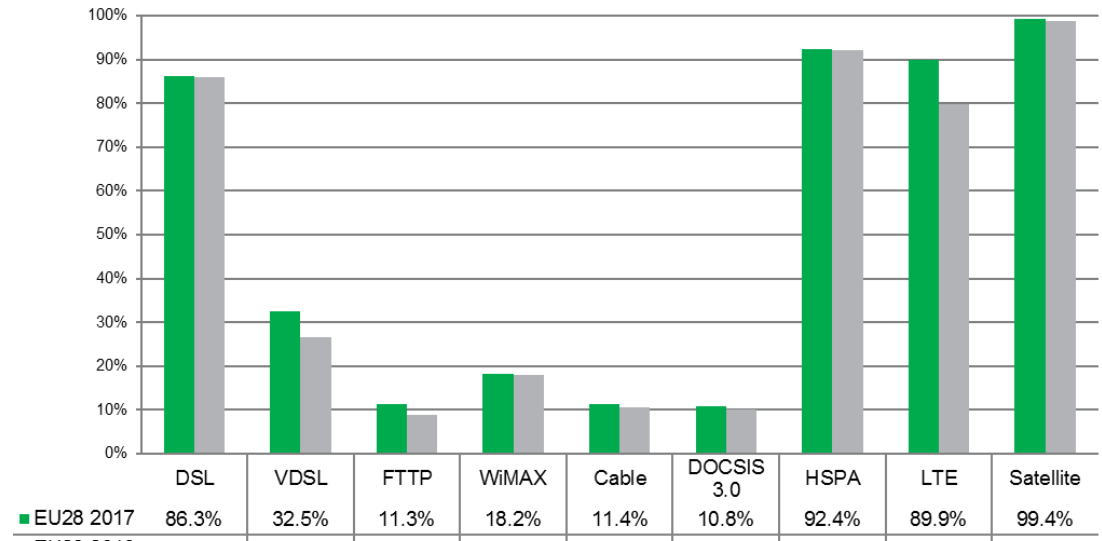
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
EU28 2017	94.1%	53.4%	26.8%	18.0%	45.2%	44.7%	97.9%	97.9%	99.4%
EU28 2016	94.3%	48.2%	23.6%	17.8%	44.3%	43.9%	98.0%	96.0%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

- For the first time, HSPA coverage did not exceed LTE coverage in the EU28, with both mobile technologies covering 97.9% of EU households. In the twelve months to mid-2017, LTE availability improved by 1.9 percentage points, whilst the proportion of EU households reached by HSPA networks reduced by 0.1 percentage points as EU household growth exceeded the deployment of HSPA networks.

- Examining rural broadband coverage, there was a difference of 5.0 percentage points between the availability of fixed broadband services at a total level (97.4%) and at a rural level (92.4%). The gap was much wider in terms of NGA technologies, as NGA networks passed 46.9% of rural EU homes, 33.2 percentage points less than total NGA coverage. Nevertheless, the gap between rural and national coverage, for both fixed and NGA technologies, is narrowing compared to previous editions of the study, supported by increasing investment in rural broadband.

EU28: Coverage by technology, rural areas



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
EU28 2017	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%
EU28 2016	86.0%	26.6%	8.8%	18.0%	10.7%	10.1%	92.2%	79.8%	98.7%

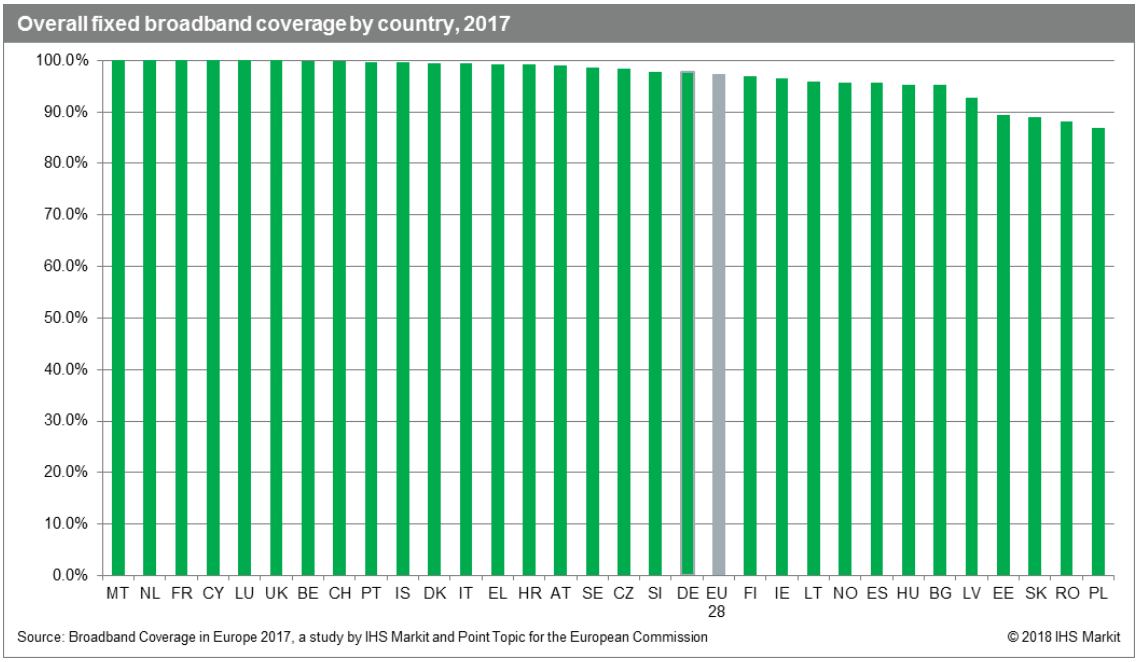
Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

- VDSL coverage continued to expand more quickly than other fixed broadband technologies in rural areas. Rural VDSL availability increased by 5.9 percentage points in the twelve months to mid-2017, passing 32.5% of rural EU homes. Growth in rural VDSL services highlights the

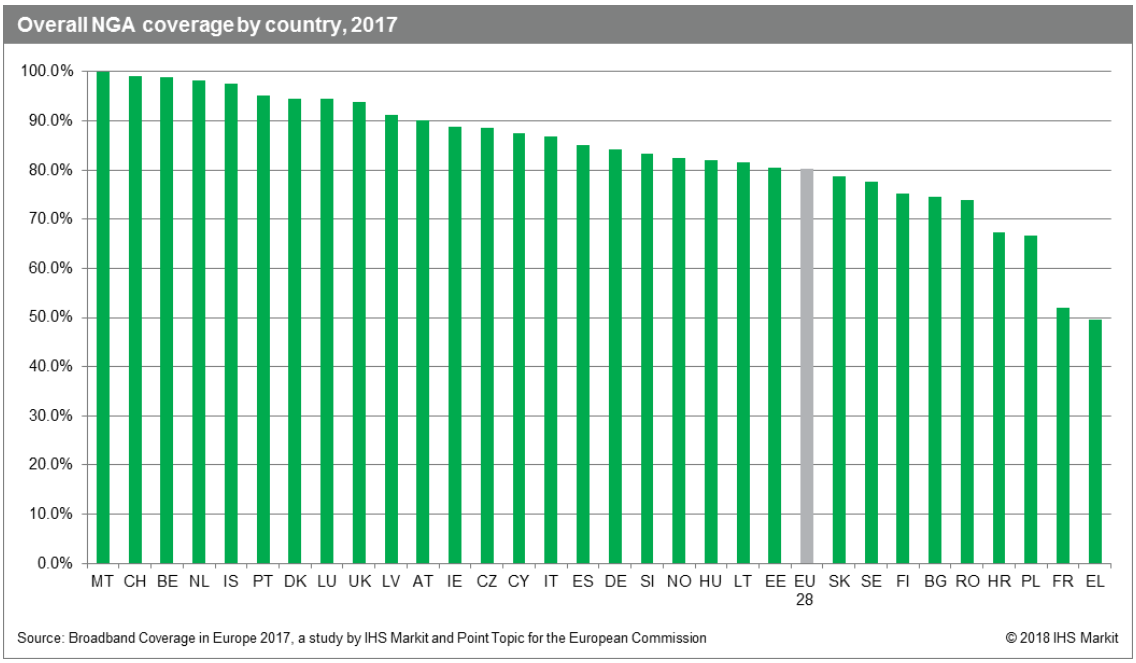
investment by operators, in particular incumbent operators, to upgrade existing DSL networks in rural areas.

- Examining mobile broadband technologies, the availability of LTE networks improved by 10.1 percentage points, reaching 89.9% of rural EU households by mid-2017. Consequently, LTE coverage is nearly as widespread as rural HSPA services (92.4%), which saw a 0.2 percentage point increase in coverage over the twelve months to the end of June 2017.

- Out of the 31 study countries, 26 countries registered fixed broadband coverage of above 95.0%, while 19 countries had fixed broadband coverage above the EU28 average (97.5%). Several countries registered complete fixed broadband coverage including Malta, the Netherlands, France, Cyprus, Luxembourg and the United Kingdom. In four countries (Estonia, Slovakia, Romania and Poland), fixed broadband availability was below 90% of households.



- As in 2016, Malta was the only country to report complete coverage for NGA technologies, while Switzerland, Belgium, the Netherlands, Iceland and Portugal all reported NGA coverage levels above 95%.



- Out of the 31 study countries, 22 countries reported NGA coverage above the EU28 average (80.1%). At 49.6%, Greece remained the lowest ranked nation in terms of the proportion of homes passed by NGA networks. Moreover, five other countries (Bulgaria, Romania, Croatia, Poland and France) registered NGA availability of below 75% of households in mid-2017.

- Looking at mobile broadband technologies, LTE coverage reached at least 99% of households in 13 study countries, with Cyprus the only country to report coverage of less than 90%. In relation to HSPA networks, Germany (91.5%) and Slovakia (92.3%) remained the only two countries to record HSPA coverage levels below 95%.

1.0 Introduction

In order to foster the development of the network-based knowledge economy and stimulate growth, the European Commission has been promoting strategies to encourage digital opportunities and enhance Europe's leading position in digital economy. In May 2015, the Digital Single Market (DSM) strategy was adopted to eliminate online barriers which hamper the free movement of goods and services online. Businesses, governments and individuals are inhibited by operating across 28 different regulatory environments and cannot fully benefit from the emerging digital tools available to them.

The European Commission estimates that once complete, a DSM could create up to €415 billion per year and generate hundreds of thousands new jobs. The DSM strategy is based on three pillars:

1. Access: better access for consumers and businesses to digital goods and services across Europe;
2. Environment: creating the right conditions and a level playing field for digital networks and innovative services to flourish;
3. Economy & Society: maximising the growth potential of the digital economy.

However, in order for consumers, businesses and governments to fully benefit from the provisions of the DSM, it is essential that access to digital infrastructure is ensured by facilitating the roll out of reliable high-speed broadband networks across Europe.

In 2010, the Digital Agenda for Europe (DAE) was created as one of the flagship initiatives of the Europe 2020 strategy, and included specific broadband coverage targets stretching to 2020:

- Universal broadband coverage of speeds above 30 Mbps by 2020
- 50% broadband coverage of speeds above 100 Mbps by 2020.

The Digital Scoreboard serves as a tool for assessing progress towards these targets. Broadband availability metrics are also a component of the Digital Economy and Society Index (DESI) that summarises indicators on Europe's digital performance and Member States digital competitiveness. One of DESI's five dimensions focuses on connectivity and measures the deployment and quality of broadband infrastructure.

In order to monitor the progress of broadband networks deployment across the Member States, DG Connect (the European Commission Directorate General for Communications Networks, Content and Technology) has commissioned the Broadband Coverage in Europe (BCE) project. This examines household coverage of all of the main fixed and wireless broadband technologies with a specific focus on Next Generation Access (NGA) technologies. In 2013, DG Connect selected the consortium of IHS Markit & VVA to run the three-year project. In 2016, IHS Markit partnered with the previous research provider of the BCE study, Point Topic, and was subsequently chosen to continue to deliver the broadband coverage research for the period 2016-2018.

The European Commission publishes and analyses the data in the Digital Scoreboard, which can be explored using the European Commission's visualisation tool. A number of broadband coverage indicators are also included in the Digital Economy and Society Index (DESI) and the European Semester related country assessments. In order to align reporting of the broadband coverage data with the publications of the DESI, the broadband coverage data collection has been scheduled to reflect the situation at the end of June (i.e. half-year data rather than year-end data points are collected). This change was first implemented in the 2015 edition of the BCE study and has been continued since then.

As in previous years, the study is primarily based on a survey of broadband network operators and National Regulatory Agencies (NRAs) to obtain a Europe-wide picture of the coverage of the nine main broadband technologies. The study initially covered thirty countries including the EU28, Norway, and Iceland. A separate study was commissioned by Glasfasernetz Schweiz to conduct identical research of broadband coverage in Switzerland. Results of the study are also included in this report increasing the total number of study countries to 31.

The nine broadband technologies analysed in this study are:

- DSL (including VDSL)
- VDSL
- Cable modem (including DOCSIS 3.0)
- DOCSIS 3.0
- FTTP (Fibre-to-the-property)
- WiMAX
- HSPA
- LTE
- Satellite

Coverage of these technologies is reported at both the national and rural levels, based on the number of homes passed by each individual technology.

The study also aims, as requested by DG Connect, to estimate the overall "combination" coverage of technologies, accounting for the overlap of the different technologies capable of delivering a comparable level of performance. The combination categories included in this study, and similar to previous years, are:

- Overall broadband coverage
    - Includes all the main broadband technologies, both fixed and mobile, but excludes satellite
    - Combination of DSL (including VDSL), cable modem (including DOCSIS 3.0), FTTP, WiMAX, HSPA and LTE

- Overall fixed broadband coverage
    - Includes all the main fixed-line broadband access technologies, but excludes satellite
    - Combination of DSL (including VDSL), cable modem (including DOCSIS 3.0), FTTP, and WiMAX

- Next Generation Access (NGA) coverage
    - Includes fixed-line broadband access technologies capable of achieving download speeds meeting the Digital Agenda objective of at least 30 Mbps coverage
    - Combination of VDSL, DOCSIS 3.0, and FTTP

In 2017, DG Connect also requested a fourth combination coverage category to be estimated on a national level:

- Overall coverage of FTTP and DOCSIS 3.0 technologies
    - Includes fixed-line broadband access technologies primarily capable of achieving download speeds meeting the Digital Agenda objective of at least 100 Mbps coverage
    - Combination of DOCSIS 3.0 and FTTP

Due to the fact that multiple operators may deploy their networks in the same or similar areas, particularly in urban and more densely populated locations, it is necessary to take into account the possibility of overlapping coverage when determining the technology combinations.

The methodology used in this report mirrors the approach developed by Point Topic in 2012, adopting a regional approach to measuring overlapping and complementary coverage. Coverage data was collected on a regional level using NUTS 3 statistical units as a research basis. The NUTS (Nomenclature of Units for Territorial Statistics) areas are geographical subdivisions generally based on existing national regional divisions of EU countries and associated countries (such as Norway, Iceland and Switzerland). More specifically, NUTS 3 level areas are smaller regional units of 150,000 to 800,000 inhabitants. There are 1,357 NUTS 3 areas in the 31 study countries. With general statistical data (such as population, household, and area size) readily available on NUTS 3 level, using this regional approach provides a comprehensive and detailed view of broadband coverage across Europe and allows for a year-to-year comparison with the BCE 2012-2015 data.

In addition to individual technology coverage and combination technology coverage, DG Connect required coverage by download speed to be included in the study. The following speed categories were thus included among the research metrics:

- Coverage by broadband network/s capable of at least 2 Mbps download speed
- Coverage by broadband network/s capable of at least 30 Mbps download speed
- Coverage by broadband network/s capable of at least 100 Mbps download speed

Coverage by speed categories was first estimated by IHS Markit in the 2013 edition of the BCE study. By including this additional metric, it is possible to obtain an additional analytical layer to evaluate the study countries' progress towards the Digital Agenda goals and determine the actual speeds consumers will be able to receive on the particular networks available to them.

In the Tender Specifications for SMART 2016/0043, DG Connect also requested additional mobile coverage data to be collected in order to better reflect availability of mobile broadband services for European consumers as well as to take into account the mobility aspect connected with mobile network accessibility.

Therefore, in addition to the standard coverage metrics, the research team provided DG Connect with data on average LTE coverage in each study country. This measurement took into account coverage of all LTE network operators, calculating the average household/population coverage level in order to better represent an actual user experience, as a typical user will only be able to use one mobile network at a time. This indicator was included as one of the components of the DESI Connectivity dimension.[1]

To address the mobility aspect of mobile networks coverage, the research team introduced a new metric looking at coverage of transportation networks in each study country. As this was a completely new metric with untested methodology, the research team applied a varied approach to estimating transportation coverage, using information provided by the mobile networks operators and NRAs, alongside additional desk research. In addition, we have compared household and landmass coverage and used Point Topic's European Kilometre Grid database and the Corine landmass database to determine population settlements within sparsely populated and/or geographically challenging regions in order to provide a fair assessment of the availability of mobile services.

Given the varying level of available information, the research team decided to take the 2016 and 2017 transportation coverage data collection as a testing ground for this metric with the aim to further evolve the methodological approach in the next iterations of the study. Therefore, following discussions with DG Connect, a decision has been made to keep the transportation coverage results for internal purposes only. The research team will continue to develop a more robust methodology with further help from NRAs and operators.

[1] DESI Indicator 1b2: 4G coverage (DESI 2017 & 2018).

The following table details the scope of the Broadband Coverage in Europe 2017 study.

Scope	Description of Broadband Coverage Metrics
Geographical coverage	• EU28 + Iceland, Norway and Switzerland • Rural and national coverage
Technologies	The following technologies are included: • DSL (excluding VDSL) • Cable modem (excluding DOCSIS 3.0) • HSPA • FTTP (Fibre to the Home and Fibre to the Building) • VDSL • Cable modem DOCSIS 3.0 • LTE • WiMAX • Satellite The study also covers the following technology combinations: • Overall broadband coverage (including DSL, VDSL, FTTP, Cable modem, Cable modem DOCSIS 3.0, WiMAX, HSPA and LTE) • Overall fixed broadband coverage (including DSL, VDSL, FTTP, Cable modem, Cable modem DOCSIS 3.0 and WiMAX) • NGA coverage (including VDSL, FTTP and cable modem DOCSIS 3.0) • Overall FTTP & DOCSIS 3.0 coverage (including FTTP and cable modem DOCSIS 3.0)
Speeds	The study covers the following speed categories: • At least 2 Mbps download • At least 30 Mbps download • At least 100 Mbps download
Mobile coverage	Additional mobile metrics are included in the 2017 edition of the study: • Average LTE coverage (average of operators in each study country) • HSPA and LTE coverage of transportation infrastructure

Acknowledgements

It would not be possible to deliver the results of this project without the support of all involved parties. First and foremost, the IHS Markit and Point Topic team would like to thank all survey respondents, both regulators and operators, who took the time to fill in the BCE questionnaire and provide us with the fundamental information and data that form the core of this study. We are very grateful for their involved and responsible approach in addressing the demanding request for information and data. While the figures in our deliverables might not always be exactly the same as those provided by respondents (due to a number of complex factors, such as different statistical bases or definitions), the research team always attempted to prioritise data received directly from respondents and reflect this information in our estimates as much as possible.

Last but certainly not least, we would like to thank DG Connect for their active involvement throughout all stages of the project.

2.0 Project Objectives

The specific objectives of the study can be set out as below:

- Collect coverage data on a country, regional, and rural level for different technologies through:
    - a survey of operators (ISPs) and National Regulatory Authorities (NRAs);
    - a review of alternative sources (e.g. operator websites, white papers, consultant reports);
- Estimate coverage for different technology and speed combinations; and
- Write up a final report on the findings on EU and country-level and prepare a database with statistical data.

3.0 Methodological approach in detail

The methodological approach used in the 2017 edition of the Broadband Coverage in Europe study mirrors the approach used in the 2013-2016 studies, which was in turn based on a methodology first implemented by Point Topic in 2012. Applying the same methodological approach allows the research team to ensure both consistency and year-on-year comparability of the data.

As in previous years of the project, a survey of NRAs and broadband network operators forms the core of this study. The survey results were validated and cross-checked against additional information gathered from other sources (including public announcements by telecoms groups) in parallel with the survey data collection. The additional research also helped to fill in any gaps, which resulted from incomplete information from NRAs or operators. Lastly, survey data and additional information were combined and used to calculate national coverage by individual technologies as well as the combination coverage categories and speed coverage categories for all study countries.

The timeline of the data collection for the 2017 edition of the BCE study follows an amended schedule first implemented for the 2015 edition of the study. This means that the collected information reflects the situation at the end of June (i.e. half-year data rather than year-end data points were collected).

The following chapters of this report provide a detailed description of the project's methodology.

3.1 Survey design and data collection

For the sake of consistency, the research team used similar wording and formatting of the survey questionnaire as in 2012-2016. Using near-identical question wording enables the research team to deliver findings which can be compared with research undertaken in previous years.

Where possible, the research team contacted survey participants that were approached for the 2012-2016 data collection. During the previous data collection the IHS Markit research team updated and expanded the list to include new contacts in already surveyed companies and organisations as well as those companies that were not previously approached. The fact that the BCE project is a long-running project means that most respondents are familiar with the study as well as the survey questionnaire, making it easier for them to fill in the by-now familiar information.

The survey questionnaire focuses on one central question, which asks about the absolute number of homes passed by broadband networks, and is applied to the following key metrics of the research:

- Technology coverage – for each of the technologies (with the exception of satellite) a question was included asking NRAs to supply the number of homes passed by each individual technology in the country.

- Regional coverage – NRAs and operators were also asked to supply homes-passed information for each of the NUTS 3 regions in all study countries for each of the technologies.

- Rural coverage – the same questions were asked of respondents for homes passed in rural areas of each NUTS 3 region as well as for the total number of rural homes passed country-wide.

- Speed coverage - the 2013-2016 survey questionnaires were extended to include questions asking participants about the numbers of homes passed by networks able to achieve speeds of at least 2 Mbps, 30 Mbps and 100 Mbps. This metric and corresponding questions were retained in the 2017 study.

In a number of cases, coverage data was delivered on a more detailed geographical level than the requested NUTS 3 areas. In these cases, the research team aggregated the provided data to match the NUTS 3 regions.

In addition to the coverage questions, the survey questionnaire also provided space for additional comments and explanations of the various technologies and speed specifications in cases in which

respondents' definitions differed from those outlined in the survey (detailed definitions of the individual broadband technologies are included in the Appendices of this report). These comments provided further insight and were reflected in the final analysis of the data.

Given the nature of satellite broadband coverage, questions regarding satellite coverage were not included in the survey questionnaire. The satellite coverage across Europe was determined based on conversations with leading satellite providers such as Eutelsat, a KA-SAT broadband provider and other smaller satellite operators.

Furthermore, in order to determine the additional metric focused on HSPA and LTE coverage of transportation links, the research team included questions regarding mobile network coverage of key road and railway infrastructure in the 2016 and 2017 questionnaires. The research team provided the length of road and rail networks (in km) in each study country and asked the NRAs and mobile network operators to provide information on percentage coverage of both individual road and rail coverage as well as combined coverage of transportation infrastructure provided by HSPA and LTE networks. In cases, where specific transportation coverage information was not available, respondents were asked to provide more general information on landmass/geographic coverage of HSPA and LTE networks, represented in terms of percentage of landmass/geographic area covered by the specific networks.

The research team has been from the onset of this project aware of the sensitivity of the requested data provided by operators, as much of the coverage data (especially on such a granular level) could be regarded as commercially sensitive by operators. Therefore, confidentiality of the information gathered from both NRAs as well as individual operators was assured at all stages of the survey data collection and subsequent analysis.

In order to protect the confidentiality of the data, study results for individual coverage technologies are published only on a total country level. On the regional NUTS 3 level, reported data is limited to coverage by technology combinations. As these technology combinations include multiple technologies, coverage by individual technologies or companies is concealed within the combined total coverage.

All of the collected data is treated as commercially confidential and was used solely for the purposes of this study.

3.2 Defining households and rural areas

The central question posed by the survey questionnaire asks about the number of homes passed by individual operator and/or technology networks, depending on the respondent. In order to make determining the numbers of homes passed in each NUTS 3 region easier for respondents, the research team provided guidance by including the total number of households in each area in the survey questionnaire.

As it is not possible to obtain annually updated household figures by NUTS3 regions for all of the BCE study countries, the research team calculated the number of households in each NUTS 3 region using NUTS 3 level population data published annually by Eurostat and average household size figures also published by Eurostat annually for each country. This approach allows the research team to maintain a unified methodology across all of the study countries using one data source.

One of the key dimensions of the study is centred around gaining information on broadband coverage in rural areas. In order for the rural data collected in the period 2013-2017 to be comparable to the 2012 dataset, the research team uses a methodology first developed by Point Topic in 2012, which defines rural areas using the Corine land cover database, and creates a database of population and land type in every square kilometre across Europe. Households in square kilometres with a population of less than one hundred are classified as rural. This granular approach based on population density identifies the truly rural areas likely to be unserved or underserved by broadband operators.

According to an updated estimation of rural population in individual NUTS 3 regions, approximately 14% of households in the study countries were rural in 2017. Combining this information with updated population and household data from Eurostat, the EU statistical office, allowed the research team to create new estimates for the numbers of rural households across each market and NUTS 3 area.

3.3 Additional research conducted in parallel to the survey

In addition to data gathered through the NRAs and ISPs survey, the research team carried out supplemental research to check the validity of survey data as well as to fill in any missing information.

The additional research was built on the IHS Markit and Point Topic team's extensive in-house knowledge of the European broadband sector and was complemented with country and regional-level data collected from publicly available NRAs and ISPs reports and details on broadband strategies and development plans of individual companies and governments.

This desk-based research provided basic estimates on country-level coverage for each technology. In many cases, information on regional deployments of next generation access technologies was also available, or it was possible to infer such detail from company communications.

The individual elements of the additional research were determined on a country-by-country basis and included (but were not limited to) desk research of the following publicly available sources:

- NRAs market reports
- ISPs financial reports and press releases
- Industry organisations white papers, special reports and analysis
- Industry news

3.4 Validation and integration of data

In this phase of the study, data collected through the survey and via additional research was brought together to obtain the actual coverage figures for all of the study countries.

The data integration was conducted on a country-by-country basis. Information gathered from additional research was cross-checked with results of the survey. In cases in which data points were missing, for example some of the NUTS 3 regions or rural coverage, a modelling methodology was applied to fill in the gaps. Models used varied on a case-by-case basis, and relied on a range of inputs, which included national coverage and regional presence data as well as the research team's knowledge of individual markets, companies' deployment strategies and ancillary data, such as population density.

Each country's data was integrated for each technology individually. This allowed the research team to first obtain estimates for individual technologies at a NUTS 3 level, which were then used to calculate estimates for technology combinations – again at a NUTS 3 level. Regional data was finally summed to obtain national-level coverage information. When integrating data on individual technologies, special attention was paid to areas for which coverage of the same technology was provided by multiple operators, in order to rule out possible overlap.

At the end of the data validation and aggregation process, the research team was able to provide estimates for each of the nine broadband technologies in all NUTS 3 areas both on total and rural level.

3.5 Estimating coverage for different technology combinations

After reaching the broadband coverage figures by individual technologies in each country and NUTS3 regions, the research team calculated estimates for the following three technology combinations, taking into account the overlaps of different technologies:

- Overall broadband coverage (including DSL, VDSL, FTTP, Standard cable modem, DOCSIS 3.0, WiMAX, HSPA and LTE)

- Overall fixed broadband coverage (including DSL, VDSL, FTTP, Standard cable modem, DOCSIS 3.0 and WiMAX)

- Overall NGA coverage (including VDSL, FTTP and DOCSIS 3.0)

In 2017, DG Connect also requested a fourth combination coverage category to be estimated on a national level:

- Overall coverage of FTTP and DOCSIS 3.0 technologies

For the sake of consistency, the research applied a similar methodology in the 2017 study to the approach used in the 2012-2016 editions of the study. Unless information provided by NRAs or telecoms groups suggested otherwise, a standardised default formula was used, taking the average of:

1. The minimum possible coverage; equal to the coverage of the most widespread technology or operator in the area; and

2. The maximum possible coverage; equal to the sum of the coverage of all the technologies or operators being considered, or to 100%, whichever was the greater.

As in previous studies, a varied formula was used in cases where technologies' coverage was more complementary than overlapping. In these cases, the minimum coverage was taken as equal to the sum of the complementary technologies, if this was greater than the most-widely available single technology.

Additionally, the estimates for combination coverage on a national level were made by summing the estimates for the NUTS 3 areas rather than applying this formula on a country level. This approach provides a more accurate data output than simply taking the country-level average.

Once the research team completed the final country level dataset, it was passed on to DG Connect and to the NRAs of all of the study countries for their feedback and comments before the finalised data was used as components of the Digital Society & Economy Index (Connectivity Dimension) and published as part of the individual country assessment reports.

In a number of cases, new and more accurate data was provided to the research team reflecting the 2016 data and thus justifying restatements of the figures published in the Broadband Coverage in Europe 2016 study.

3.6 Estimating coverage for speed categories

The speed categories were first included as broadband coverage metrics in 2013 in order to provide additional analytical layer to evaluate the study countries' progress towards the Digital Agenda goals and to estimate the download speeds available to households across the EU Member States. This additional component of the broadband coverage research was retained in the 2017 edition of the study with the following speed categories included among the metrics:

- Coverage by broadband network/s capable of at least 2 Mbps download speed

- Coverage by broadband network/s capable of at least 30 Mbps download speed

- Coverage by broadband network/s capable of at least 100 Mbps download speed

Including this metric allows for a comparison of the technology coverage, which might be reported as relatively high, to the actual speeds consumers will be able to receive on the networks available to them.

The following methodological approach was first implemented in 2013 and carried over in subsequent iterations of the study. In order to estimate the coverage by speed categories, the research team needed to develop a suitable methodology and clear definition to determine coverage by realistically achievable speeds as required by DG Connect. Thus, the following speed categories were added among the research metrics and questions regarding these categories were included in the survey questionnaire:

- Coverage by broadband network/s capable of realistically achieving actual download speeds of at least 2 Mbps. This category encompassed DSL (including VDSL), FTTP, WiMAX, standard cable (including DOCSIS 3.0 cable) broadband access technologies. However, as not all DSL connections are capable of download speeds of 2Mbps and higher, respondents were asked to exclude those connections which did not meet the criteria from their answers.

- Coverage by broadband network/s capable of realistically achieving actual download speeds of at least 30 Mbps. This category encompassed VDSL, FTTP, and DOCSIS 3.0 cable broadband access technologies. However, as not all connections utilizing these technologies can achieve 30 Mbps and higher actual download speeds (for example, VDSL connections with distance from the exchange point higher than 500m see radical decrease in actual speeds), respondents were asked to exclude those connections which did not meet the criteria from their answers.

- Coverage by broadband network/s capable of realistically achieving actual download speeds of at least 100 Mbps. This category encompassed FTTP and DOCSIS 3.0 cable broadband access technologies. In cases where vectoring is applied to VDSL2 technology and speeds reach 100 Mbps and higher download speeds, VDSL with vectoring was asked to be included in this category. However, as not all connections utilizing these technologies can achieve 100 Mbps actual download speeds (for example, in the case of FTTB – fibre-to-the-building – connections included in the FTTP category in-building wiring can pose significant constraints on achievable end-user broadband speeds), respondents were asked to exclude those connections from their answers.

The coverage of these speed categories was then defined as a household having technical access to one or more networks supporting at least 2, 30, or 100 Mbps download speed connections if the connection's broadband speed was capable of achieving a minimum of 2, 30, or 100 Mbps download speed (respectively) for the majority of the time. 'Majority of time' is understood to mean actual download speeds achieved by a household for at least 75% of the time.

As speed information can be generally hard to decode, even for the NRAs and ISPs themselves, the research team, in addition to the collected survey data, also relied on sector knowledge regarding deployments to make informed estimates of achievable speeds to gain a complete picture of coverage by the speed categories.

Following discussions with DG Connect, a decision has been made to focus the speed categories on speed availability over fixed networks only and neither HSPA nor LTE networks were included in analysis of achievable speeds. While considerable improvements in terms of speed and connection quality attainable over LTE mobile networks have been achieved in the last couple of years, there continue to be inconsistencies in terms of reliability of broadband connectivity over mobile networks.

Note that unlike the technology coverage, the speed metric categories have been determined on a country level only, as gathering information on rural and regional NUTS 3 level would not have been feasible within the scope of the study – although we hope that NRAs and ISPs will consider collecting and making such information available at a future point in time.

3.7 Estimating additional mobile coverage metrics

As required in the Tender Specifications for SMART 2016/0043 and following the discussions with DG Connect at the inception meeting, the research team has introduced two new mobile metrics as part of the 2016 Broadband Coverage in Europe study. These metrics are aimed to better reflect availability of mobile broadband services for European consumers as well as to take into account the mobility aspect connected with mobile networks accessibility. In order to comply with the Tender Specifications, the research team introduced the following additional mobile metrics:

- Average LTE coverage

- HSPA and LTE networks coverage of transportation infrastructure

The first additional metric took into account LTE household/population coverage provided by individual operators in each study country. This data was provided either by the operators themselves, by the NRAs or collected from publicly available sources, such as information accessible from operators' websites, quarterly reports, press releases, etc. The research team then provided DG Connect with an overall average LTE coverage value, calculated as a simple average of operators' LTE networks coverage in each study country.

This indicator was requested by DG Connect to serve as a better measurement of actual user experience (as a typical user will only be able to use one network at a time) and was included as one of the components of the DESI's Connectivity dimension (1b1 – 4G Coverage).

The second additional mobile coverage metric aimed to estimate HSPA and LTE mobile networks coverage of transportation infrastructure in the study countries. As this was a completely new metric with untested methodology, the research team applied varied approach to estimating the transportation coverage consisting of information provided by the mobile networks operators, NRAs, desk research as well as comparing household and landmass coverage and using it to determine overlay of geographical coverage and key transportation links in order to provide fair assessment of the availability of mobile services.

The research team included questions regarding mobile network coverage of key road and railway infrastructure in the 2016 and 2017 questionnaires, providing the length of road and rail networks (in km) in each study country. NRAs and mobile network operators were asked to provide information on percentage coverage of both individual road and rail coverage as well as combined coverage of transportation infrastructure provided by HSPA and LTE networks. In cases, where specific transportation coverage information was not available, the respondents were asked to provide more general information on landmass/geographic coverage of the HSPA and LTE networks, represented in terms of percentage of the total country landmass area covered by the specific networks.

In parallel, the research team collected information from additional sources such as NRA reports and other operator reported and publicly available information to complement the survey data. In cases where only landmass coverage information was available, coverage of transportation infrastructure was determined by comparing landmass and population/household coverage values, and overlaying with Point Topic's European Kilometre Grid database and the Corine landmass database.

Given the varying level of available information, the research team decided to take the 2016 and 2017 transportation coverage data collection as a testing ground for this metric with the aim to further evolve the methodological approach in the next iterations of the study. Therefore, following discussions with DG Connect, a decision has been made to continue to keep the transportation mobile coverage results for internal purposes. The research team will continue to develop a more robust methodology with further help from NRAs and operators.

4.0 European Overview

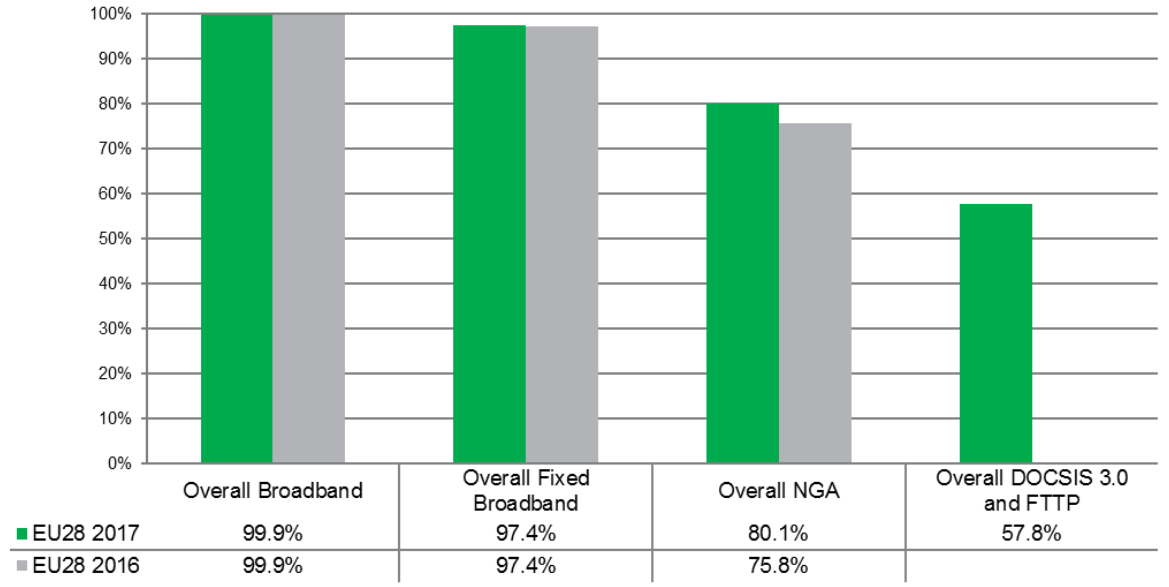
4.1 Europe-wide coverage by technology combinations

The main objective of the 2017 Broadband Coverage in Europe study was to assess the availability of broadband services across the EU, with additional information provided for Norway, Iceland and Switzerland.

As in the previous editions of the study, nine broadband technologies (DSL, VDSL, FTTP, WiMAX, cable, DOCSIS 3.0, HSPA, LTE, satellite) were analysed to ensure comparability and to evaluate progress in broadband rollout across Europe.

The collected data show that over 219 million EU households (99.9%) had access to at least one of the main fixed or mobile broadband access technologies in mid-2017 (excluding satellite), an increase of 0.9 million households compared to mid-2016. When satellite coverage is included, basic broadband services are now offered to every household in the EU.

EU28: Coverage by technology combination, 2017



	Overall Broadband	Overall Fixed Broadband	Overall NGA	Overall DOCSIS 3.0 and FTTP
EU28 2017	99.9%	97.4%	80.1%	57.8%
EU28 2016	99.9%	97.4%	75.8%	

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Note: Overall DOCSIS 3.0 & FTTP data was not collected in 2016

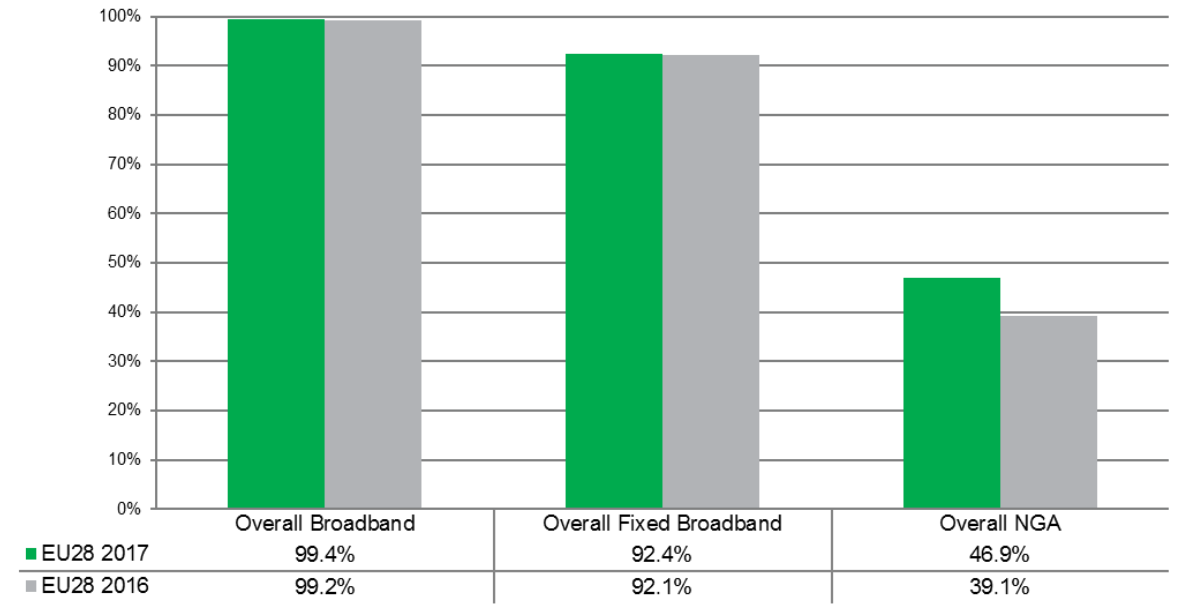
By mid-2017, the proportion of homes passed by fixed broadband networks (DSL, cable, FTTP or WiMAX) remained at 97.4%, highlighting the maturity of fixed broadband services in Europe. Given the increase in the number of households in the EU28, in absolute terms, fixed broadband coverage increased by 0.9 million during the twelve months to mid-2017.

As in previous years, the largest growth among the combination categories was witnessed in coverage of Next Generation Access (NGA) networks. During the twelve-month period to mid-2017, NGA coverage increased by 4.3 percentage points. This marked a slight reduction compared to NGA growth in the twelve months to mid-2016 (5.5 percentage points), but was still equivalent to 9.9 million new households gaining access to next generation broadband services. By mid-2017, 80.1% of households across the EU Member States were passed by at least one NGA technology (VDSL, FTTP or Cable DOCSIS 3.0).

In 2017, DG Connect also requested a fourth combination coverage category to be estimated on a national level indicating overall coverage by FTTP & DOCSIS 3.0 networks. These two technologies are those primarily capable of achieving at least 100Mbps download speeds (barring some still limited VDSL2 vectoring capability) and this metric thus provides an indication of the technological availability of these high-speed networks. In-mid 2017, nearly two in three EU households (57.8%) had access to either FTTP or DOCSIS 3.0 broadband services.

Access to fast broadband services in rural areas remains a key priority for the EU. At the end of June 2017, 99.4% of rural households across the EU28 had access to at least one broadband technology. However, only 46.9% (14.3 million rural households) could benefit from NGA broadband in mid-2017. This equates to a 7.8 percentage point increase, or 2.3 million additional households, compared to mid-2016. Rural NGA coverage growth was therefore slower in the twelve months to mid-2017 than in the twelve months to mid-2016, when rural NGA availability increased by 9.5 percentage points.

EU28: Coverage by technology combination in rural areas, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

4.2 Europe-wide coverage by individual technologies

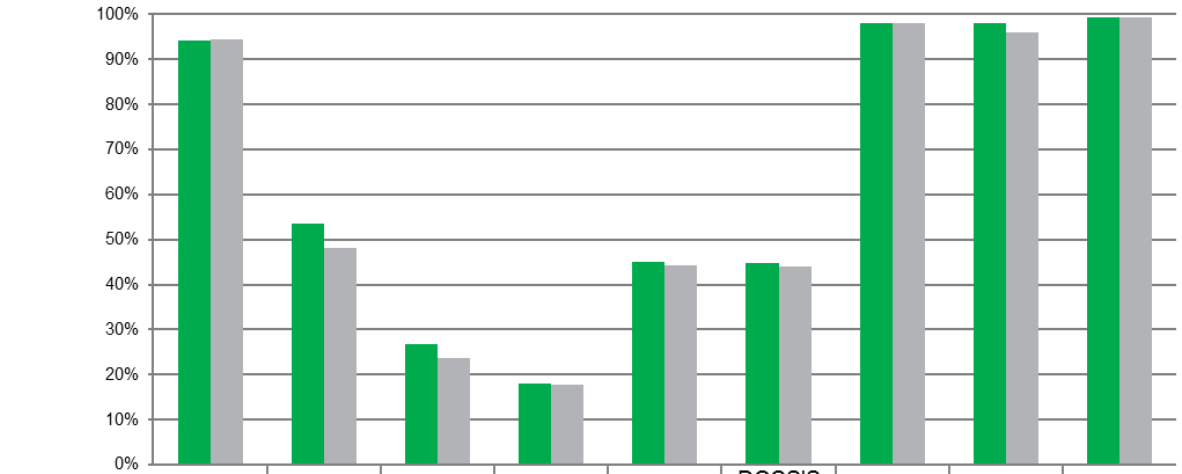
4.2.1 Coverage by technology in total

At the end of June 2017, satellite broadband was available to 99.4% of EU households, remaining the most pervasive technology in Europe in terms of overall coverage. Our research indicates there has been no change in satellite broadband availability at an EU28 level compared to 2016. In the Baltic countries, there continued to be limited coverage from KA-band satellites, with satellite broadband reaching only certain parts of Estonia, Latvia and Lithuania. Iceland remained the only study country where there were no satellite broadband services available.

Examining the availability of fixed broadband technologies, DSL remained the most pervasive broadband technology, reaching 94.1% of EU households in mid-2017. This represents a 0.2 percentage point decline compared to mid-2016, underpinned by household growth exceeding DSL deployment. In absolute terms, DSL coverage increased by 0.2 million households during the twelve-month period. Moreover, cable network availability continued to expand steadily, rising by 0.8 percentage points to reach 45.1% by mid-2017. In absolute terms, this is equivalent to an additional 2.3 million households capable of receiving cable broadband services.

Following a 1.8 percentage point decline in the twelve months to mid-2016, WiMAX availability increased by 0.2 percentage points in the twelve-month period to mid-2017, reaching 18.0% of EU households. WiMAX coverage growth is attributed to coverage increases in Spain and Denmark. In addition, while in the last couple of years European operators chose to redistribute their WiMAX spectrum for LTE transmission, this trend was less pervasive in 2017 as operators explore their options in combining fibre optic connectivity with fixed wireless distribution.

EU28: Coverage by technology, total



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
EU28 2017	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%
EU28 2016	94.3%	48.2%	23.6%	17.8%	44.3%	43.9%	98.0%	96.0%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

VDSL remained the fastest growing NGA technology, with coverage rising by 5.2 percentage points during the study period. VDSL services, therefore, continued to be most widespread NGA technology, reaching more than half (53.4%) of EU households. Meanwhile, the proportion of homes passed by FTTP networks increased by 3.2 percentage points, leading to more than a quarter (26.8%) of EU households having access to FTTP broadband services.

Growth in DOCSIS 3.0 availability was considerably lower than the coverage increases for VDSL and FTTP deployments. DOCSIS 3.0 coverage expanded at a similar rate to the previous iteration of the study, rising by 0.8 percentage points, reaching 44.7% of EU households. Limited growth can be attributed to the lack of deployment of new cable networks, in addition to the fact that 99% of cable networks had already been upgraded to DOCSIS 3.0 by mid-2016.

Examining mobile network coverage, HSPA remained relatively unchanged and continued to provide near universal availability (97.9%). Moreover, LTE coverage increased by 1.9 percentage points during the period, also reaching 97.9% availability. Consequently, this year's study was the first time that HSPA coverage did not exceed LTE coverage in the EU28. Given the continued deployment of LTE networks in many Member States, LTE can be expected to overtake HSPA coverage in the EU in the following year's study.

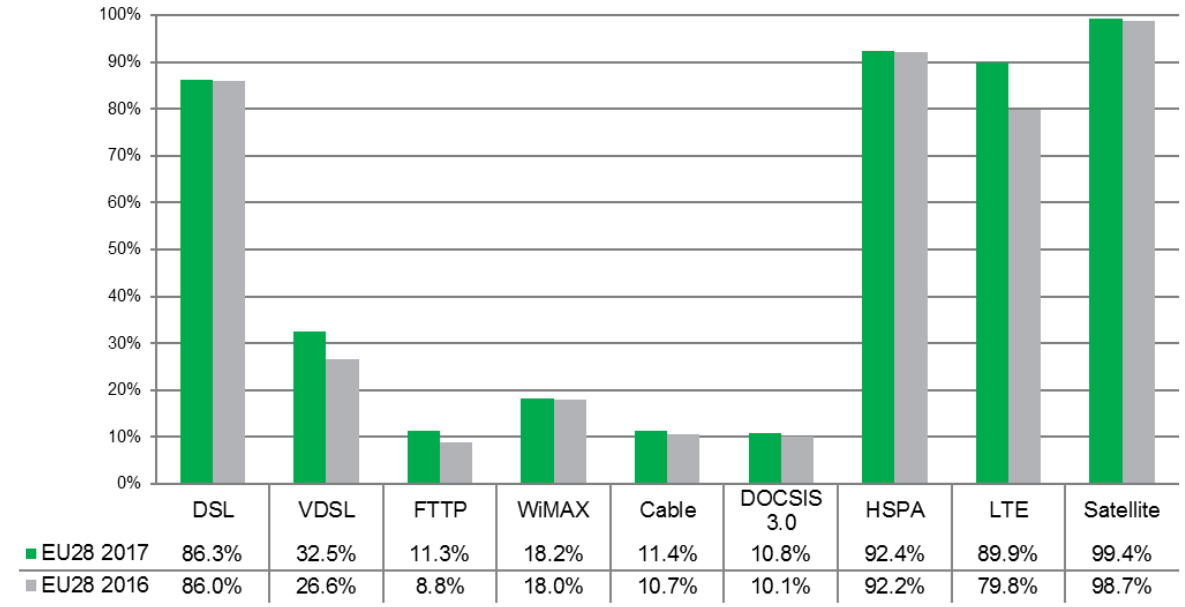
4.2.2 Coverage by technology in rural areas

Historically, it has been hard for operators to justify investments in rural areas. As a result of the low population density in these areas, investments can be viewed as economically less profitable. Consequently, achieving the Digital Agenda's goal of universal 30 Mbps coverage by 2020 continues to represent a considerable challenge in EU's rural regions.

Broadband coverage levels in rural regions remain notably lower than total national coverage, with fixed broadband networks passing 92.4% of rural EU households compared to 97.4% of total households. The gap between total NGA coverage and rural NGA coverage is much larger, but at 33.2 percentage points, it continued to narrow during the twelve months to mid-2017. For comparison, the difference in total and rural NGA coverage was 36.7 percentage points in mid-2016, and 40 percentage points in mid-2015, highlighting the shift in NGA network deployments towards rural areas.

During the twelve months to mid-2017, rural VDSL coverage expanded by 5.9 percentage points, reaching 32.5% of rural households. As was the case in previous years, the additional VDSL coverage relates mainly to areas already covered by DSL networks, which are being gradually upgraded to VDSL. Consequently, this increase would not account for newly deployed networks to previously unserved areas.

EU28: Coverage by technology, rural areas



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
EU28 2017	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%
EU28 2016	86.0%	26.6%	8.8%	18.0%	10.7%	10.1%	92.2%	79.8%	98.7%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

The most widespread fixed broadband technology in rural areas continued to be DSL, reaching 86.3% of rural EU households by mid-2017, an increase of 0.3 percentage points. WiMAX coverage expanded by a similar amount, growing by 0.2 percentage points, to cover 18.2% of rural households by the end of June 2017.

Cable network deployment in rural areas continued at a similar rate to the previous year, rising by 0.7 percentage points to reach 11.4% of EU rural households by mid-2017. Cable coverage in rural areas remained limited due to the high costs associated with deploying cable networks. As a result, operators prioritised new cable network deployment in urban areas to take advantage of the higher population

densities, which help to maximise the return on investment. Cable networks in rural areas have been largely upgraded to DOCSIS 3.0, underpinned by the relatively low cost of upgrading cable networks to DOCSIS 3.0 compared to the cost of the initial cable deployment. Consequently, DOCSIS 3.0 services passed 10.8% of rural EU homes by mid-2017. For the first time, the proportion of rural EU households covered by DOCSIS 3.0 services was lower than rural FTTP availability. Rural FTTP coverage increased by 2.5 percentage points during the period, reaching 11.3% of rural EU households.

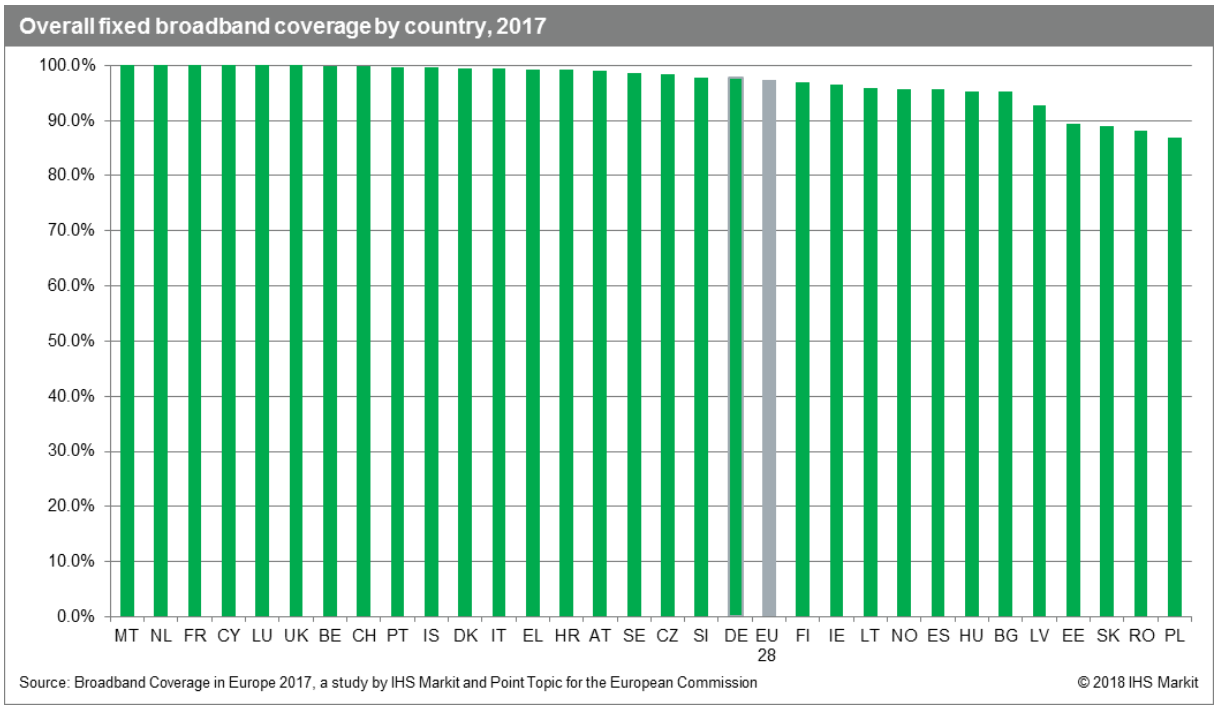
Looking at mobile broadband, rural HSPA network deployment slowed in the twelve-month period to mid-2017. HSPA coverage only increased by 0.2 percentage points in the twelve months to mid-2017, compared to the 2.3 percentage point increase in 2016. It was a similar story for rural LTE growth. Although LTE remained the fastest growing rural broadband technology, the increase in coverage of 10.2 percentage points was significantly lower than the 43.4 percentage point growth in the previous year's study. This highlights the maturity of rural LTE services, which covered 89.9% of rural EU households by mid-2017. It is worth noting that the rollout of LTE networks in rural areas has the potential to improve rural coverage in regions where fixed network deployment is more difficult or not feasible.

The nature of satellite technology means that satellite broadband services reach a similar level of coverage in rural areas as across the EU as a whole. As such, satellite broadband coverage remained relatively unchanged, reaching 99.4% of rural areas. Satellite remains the only option for receiving broadband access in the most sparsely populated and hard-to-reach regions.

4.3 Country comparison by total technology coverage

4.3.1 Total overall fixed broadband by country

The overall fixed broadband coverage category has been designed to provide a measure of progress in deployment of fixed broadband access technologies, which are capable of providing households with broadband services of at least 2 Mbps download speed. Four technologies make up the overall fixed broadband coverage figure: DSL (including VDSL), cable (including DOCSIS 3.0), FTTP, and WiMAX. Note that FTTP coverage trends are discussed in more detail in the following chapter on NGA coverage by country.

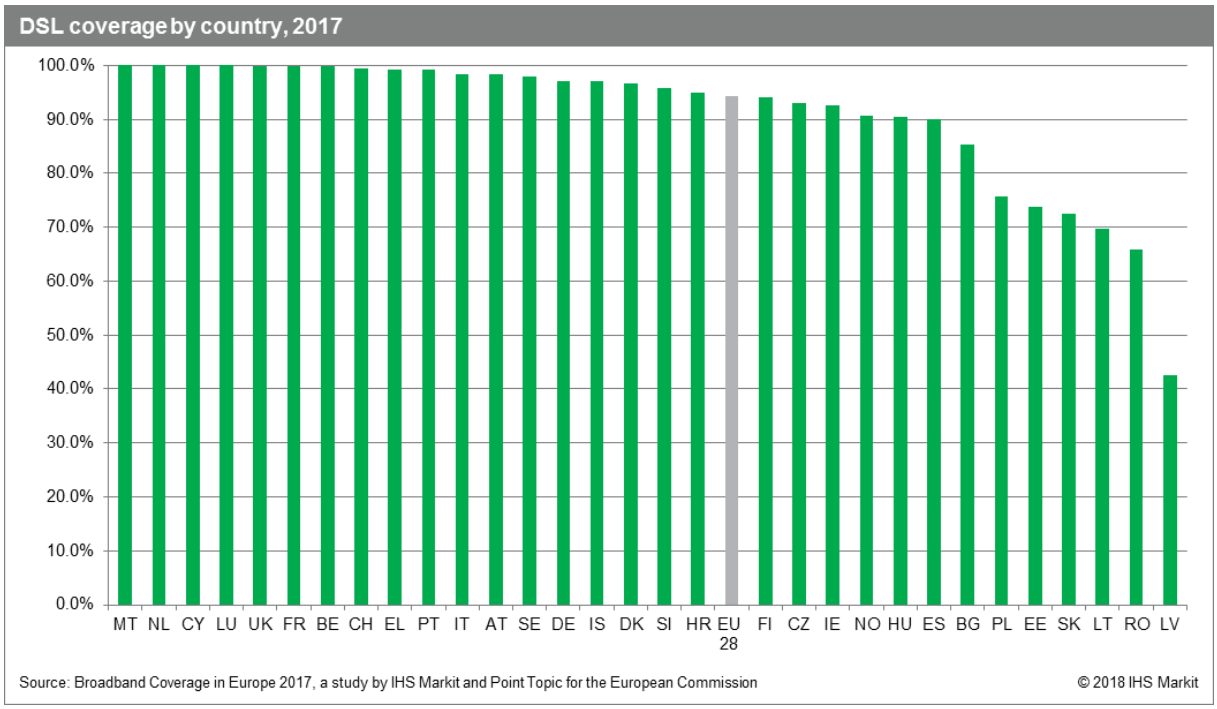


In total, 26 out of the 31 study countries registered fixed broadband coverage of above 95%, highlighting the breadth of fixed broadband coverage in most nations. Several countries recorded complete, or near complete, fixed broadband coverage including Malta, the Netherlands, France, Cyprus, Luxembourg and the UK. Given the high fixed broadband coverage achieved in many countries by mid-2016, most countries recorded only minor improvements in fixed broadband coverage during the twelve months to mid-2017. The largest coverage increase was in Croatia, where fixed broadband coverage expanded by 2.3 percentage points to reach 99.3% of households. Four countries (Estonia, Slovakia, Romania and Poland) reported coverage below 90% in mid-2017. These countries face fixed broadband coverage challenges due to their sparsely populated and underserviced rural areas.

4.3.1.1 Total DSL coverage by country

During the twelve months to mid-2017, DSL continued to be the most pervasive fixed broadband technology in terms of coverage. In total, 24 out of the 31 study countries recorded DSL coverage above 90%, with the EU average for DSL availability reaching 94.3%. As in the previous year, Malta, the Netherlands, France, Cyprus, Luxembourg and the United Kingdom reported complete coverage by DSL networks. However, it is important to note that while universal DSL coverage was registered for these countries, this is generally considered accurate to one decimal place to account for the possibility of a negligible number of remote homes failing to receive DSL coverage.

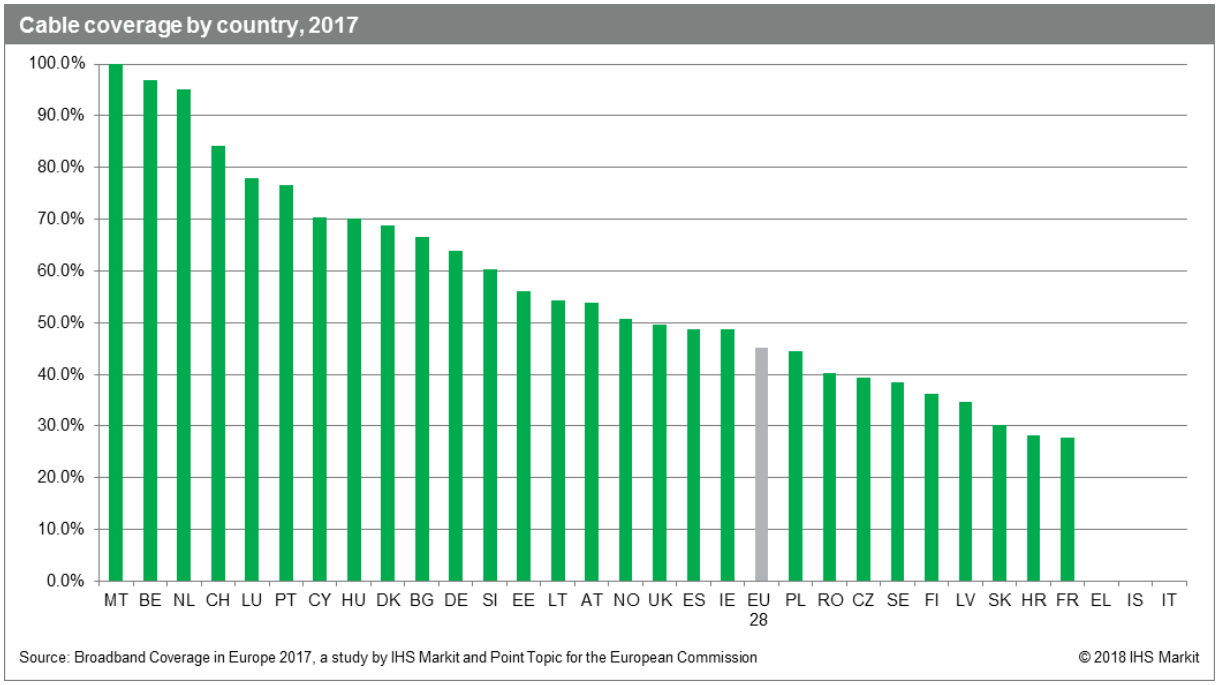
Universal or near-universal DSL coverage (i.e. very close to 100% of households) was observed in countries with the most developed traditional telephone networks as DSL technology utilizes legacy fixed line twisted-pair copper network infrastructure.



As in 2016, Poland, Estonia, Slovakia, Lithuania, Romania and Latvia all recorded DSL coverage levels below 80%. In a number of these countries, DSL coverage has begun to give way to NGA technologies such as FTTP, which is discussed in more detail in the individual country chapters.

4.3.1.2 Total cable coverage by country

Compared to DSL coverage, there is considerable variation in cable coverage by country. Traditionally, cable operators have concentrated deploying their networks in urban and semi-urban areas, as higher population densities in these areas helped to ensure return on investment. Cable networks are also likely to have greater coverage in countries with a history of cable TV uptake. Conversely, in countries where cable companies entered the market at a later stage or their operations failed (such as in Italy), cable coverage tends to be considerably lower.

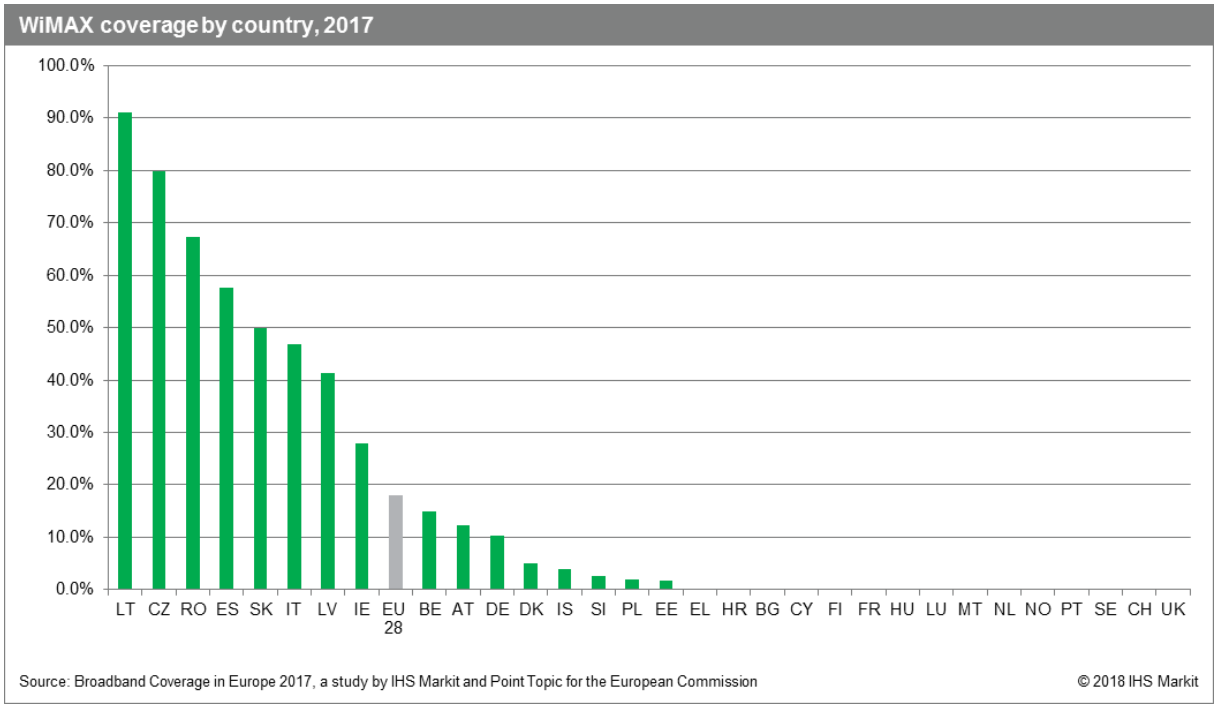


As cable deployments are generally centred on urban areas, there tend to be low levels of extra coverage provided by cable technology due to overlap with DSL in these urban areas. However, DOCSIS 3.0 cable services continue to contribute considerably to NGA broadband availability across the EU, as described in the following chapter.

Malta, Belgium and the Netherlands remained the only three countries where the proportion of homes passed by cable networks exceeded 95%. Malta ranked highest in terms of cable coverage, with near universal coverage (99.9%). In total, nineteen countries recorded cable availability above the EU average of 45.1%. Romania recorded the largest increase in cable coverage, rising by 8 percentage points to pass 40.3% of homes, but remained below the EU average for cable availability. Twelve other nations also reported below average cable coverage. This included three countries (Greece, Iceland and Italy) where cable networks remained completely absent.

4.3.1.3 Total WiMAX coverage by country

When determining WiMAX coverage, it is important to keep in mind the limitations of WiMAX signals. WiMAX can technically offer quite extensive geographic reach, yet the number of customers that the network can realistically support may be much smaller than a fixed wireline technology. Another challenging factor is the great fragmentation of the European WiMAX market, which features many small providers operating across Europe. On the other hand, WiMAX technology generally provides a viable broadband solution for less-densely populated and harder-to-reach areas.

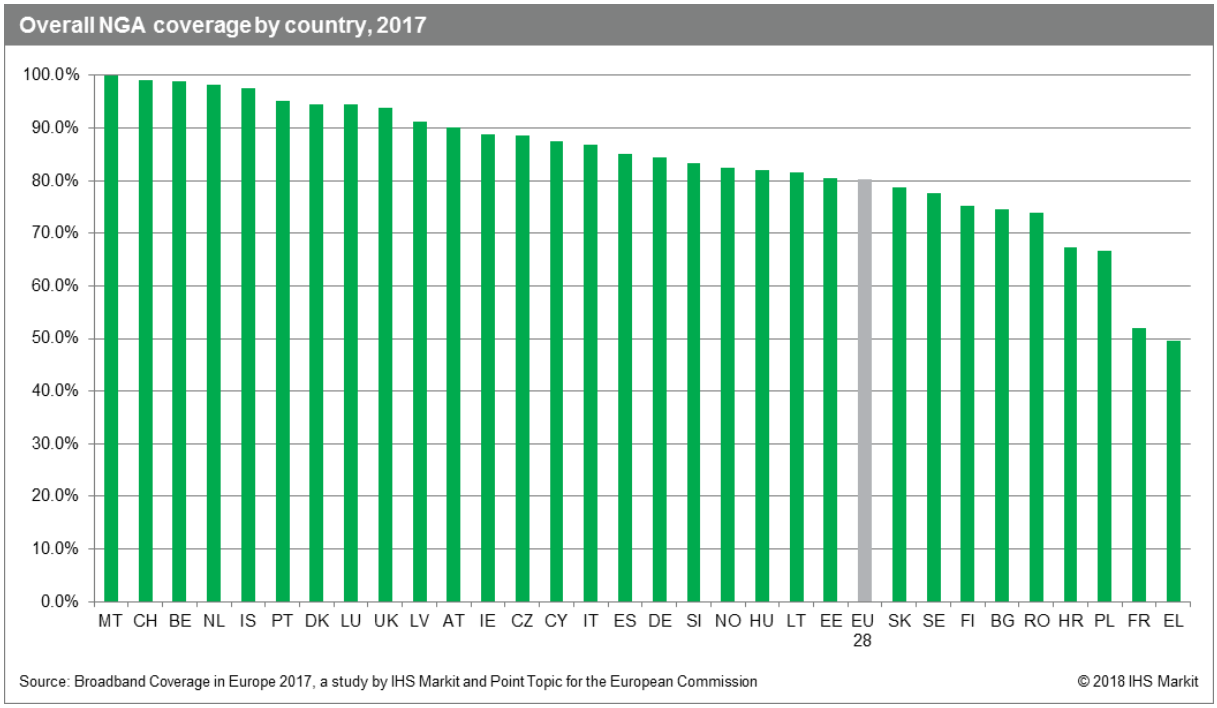


The EU average for WiMAX coverage reached 18% by mid-2017, an increase of 0.2 percentage points during the twelve-month period. Nevertheless, WiMAX continues to be a marginal broadband technology in most study countries, with Lithuania, Czech Republic and Romania the only countries where WiMAX coverage exceeded two-thirds of households.

Spain and Denmark witnessed the largest increases in WiMAX coverage at 3.3 and 2.2 percentage points, respectively. On the other hand, Latvia and Czech Republic registered reductions in WiMAX coverage of around 3.5 percentage points. By mid-2017, thirteen countries reported no WiMAX coverage, compared to fifteen countries in mid-2016, after minor WiMAX deployments in Greece and Croatia.

4.3.2 Total overall NGA coverage by country

The NGA combination category comprises of VDSL, FTTP and DOCSIS 3.0 technologies, all typically capable of delivering a service speed of at least 30 Mbps (although VDSL local loop lengths mean that actual speeds do vary[2]). The main objective of the Digital Agenda for Europe is to have complete coverage of European households at this speed by 2020. The analysis of the combination therefore constitutes an evaluation of the rollout of the relevant technologies and progress towards this goal.



By mid-2017, there continued to be considerable differences in NGA coverage across the study countries. This reflects the various strategies and approaches to high-speed broadband deployment across Europe. Malta remained the only country to record complete coverage for the NGA technology category, whilst five other countries (Switzerland, Belgium, the Netherlands, Iceland and Portugal) recorded coverage levels above 95%. On the other hand, of the 31 study countries, nine countries reported coverage levels below the European average (80.1%). Greece was the only study country where less than a half of households (49.6%) had access to NGA services.

4.3.2.1 Total VDSL coverage by country

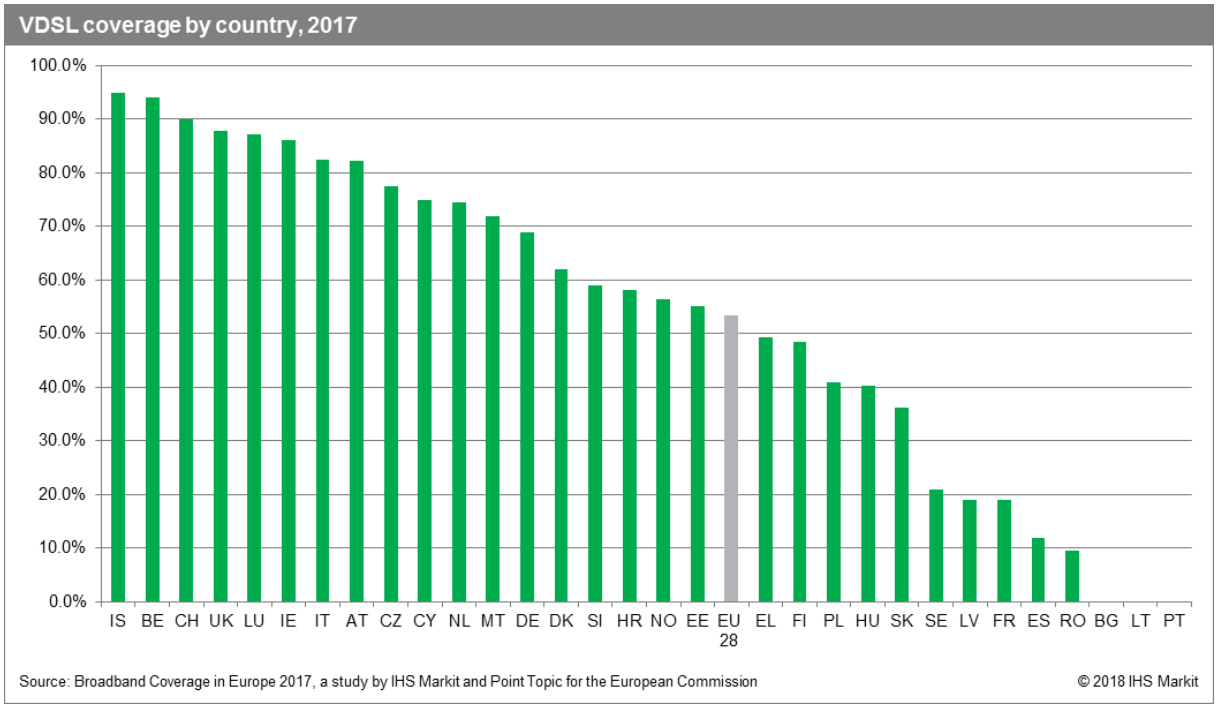
The EU average for VDSL coverage reached 53.4% in mid-2017, as VDSL availability passed 50% for the first time. VDSL continued to be the NGA technology showing the fastest coverage growth during the period, increasing by 5.2 percentage points, although VDSL coverage growth slowed compared to the twelve-month period to mid-2016. Many operators continue to focus their deployment strategies on upgrading existing copper infrastructure, rather than investing in the typically more expensive deployments of fibre optic networks all the way to customers' property.

It is important to note that broadband performance on VDSL lines varies depending on the length of the copper loop from the VDSL enabled cabinet connected to the optical fibre backhaul. Formerly, households with a VDSL connection at a distance of about 500 metres from a VDSL enabled street cabinet or exchange, typically, reached download connection speeds of around 25 Mbps. However, with the newest VDSL technology, these speeds can be achieved up to a distance of 1000 metres.[3]

By mid-2017, Iceland, Belgium and Switzerland all recorded VDSL coverage levels that exceeded 90%, whilst VDSL networks passed more than 80% of homes in five other countries (the UK, Luxembourg, Ireland, Italy and Austria). Overall, eighteen study countries had VDSL coverage that was higher than the EU average of 53.4%. This included Czech Republic, Croatia, Germany and Italy, which all saw a

[2] Please see Chapter 4.5 for more information on actual download speed coverage.
[3] For further analysis of actual download speed coverage please see Chapter 4.5.

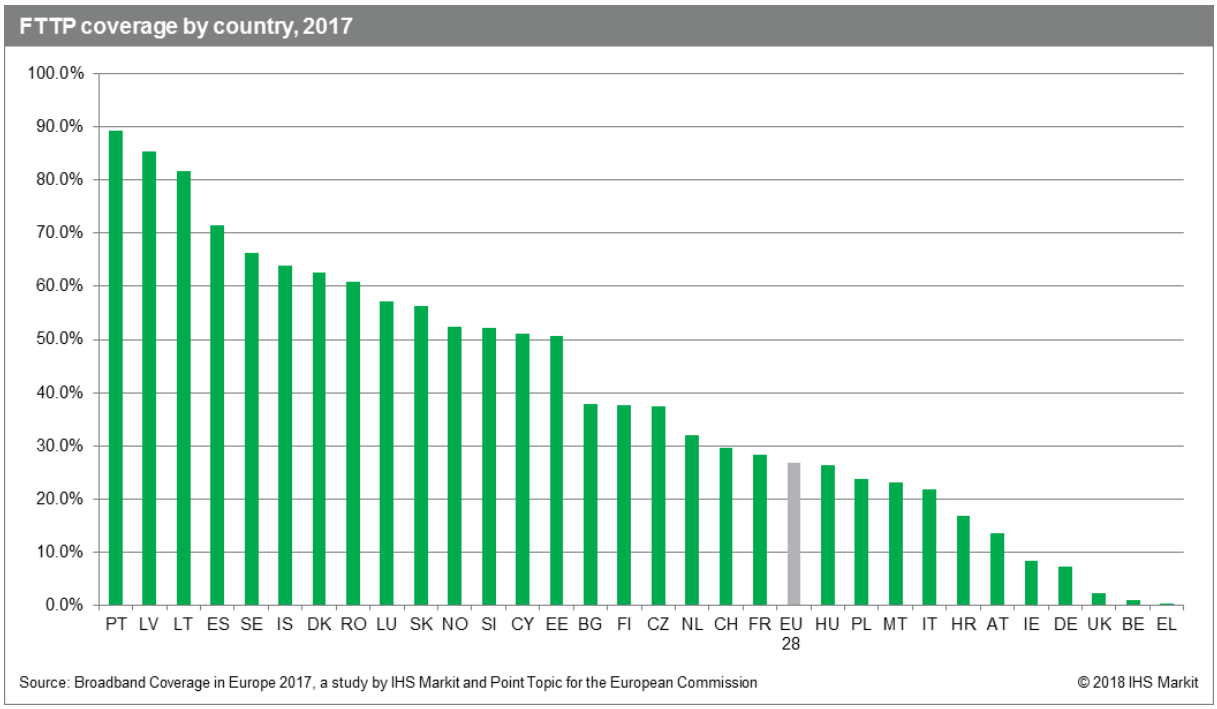
double-digit percentage point increase in VDSL coverage during the period. The Czech Republic recorded the largest VDSL coverage increase, equivalent to 24.3 percentage points.



However, VDSL services remained far from widespread in a number of countries. As was the case in 2016, Latvia, France, Spain and Romania all recorded VDSL coverage of less than 20%, while three study countries (Bulgaria, Lithuania and Portugal) reported no VDSL availability. In many of these countries, operators have chosen to deploy NGA technologies other than VDSL.

4.3.2.2 Total FTTP coverage by country

By mid-2017, Portugal continued to rank highest in terms of FTTP coverage. FTTP networks in Portugal passed 89.4% of homes, a 3.3 percentage point increase. Latvia and Lithuania also recorded FTTP availability that exceeded 80% of households at 85.3% and 81.6%, respectively. Spain was the only other country to report FTTP coverage above 70% of households, with 71.4% homes passed by FTTP networks.

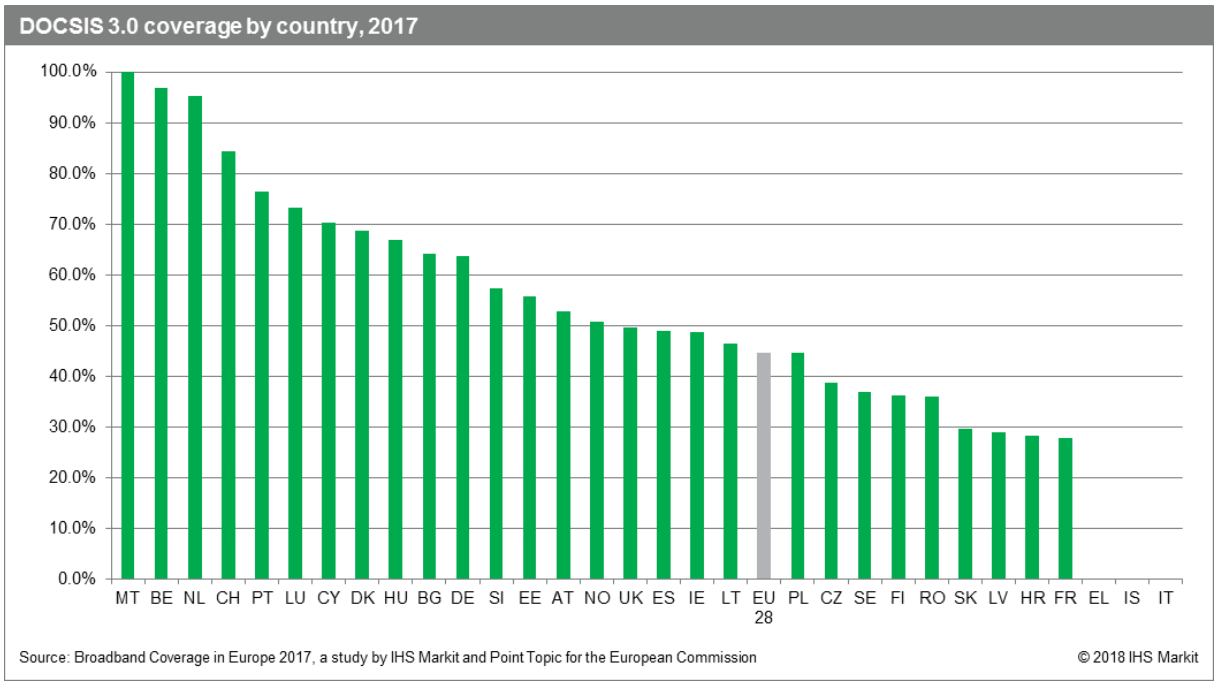


During the twelve-month period to mid-2017, Spain recorded the highest increase in FTTP coverage, growing by 8.6 percentage points. The growth in FTTP coverage in Spain can be attributed to network sharing agreements among operators, as well as alternative operators having access to the incumbent's ducts in order to accelerate deployment. Along with Spain, three other nations (France, Poland and Malta) reported growth in FTTP availability of more than 7 percentage points.

The EU average for FTTP coverage reached 26.8% as of mid-2017, with eleven countries reporting coverage levels below the EU average. Whilst FTTP networks were available in all study countries, availability was very limited in some instances. The UK reported FTTP coverage of 2.3% of households, whilst Belgium (0.8%) and Greece (0.4%) ranked as the lowest countries in terms of FTTP availability. In these countries, operators have prioritised VDSL upgrades to existing DSL networks as opposed to investing in the typically more expensive FTTP technology. Such operators tend to view the speeds associated with VDSL technologies as sufficient to satisfy current demand. In addition, some of these operators have also begun to trial solutions such as G.fast to increase achievable speeds using existing copper infrastructure.

4.3.2.3 Total DOCSIS 3.0 coverage by country

During the twelve months to mid-2017, the proportion of cable networks upgraded to DOCSIS 3.0 remained relatively unchanged. This is unsurprising given the high proportion of cable networks across Europe already upgraded to DOCSIS 3.0 by mid-2016 (99%). Moreover, as in the previous year, sixteen study countries had fully upgraded their cable networks to DOCSIS 3.0. In addition, DOCSIS 3.0 comprised over 80% of cable networks in all countries with cable broadband coverage.

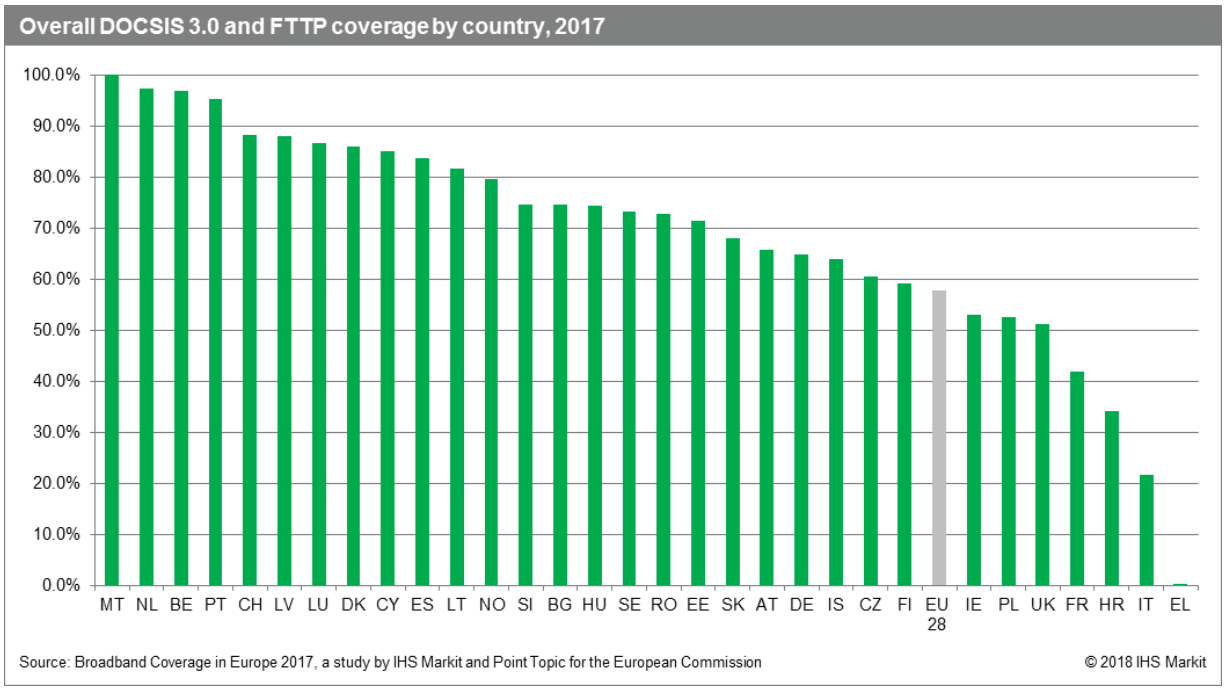


As in 2016, Malta was the only country to record universal DOCSIS 3.0 availability. Two other study countries (Belgium and the Netherlands) recorded DOCSIS 3.0 coverage levels above 95%. Switzerland (84.3%) and Portugal (76.3%) were the only two other study countries where DOCSIS 3.0 networks passed more than three-quarters of homes. DOCSIS 3.0 coverage in nineteen study countries exceeded the EU average (44.7%). Austria recorded the largest increase in DOCSIS 3.0 availability, with coverage increasing by 5.5 percentage points to pass 52.8% of homes. Romania recorded the second largest increase in DOCSIS 3.0 availability, at 5.3 percentage points, but DOCSIS 3.0 coverage remained below the EU average in the country. As was the case in previous years, three countries (Greece, Iceland and Italy) did not have cable broadband networks, therefore reported no DOCSIS 3.0 coverage.

4.3.3 Overall FTTP and DOCSIS 3.0 coverage by country

In 2017, DG Connect requested a fourth combination coverage category to be estimated on a national level indicating overall coverage by FTTP & DOCSIS 3.0 networks. These two technologies are those primarily capable of achieving at least 100Mbps download speeds (barring some still limited VDSL2 vectoring capability) and this metric thus provides an indication of the technological availability of these high-speed networks. In-mid 2017, 57.8% of EU homes were passed by at least one FTTP or DOCSIS 3.0 network.

Among the countries registering the highest overall FTTP & DOCSIS 3.0 coverage were those with most widespread DOCSIS 3.0 coverage, such as Malta, the Netherlands and Belgium, all reaching coverage levels over 90%. On the other hand, countries such as Greece and Italy record the lowest levels, due to absence of cable networks and operators' preference for VDSL upgrades over FTTP deployments.

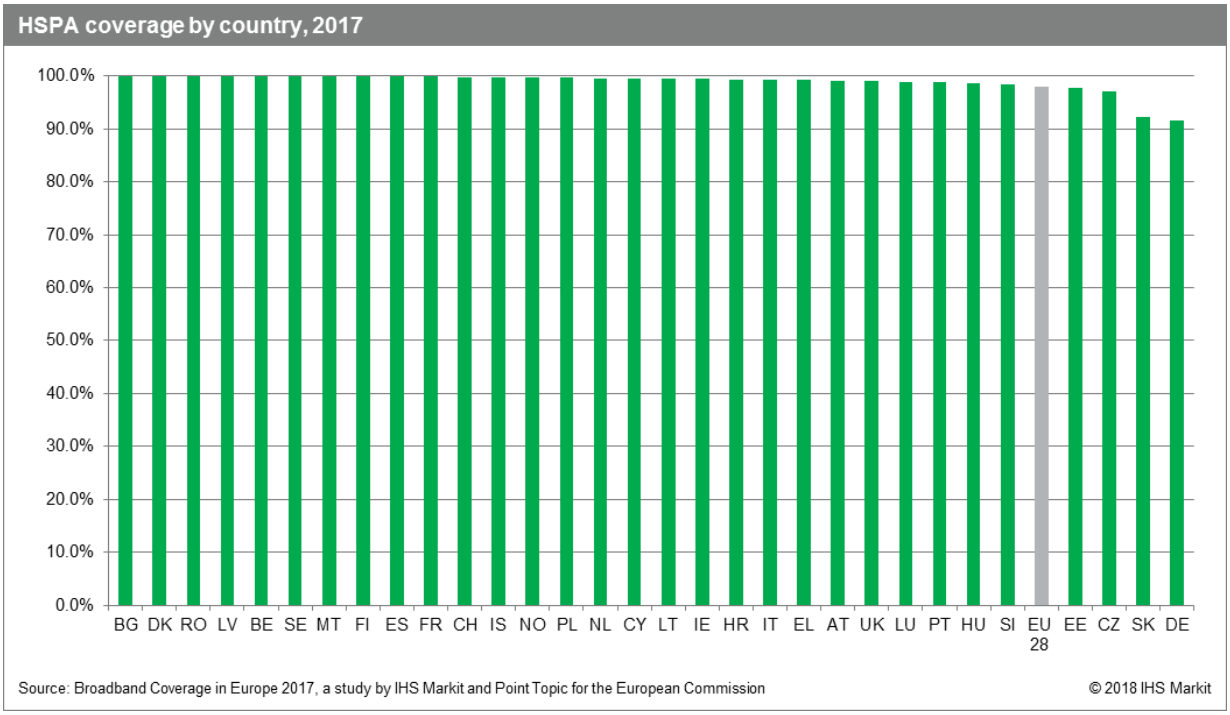


4.3.4 Mobile broadband technologies coverage by country

4.3.4.1 Total HSPA coverage by country

As was the case in previous iterations of the study, HSPA services provided near-universal coverage. By mid-2017, HSPA networks covered 97.9% of EU households, a 0.1 percentage point decrease. The reduction in HSPA availability was due to the growth in the number of households exceeding HSPA deployment. In absolute terms, the number of households reached by HSPA networks increased by 0.6 million.

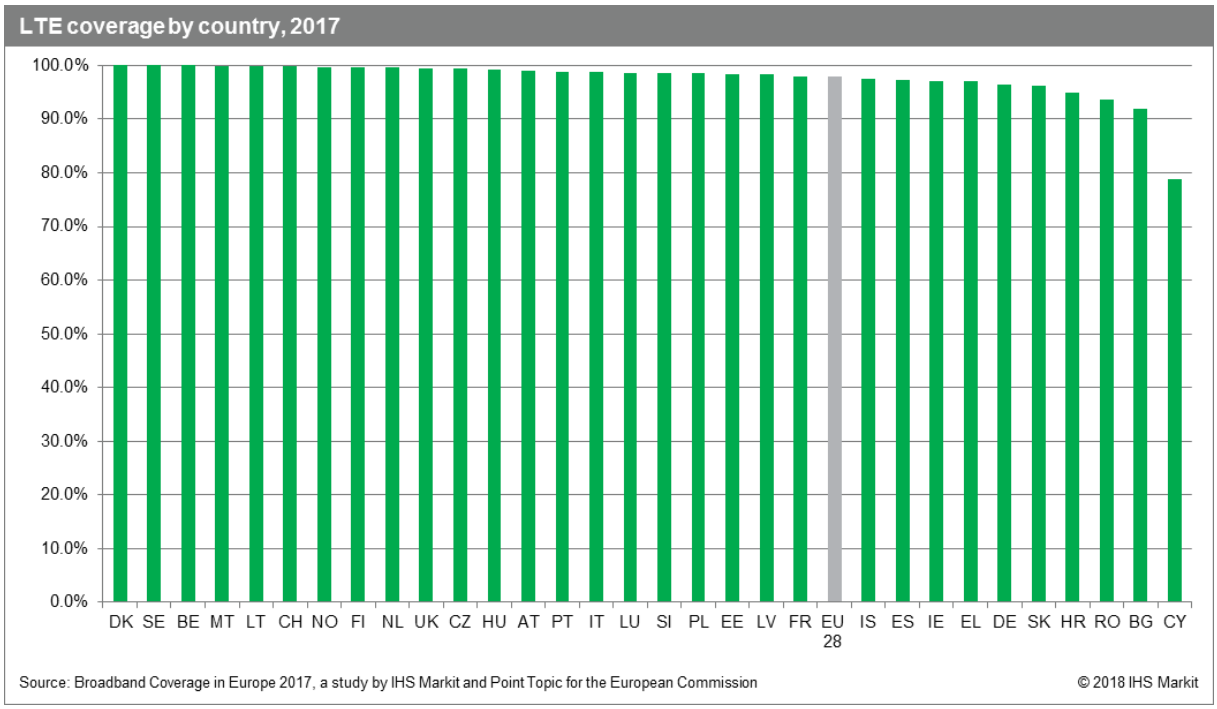
Slovakia was the only country that registered a coverage increase of more than a single percentage point, with HSPA availability rising by 1.6 percentage points to cover 92.3% of households. However, Slovakia remained one of only two countries with HSPA availability below 95%. The other county was Germany, which recorded HSPA coverage of 91.5%.



However, it is important to note that the actual performance and user experience of HSPA broadband varies greatly due to varying standards of individual operators as well as actual conditions in each coverage area. CDMA-based mobile networks (such as HSPA) are also subject to changes in the range of the geographical area covered by a cellular telephone transmitter based on the amount of traffic using that transmitter in any given moment – so called cell breathing. Thus, the quality of mobile broadband connection can vary significantly, within an area as a consequence of geographic or building features, and temporally as a consequence of cell breathing. There can also be significant differences between indoors and outdoors coverage with respect to mobile broadband performance. For the purpose of this study the research team defined HSPA coverage based on outdoors coverage of premises.

4.3.4.2 Total LTE coverage by country

Average LTE coverage in the EU increased by 1.8 percentage points in the twelve-month period to mid-2017, reaching 97.8% of households. As a result, LTE was no longer the fastest growing broadband technology in terms of coverage, with high levels of coverage already achieved in mid-2016 (96%). As was the case in the 2016 study, 21 study countries reported coverage levels above the EU average (97.9%). Moreover, thirteen countries registered LTE coverage exceeding 99% of households, with Denmark, Sweden, Belgium and Malta all recording LTE availability of at least 99.9%. In ten study countries, LTE networks passed higher levels than HSPA networks, including Germany where LTE availability exceeded HSPA availability by 5 percentage points.



Romania recorded the largest increase in LTE coverage during the twelve-month period, passing 93.6% of homes, an increase of 18.4 percentage points. Bulgaria was the only other country that registered a double-digit percentage point increase, with LTE availability expanding by 15.4 percentage points to cover 93.6% of households. Despite these large coverage increases, LTE availability in Romania and Bulgaria continued to be below the EU average. Cyprus recorded the lowest LTE coverage (78.8%) as of mid-2017. Cyprus was late to launch LTE with the first LTE networks not deployed until March 2015[4], and with limited coverage growth during the period (4.5 percentage points), it remained the only study country with LTE availability below 80% of households.

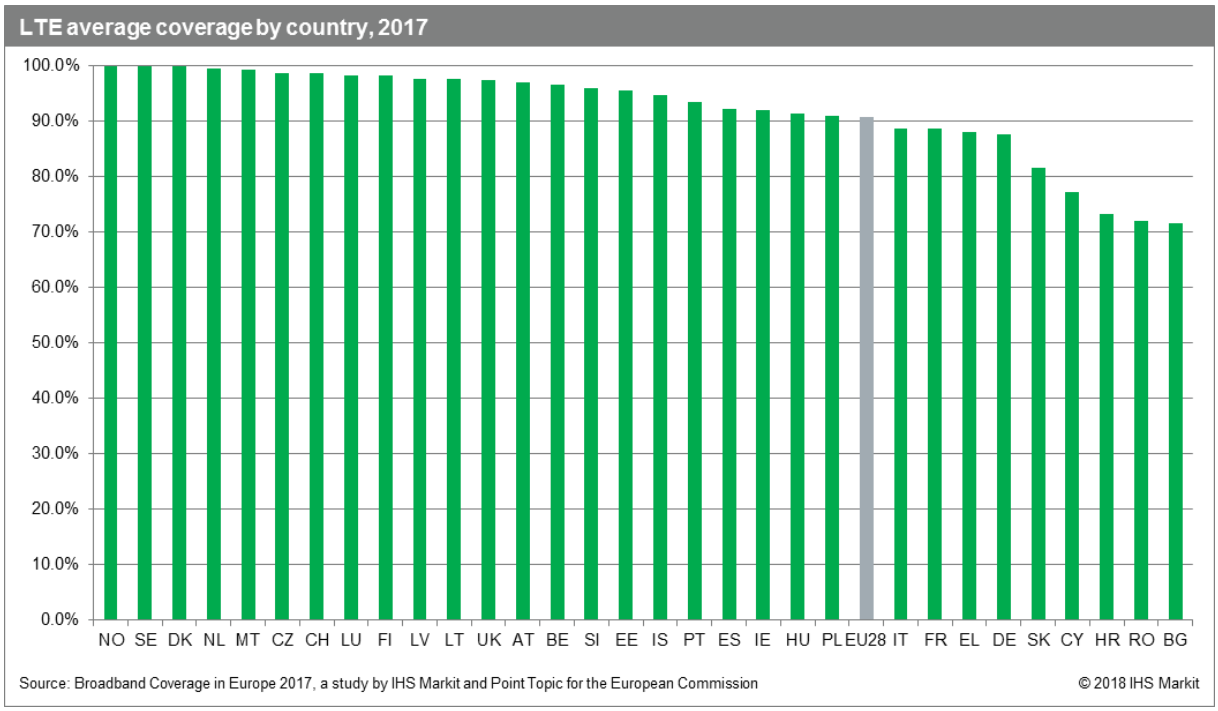
4.3.4.3 Average LTE coverage by country

In addition to the standard measurement of LTE broadband coverage analysing the highest possible coverage after taking into account overlapping network coverage of operators providing LTE services over their networks in the same area, DG Connect has also asked the research team to provide them with a new metric looking at average coverage of all LTE operators. This indicator aims to serve as a better measurement of actual user experience, as a typical user will only be able to connect to one LTE network at a time. The average LTE coverage metric has been also included as one of the components of the Connectivity dimension of the Digital Economy & Society Index published in May 2018.

As in the previous year, all operators in Denmark, Norway and Sweden provided universal coverage. As a result, no matter which particular operator a consumer decides to use, there will be ubiquitous coverage. Average operator LTE coverage exceeded 99% in the Netherlands and Malta, whilst the average LTE coverage was higher than 95% in eleven countries.

The average LTE coverage level in nine countries (Italy, France, Greece, Germany, Slovakia, Cyprus, Croatia, Romania and Bulgaria) was below the overall EU average total of 90.8%. In these countries, operators provide only partial LTE coverage, limiting the user's experience of these networks.

[4] ttp://in-cyprus.com/mtn-primetel-launch-4g-networks/



4.3.4.4 Total mobile coverage of transportation links

As per the Tender Specifications and DG Connect's specification during the inception meeting, the research team has aimed to provide information on availability of mobile broadband connectivity not limited to household coverage, which would better reflect the mobility aspect of mobile connectivity.

As in 2016, the data collection and analysis in 2017 provided best-effort estimates based on data obtained from NRAs, mobile network operators, as well information attained from various official NRA-backed reports assessing national mobile networks connectivity and publicly available operator published information, such as operator coverage maps. The research team also collected data on landmass/geographic coverage of mobile networks, which was used to help guide the estimates in cases where transportation coverage information was not available. In addition, Point Topic's European Kilometre Grid database and the Corine landmass database were also used to compare operator published coverage maps with the geographic location of key transportation links.

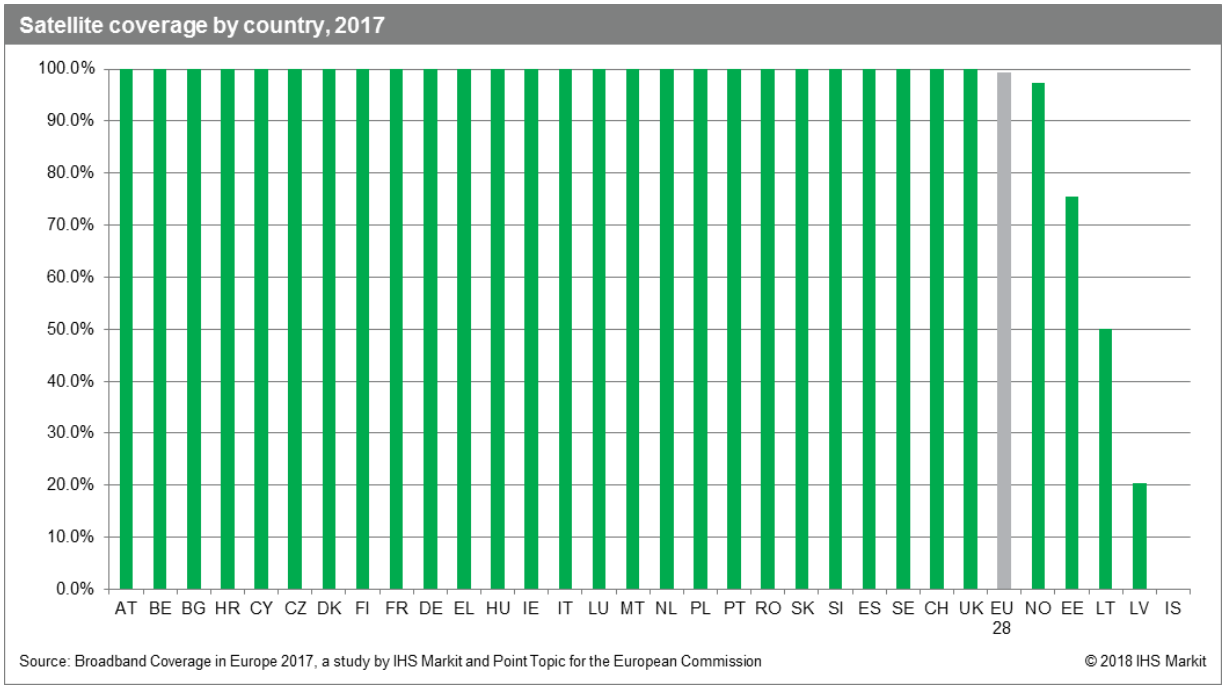
As such the research team considered transportation infrastructure in terms of motorways and roads as well as railway networks. However, it is outside of the scope of this evaluation to take into account the quality of service components associated for example with lost connectivity due to road and rail tunnels, tower signal handover when travelling in high-speed on a motorway or with restricted signal strength inside train carriages caused by the thickness of the carriage walls. Therefore, these and other factors influencing mobile broadband connectivity and user experience were not evaluated.

Given the varying level of available information, the research team decided to take both the 2016 and 2017 transportation coverage data collection as a testing ground for this metric with the aim to further evolve the methodological approach in the next iterations of the study. Therefore, following discussions with DG Connect, a decision has been made to keep the transportation coverage results for internal purposes. The research team will continue to develop a more robust methodology with further help from NRAs and operators.

4.3.4.5 Total satellite coverage by country

At the end of June 2017, all of the study countries, with the exception of Iceland, were covered by KA-band satellite, which is able to deliver a 2Mbps broadband service. However, in certain countries (Estonia, Lithuania and Latvia) there was only partial satellite coverage. As in 2016, satellite beams are still capable of reaching about 75% of Estonian households, approximately 50% of Lithuanian households and just over 20% of Latvian households. In addition, satellite dishes with 1.2m diameter

are required to receive satellite broadband services in these areas, making the widespread use of satellite broadband in these three countries more challenging.



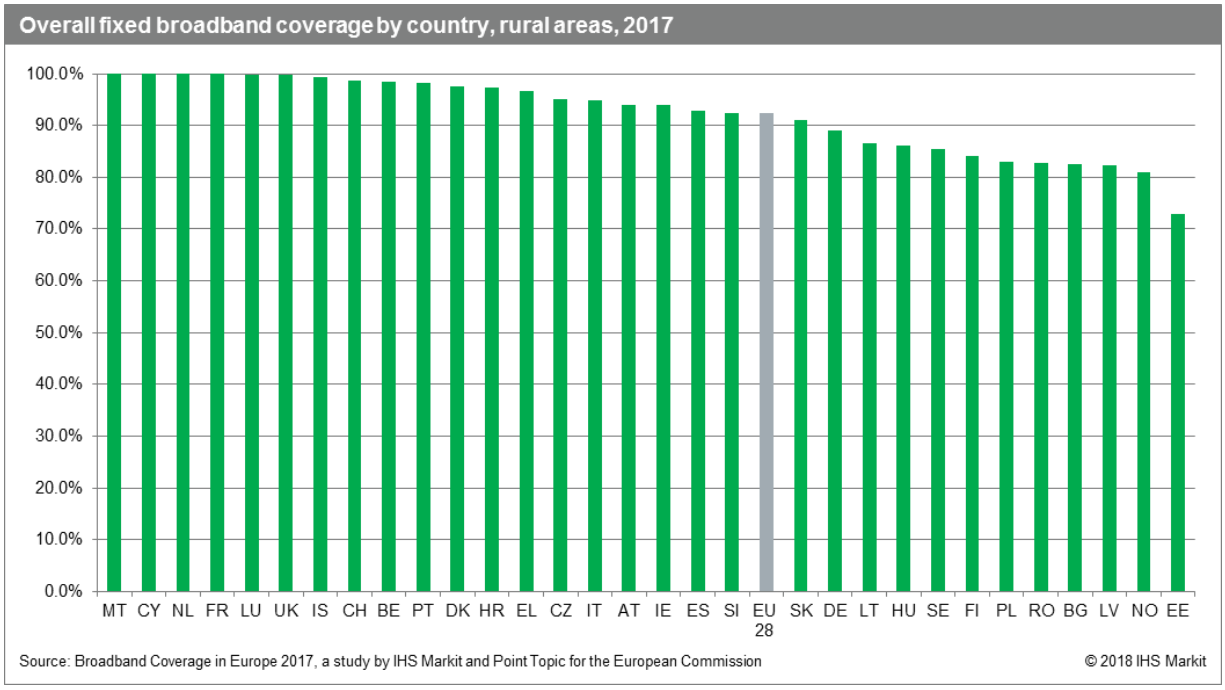
Moreover, it is important to note that while satellites are technically able to cover all households in the reach of a particular beam, the actual number of users that can be serviced by a single beam is limited by the peak average bandwidth usage, thus restricting number of serviceable homes in a particular area.

As in the previous year, the research team estimated the total EU coverage of satellite broadband as reaching over 99% of EU households. Satellite coverage in rural areas was assumed to be identical to the total satellite coverage and satellite coverage for overseas administrative areas was assumed to be the same as coverage of the respective countries they belong to (France, Portugal and Spain).

4.4 Country comparison by rural technology coverage

4.4.1 Rural overall fixed broadband coverage by country

Rural fixed coverage in most study countries continued to be lower than national fixed coverage. By mid-2017, rural fixed broadband coverage reached 92.4% of rural households compared to national coverage of 97.4%. However, the gap between total fixed coverage and rural fixed coverage continues to reduce. In mid-2017, the gap closed to 5.0 percentage points, compared with 5.3 percentage points in mid-2016.



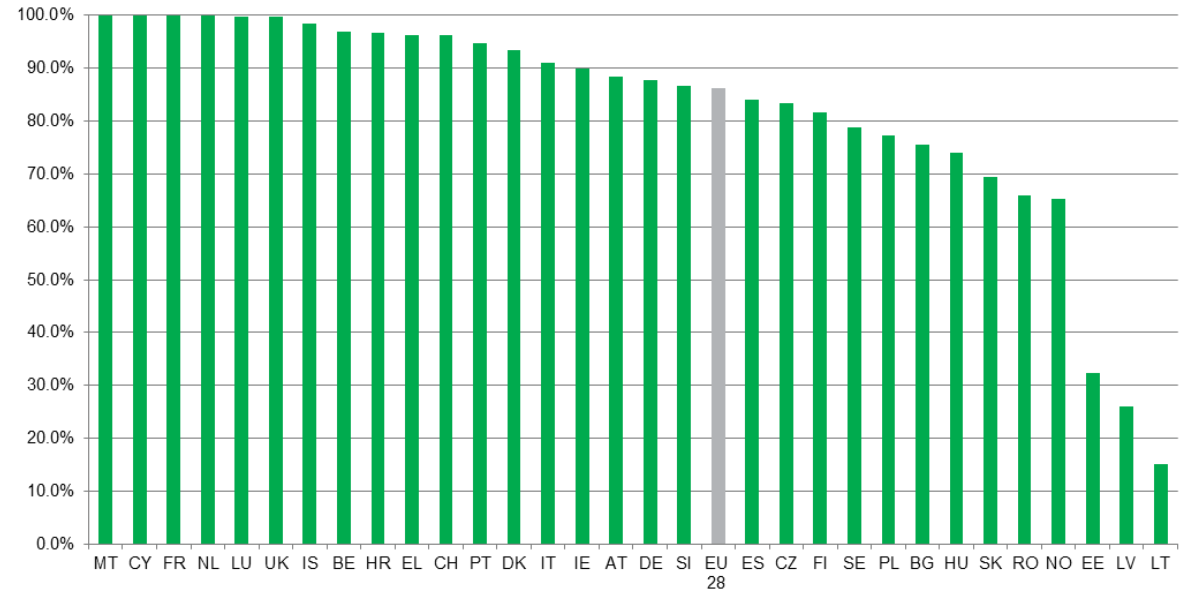
Nineteen study countries reported rural fixed broadband coverage above the EU average (92.4%). Moreover, seven countries reported that more than 99% of rural households were covered by at least one fixed broadband technology. Predominantly, these are countries with relatively high levels of urbanisation. For instance, in 2017 just 1% of households in Malta were classified as rural, 8% in the Netherlands, and 12% in Cyprus.

It should be noted that data on rural coverage collected from NRAs and individual operators was not always as comprehensive as total market-level data. In cases when information on rural coverage was incomplete, the research team estimated rural coverage using similar approach applied by Point Topic in previous years of the study. These estimations assume that a technology will typically cover a particular rural area only when urban or non-rural areas within the same region reach 100% coverage.

4.4.1.1 Rural DSL, WiMAX and cable coverage by country

DSL continued to be the most pervasive fixed broadband technology in terms of the number of rural homes passed, reaching 86.3% of rural EU households. This equalled a 0.3 percentage point increase during the twelve months to the end of June 2017, and meant that rural DSL coverage was 7.8 percentage points lower than the total EU average for DSL services. The difference between total and rural DSL coverage was considerable in some countries, such as Lithuania (54.8 percentage points) and Estonia (36.9 percentage points). In other countries, such as Belgium and the UK, there was no difference in total and rural DSL coverage, with complete availability in both categories.

DSL coverage by country, rural areas, 2017

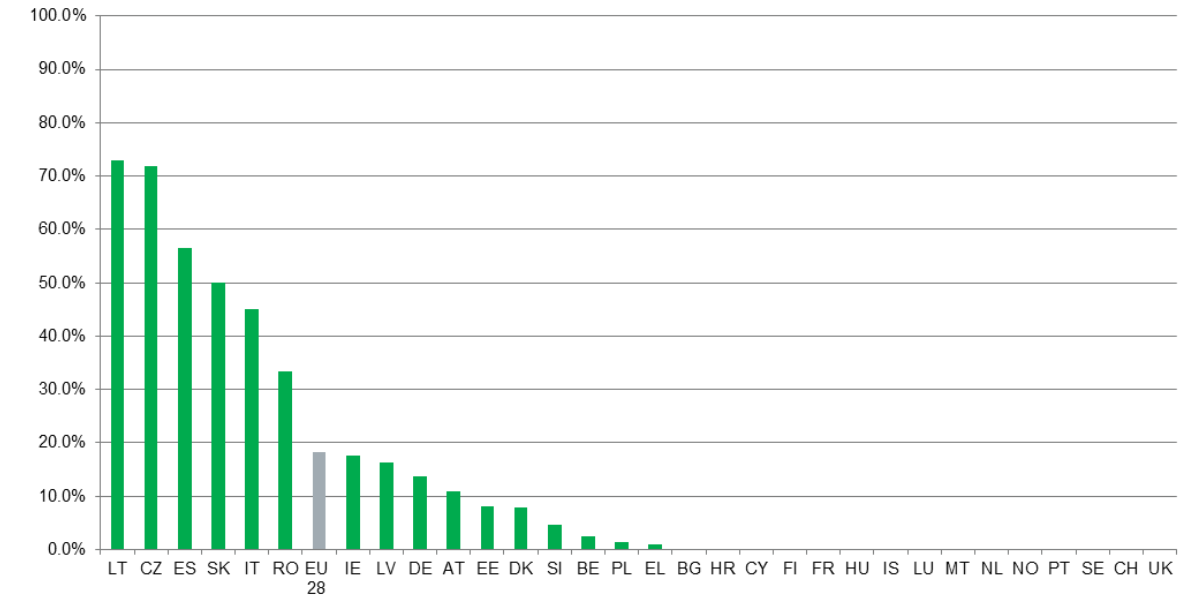


Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In mid-2017, eighteen countries recorded rural DSL coverage levels above the EU average (86.3%). This included Iceland and Croatia, which reported the largest growth in rural DSL availability at 10.3 percentage points and 4.2 percentage points, respectively. In three countries (Estonia, Latvia and Lithuania), rural DSL coverage reached fewer than a third of rural households, which was considerably below the other study countries.

However, other technologies can serve as a partial substitute for DSL in rural areas meaning that countries with low-DSL coverage in rural areas are often among the leaders in terms of rural WiMAX coverage. For instance, Lithuania recorded rural WiMAX coverage of 73.0% by mid-2017, well-above the EU average of 18.2%.

WiMAX coverage by country, rural areas, 2017

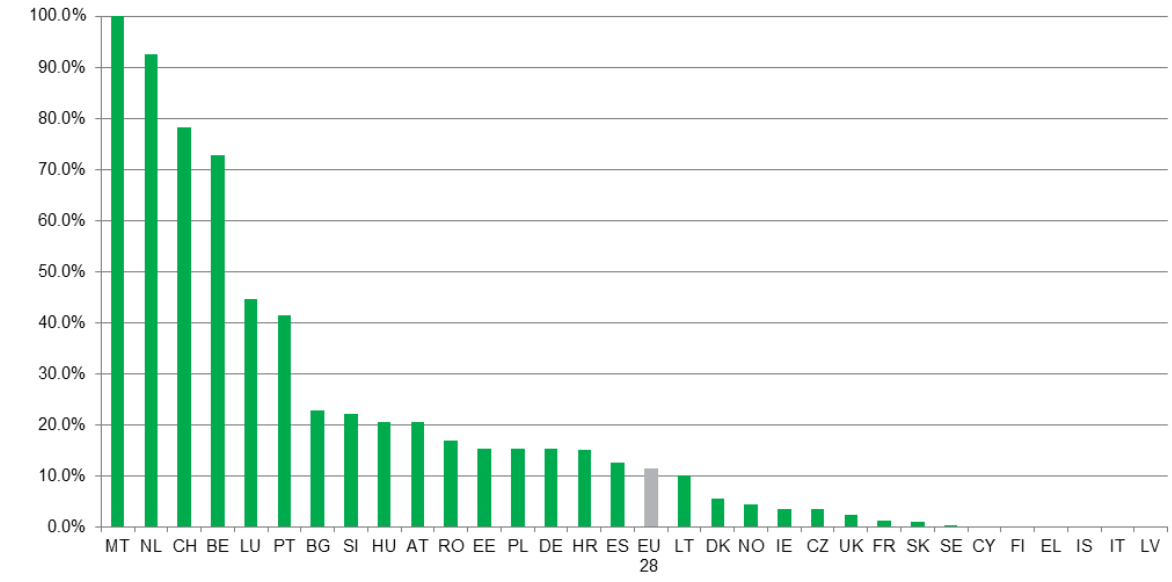


Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Twenty-five of the study countries recorded rural WiMAX coverage below the EU average, including fifteen countries where WiMAX was not available to rural households.

As in previous years, rural cable coverage was substantially below total cable coverage, as cable companies continued to focus on urban and semi-urban areas. Consequently, by mid-2017 only 11.4% of rural EU households had access to cable broadband. This equates to a 0.7 percentage point increase, a similar growth rate to previous years. Two countries, Bulgaria and Romania, experienced rural cable growth exceeding 5 percentage points during the twelve-month period.

Cable coverage by country, rural areas, 2017

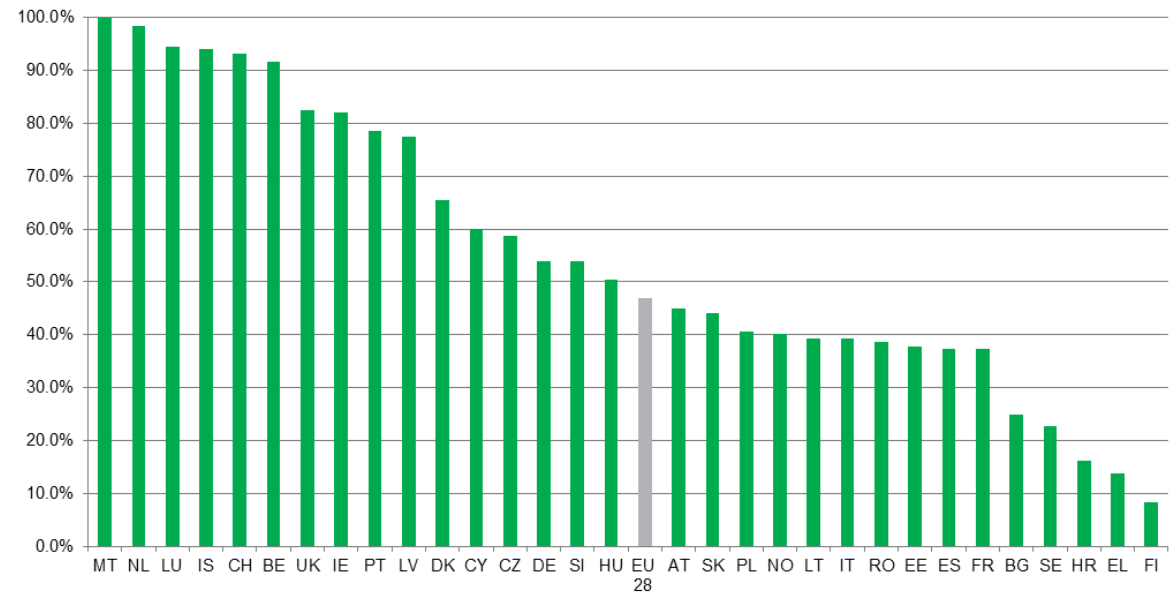


Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

4.4.2 Rural NGA coverage by country

Ensuring access to high-speed broadband services for rural households is one of the main challenges that European countries face in implementing their national strategies for achieving the targets set out in the Digital Agenda for Europe.

Overall NGA coverage by country, rural areas, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

At the end of June 2017, the rural EU average for NGA coverage was 46.9%, an increase of 7.7 percentage points compared to mid-2016. Although rural NGA coverage was 33.2 percentage points below total NGA coverage (80.1%), the difference between the two categories continued to close during the period. For comparison, the coverage difference between national and rural NGA coverage was 36.7 percentage points in mid-2016, and 40.0 percentage points in mid-2015. This indicates that network deployment is shifting towards rural areas, as urban areas start to reach saturation for NGA coverage.

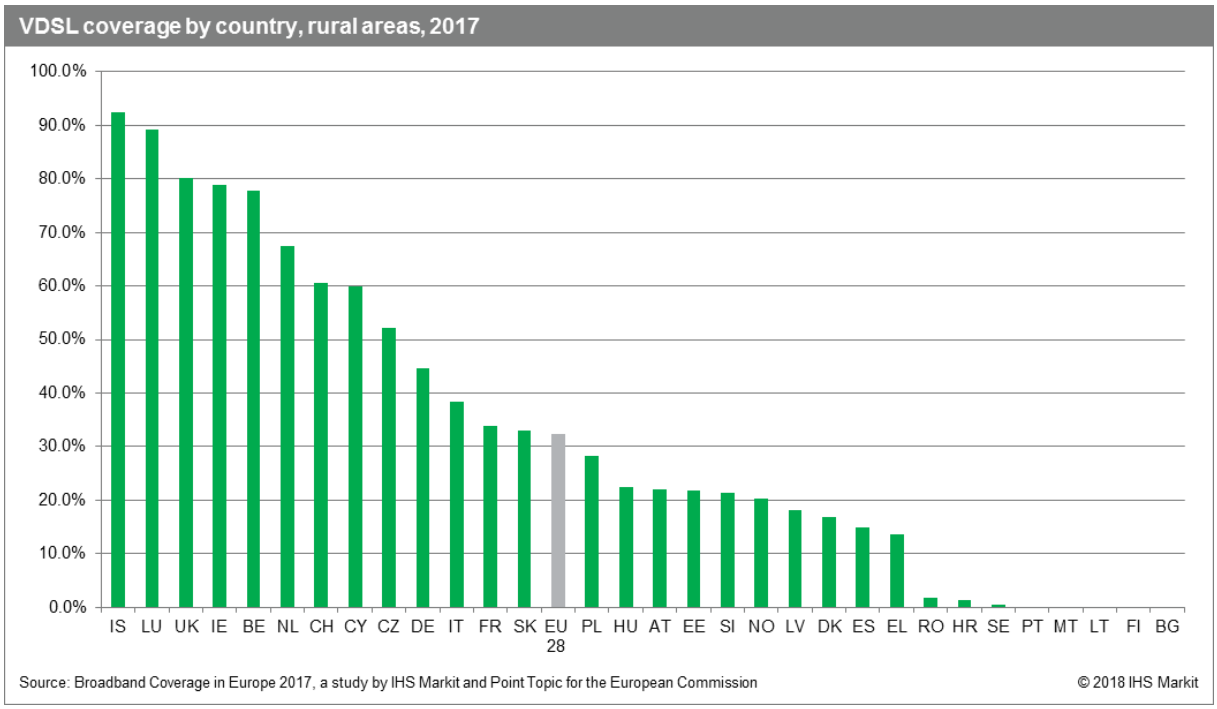
Malta remained the EU leader in terms of rural NGA coverage, with near-complete NGA availability in rural areas. Five other countries recorded rural NGA coverage exceeding 90%: the Netherlands, Luxembourg, Iceland, Switzerland and Belgium. In total, sixteen countries recorded NGA availability above the EU average. Three countries (Ireland, Italy and Greece) recorded double-digit percentage increases in rural NGA availability year-on-year, however, despite this growth Italy and Greece remained below the EU average for rural NGA coverage. Both countries were late to begin rural NGA deployment; in 2015, Italy recorded no rural NGA availability whilst rural NGA coverage in Greece was 0.5%. By mid-2017, 39.2% of Italian rural homes and 13.7% of Greek rural homes were passed by NGA networks.

At the end of June 2017, Finland was the only study country where rural NGA availability was below 10%. In Finland, mobile technologies are key to providing rural broadband coverage.

4.4.2.1 Rural VDSL, FTTP and DOCSIS 3.0 coverage by country

As in previous years, VDSL was the most widespread rural NGA technology. Rural VDSL networks passed 32.5% of rural homes in the EU, a 5.9 percentage point increase during the twelve months to mid-2017.

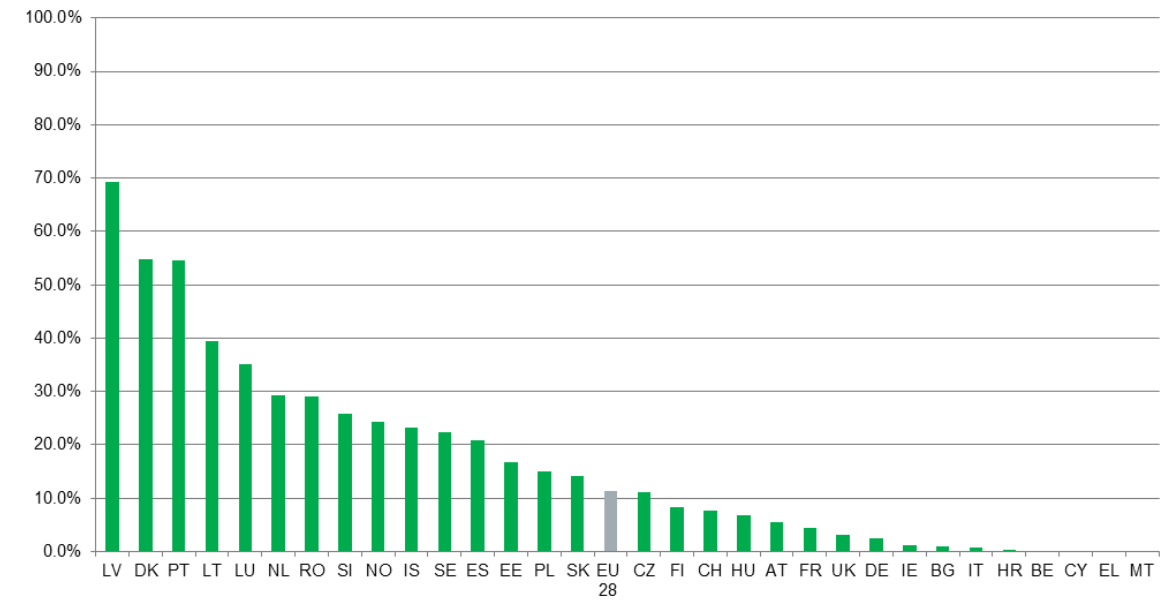
Iceland had the highest rural VDSL availability (92.3%), whilst rural VDSL coverage in four other study countries (Luxembourg, the UK, Ireland and Belgium) exceeded more than three-quarters of rural households. Nine study countries recorded rural VDSL coverage below 2%, with five countries (Portugal, Malta, Lithuania, Finland and Bulgaria) reported having no rural VDSL networks.



In mid-2017, Latvia remained the leader in terms of rural FTTP coverage (69.3%). Denmark and Portugal were the only two other countries where rural FTTP availability was above 50%, with both countries deploying FTTP in rural areas at a fast rate during the period. Spain registered the largest increase in rural FTTP availability, rising by 11.1 percentage points to pass 20.9%.

Sixteen countries recorded rural FTTP coverage below the EU average of 11.3%. As was the case in previous years, rural households in four countries (Belgium, Cyprus, Greece and Malta) had no access to FTTP services.

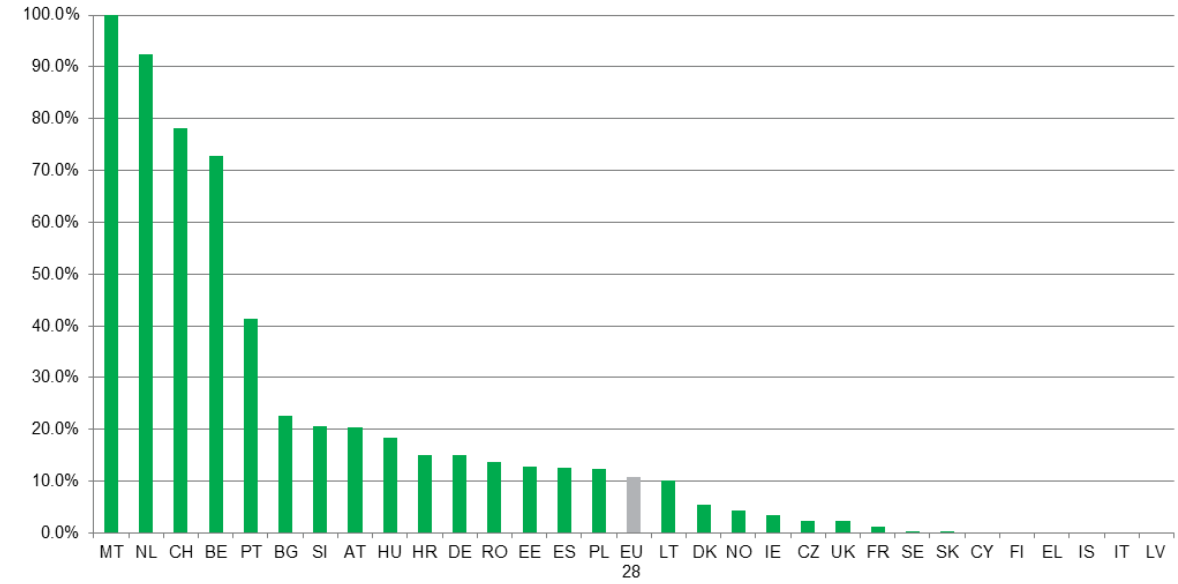
FTTP coverage by country, rural areas, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Developments in rural DOCSIS 3.0 coverage broadly reflected the availability of standard cable broadband services. As was the case in the previous iteration of the study, rural DOCSIS 3.0 coverage increased by 0.7 percentage points during the twelve-month period, passing 11.4% of rural homes. Malta was the leader in terms of rural DOCSIS 3.0 coverage (99.9%), with the Netherlands and Switzerland also passing over a half of rural homes with DOCSIS 3.0 networks.

DOCSIS 3.0 coverage by country, rural areas, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

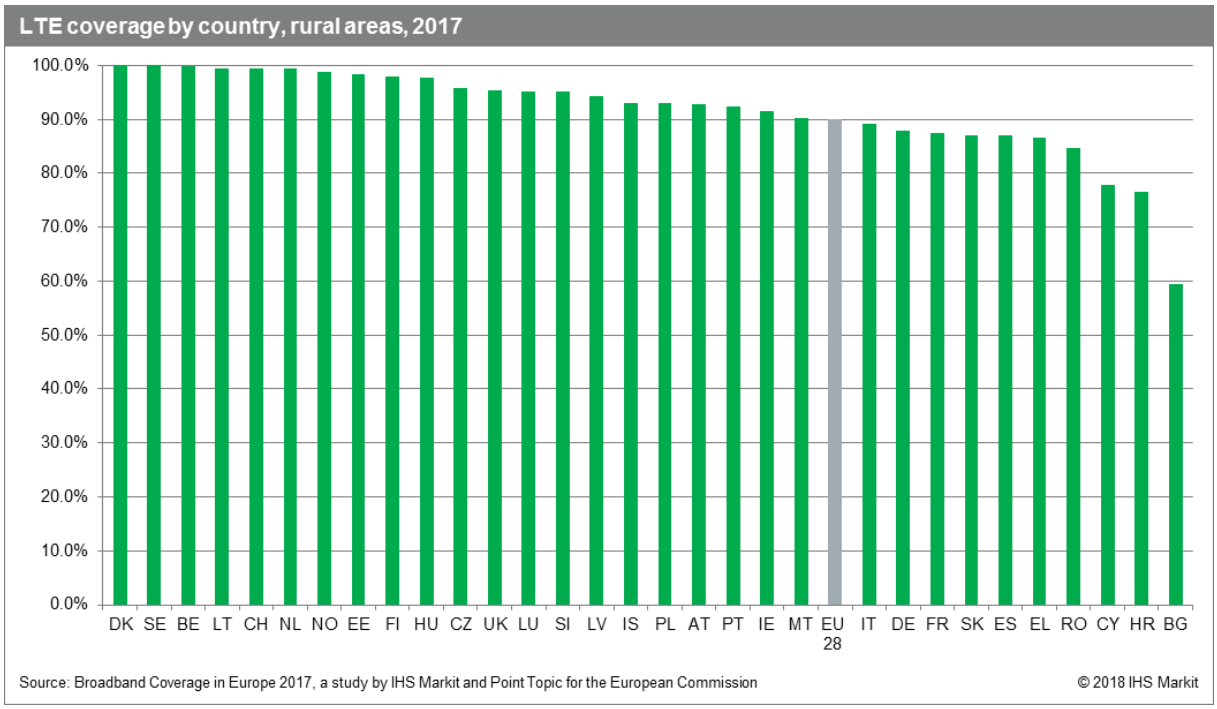
4.4.3 Rural Mobile coverage by country

4.4.3.1 Rural HSPA coverage by country

HSPA continued to offer the second widest rural broadband coverage in the EU after satellite broadband. By mid-2017, Bulgaria, Denmark, Latvia and Romania all recorded complete HSPA coverage. Several other nations recorded near-complete coverage levels.

The EU average for rural HSPA availability reached 92.4% in mid-2017. Five countries (Portugal, the UK, Czech Republic, Slovakia and Germany) recorded rural HSPA coverage below the EU average. In all five of these countries, rural LTE coverage exceeded rural HSPA deployment, reflecting the focus of mobile network operators on rural LTE deployment.

4.4.3.2 Rural LTE coverage by country



By mid-2017, the EU average for rural LTE coverage was 89.9%, an increase of 10.2 percentage points in the twelve-month period. Following the rapid expansion of rural LTE services in the last two years, the EU average rural LTE availability is only 2.5 percentage points below the corresponding HSPA figure.

At the end of June 2017, Denmark and Sweden recorded universal LTE coverage in rural areas, with four other study countries (Belgium, Lithuania, Switzerland and the Netherlands) reporting rural LTE coverage above 99%. Moreover, in total, 21 countries reported coverage levels above the EU average (89.9%). Bulgaria was the only country to record rural LTE coverage of below 60%.

With no rural LTE coverage in mid-2016, Cyprus recorded the largest coverage increase (77.8 percentage points) in the twelve months to the end of June 2017. Bulgaria, Malta and Romania also registered considerable growth in rural LTE availability, at 40.6, 39.1 and 35.2 percentage points, respectively.

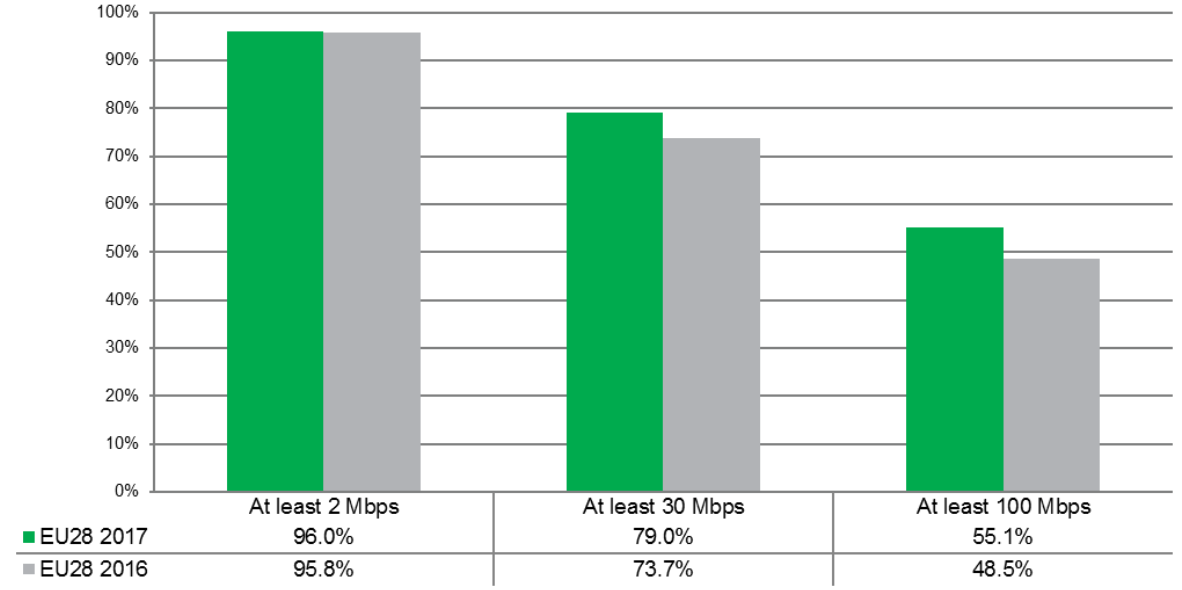
4.5 Coverage by speed categories

4.5.1 Europe-wide coverage by speed categories

In previous iterations of this study, the analysis of download speed categories included mobile as well as fixed broadband technologies. However, following discussions with DG Connect, it was decided that this year's study will focus on download speed availability over fixed networks only. As a result, neither HSPA nor LTE networks are included in the analysis of achievable speeds. This is because inconsistencies remain in the reliability of broadband connectivity over mobile networks, despite improvements in the speed and connection quality associated with LTE services.

Examining coverage levels by the individual speed categories, by mid-2017 96.0% of EU homes were passed by fixed broadband networks capable of providing them with actual download speeds of at least 2 Mbps.

EU28: Coverage by download speed categories, 2017



	At least 2 Mbps	At least 30 Mbps	At least 100 Mbps
EU28 2017	96.0%	79.0%	55.1%
EU28 2016	95.8%	73.7%	48.5%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In mid-2017, 79.0% of EU households had access to a fixed broadband service that provided an actual download speed of at least 30 Mbps, a 5.3 percentage point increase during the twelve months to the end of June 2017. This increase was driven by the overall growth in NGA coverage as well as the technological advancements that meant that a higher number of VDSL networks were capable of supporting 30 Mbps download speeds.

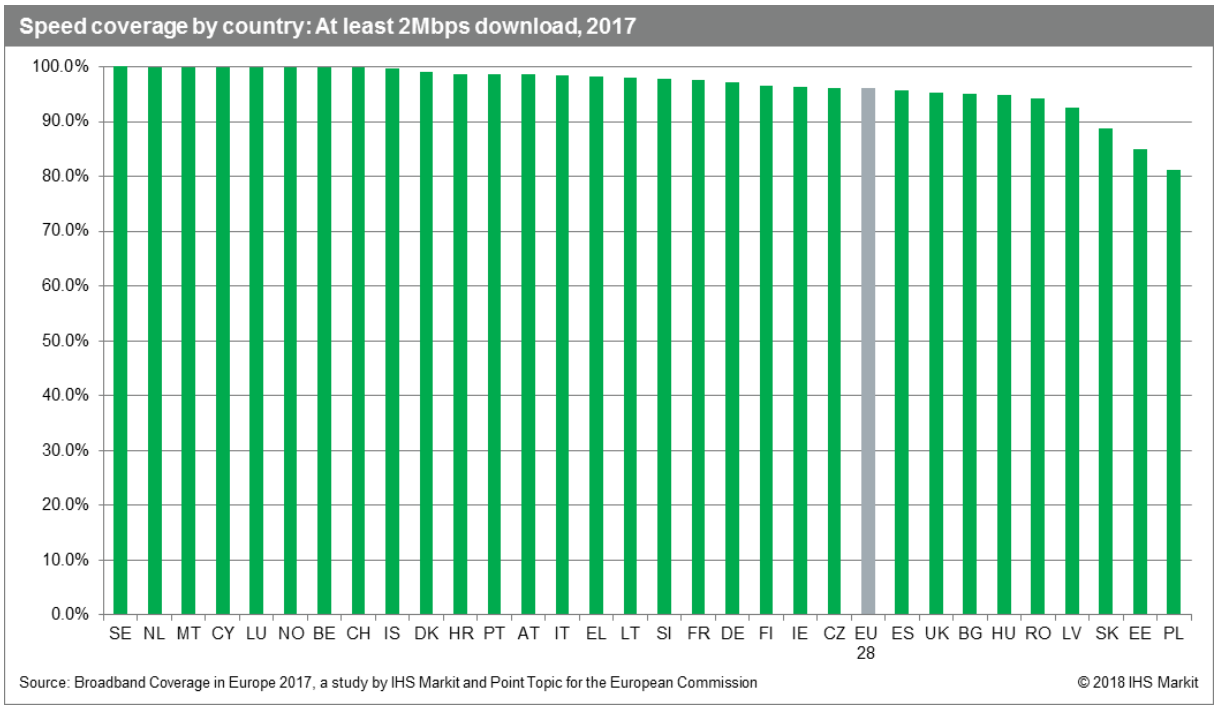
Following a 6.6 percentage point year-on-year increase, the research team estimates that over a half (55.1%) of EU households had access to broadband services capable of providing at least 100 Mbps actual download speeds in mid-2017. Consequently, EU as whole has reached the Digital Agenda goal of 50% of households having access to 100 Mbps broadband services by 2020. However, as is explained in the following sections, significant differences remain among individual countries.

4.5.2 Country comparison of coverage by speed categories

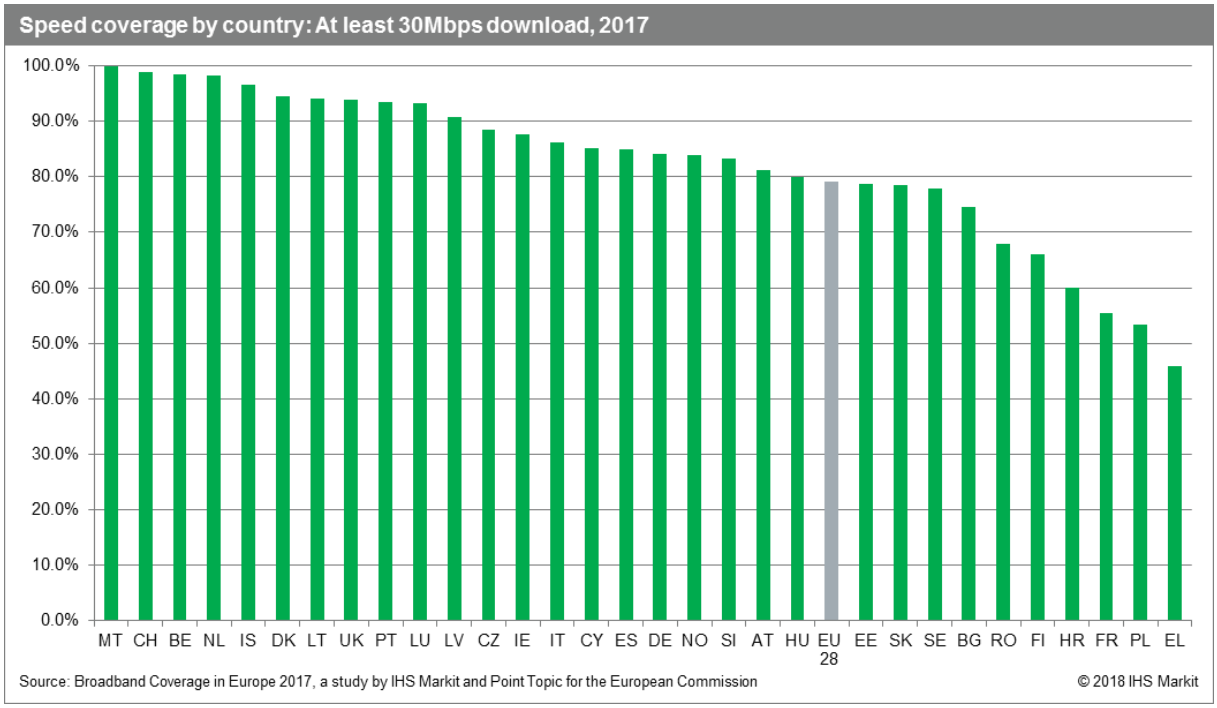
By mid-2017, most study countries had near universal availability of fixed broadband services capable of at least 2 Mbps actual download speeds. In ten countries, at least 2 Mbps actual download speeds were available to more than 99% of households, whilst in total 22 countries had at 2 Mbps coverage that exceeded the EU average (96.0%).

Those countries with lower availability of at least 2 Mbps broadband connections tend to have a higher proportion of DSL or WiMAX networks in the make-up of fixed broadband coverage. Traditionally, DSL (and WiMAX) networks have been less reliable in sustaining actual speeds at peak times compared to

cable and FTTP networks. As was the case in 2016, Slovakia, Estonia and Poland were the only countries where less than 90% of homes were passed by networks capable of delivering at least 2 Mbps actual download speeds.



In five countries (Malta, Switzerland, Belgium, the Netherlands and Iceland), fixed broadband services capable of at least 30 Mbps download speeds were available to at least 95% of households. In total, 21 nations reported at least 30 Mbps coverage above the EU average (79.0%). Greece was the only country where less than a half of households (45.9%) were passed by fixed broadband services capable of at least 30 Mbps download speeds.



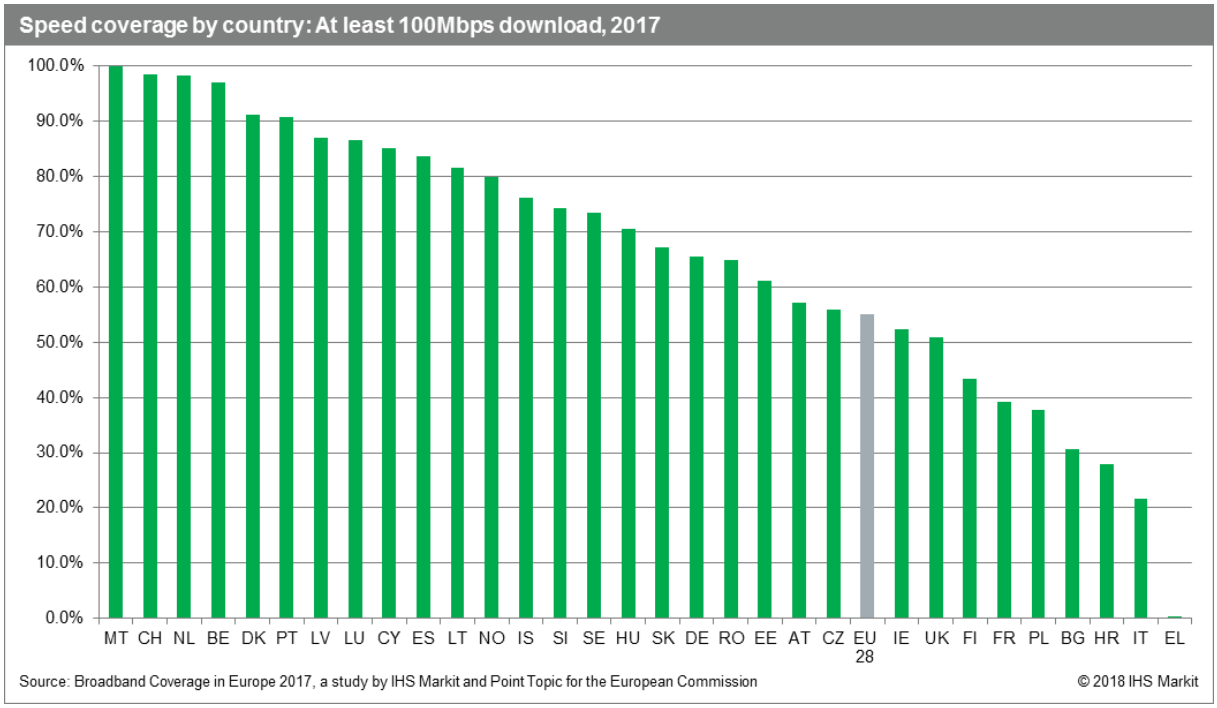
Czech Republic, Italy and Ireland all witnessed double-digit percentage point growth in the availability of connections supporting at least 30 Mbps actual download speeds in the twelve-month period to the end of June 2017. The highest growth was registered in Czech Republic, where at least 30 Mbps

coverage expanded by 14.6 percentage points. All three countries recorded large improvements in VDSL coverage during the period, with information provided by the main VDSL network operators indicating that most connections over the newly deployed VDSL networks were capable of supporting actual speeds of at least 30 Mbps.

However, this was not the case for other countries, which have seen large increases in VDSL coverage in recent years, resulting in high levels of VDSL coverage compared to other NGA technologies. As the quality of VDSL connection speeds relies on a number of factors, such as distance from the street cabinet or presence of crosstalk, VDSL networks tend to be affected the most in terms of inconsistencies in actual speeds achieved at peak times.

Examining countries with the largest gaps between NGA coverage and at least 30 Mbps coverage, NGA coverage is 13.3 percentage points higher than at least 30Mbps coverage in Poland. Finland and Austria also recorded a difference in NGA coverage and at least 30 Mbps coverage of more than 8 percentage points.

As mentioned, over a half (55.1%) of EU households had access to broadband services capable of providing at least 100 Mbps actual download speeds in mid-2017. As a result, the EU as whole has achieved the Digital Agenda's goal of having 50% of households with access to 100 Mbps broadband services by 2020. Nevertheless, there are considerable differences among individual countries. By mid-2017, over 98% of households in Malta, Switzerland and the Netherlands were passed with a fixed broadband service capable of reaching at least 100 Mbps actual download speeds, compared to only 0.4% of homes in Greece.

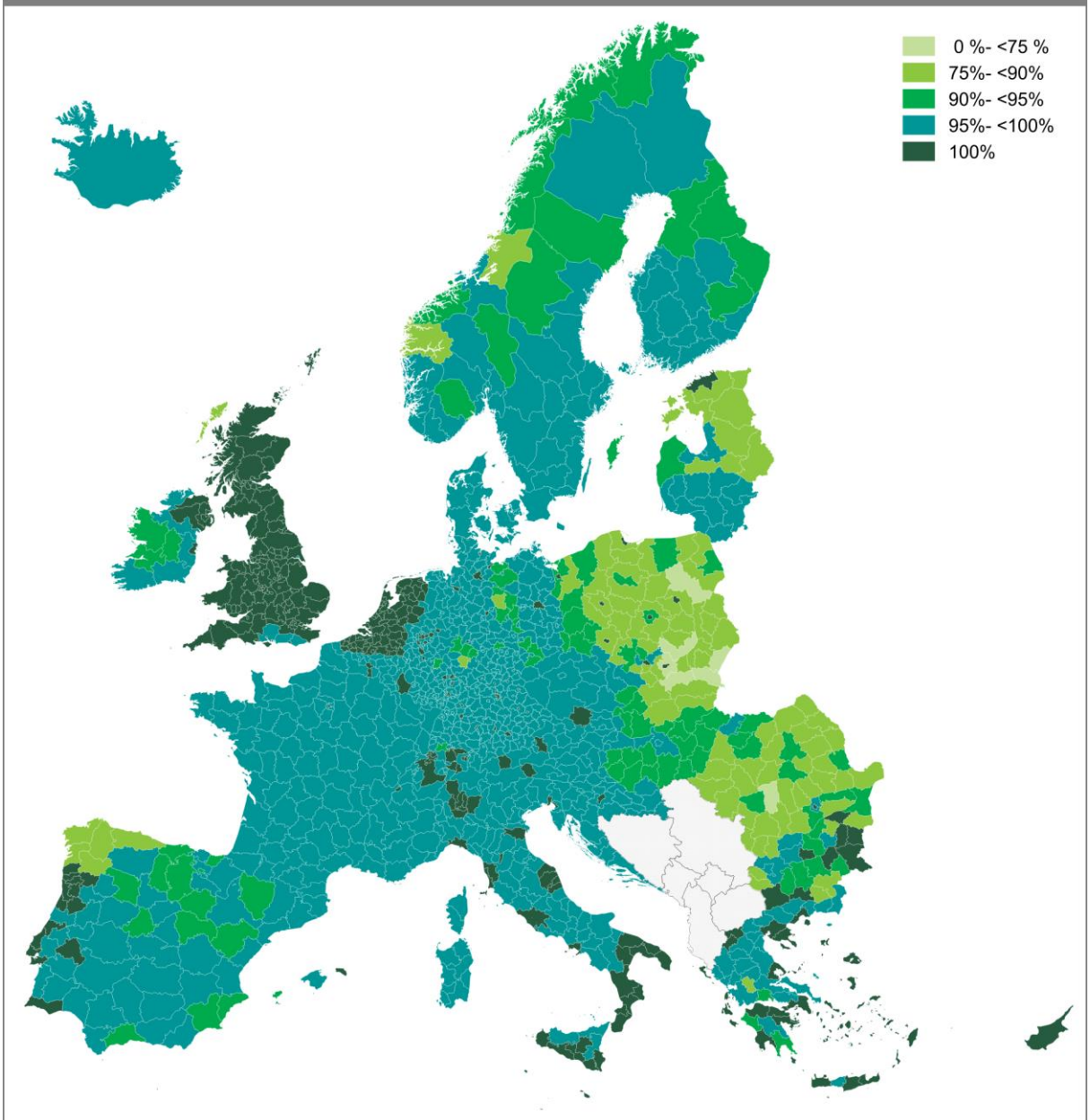


In countries such as the UK, Italy, Austria and Ireland, VDSL networks equated to a considerable portion of the overall NGA coverage. As a result, there was a notable difference between NGA coverage and the availability of fixed broadband services capable of at least 100 Mbps download speeds. For example, in mid-2017 the UK had NGA coverage of 93.9%, but services supporting actual download speeds of at least 100 Mbps reached around a half (50.9%) of UK households.

4.6 NUTS 3 level total coverage

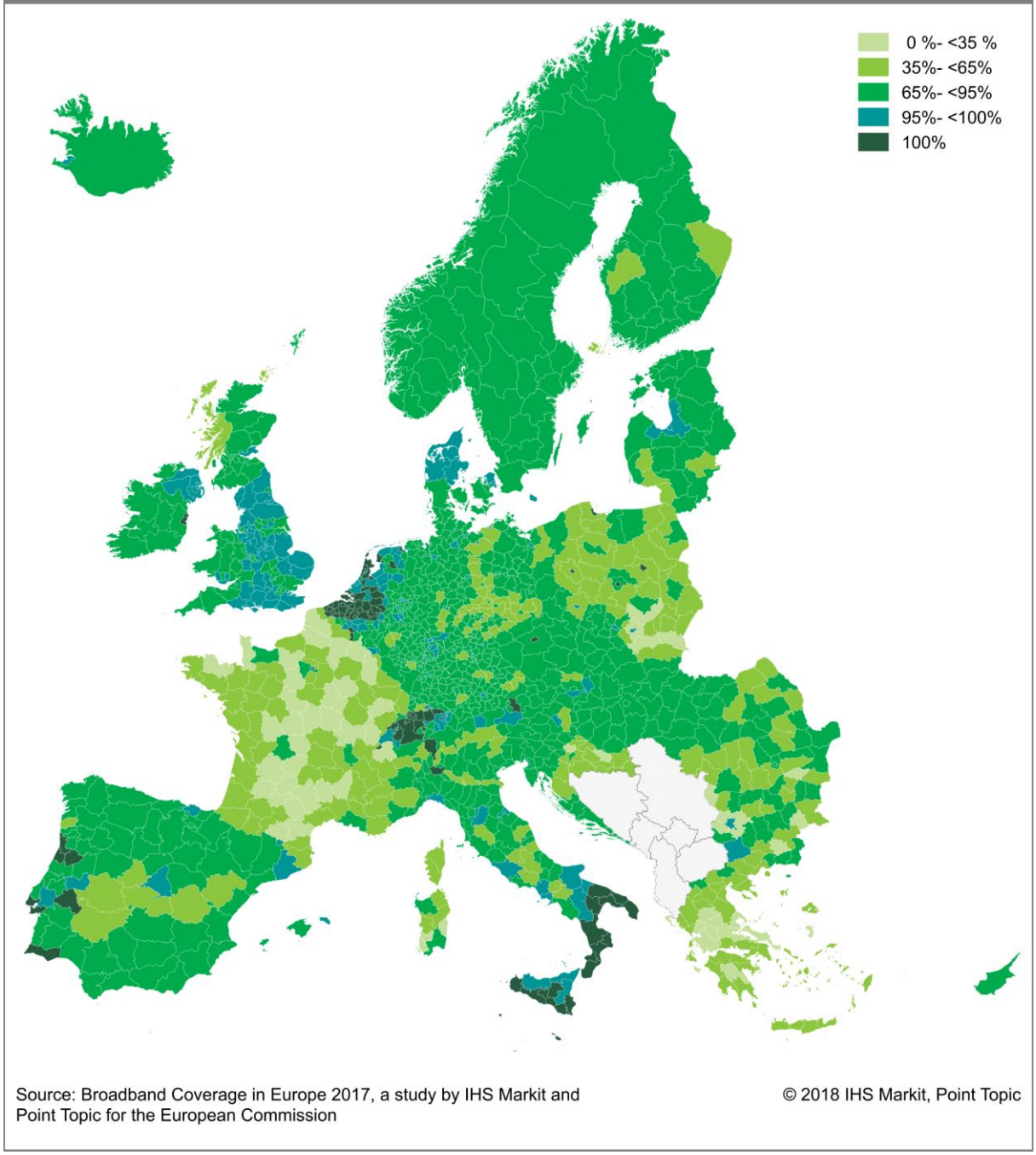
The maps included in this chapter indicate the distribution of fixed and NGA broadband coverage across Europe's regions and demonstrate the study results discussed in the previous chapters of this report.

Europe: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

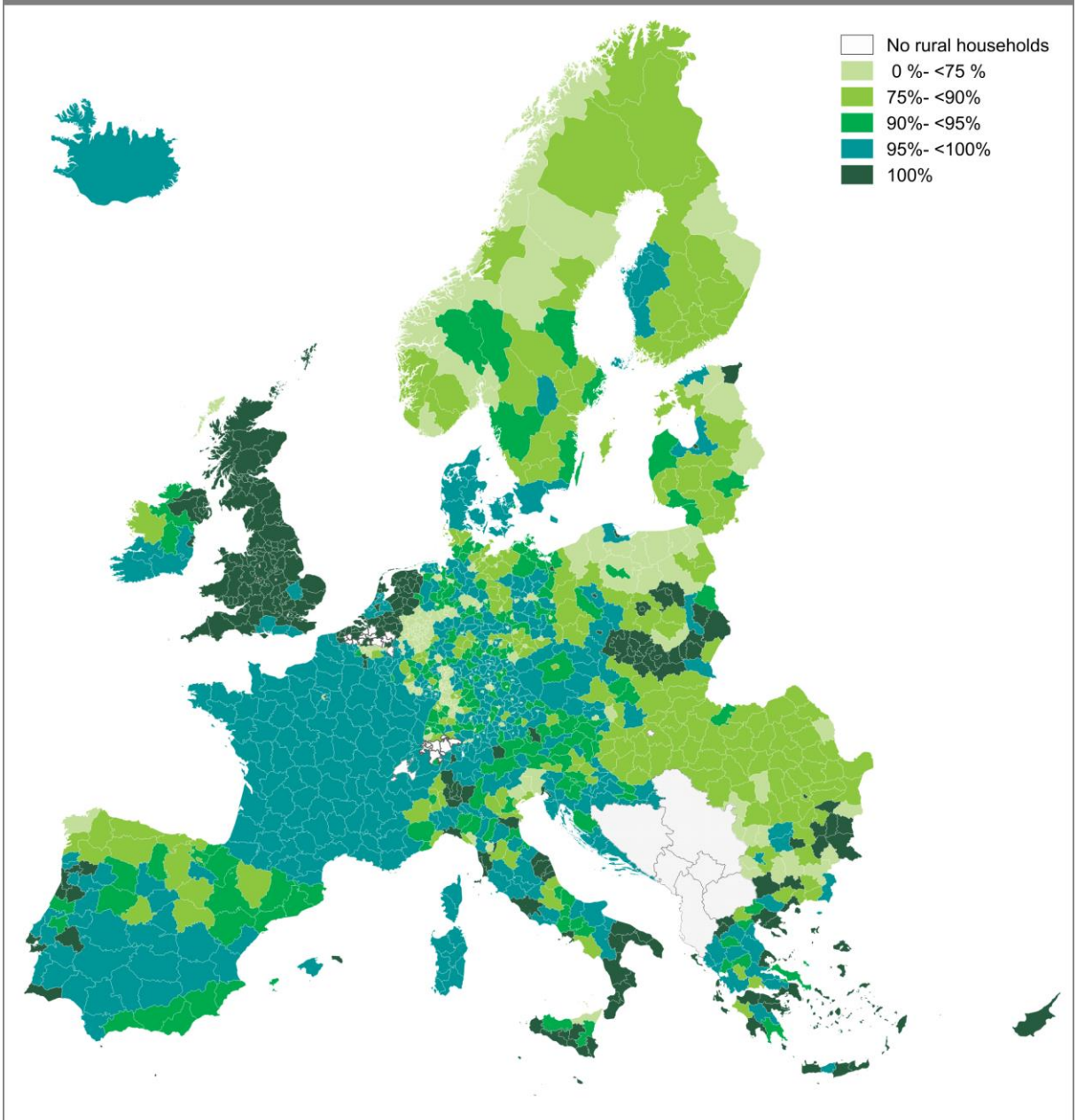
Europe: Overall NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

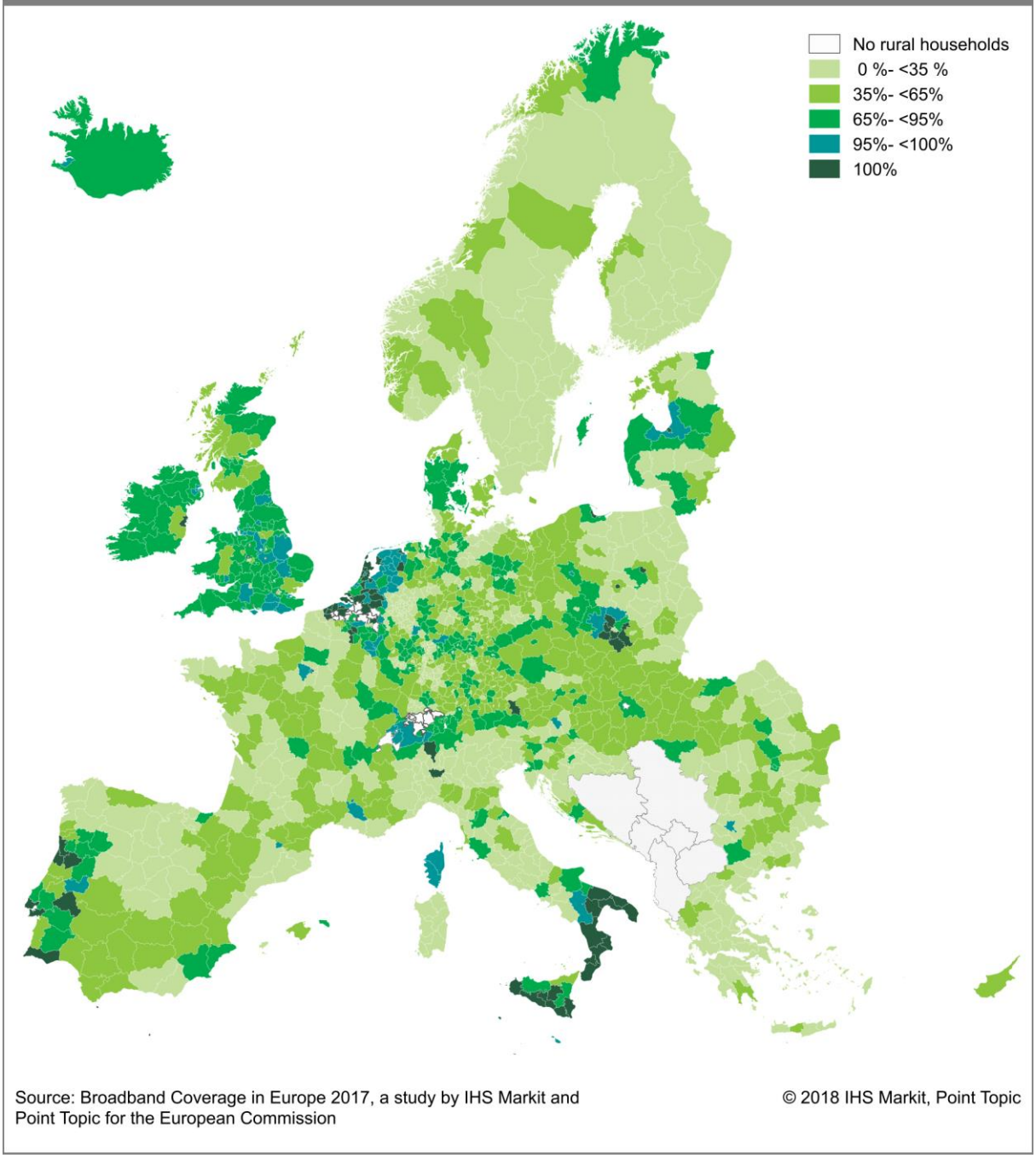
It is important to note that Belgium, France, Hungary, Switzerland, Spain and the United Kingdom all have NUTS3 regions which do not have any rural households. These NUTS3 regions are represented by the white areas on the rural coverage maps.

Europe: Overall fixed rural broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Europe: Overall rural NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

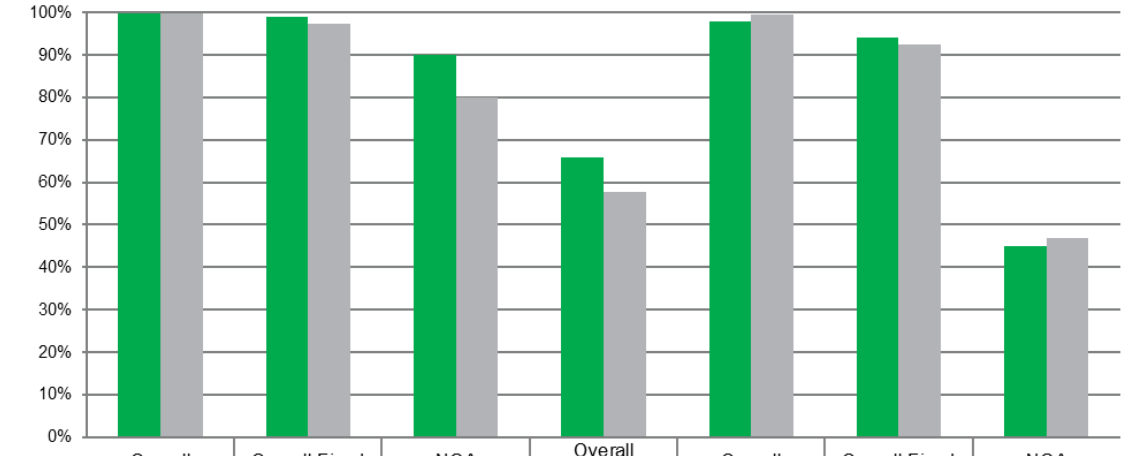
5.0 Coverage by Country

5.1 Austria

5.1.1 National coverage by broadband technology

As in previous years, overall broadband coverage in Austria continued to be slightly below the EU average, both nationally and in rural areas. Fixed broadband coverage was unchanged at a national and rural level during the period, but remained above the EU average. There was an increase in national NGA coverage, rising by 0.8 percentage points year-on-year. The increase in rural NGA coverage was more substantial, at 4.3 percentage points. However, despite this increase, rural NGA coverage in Austria moved below the EU average of 46.9% as the pace of rural NGA deployments was slower than on the EU level.

Austria: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 and FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Austria	99.7%	99.1%	90.0%	65.8%	98.0%	94.0%	45.0%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

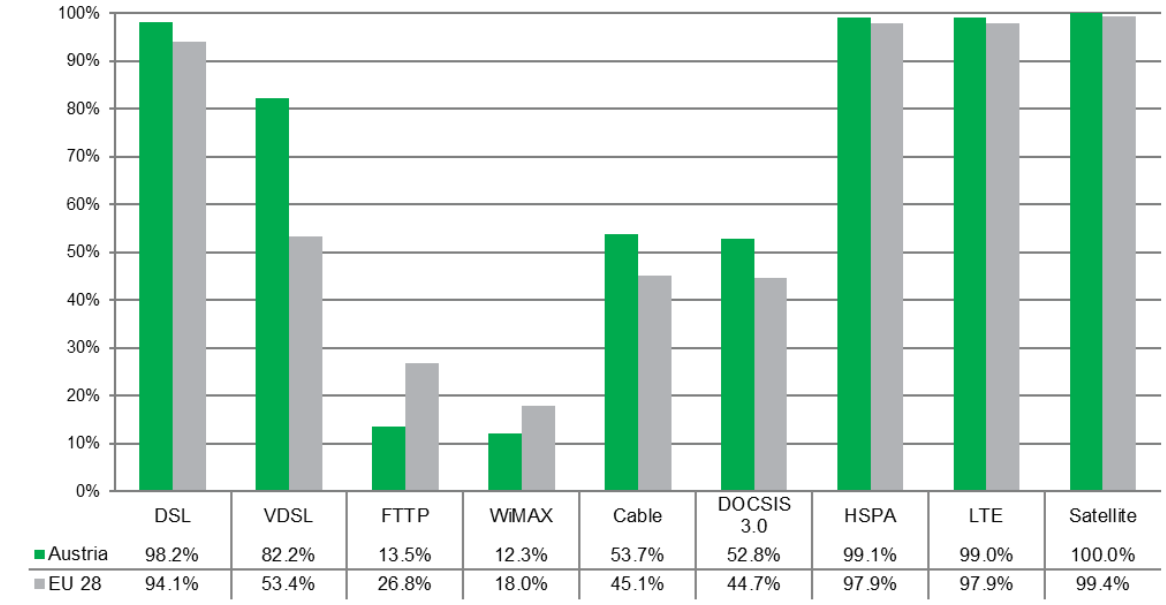
At the end of June 2017, DSL networks passed 98.2% of Austrian homes. Cable coverage registered an increase of 4.6 percentage points with the proportion of homes passed by cable networks (53.7%) remaining above the EU average (45.1%) in mid-2017.

Concerning NGA broadband, VDSL continued to be the key NGA technology in Austria. By mid-2017, VDSL networks passed 82.2% of households, which was considerably above the EU average (53.4%). Incumbent operator Telekom Austria is exploring other ways to increase the speeds of its existing infrastructure, including G.fast.[5] Like VDSL, DOCSIS 3.0 coverage remained above the EU average, increasing by 5.6 percentage points to reach 52.6% of households. The availability of FTTP networks improved by 5.7 percentage points to 13.5%, but remained below the EU average (26.8%).

In relation to mobile broadband technologies, Austria recorded near universal coverage of HSPA and LTE networks in the previous iteration of the study. In terms of average LTE operator coverage, there was an increase of 7.7 percentage points, as average LTE operator coverage increased to 97.0% as of mid-2017.

[5] https://www.a1.group/en/newsroom/2017-3-22-telekom-austria-group-austrian-subsidiary-a1-presents-xg-fast-with-transmission-rates-in

Austria: Coverage by technology, total, 2017

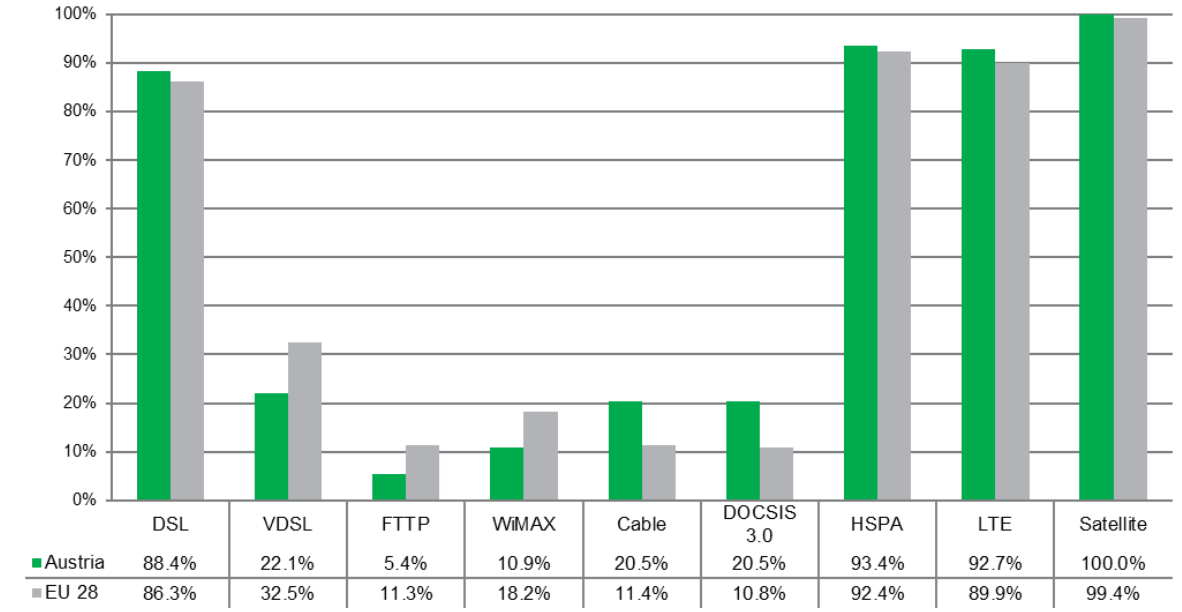


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Austria	98.2%	82.2%	13.5%	12.3%	53.7%	52.8%	99.1%	99.0%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Examining rural broadband coverage, DSL continued to be the primary broadband technology in rural areas, passing 88.4% of homes. The number of rural homes passed by cable networks was consistent with the previous edition of the study, as coverage remained at 20.5%. There was a 0.8 percentage point decrease in rural WiMAX coverage as the number of rural homes passed by the technology dropped to 10.9%.

Austria: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Austria	88.4%	22.1%	5.4%	10.9%	20.5%	20.5%	93.4%	92.7%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Looking at rural NGA coverage as of mid-2017, VDSL coverage improved by 4.2 percentage points during the twelve-month period, passing 22.1% of rural homes in Austria. This increase in rural VDSL coverage resulted in VDSL overtaking DOCSIS 3.0 as the dominant NGA technology in rural areas, with rural DOCSIS 3.0 and rural FTTP coverage remaining consistent during the period.

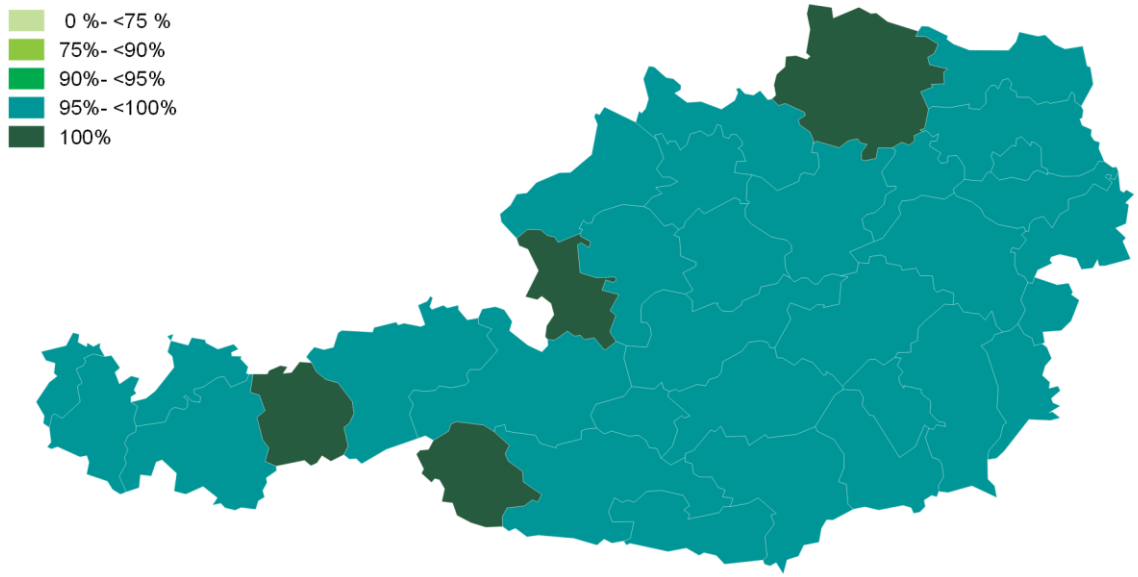
In relation to mobile broadband technologies in rural areas, the proportion of Austrian households covered by HSPA and LTE remained unchanged during the twelve months to June 2017. Nevertheless, HSPA and LTE coverage in rural areas continued to be slightly above the EU average. Moreover, with high levels of rural LTE coverage, mobile network operators Telekom Austria and T-Mobile Austria have both launched fixed-mobile solutions to deliver high-speed broadband in rural areas.[67]

[6] https://www.a1.group/en/newsroom/2016-7-15-telekom-austria-group-austrian-subsidiary-a1-presents-the-internet-of-the-next-generation
[7] https://newsroom.t-mobile.at/2017/11/13/t-mobile-breitband-offensive/

5.1.2 Regional coverage by broadband technology

Examining coverage levels in individual regions, fixed broadband coverage did not vary significantly across regions, with all regions reporting coverage between 96% and 100%. Austria recorded universal fixed broadband coverage in several regions, including Innsbruck, Osttirol, Salzburg und Umgebung and Waldviertel.

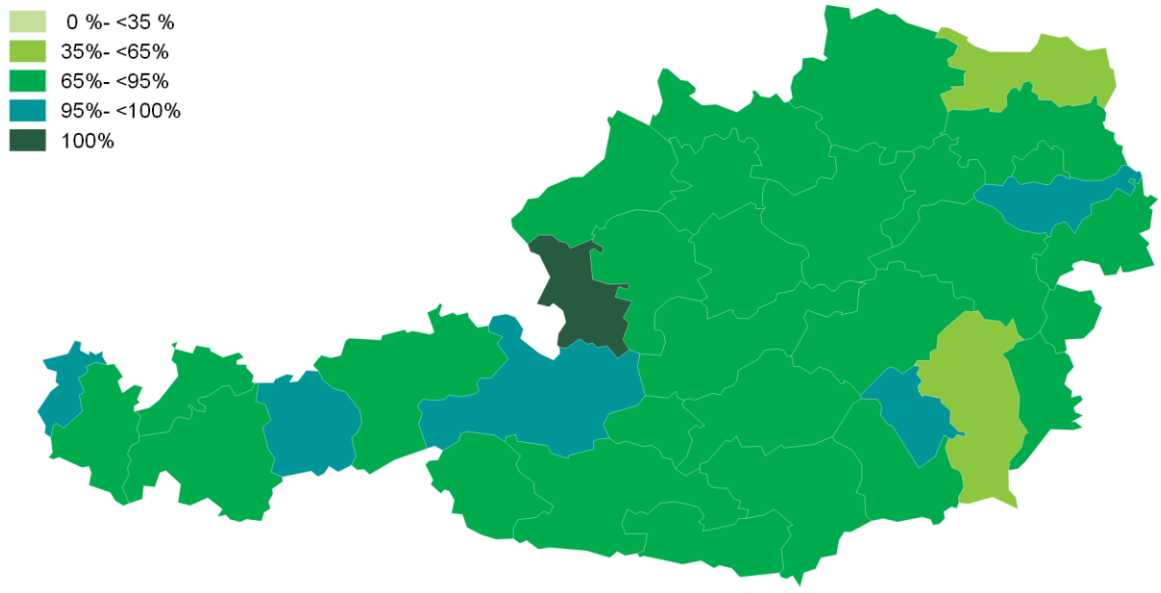
Austria: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

NGA availability remained varied in Austria, with coverage levels ranging from slightly below 65% (Weinviertel) to 100% (Salzburg und Umgebung).

Austria: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.1.3 Data tables for Austria

Statistic	National
Population	8,690,076
Persons per household	2.2
Rural proportion	13.6%

	Austria 2017		Austria 2016		Austria 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	98.2%	88.4%	98.3%	89.0%	98.3%	89.9%	94.1%	86.3%
VDSL	82.2%	22.1%	82.1%	17.9%	82.1%	17.9%	53.4%	32.5%
FTTP	13.5%	5.4%	7.8%	5.3%	7.8%	5.3%	26.8%	11.3%
WiMAX	12.3%	10.9%	12.5%	11.7%	12.5%	11.7%	18.0%	18.2%
Cable	53.7%	20.5%	49.1%	20.7%	49.1%	20.7%	45.1%	11.4%
DOCSIS 3.0	52.8%	20.5%	47.2%	20.7%	47.2%	20.7%	44.7%	10.8%
HSPA	99.1%	93.4%	99.1%	93.4%	99.1%	93.4%	97.9%	92.4%
LTE	99.0%	92.7%	99.0%	92.6%	99.0%	92.6%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	97.0%	-	89.3%	-	-	-	90.8%	-
Satellite	100.0%	100%	100%	100%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.7%	98.0%	99.7%	97.8%	99.7%	97.8%	99.9%	99.4%
Overall fixed broadband	99.1%	94.0%	99.1%	94.2%	99.1%	94.2%	97.4%	92.4%
NGA broadband	90.0%	45.0%	89.2%	41.5%	89.2%	41.5%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	65.8%	-	-	-	-	-	57.8%	-
At least 2 Mbps	98.6%	-	98.5%	-	98.5%	-	96.0%	-
At least 30 Mbps	81.1%	-	80.3%	-	80.3%	-	79.0%	-
At least 100 Mbps	57.2%	-	52.9%	-	52.9%	-	55.1%	-

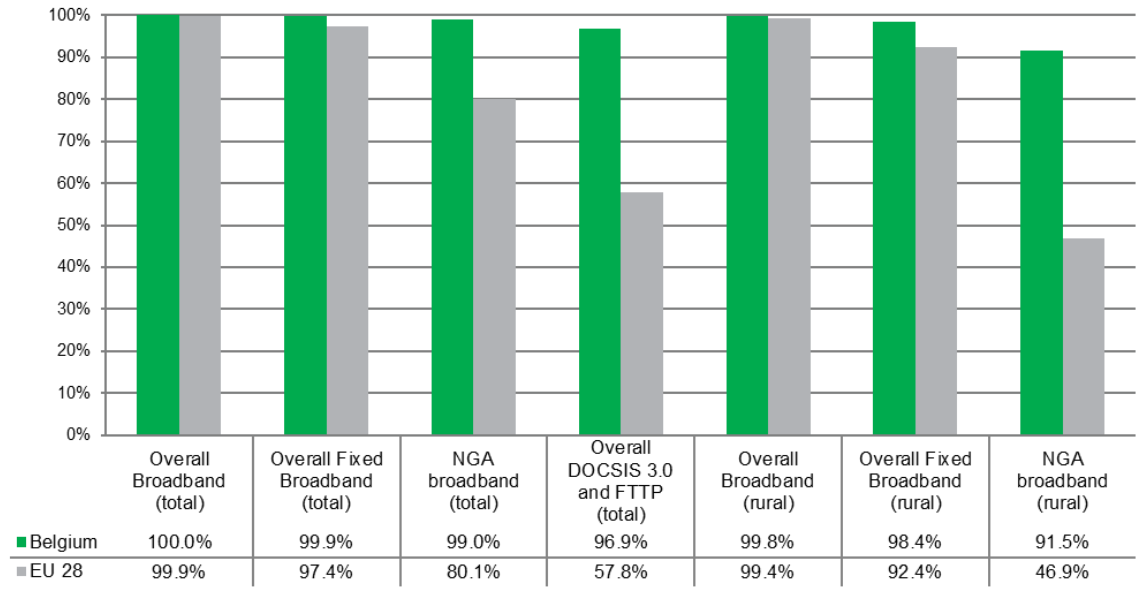
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.2 Belgium

5.2.1 National coverage by broadband technology

Belgium continued to outperform the EU average in terms of broadband coverage for all technology combination categories. Given the high broadband coverage levels achieved in previous years, there was minimal change in broadband coverage levels for each of the technology combinations in the twelve months to the end of June 2017. One exception was the 3.3 percentage point increase in rural NGA coverage, which reached 91.5% of rural households by mid-2017.

Belgium: Coverage by technology combination, 2017

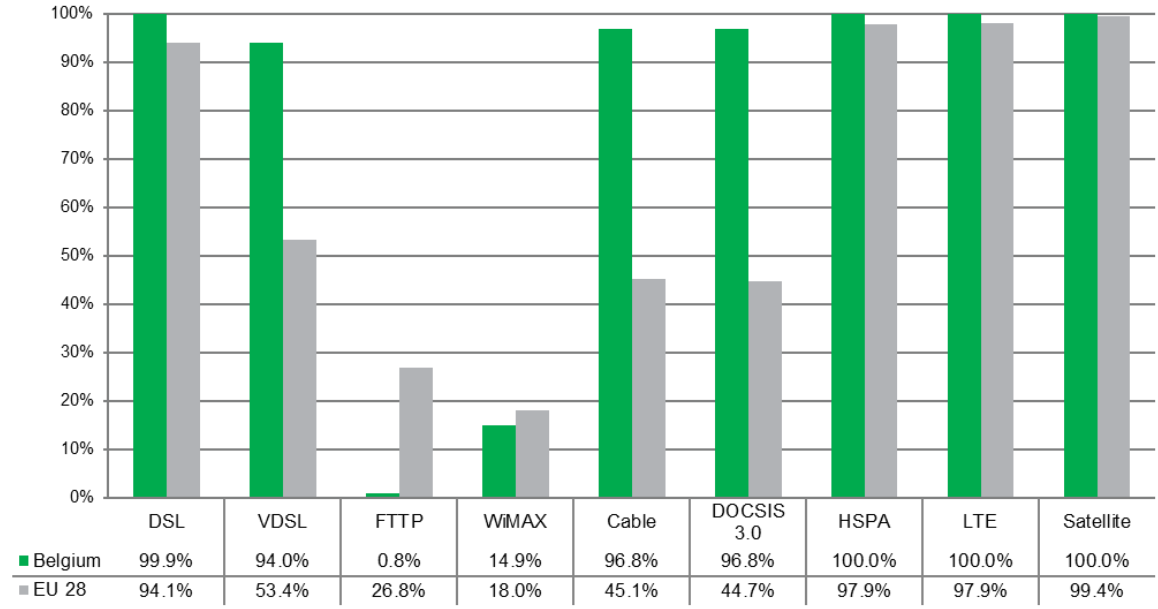


	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 and FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Belgium	100.0%	99.9%	99.0%	96.9%	99.8%	98.4%	91.5%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Looking at individual technologies at a national level, there were limited coverage increases reported during the twelve months to mid-2017. The proportion of households reached by DSL services remained consistent at 99.9%, while there was a 0.4 percentage point rise in cable coverage, reaching 96.8% of Belgian households.

Belgium: Coverage by technology, total, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Belgium	99.9%	94.0%	0.8%	14.9%	96.8%	96.8%	100.0%	100.0%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

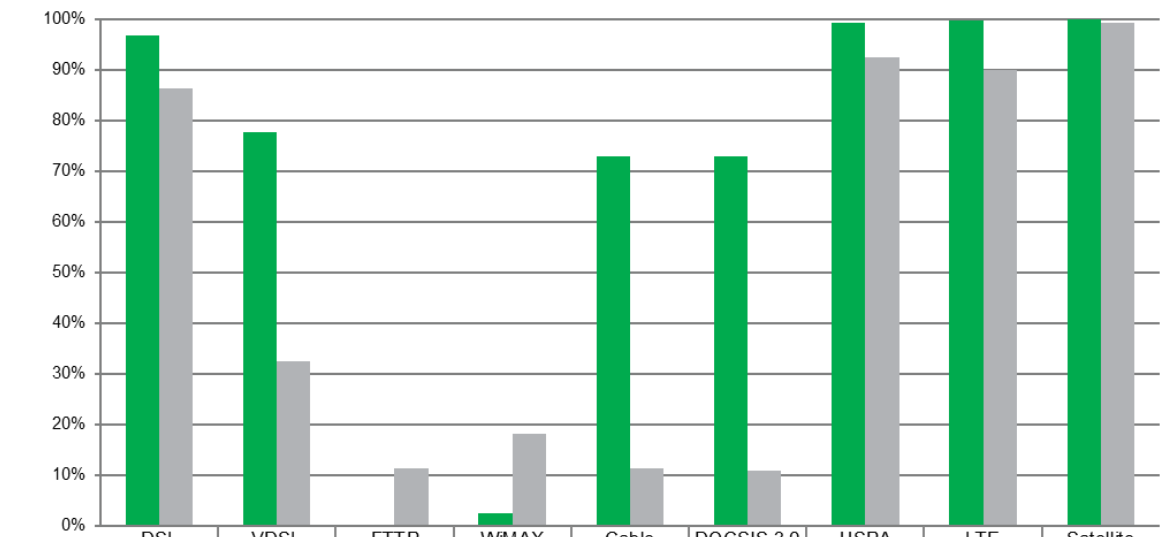
DOCSIS 3.0 remained the leading NGA technology in Belgium, passing 96.8% of homes. The next most widespread NGA technology was VDSL, which increased by 1.5 percentage points during the period, reaching 94.0% of households. Despite this increase, Belgium lost its leading position in VDSL coverage to Iceland (94.9%) in 2017.

In comparison to DOCSIS 3.0 and VDSL, FTTP coverage in Belgium remained minimal, expanding by 0.2 percentage points with FTTP services being available to just 0.8% of households by mid-2017. In light of this lack of FTTP availability, Belgian incumbent Proximus plans to spend EUR 3 billion on FTTP networks across the next 10 years to cover at least 50% of households and 85% of enterprises.[8] Proximus initiated its FTTP rollout at the start of 2017 in five large cities (Brussels, Namur, Charleroi, Antwerp and Gent).[9]

With high coverage recorded already in previous years, the proportion of households covered by mobile broadband technologies was relatively unchanged during the twelve months to the end of June 2017. By mid-2017, the average coverage of all LTE networks operators in Belgium was 96.6%, an increase of 2.1 percentage points in the twelve-month period.

Examining fixed broadband access in rural areas, DSL coverage was unchanged during the period, at 96.9%. There was a slight uplift in terms of cable and DOCSIS 3.0 coverage in rural areas, increasing by 1.9 percentage points, with 72.8% of homes passed. However, VDSL networks remained the key NGA technology in rural areas, expanding by 4.3 percentage points during the twelve months, passing 77.7% of rural homes. As in previous years, there was no rural FTTP coverage in Belgium.

Belgium: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Belgium	96.9%	77.7%	0.0%	2.5%	72.8%	72.8%	99.4%	99.8%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In terms of mobile broadband access in rural areas, there continued to be universal HSPA coverage. The proportion of rural households covered by LTE technology increased by 1.2 percentage points, reaching 99.8%.

When comparing rural coverage in Belgium with other countries, it is important to note that Belgium is the second most urbanised country included in the study (after Malta). In total, 4.1% of households in Belgium are classified as rural, compared to the EU average of 14.0%.

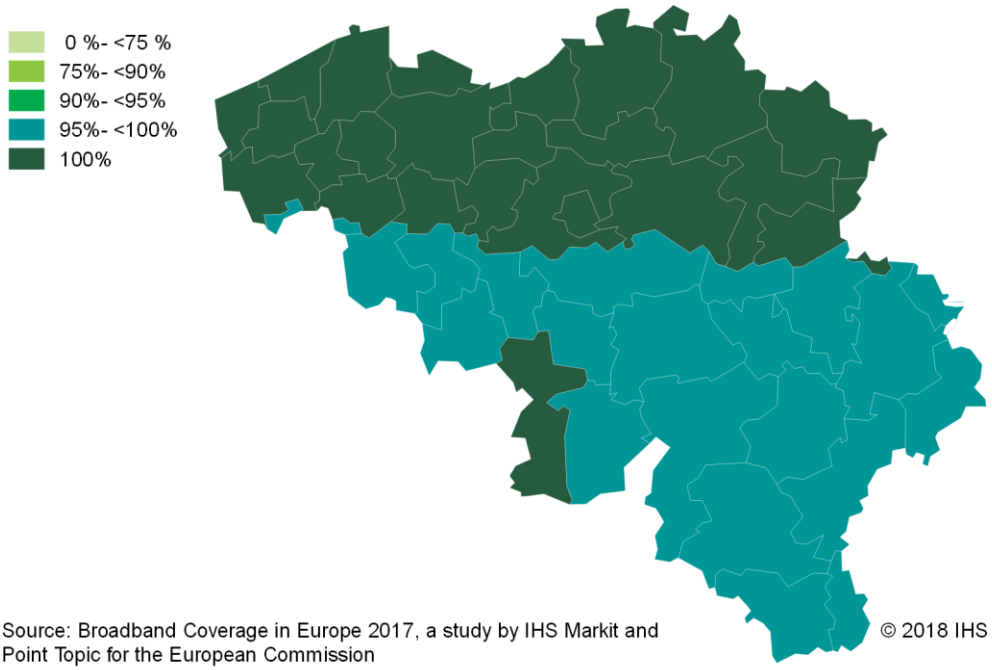
[8] https://www.proximus.com/en/news/20161216_Fiber

[9] https://www.proximus.com/sites/default/files/Documents/Investors/Reports/2017/q3/Q3_17_Quarterly_report.pdf

5.2.2 Regional coverage by broadband technology

Fixed broadband coverage in all Belgian regions exceeded 99%. For the first time, Belgium recorded universal fixed broadband coverage in the borough of Thuin in Wallonia. As was the case last year, Belgium recorded universal fixed broadband coverage in all areas of the Flemish region.

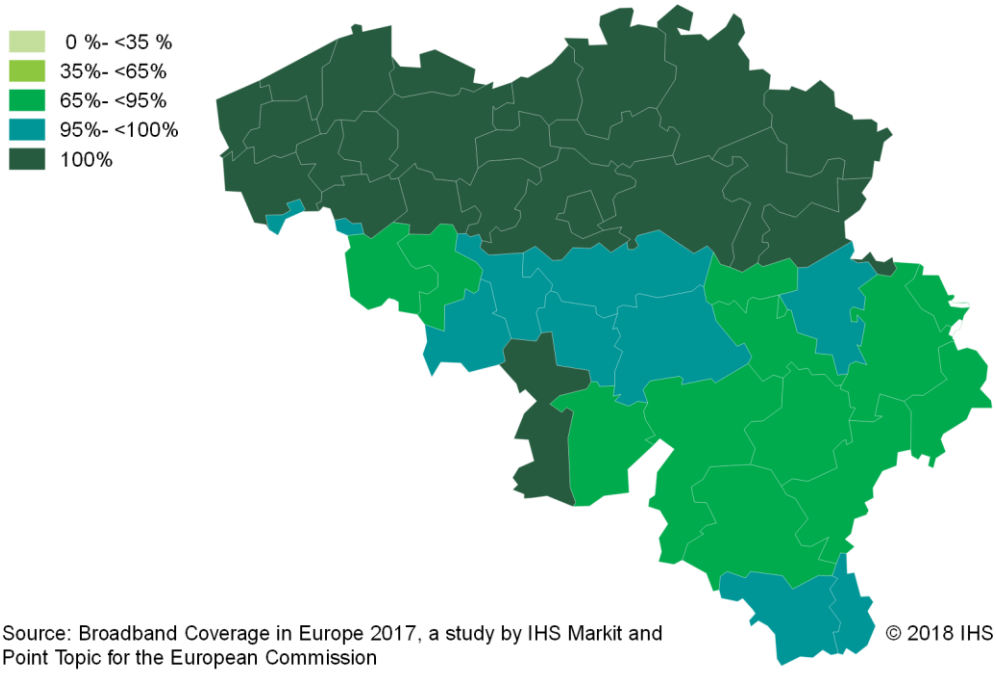
Belgium: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

As in 2016, the Flemish regions of Belgium registered complete NGA coverage, whilst NGA coverage in the Walloon regions ranged from 94% to 100%.

Belgium: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.2.3 Data tables for Belgium

Statistic	National
Population	11,311,117
Persons per household	2.3
Rural proportion	4.1%

	Belgium 2017		Belgium 2016		Belgium 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.9%	96.9%	99.9%	96.9%	99.9%	98.8%	94.1%	86.3%
VDSL	94.0%	77.7%	92.5%	73.4%	90.4%	71.9%	53.4%	32.5%
FTTP	0.8%	0.0%	0.6%	0.0%	0.4%	0.0%	26.8%	11.3%
WiMAX	14.9%	2.5%	14.8%	2.6%	15.0%	3.3%	18.0%	18.2%
Cable	96.8%	72.8%	96.4%	70.9%	96.3%	64.6%	45.1%	11.4%
DOCSIS 3.0	96.8%	72.8%	96.4%	70.9%	96.3%	64.6%	44.7%	10.8%
HSPA	100.0%	99.4%	100.0%	99.4%	97.9%	81.0%	97.9%	92.4%
LTE	100.0%	99.8%	99.9%	98.6%	85.6%	38.0%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	96.6%	-	94.5%	-	-	-	90.8%	-
Satellite	100.0%	100%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	99.8%	100.0%	99.8%	99.9%	99.4%	99.9%	99.4%
Overall fixed broadband	99.9%	98.4%	99.9%	98.5%	99.9%	99.4%	97.4%	92.4%
NGA broadband	99.0%	91.5%	98.9%	88.3%	98.9%	86.4%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	96.9%	-	-	-	-	-	57.8%	-
At least 2 Mbps	99.9%	-	99.8%	-	99.8%	-	96.0%	-
At least 30 Mbps	98.4%	-	98.2%	-	98.1%	-	79.0%	-
At least 100 Mbps	96.9%	-	96.5%	-	96.4%	-	55.1%	-

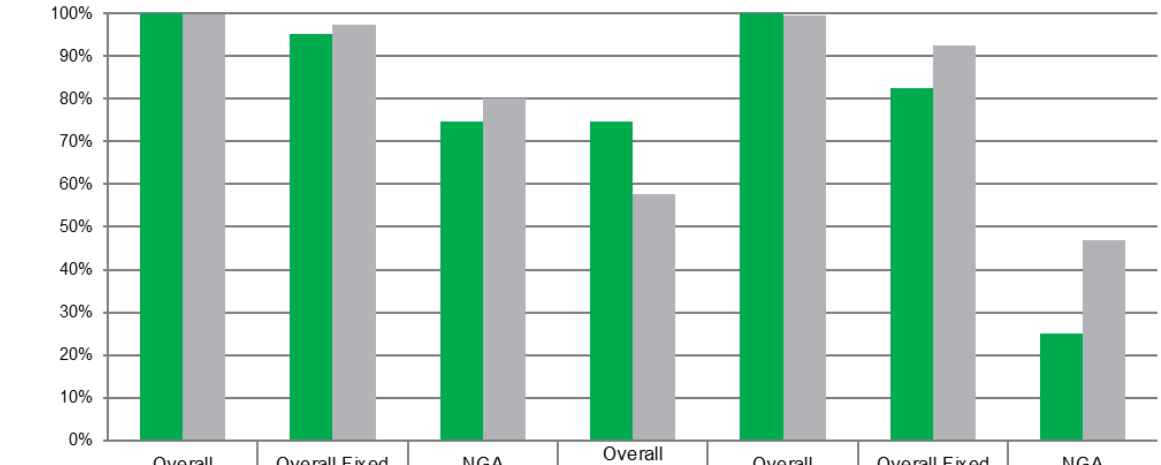
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.3 Bulgaria

5.3.1 National coverage by broadband technology

Both overall broadband and fixed broadband national coverage in Bulgaria remained relatively unchanged throughout the twelve months to mid-2017. The most significant improvements were witnessed in rural areas, where coverage of fixed technologies increased by 1.6 percentage points. In total, NGA coverage in Bulgaria increased by 0.5 percentage points, reaching 74.6% at the end of June 2017. In rural areas, NGA technologies became available to one quarter of the rural households, recording an annual increase of 7.7 percentage points. Despite these improvements, Bulgarian fixed and NGA coverage remained well below the EU average. However, taking a closer look at the overall DOCSIS 3.0 and FTTP combination category, the country is 16.8 percentage points above the EU average of 57.8%.

Bulgaria: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 and FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Bulgaria	100.0%	95.2%	74.6%	74.6%	100.0%	82.5%	25.0%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Looking at individual technologies, DSL continued to be the leading fixed broadband technology, passing 85.2% of the Bulgarian homes by mid-2017. Cable broadband availability in Bulgaria was well above the EU average of 45.1%, reaching 66.6% of households in the country. Historically, the Bulgarian broadband market was characterised by high levels of WiMAX coverage; however, in 2016 LTE operators decided to discontinue the service in order to reallocate the spectrum to LTE networks.

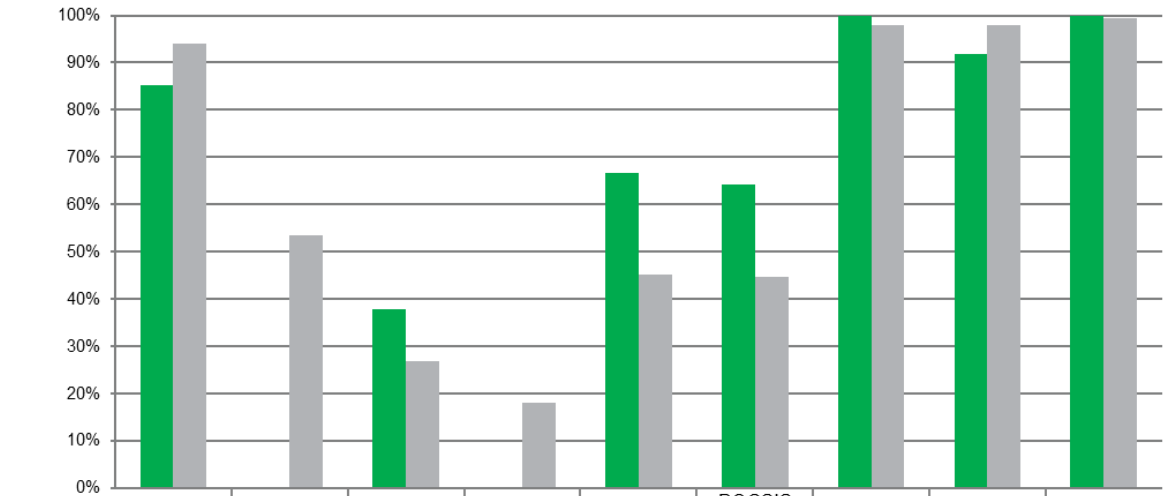
While VDSL remains absent in the country, the remaining NGA technologies saw an improvement in coverage levels over the twelve months to mid-2017. While the average EU increase in FTTP was 3.2 percentage points, this technology in Bulgaria only grew by 0.7 percentage points. Regardless of its slower growth rate, at 37.8%, FTTP coverage in Bulgaria exceeded the EU average of 26.8%. The increase in FTTP coverage was due to operators' efforts to continue fibre-optic network deployment. Most notably, in September 2016, Coolbox (formerly ITD Network) launched FTTP services with download speeds of up to 1Gbps for the residents of Plovdiv and Veliko Tarnovo. The project was carried out with national and EU funding aimed at improving regional development and competition.[10] With regards to FTTP coverage in Bulgaria, one specific aspect of the market needs to be highlighted: in a number of areas, fibre-optic technology is rolled out very close to the residential premises, with the remainder of the network being serviced by a coaxial cable, covering the distance from the last amplifier to the customer's home. While this FTTLA (fibre-to-the-last-amplifier) architecture is sometimes described as FTTB, in the case of Bulgaria this coverage was classified as DOCSIS 3.0 rather than FTTP. This classification was applied by Point Topic in 2012 and maintained in subsequent analysis.

[10] https://www.cooolbox.bg/news/izpalnenie-na-dogovor-za-bezvazmezdna-finansova-pomosht

Given that both FTTP and DOCSIS 3.0 technologies are combined in the NGA broadband coverage category, this classification does not impact the total NGA coverage levels.

LTE services in Bulgaria have come a long way since they were first launched in 2014. Rapid deployment of LTE networks brought LTE coverage in Bulgaria closer to the EU average of 97.9% and, after recording the second highest year-on-year LTE coverage growth among study countries, at 15.4 percentage points, LTE services were available to 91.9% of Bulgarian households in mid-2017. Yet, because Bulgaria was one of the last countries in Europe to roll out LTE networks, total LTE coverage in the country was still the second lowest among the study countries. Average LTE coverage increased from 65.7% in mid-2016 to 71.6% at the end of June 2017 yet, as with overall coverage, remained considerably below the EU average level (90.8%).

Bulgaria: Coverage by technology, total, 2017

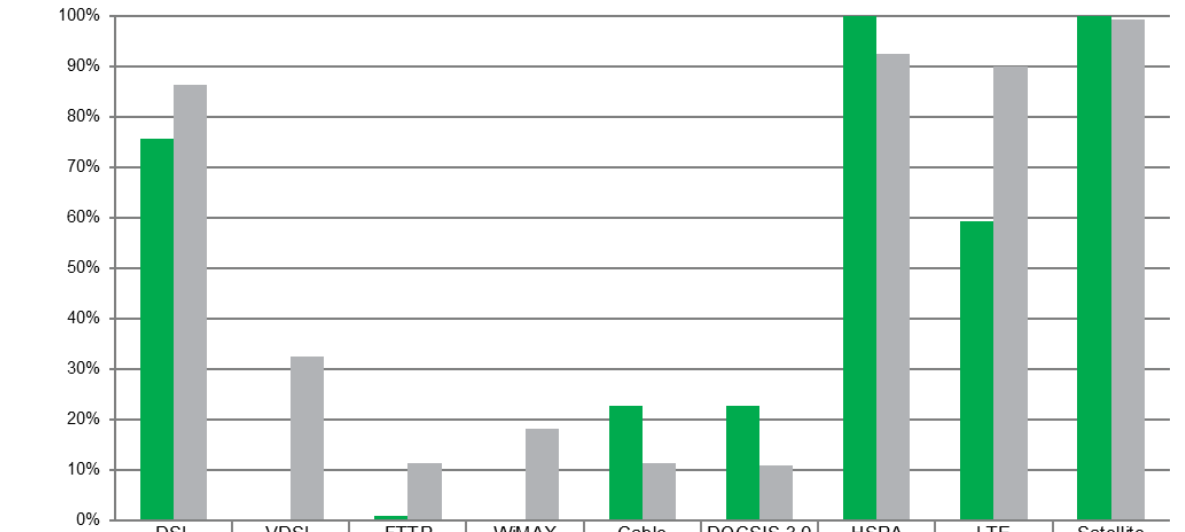


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Bulgaria	85.2%	0.0%	37.8%	0.0%	66.6%	64.2%	100.0%	91.9%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

DSL continued to be the leading technology in rural areas, reaching 75.6% of households. Cable networks recorded an increase of 5.7 percentage points, reaching 22.8% of rural homes, which is twice as high as the EU average for cable coverage in rural areas. As mentioned, WiMAX is no longer available in Bulgaria since WiMAX services were discontinued in 2016.

Bulgaria: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Bulgaria	75.6%	0.0%	0.9%	0.0%	22.8%	22.6%	100.0%	59.3%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

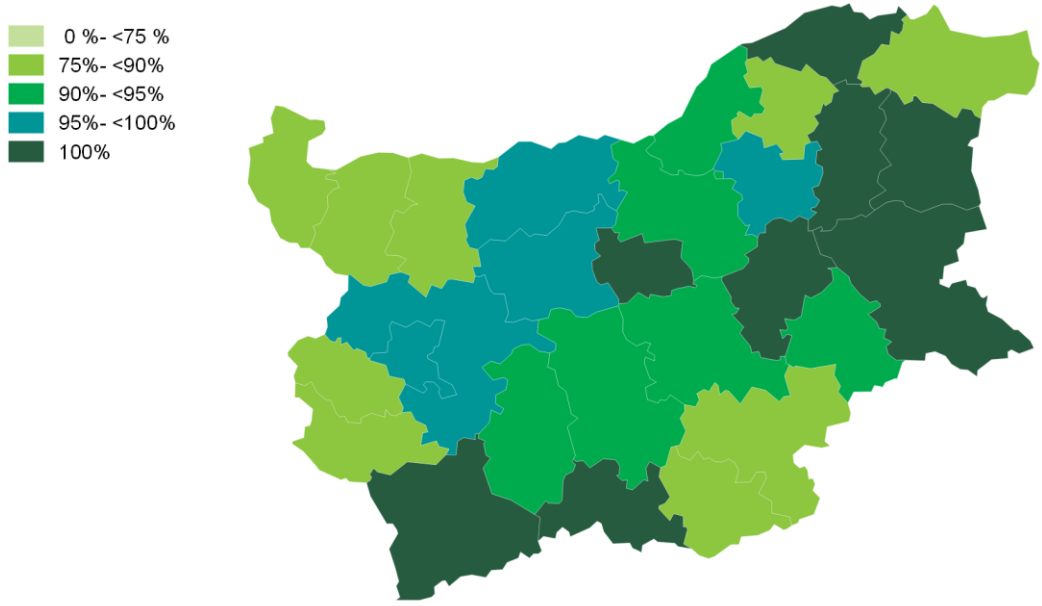
Since VDSL is not available in this market, the only NGA technologies present in rural areas are DOCSIS 3.0 and FTTP. Due to the abovementioned re-classification of FTTLA as DOCSIS 3.0 in this market, actual FTTP was available to less than 1% of the rural homes. However, DOCSIS 3.0 coverage exceeded the EU average, reaching 22.8% of rural households.

Rural LTE coverage grew by 40.6 percentage points, the highest increase among all study countries. By the end of June 2017, nearly two-thirds (59.3%) of rural homes were passed by LTE networks. Despite this significant growth, rural LTE coverage in Bulgaria remained 30.6 percentage points below the EU average. HSPA coverage remained universal in rural areas.

5.3.2 Regional coverage by broadband technology

As in 2016, there was compete fixed broadband coverage in eight Bulgarian regions: Gabrovo, Silistra, Varna, Shumen, Burgas, Sliven, Blagoevgrad, and Smolyan. Pernik was the region with the lowest coverage, standing at 81.4%.

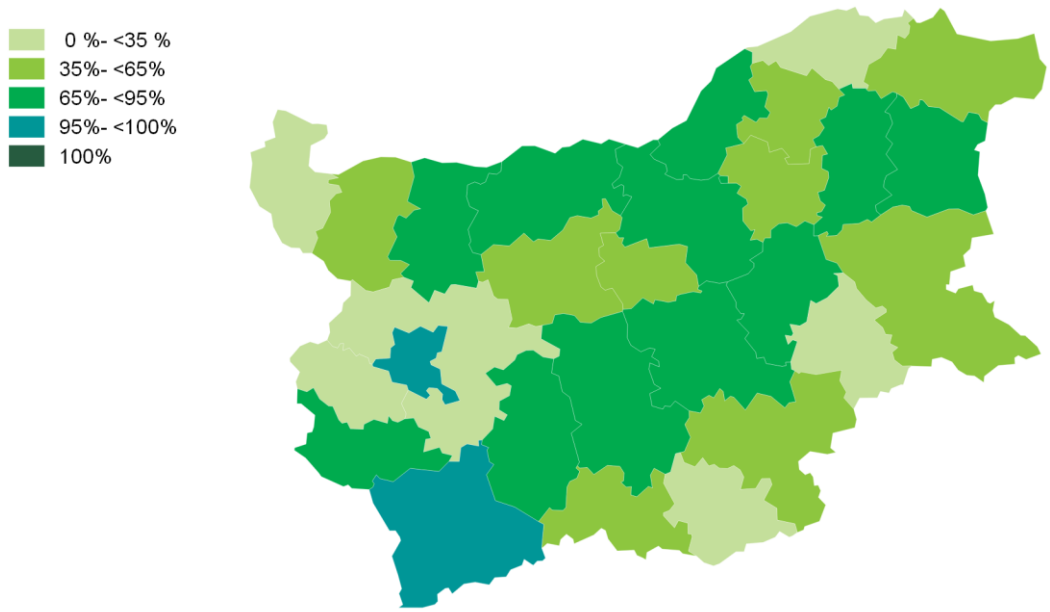
Bulgaria: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

By mid-2017, NGA coverage in Bulgaria continued to vary – from reaching nearly complete coverage in the capital Sofia and in Blagoevgrad, to as low as 12.2% in Vidin. The regions of Varna, Plovdiv, Stara Zagora, and Pazardzhik, where urbanization levels are higher, all recorded NGA coverage of 91.1% or higher.

Bulgaria: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.3.3 Data tables for Bulgaria

Statistic	National
Population	7,101,859
Persons per household	2.4
Rural proportion	19.9%

	Bulgaria 2017		Bulgaria 2016		Bulgaria 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	85.2%	75.6%	85.2%	75.3%	85.1%	76.0%	94.1%	86.3%
VDSL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	53.4%	32.5%
FTTP	37.8%	0.9%	37.1%	0.8%	32.2%	0.7%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	64.6%	12.3%	18.0%	18.2%
Cable	66.6%	22.8%	65.9%	16.9%	64.9%	16.2%	45.1%	11.4%
DOCSIS 3.0	64.2%	22.6%	63.6%	16.9%	62.9%	16.2%	44.7%	10.8%
HSPA	100.0%	100.0%	100.0%	100.0%	99.9%	99.6%	97.9%	92.4%
LTE	91.9%	59.3%	76.5%	18.7%	48.1%	0.0%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	71.6%	-	65.7%	-			90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%	99.4%
Overall fixed broadband	95.2%	82.5%	95.2%	80.8%	95.2%	81.2%	97.4%	92.4%
NGA broadband	74.6%	25.0%	74.1%	17.3%	71.8%	16.7%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	74.6%	-	-	-	-	-	57.8%	-
At least 2 Mbps	95.0%	-	94.9%	-	94.9%	-	96.0%	-
At least 30 Mbps	74.5%	-	71.3%	-	68.4%	-	79.0%	-
At least 100 Mbps	30.7%	-	18.6%	-	15.7%	-	55.1%	-

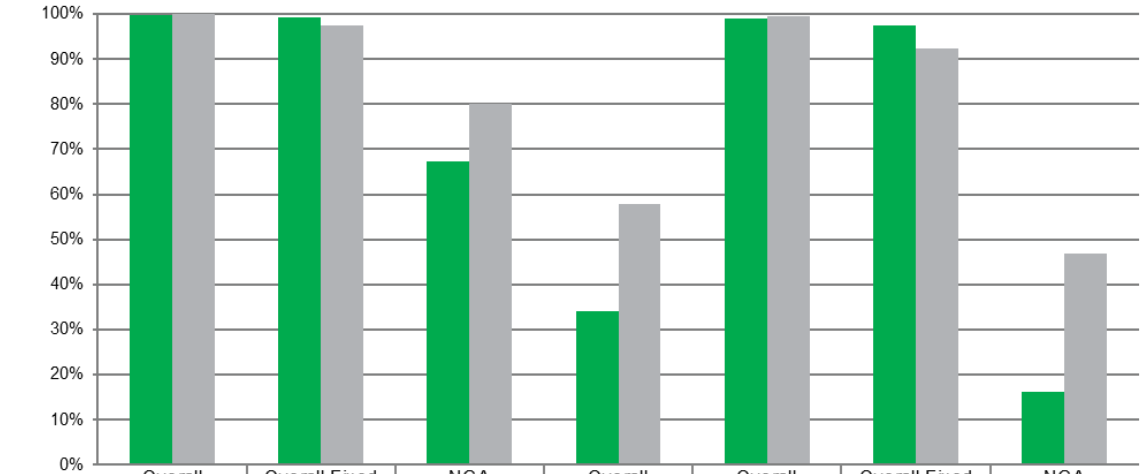
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.4 Croatia

5.4.1 National coverage by broadband technology

Over the twelve months ending June 2017, overall broadband coverage in Croatia remained slightly below the EU average, reaching 99.7% of Croatian homes. While fixed broadband was available to 99.3% of households, NGA coverage remained low at 67.4%. Nevertheless, NGA availability in Croatia improved significantly compared to June 2016, increasing by 7.4 percentage points, driven by VDSL deployments. This was also visible on a rural level where NGA coverage improved by 6 percentage points, reaching 16.1% of the rural households. While this represented a considerable improvement compared to the previous edition of this study, rural NGA levels in Croatia remained significantly below the EU average of 46.9%. By mid-2017, rural NGA coverage in Croatia was the third lowest in the EU28.

Croatia: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Croatia	99.7%	99.3%	67.4%	34.1%	99.0%	97.3%	16.1%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Looking more closely at the individual technologies, DSL remained the most widespread fixed broadband technology, reaching 98.8% of Croatian homes. Over the twelve months to mid-2017, DSL coverage improved by 3.9 percentage points, remaining well above the EU average. All cable connections in Croatia were fully upgraded to DOCSIS 3.0 by mid-2016.[11]

All NGA technologies recorded improvements in Croatia over the twelve months to mid-2017. VDSL coverage levels continued to increase, gaining 14 percentage points compared to mid-2016. By the end of June 2017, VDSL networks reached 58.2% of households, exceeding the EU average (53.4%). Examining other NGA technologies, DOCSIS 3.0 availability increased by 1.4 percentage points, reaching 28.3% of Croatian households at the end of June 2017, but remained below the EU average. Similarly, despite recording an increase of 1.2 percentage points, FTTP coverage in Croatia was below the EU average (26.8%), reaching 16.8% of Croatian households. One of the factors contributing to the increase in FTTP coverage was increased investment by the incumbent, T-Hrvatski Telekom, in fibre-optic infrastructure in line with the operator's ambition to provide access to speeds of up to 100 Mbps to half of the population of Croatia.[12]

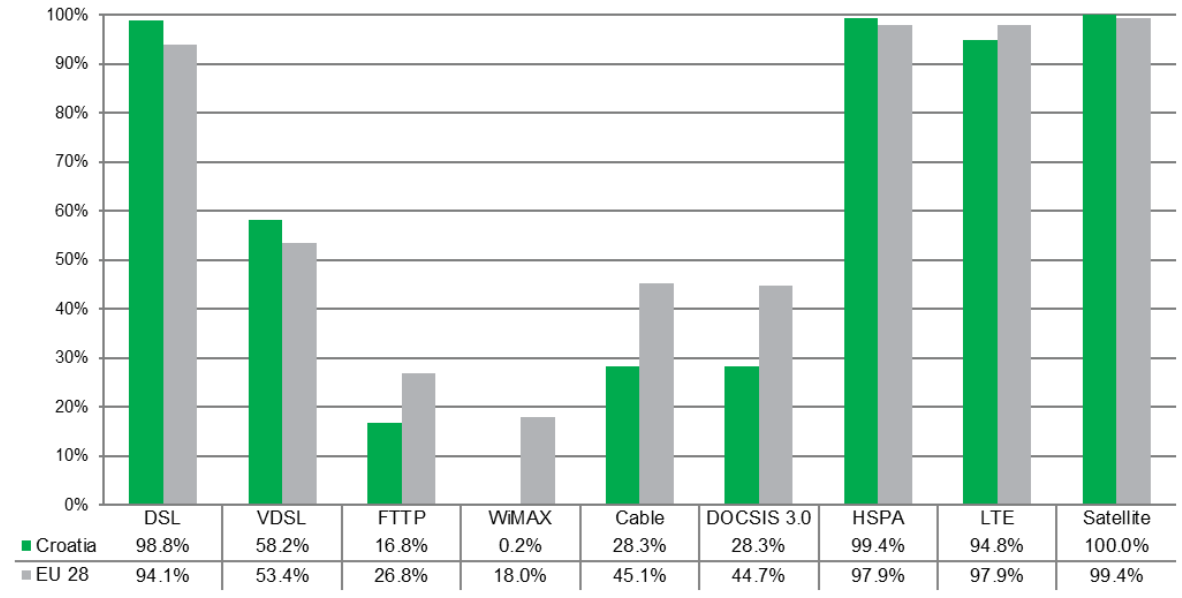
Total LTE coverage continued to grow at a steady pace, increasing by 4.7 percentage points year-on-year. At the end of June 2017, LTE coverage reached 94.8% of households in Croatia, but remained below the EU average of 97.9%. Due to continued LTE deployments by Croatian mobile operators,

[11] As advised by HAKOM (Croatian Regulatory Authority for Network Industries, https://www.hakom.hr/), cable availability in Croatia was revised for the historic period 2013-2016.

[12] http://www.poslovni.hr/tehnologija/tomaskovic-ht-u-optiku-do-2020-ulaze-2-mlrd-kuna-319224

average LTE operator coverage increased by 6.6 percentage points to 73.3%, but was still well below the EU average of 90.8%.

Croatia: Coverage by technology, total, 2017

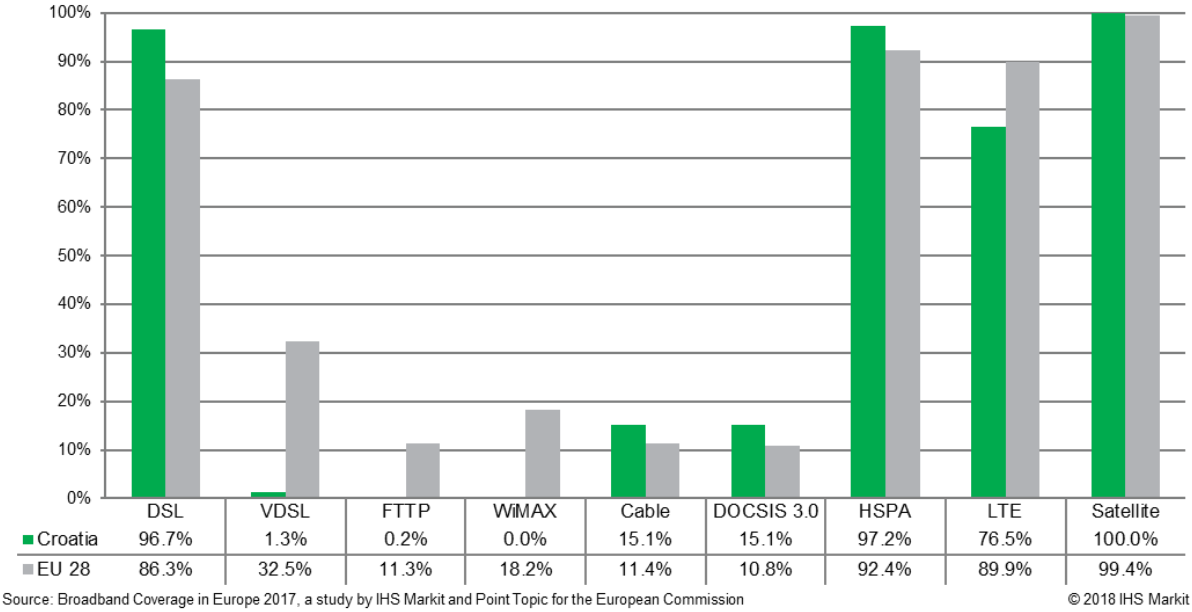


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Croatia	98.8%	58.2%	16.8%	0.2%	28.3%	28.3%	99.4%	94.8%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

On rural level, DSL remained the most widespread technology, reaching 96.7% of rural homes to exceed the EU average by over 10 percentage points. DOCSIS 3.0 availability increased by 5.3 percentage points during the twelve months to mid-2017, passing 15.1% of rural homes compared to the EU average of 10.8%. However, rural coverage of both remaining NGA technologies remained low, with less than 1.3% of rural homes reached by VDSL services and FTTP networks passing only 0.2% of the rural homes.

Croatia: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Croatia	96.7%	1.3%	0.2%	0.0%	15.1%	15.1%	97.2%	76.5%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

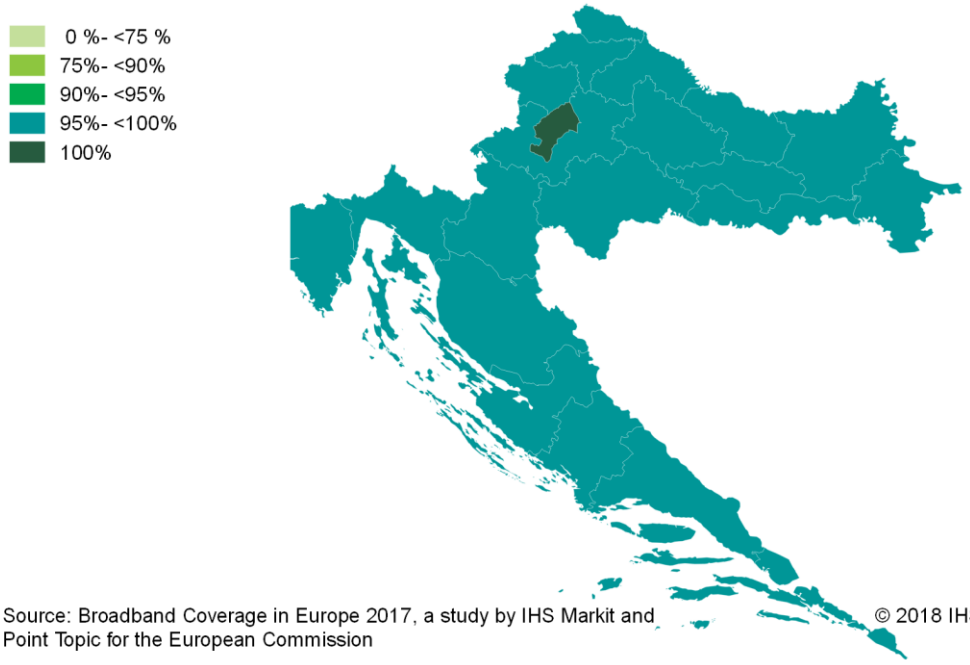
Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Rural LTE coverage recorded a strong improvement during the study period, increasing by 20.5 percentage points. However, at 76.7%, rural LTE coverage remained below the EU average of 89.9%. Meanwhile, rural HSPA network coverage exceeded the EU average by nearly 5 percentage points, reaching 97.3% of households.

5.4.2 Regional coverage by broadband technology

By mid-2017, coverage in all regions in Croatia exceeded 95%, with availability in the lowest-covered regions of Krapinsko-zagorska and Virovitičko-podravska increasing by 11 and 12 percentage points respectively over the past 12 months.

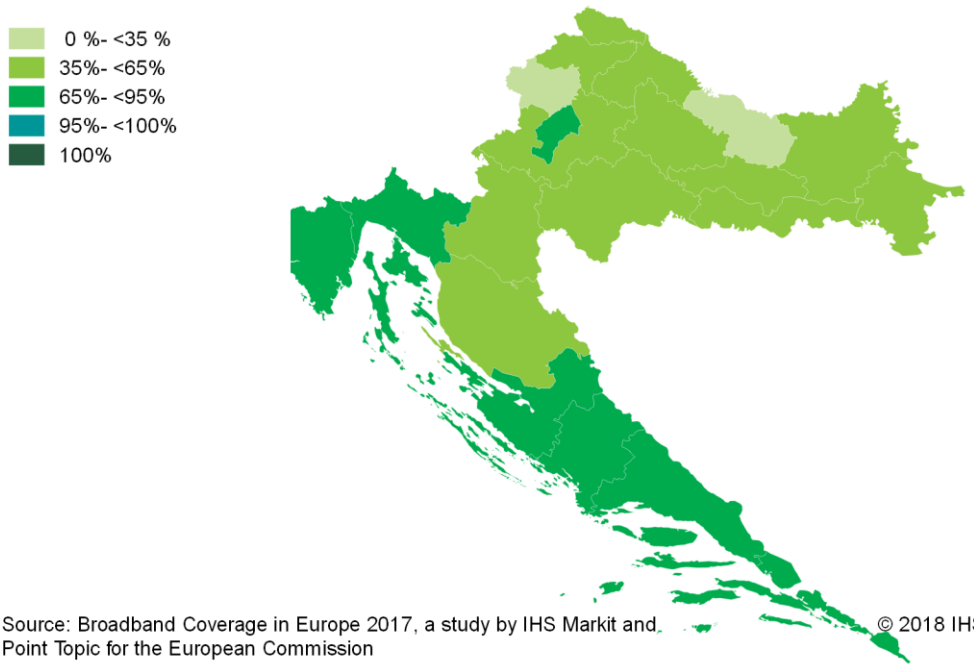
Croatia: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Looking at regional NGA coverage patterns, NGA coverage increased more significantly in regions that previously had lower levels of coverage; however, coverage remained varied, ranging from 29.5% in Krapinsko-zagorska region to 91.2% in Primorsko-goranska region. The capital region, Grad Zagreb, had the second highest regional NGA coverage of 88.5%.

Croatia: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.4.3 Data tables for Croatia

Statistic	National
Population	4,217,377
Persons per household	2.8
Rural proportion	22.1%

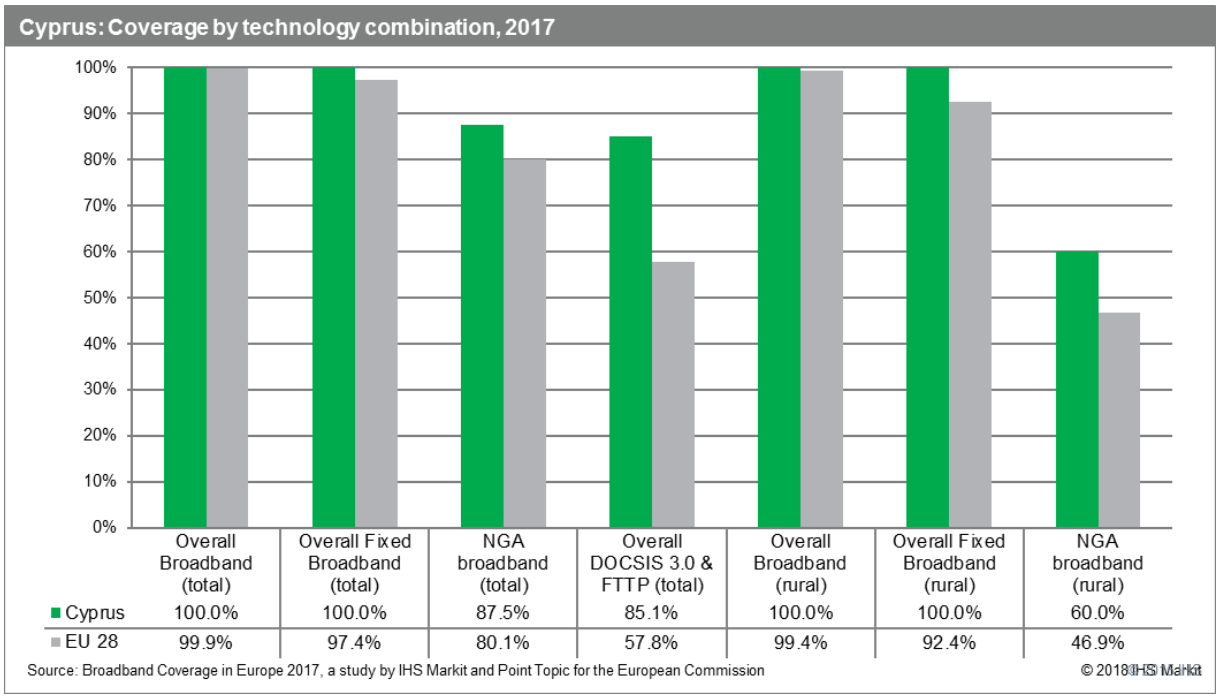
	Croatia 2017		Croatia 2016		Croatia 2015		EU28 2017	
Technology	Total	Rural	Total	Total	Total	Rural	Total	Rural
DSL	98.8%	96.7%	94.9%	86.4%	94.7%	86.1%	94.1%	86.3%
VDSL	58.2%	1.3%	44.2%	0.2%	35.9%	0.0%	53.4%	32.5%
FTTP	16.8%	0.2%	15.6%	0.2%	10.1%	0.0%	26.8%	11.3%
WiMAX	0.2%	0.0%	0.0%	0.0%	2.0%	3.2%	18.0%	18.2%
Cable	28.3%	15.1%	*26.9%*	*9.8%*	*24.9%*	*10.2%*	45.1%	11.4%
DOCSIS 3.0	28.3%	15.1%	26.9%	9.8%	23.0%	9.8%	44.7%	10.8%
HSPA	99.4%	97.2%	99.2%	96.4%	98.0%	91.0%	97.9%	92.4%
LTE	94.8%	76.5%	90.1%	56.0%	68.9%	10.7%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	73.3%	-	66.7%	-			90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.7%	99.0%	99.6%	98.3%	99.1%	95.9%	99.9%	99.4%
Overall fixed broadband	99.3%	97.3%	97.0%	89.2%	96.9%	89.2%	97.4%	92.4%
NGA broadband	67.4%	16.1%	59.9%	10.1%	52.0%	9.8%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	34.1%	-	-	-	-	-	57.8%	-
At least 2 Mbps	98.7%	-	98.7%	-	96.1%	-	96.0%	-
At least 30 Mbps	60.0%	-	60.0%	-	49.1%	-	79.0%	-
At least 100 Mbps	27.9%	-	27.9%	-	22.0%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.5 Cyprus

5.5.1 National coverage by broadband technology

As Cyprus achieved complete overall and fixed broadband coverage at a national and rural level already in 2012, there was no change in either technology combination category. There was also no change in NGA broadband coverage, at either a national or a rural level, as the deployment of individual NGA technologies was limited to areas served already by an alternative NGA network. Despite this, both measurements remained above the EU average. By mid-2017, 87.5% of homes nationally and 60.0% of homes in rural areas were passed by NGA broadband.



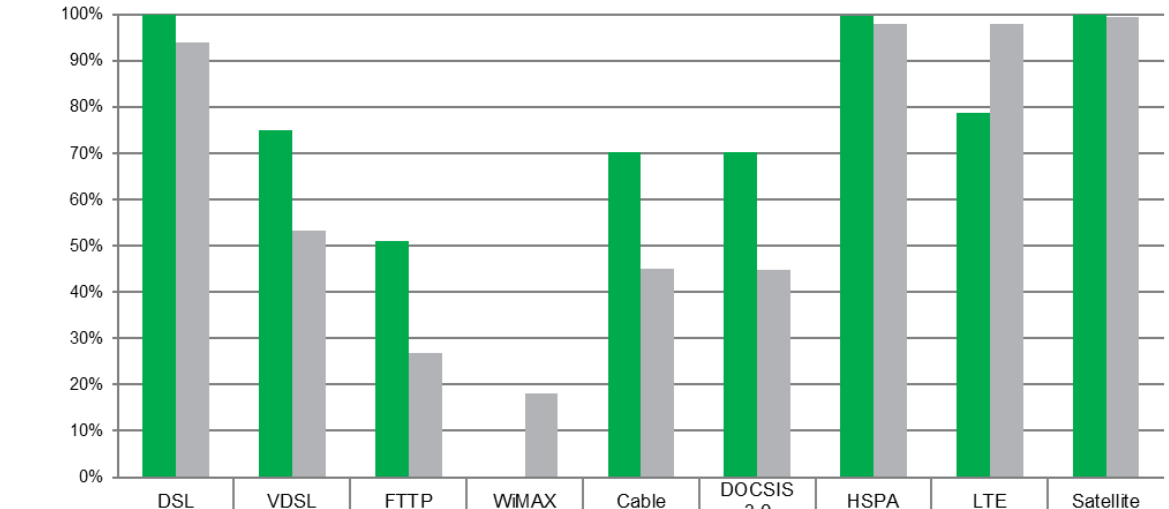
Considering individual broadband technologies, DSL services were available to all households in Cyprus. Moreover, cable networks passed 70.2% of homes, an increase of 1.5 percentage points compared with mid-2016. Looking at other NGA technologies, the proportion of homes passed by VDSL and FTTP networks remained unchanged from previous years. VDSL was the most widespread NGA technology, passing 75.0% of homes, while FTTP networks reached more than a half (51.2%) of Cypriot households.

Examining mobile broadband technologies, HSPA coverage expanded by 0.6 percentage points to reach 99.6% of households. There was higher growth in terms of LTE coverage, at 4.5 percentage points, with the technology covering 78.8% of households in mid-2017. Nevertheless, LTE coverage in Cyprus continued to be the lowest among all study countries. Cyprus was late to launch LTE services, with the first LTE networks in Cyprus not deployed until March 2015.[13] Consequently, operators continued to make significant LTE investments during the period, with MTN becoming the first mobile operator in Cyprus to launch LTE-Advanced services in March 2017.[14] In terms of average LTE operator coverage, there was an increase of 13.1 percentage points, as average LTE operator coverage increased to 77.3% as of mid-2017.

[13] http://in-cyprus.com/mtn-primetel-launch-4g-networks/

[14] http://www.mtn.com.cy/en/general/company/press-room/mtn-4g/

Cyprus: Coverage by technology, total, 2017



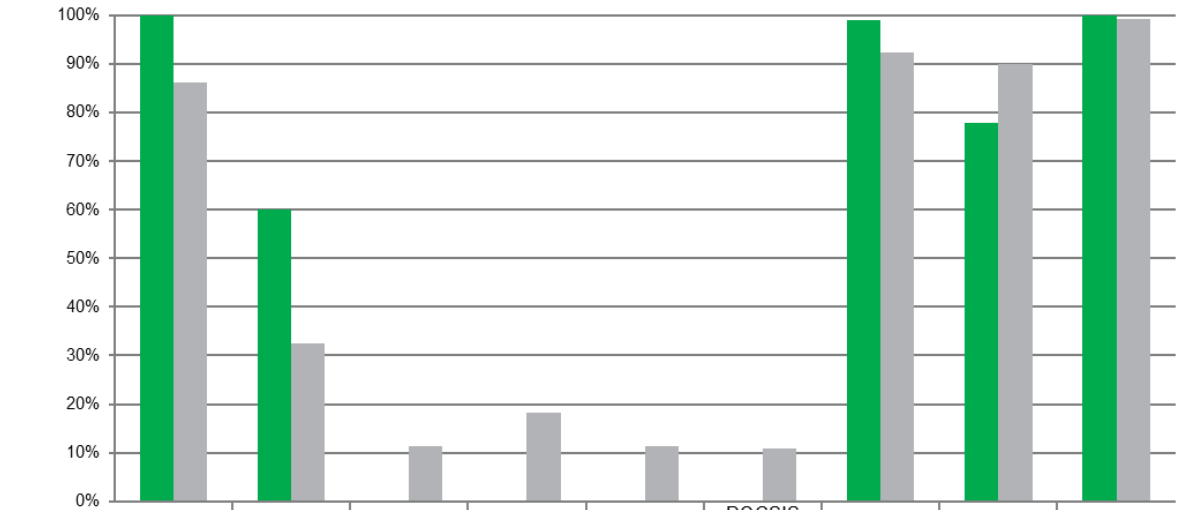
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Cyprus	100.0%	75.0%	51.2%	0.0%	70.2%	70.2%	99.6%	78.8%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

By mid-2017, DSL broadband provided universal rural coverage in Cyprus. Given that neither FTTP nor DOCSIS 3.0 networks were present in rural areas, VDSL remained the only NGA access technology available to rural households. The proportion of rural households covered by VDSL networks remained at 60.0% in the twelve months to the end of June 2017.

Looking at the availability of mobile broadband, rural LTE coverage increased by 77.8 percentage points as mobile network operators in Cyprus deployed LTE technology for the first time in rural areas. In the previous edition of the study, Cyprus was the only study country without rural LTE coverage. With the focus on rural LTE deployment, rural HSPA coverage (99.0%) did not increase during the period but remained above the EU average (92.4%).

Cyprus: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Cyprus	100.0%	60.0%	0.0%	0.0%	0.0%	0.0%	99.0%	77.8%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.5.2 Regional coverage by broadband technology[15]

Cyprus: Overall fixed broadband coverage, 2017

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Cyprus: NGA broadband coverage, 2017

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

[15] Please note that even though the map depicts the area of the whole island, the data on broadband coverage concern only the areas under the effective control of the Republic of Cyprus.

5.5.3 Data tables for Cyprus

Statistic	National
Population	848,319
Persons per household	2.8
Rural proportion	11.6%

	Cyprus 2017		Cyprus 2016		Cyprus 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	94.1%	86.3%
VDSL	75.0%	60.0%	75.0%	60.0%	68.0%	56.6%	53.4%	32.5%
FTTP	51.2%	0.0%	51.2%	0.0%	49.3%	0.0%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	18.2%
Cable	70.2%	0.0%	68.7%	0.0%	57.5%	0.0%	45.1%	11.4%
DOCSIS 3.0	70.2%	0.0%	68.7%	0.0%	57.5%	0.0%	44.7%	10.8%
HSPA	99.6%	99.0%	99.0%	99.0%	99.0%	99.0%	97.9%	92.4%
LTE	78.8%	77.8%	74.3%	0.0%	60.2%	0.0%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	77.3%	-	64.2%	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.4%
Overall fixed broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	97.4%	92.4%
NGA broadband	87.5%	60.0%	87.5%	60.0%	84.0%	56.6%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	85.1%	-	-	-	-	-	57.8%	-
At least 2 Mbps	100%	-	100.0%	-	100.0%	-	96.0%	-
At least 30 Mbps	85.1%	-	84.3%	-	78.7%	-	79.0%	-
At least 100 Mbps	85.1%	-	84.3%	-	78.7%	-	55.1%	-

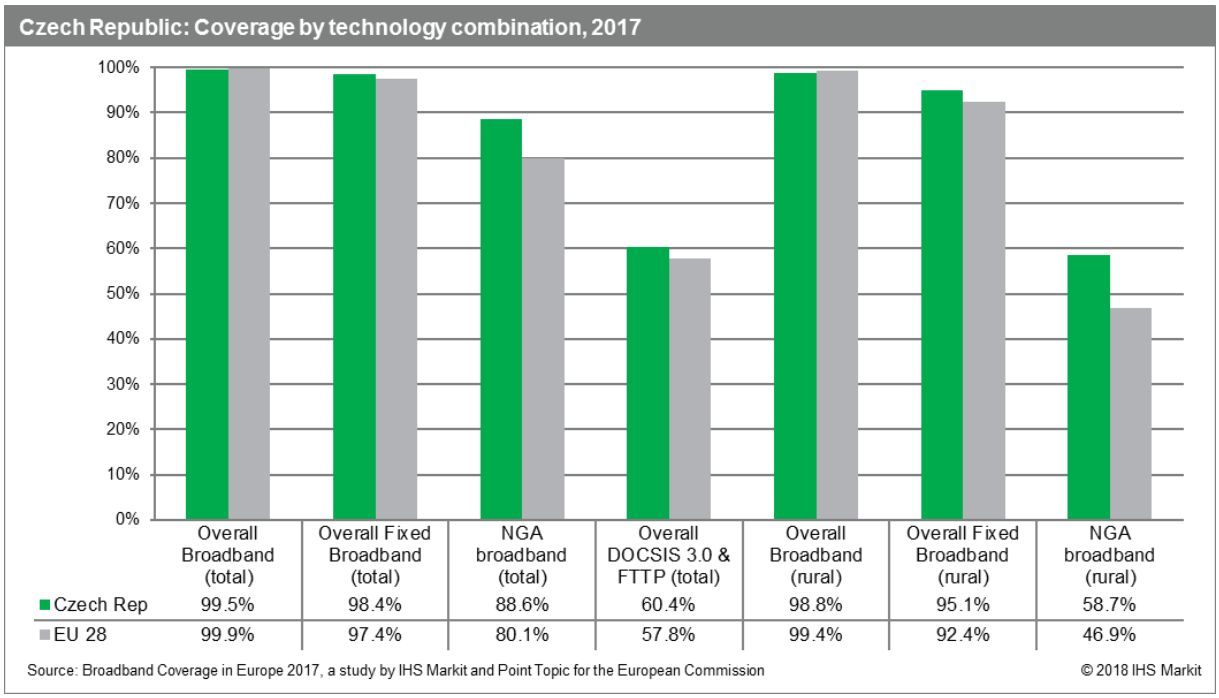
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.6 Czech Republic

5.6.1 National coverage by broadband technology

As of mid-2017, 98.4% of Czech homes were passed by at least one fixed broadband technology, slightly above the EU average of 97.4%. In rural areas, 95.1% rural households had access to fixed broadband services. With regards to NGA technologies, on a national level 88.6% of Czech households were able to connect to high-speed broadband at the end of June 2017, following a 13.5 percentage point year-on-year increase facilitated primarily by VDSL deployments. When evaluating availability of only FTTP and DOCSIS 3.0 services, two-thirds (60.4%) of Czech households were passed by either networks in mid-2017.

Rural NGA coverage also experienced a significant growth over the twelve months to mid-2017, increasing by 6.8 percentage points and reaching nearly two-thirds (58.7%) of rural households at the end of June 2017, above the EU average of 46.9%.



DSL and WiMAX were the two dominant fixed broadband technologies in the Czech Republic, with DSL and WiMAX networks passing 93.1% and 79.8% of Czech homes, respectively. The Czech broadband market is characterised by a large number of small local fixed wireless providers, which is reflected in the relatively high total WiMAX coverage figure based on the combined coverage offered by these providers (some of which also offer services within both licenced and unlicensed bands).

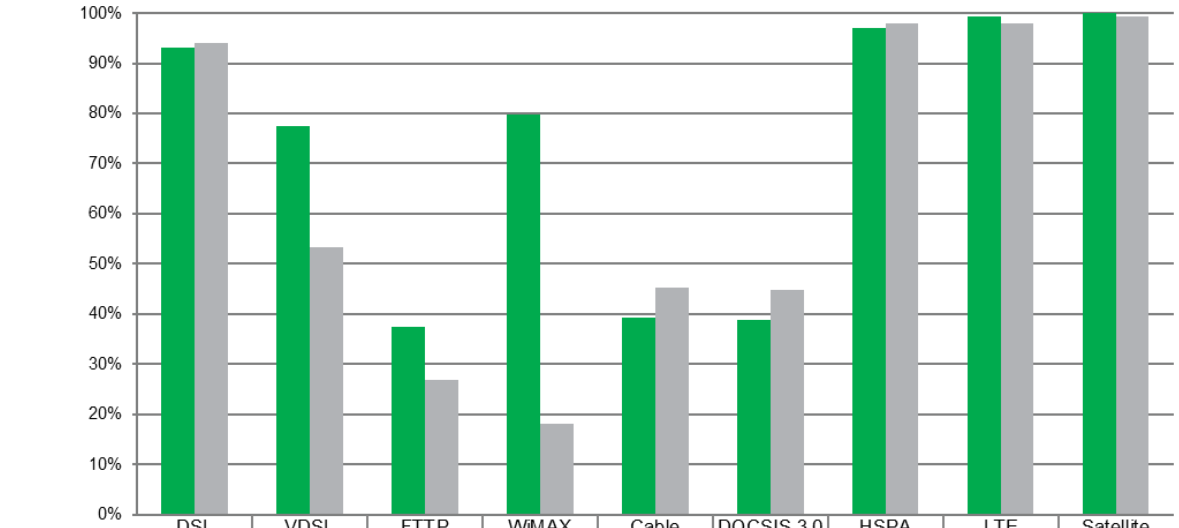
Cable coverage increased slightly by 0.9 percentage points compared to mid-2016 with cable broadband services being available to 39.2% of Czech households. As cable companies have traditionally limited their presence to big cities across the Czech Republic, the vast majority of households covered by cable networks were located in urban areas.

The most significant developments were recorded in terms of NGA coverage. Following the structural separation of the incumbent O2 Czech Republic in 2015, the now independent infrastructure incumbent, CETIN, continued its fast-paced roll-out of VDSL services. Nationally, VDSL coverage increased by 24.3 percentage points, with 77.4% of Czech households having access to VDSL services by mid-2017. Cable companies, such as UPC or Nej.cz, also continued with improvement works on their networks albeit at a more limited level. Following a 1.0 percentage point year-on-year increase DOCSIS 3.0 services were available to a total of 38.8% of Czech households.

At the end of June 2017, FTTP networks were estimated to pass 37.4% of Czech households following a 2.4 percentage point increase compared to mid-2016. Most of this increase can be attributed to smaller and local operators rolling out these networks.

By mid-2017, LTE coverage remained unchanged at a near universal coverage level with 99.4% of homes passed by at least one LTE network. When average coverage of all LTE network operators is considered in mid-2017, on average 98.8% of Czechs had access to LTE services.

Czech Republic: Coverage by technology, total, 2017

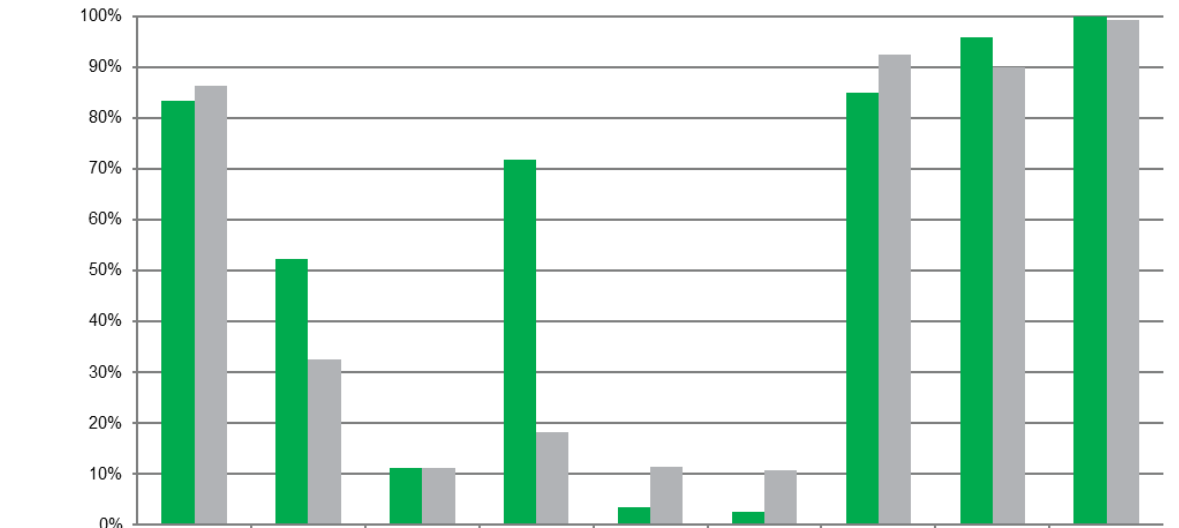


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Czech Rep	93.1%	77.4%	37.4%	79.8%	39.2%	38.8%	97.0%	99.4%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

On a rural level, both VDSL and FTTP technologies recorded moderate coverage increases in the twelve-month period to mid-2017. Availability of rural VDSL services grew by 5.2 percentage points with 52.2% of rural homes being passed by VDSL networks, while 11.1% of rural households had access to FTTP services, following a 3.3 percentage point increase compared to mid-2016. With deployments of LTE networks nearly complete already in 2016, rural LTE coverage remained unchanged with LTE services available to 95.8% of rural households across the Czech Republic in mid-2017.

Czech Republic: Coverage by technology, rural areas, 2017



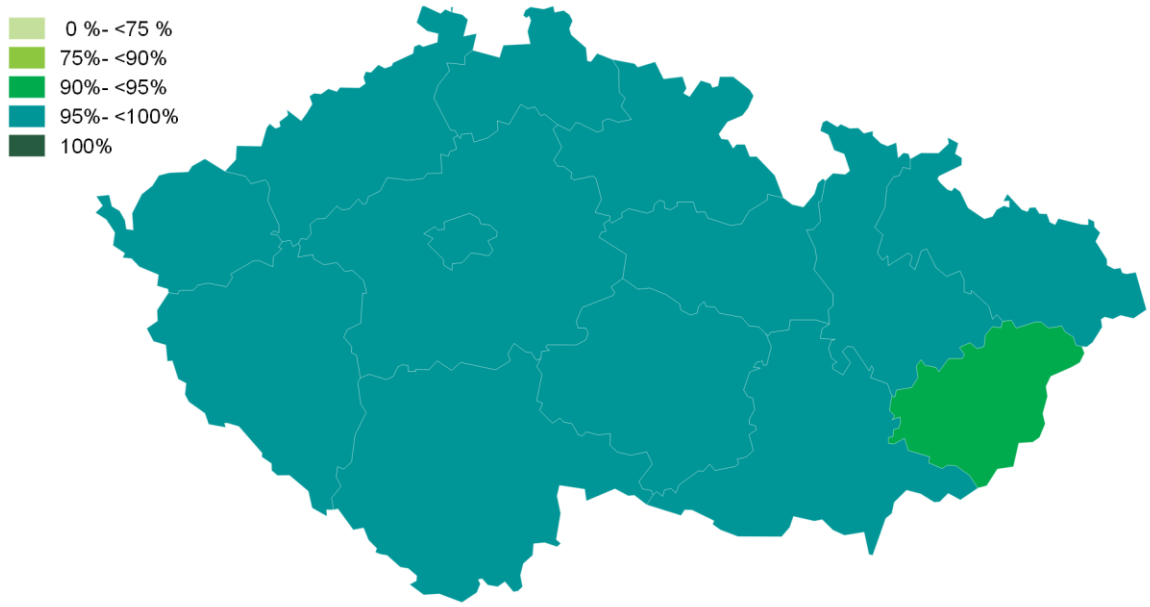
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Czech Rep	83.4%	52.2%	11.1%	71.8%	3.5%	2.4%	84.9%	95.8%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.6.2 Regional coverage by broadband technology

Fixed broadband coverage levels in all regions of the Czech Republic exceeded 98% although no region reported complete coverage.

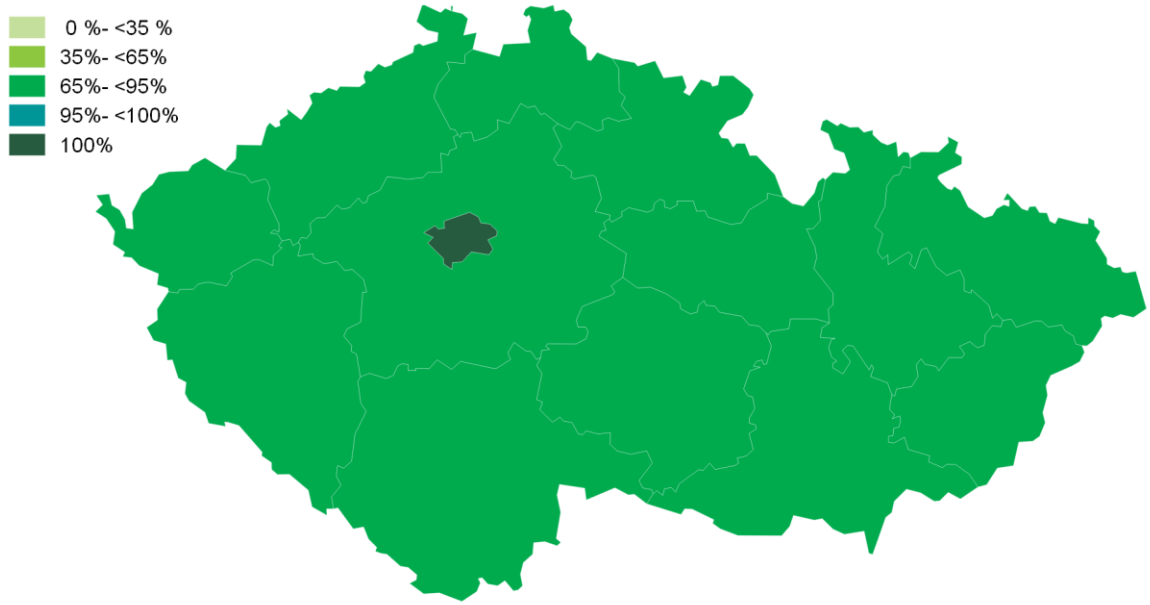
Czech Republic: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Regional NGA coverage recorded more varied levels ranging from around 80% in the Vysočina and Středočeský regions to more than 99% in the capital, Prague.

Czech Republic: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.6.3 Data tables for Czech Republic

Statistic	National
Population	10,553,843
Persons per household	2.4
Rural proportion	14.3%

	Czech Rep. 2017		Czech Rep. 2016		Czech Rep. 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	93.1%	83.4%	*93.1%*	*83.4%*	*93.1%*	80.8%	94.1%	86.3%
VDSL	77.4%	52.2%	53.1%	47.0%	52.0%	23.6%	53.4%	32.5%
FTTP	37.4%	11.1%	35.0%	7.7%	17.3%	5.7%	26.8%	11.3%
WiMAX	79.8%	71.8%	83.7%	83.5%	70.6%	69.9%	18.0%	18.2%
Cable	39.2%	3.5%	38.3%	3.1%	33.7%	1.5%	45.1%	11.4%
DOCSIS 3.0	38.8%	2.4%	37.7%	2.0%	33.3%	0.6%	44.7%	10.8%
HSPA	97.0%	84.9%	97.0%	84.9%	97.0%	79.2%	97.9%	92.4%
LTE	99.4%	95.8%	99.4%	95.8%	93.8%	56.3%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	98.8%	-	94.3%	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.5%	98.8%	99.8%	99.2%	99.2%	94.4%	99.9%	99.4%
Overall fixed broadband	98.4%	95.1%	*98.9%*	96.5%	*98.5%*	90.4%	97.4%	92.4%
NGA broadband	88.6%	58.7%	75.1%	51.9%	72.9%	26.7%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	60.4%	-	-	-	-	-	57.8%	-
At least 2 Mbps	96.1%	-	*96.1%*	-	*98.0%*	-	96.0%	-
At least 30 Mbps	88.6%	-	73.9%	-	72.7%	-	79.0%	-
At least 100 Mbps	55.9%	-	44.5%	-	43.3%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

All restatements are highlighted in italics.

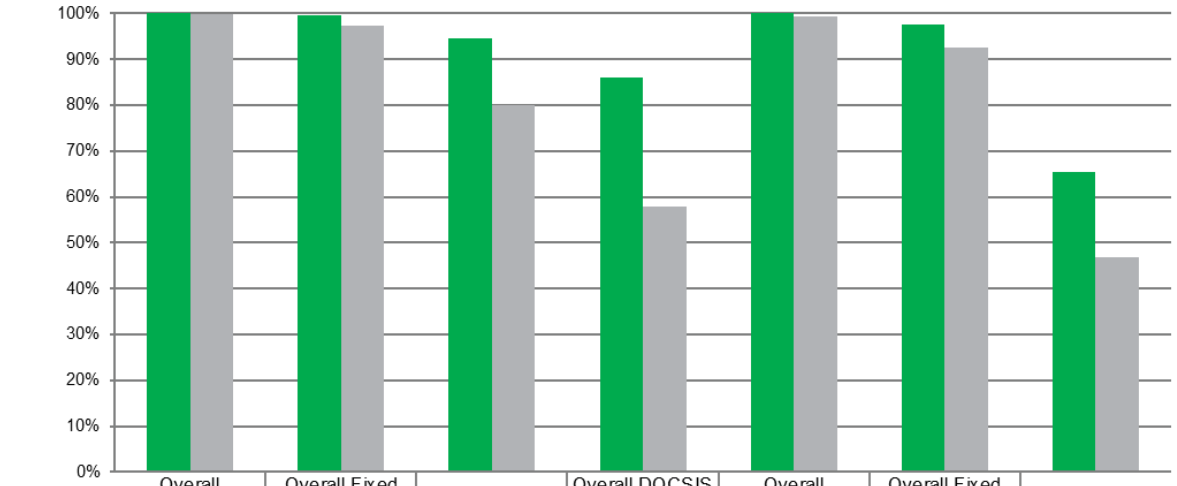
Data on DSL and VDSL coverage is from the incumbent infrastructure company, CETIN. New data available from CETIN led to a restatement of 2016-2015 DSL and fixed coverage data. All restatements are highlighted in italics.

5.7 Denmark

5.7.1 National coverage by broadband technology

As in the previous edition of this study, at the end of the examined period, overall broadband coverage in Denmark remained universal. Nationwide fixed broadband coverage in Denmark increased by 0.2 percentage points, also reaching almost universal coverage. Moreover, NGA services achieved coverage of 94.6%, increasing by 1.3 percentage points in the twelve months to mid-2017, surpassing the EU average by nearly 15 percentage points. Availability of fixed and NGA broadband also improved at a rural level, reaching 97.5% and 65.5% of rural households, respectively.

Denmark: Coverage by technology combination, 2017

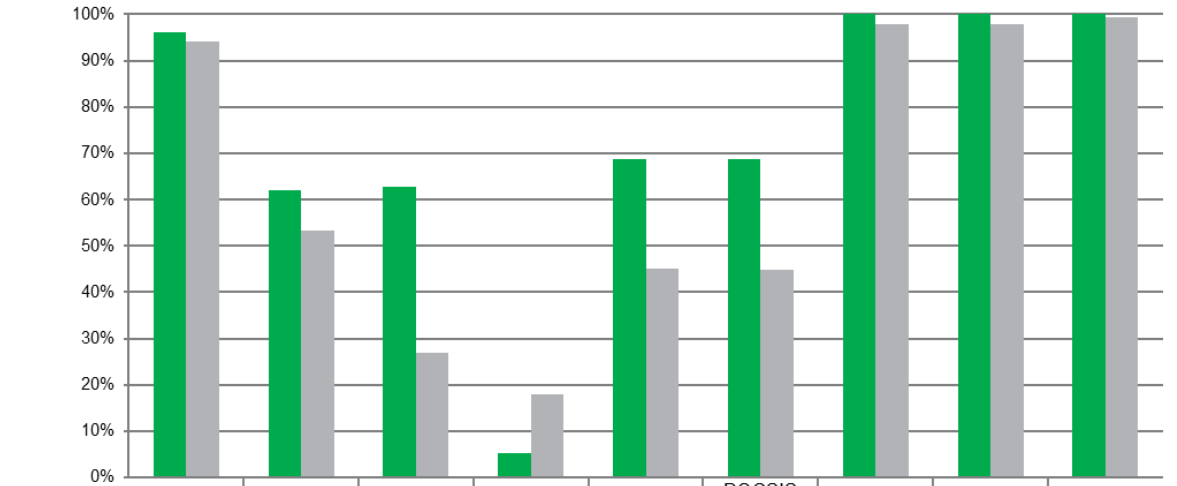


	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Denmark	100.0%	99.5%	94.6%	85.9%	100.0%	97.5%	65.5%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Examining individual technologies, DSL remained the dominant fixed broadband technology in Denmark. Despite a 0.7 percentage point reduction in coverage in the twelve months to the end of June 2017, DSL reached 96.1% of households, exceeding the EU average of 94.1%.

Denmark: Coverage by technology, total, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Denmark	96.1%	62.0%	62.7%	5.1%	68.8%	68.8%	100.0%	100.0%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

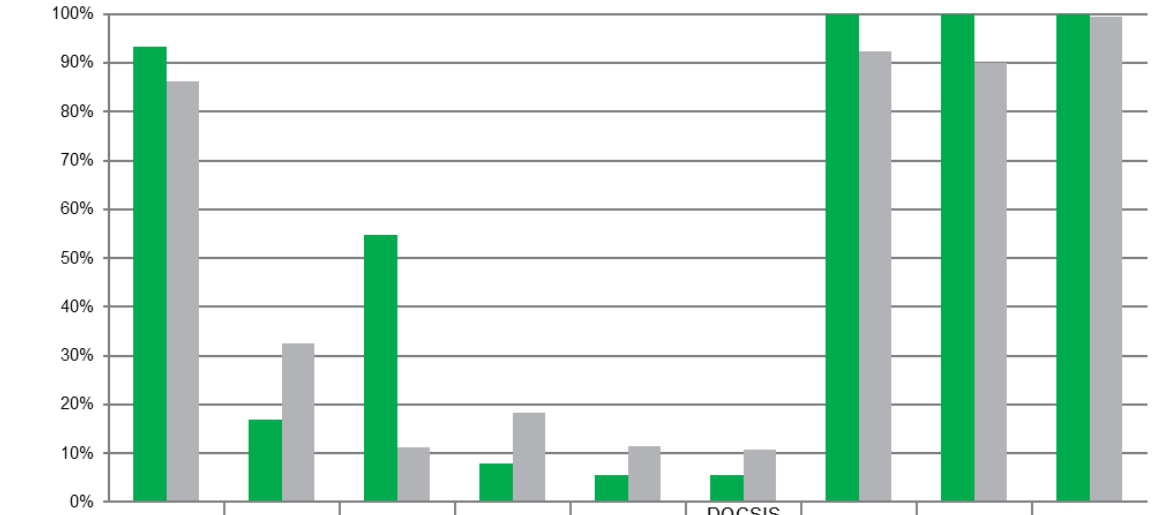
The next most prevalent technology was cable, passing 68.8% of homes, surpassing the EU average by 23.7 percentage points. Despite increasing by 2.2 percentage points year-on-year, the reach of WiMAX technologies remained low at 5.1%.

By mid-2017, coverage of all NGA technologies in Denmark improved year-on-year and outperformed the average EU levels. VDSL coverage increased slightly, growing 0.6 percentage points and reaching 62.0% of households. FTTP coverage improved at a faster rate, increasing 4.9 percentage points to pass 62.7% of Danish homes by the end of June 2017. The pace of deployment of DOCSIS 3.0 networks decreased compared to the previous edition of this study; however, coverage still increased by 1.1 percentage points in the study period. By mid-2017, DOCSIS 3.0 services were available to 68.8% of Danish households, 24 percentage points above the EU average. Incumbent operator TDC continued to upgrade its cable network to DOCSIS 3.1 via its subsidiary YouSee, as it aims to provide 1Gbps speeds to the majority of Danish households by the end of 2017.[16]

As an early LTE adopter, Denmark already achieved complete LTE coverage in 2016, which was maintained during the current study period. Since HSPA coverage was also universal, operators continued to direct their efforts towards extending LTE-A networks, which were launched in 2015 by TDC[17], Telenor and Telia[18]. By the end of 2016, TDC carried out successful gigabit trials over its mobile network, extending the trial zone throughout central Copenhagen and other selected areas in 2017.[19]

In terms of broadband coverage in rural areas, DSL continued to be the most widespread technology, passing 93.4% of homes. This represents a slight year-on-year decrease of 0.7 percentage points; however, all the remaining technologies recorded improved coverage. Cable and WiMAX coverage in rural Denmark remained lower than the EU average, at 5.6% and 7.9% respectively. Looking at NGA technologies, VDSL remained relatively low at 16.8%, while DOCSIS 3.0 networks passed only 5.6% of the rural households. The key NGA technology for rural areas remains FTTP, which increased by 5.8 percentage points compared to mid-2016, reaching 55.8% of rural homes in Denmark – almost 5 times higher than the EU average for this technology. Since Denmark recorded universal HSPA and LTE coverage already in previous years, availability of these technologies in rural areas remained universal at the end of June 2017.

Denmark: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Denmark	93.4%	16.8%	54.8%	7.9%	5.6%	5.6%	100.0%	100.0%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

[16] https://tdcgroup.com/en/news-and-press/news-and-press-releases-list/2016/1/simpler-and-better--for-our-customers-and-for-tdc-group-1301297

[17] https://www.globaltelecomsbusiness.com/article/b11vydf2x11ngs/denmark39s-tdc-launches-ltea

[18] https://www.mobileeurope.co.uk/press-wire/teliasonera-tests-lte-a-in-denmark

[19] https://tdcgroup.com/en/news-and-press/news-and-press-releases-list/2016/12/tdc-group-gives-mobile-network-a-giga-boost-1674865

5.7.2 Regional coverage by broadband technology

Overall fixed broadband coverage became almost universal in Denmark by mid-2017, standing at 98.9% or higher in all regions. There is nearly full coverage in the highly urbanised regions of Byen København, Nordsjælland, and Københavns omegn.

Denmark: Overall fixed broadband coverage, 2017

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Compared to mid-2016, NGA coverage exceeded the 95% threshold in three more regions, with seven Danish regions having NGA coverage between 95% and 100%. Of the remaining four, Vest- og Sydsjælland and Fyn had the lowest NGA coverage, with 86.1% and 85.5% respectively.

Denmark: NGA broadband coverage, 2017

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.7.3 Data tables for Denmark

Statistic	National
Population	5,659,715
Persons per household	2.1
Rural proportion	10.8%

	Denmark 2017		Denmark 2016		Denmark 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	96.1%	93.4%	96.8%	93.5%	98.0%	94.0%	94.1%	86.3%
VDSL	62.0%	16.8%	61.3%	15.8%	63.0%	16.0%	53.4%	32.5%
FTTP	62.7%	54.8%	57.8%	49.0%	57.0%	46.0%	26.8%	11.3%
WiMAX	5.1%	7.9%	2.9%	5.6%	3.0%	4.0%	18.0%	18.2%
Cable	68.8%	5.6%	67.7%	5.1%	65.0%	6.0%	45.1%	11.4%
DOCSIS 3.0	68.8%	5.6%	67.7%	5.1%	65.0%	6.0%	44.7%	10.8%
HSPA	100.0%	100.0%	100.0%	100.0%	99.0%	99.0%	97.9%	92.4%
LTE	100.0%	100.0%	100.0%	100.0%	99.0%	99.0%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	100.0%	-	100.0%	-			90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	100.0%	100.0%	100.0%	99.5%	99.5%	99.9%	99.4%
Overall fixed broadband	99.5%	97.5%	99.3%	96.8%	99.0%	97.0%	97.4%	92.4%
NGA broadband	94.6%	65.5%	93.3%	59.3%	91.7%	54.7%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	85.9%	-	-	-	-	-	57.8%	-
At least 2 Mbps	99.2%	-	98.9%	-	99.0%	-	96.0%	-
At least 30 Mbps	94.6%	-	93.3%	-	92.0%	-	79.0%	-
At least 100 Mbps	91.2%	-	88.9%	-	87.0%	-	55.1%	-

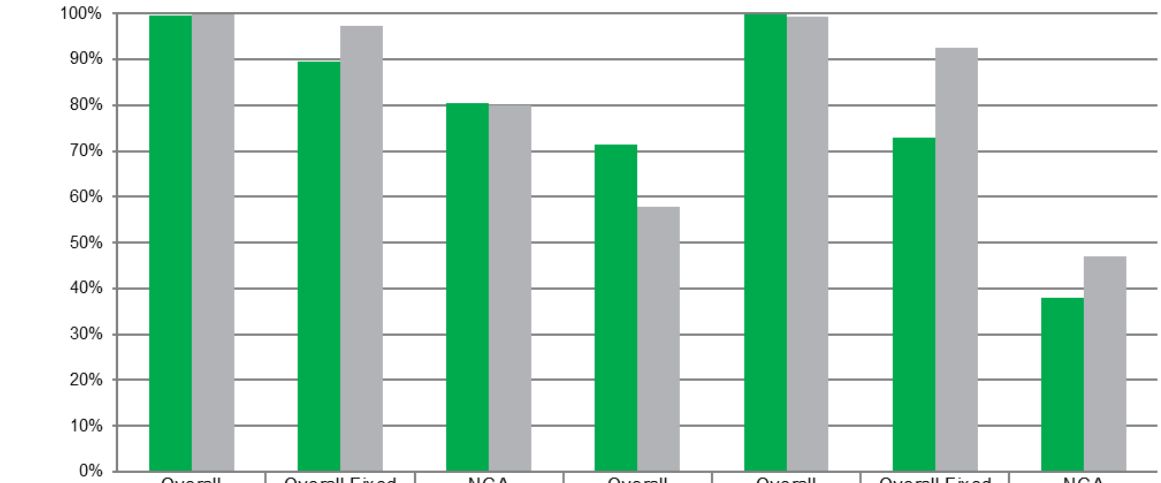
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.8 Estonia

5.8.1 National coverage by broadband technology

At the end of June 2017, both overall and fixed broadband coverage in Estonia remained below the EU average. Overall broadband availability remained unchanged during the study period, reaching 99.6% of the total households. In rural areas, fixed broadband availability decreased slightly, reaching 72.9%, nearly 20 percentage points below the EU average of 92.4%. Availability of NGA technologies in Estonia improved by 1.3 percentage points on a national level and by 1.8 percentage points in rural areas due to increased availability of FTTP and DOCSIS 3.0.

Estonia: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Estonia	99.6%	89.5%	80.4%	71.3%	99.7%	72.9%	37.8%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Most individual technologies, with the exception of cable, DOCSIS 3.0 and FTTP, recorded year-on-year drops in Estonia, in part due to increased number of households and partially due to network upgrades. DSL availability decreased by 4.4 percentage points compared to mid-2016, reaching 69.3% of Estonian households, remaining 25 percentage points below the EU average. On the other hand, by the end of June 2017, cable broadband networks passed 56.1% of Estonian homes, surpassing the EU average by 11.0 percentage points.

NGA technologies in Estonia continued to reach coverage levels above the EU average. Incumbent Telia Eesti has started replacing ADSL with NGA technologies, such as VDSL2+, FTTP and G.fast, with the aim of completely phasing out ADSL by the end of 2020.[20] DOCSIS 3.0 remained the leading NGA technology, recording an increase of 3.9 percentage points during the period. By mid-2017, DOCSIS 3.0 passed 55.7% of Estonian homes, surpassing the EU average by 11 percentage points. VDSL was the next most widespread NGA technology, covering 55.1% of households. In addition, FTTP coverage in Estonia improved by 2.2 percentage points, reaching 50.1% - nearly double the EU average of 26.8%. FTTP coverage is expected to continue to improve over the next twelve months, since the alternative operator Starman announced that it will be upgrading its DOCSIS 3.0 network to FTTP.[21]

On a national level, LTE coverage accounted for 98.5% of Estonian households, surpassing the EU average by 8.5 percentage points. However, after recording a significant increase from mid-2015 to mid-2016, LTE coverage remained unchanged over the twelve months to the end of June 2017. Average LTE coverage in Estonia increased slightly in the twelve months to mid-2017, reaching 99.5% of the

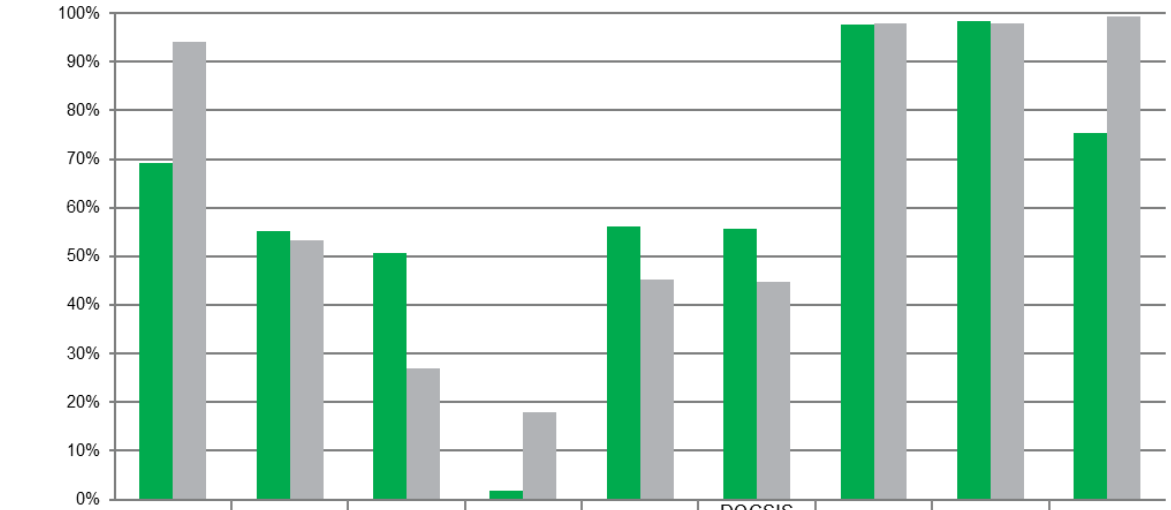
[20] https://news.err.ee/594742/telia-to-invest-40-million-in-replacing-adsl-networks

[21] https://www.telegeography.com/products/commsupdate/articles/2017/05/11/estonias-starman-upgrading-to-ftth-instead-of-docsis-3-1/

country's population. Meanwhile, HSPA technologies were available to 97.7% of households, recording a slight 1.1 percentage point decrease.

In terms of satellite services, along with Latvia and Lithuania, only a limited number of Estonian households continued to be covered by satellite broadband. Since the relevant satellites have limited orbital slots, coverage in this market is only 75.4% due to limitations on the addressable market due to technical requirements for larger dishes to receive the satellite signal in some areas.

Estonia: Coverage by technology, total, 2017

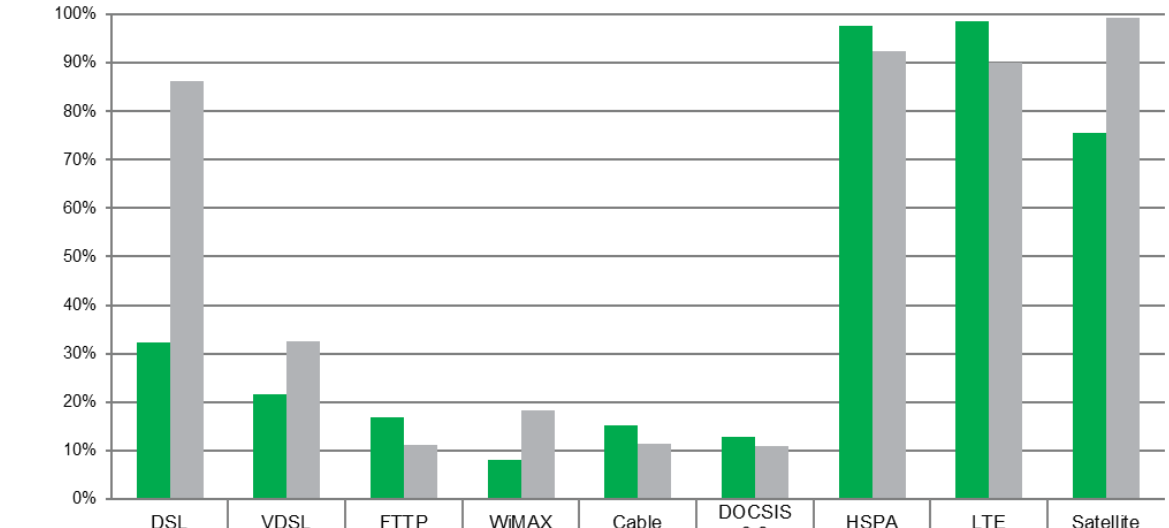


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Estonia	69.3%	55.1%	50.7%	1.7%	56.1%	55.6%	97.7%	98.5%	75.4%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Over the twelve months to mid-2017, DSL coverage decreased in rural areas, passing only 32.4% of homes. The three Baltic countries, Lithuania, Latvia and Estonia, had the lowest levels of rural DSL coverage across all studied territories. The reason behind this is that DSL networks were not yet fully developed in rural areas when operators began rolling out NGA technologies. Therefore, lower rural DSL availability in the Baltic countries owes to both lower levels of initial coverage and disconnecting DSL services in favour of next-generation technologies. WiMAX coverage also remained below the EU average, with rural availability of only 8.1%. On the other hand, cable exceeded the EU average by 3.8 percentage points, passing 15.2% of households in Estonia's rural areas.

Estonia: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Estonia	32.4%	21.7%	16.8%	8.0%	15.2%	12.7%	97.7%	98.5%	75.4%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

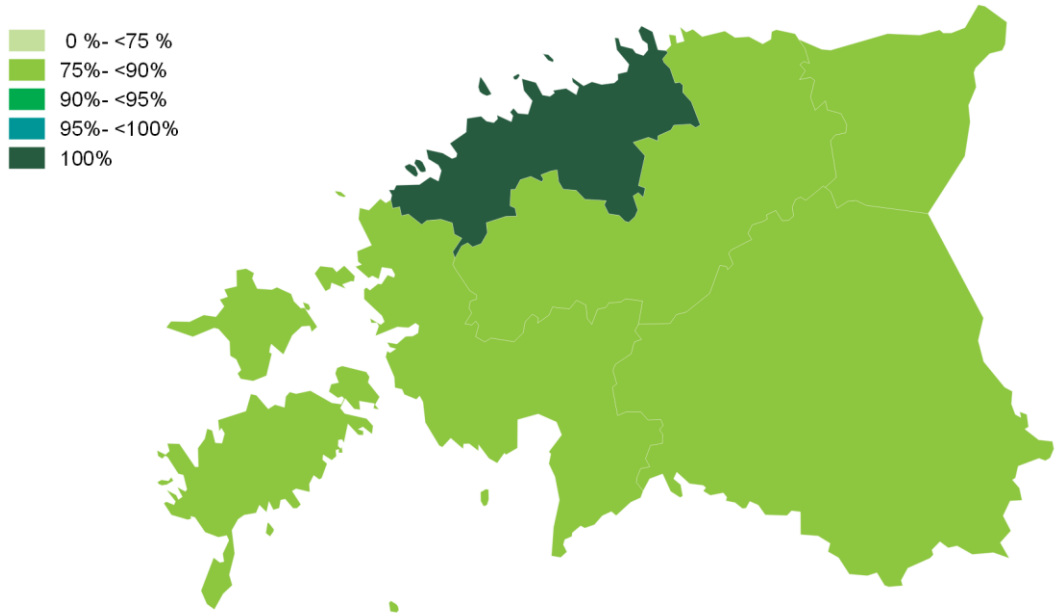
Looking at the rural coverage of NGA technologies, FTTP outperformed the EU average of 11.3%, passing 16.8% of rural households in Estonia. Over the twelve months to mid-2017, FTTP broadband availability improved by 1.3 percentage points. DOCSIS 3.0 also improved over the study period, increasing by 0.8 percentage points to reach 12.7% of rural households. Despite VDSL coverage decreasing on a national level, rural availability increased, with VDSL networks passing 21.7% of rural homes.

Examining mobile technologies, rural LTE coverage increased by 2.4 percentage points, reaching 98.5% of rural households in Estonia. While HSPA availability improved in terms of the absolute number of rural households covered, this did not compensate for the annual growth in rural households, resulting in a 0.3 percentage point drop in coverage compared to the previous year.

5.8.2 Regional coverage by broadband technology

Regional fixed coverage in Estonia remained varied, ranging from 77.9% in the region of Kesk-Eesti, to complete coverage in the capital region of Põhja-Eesti. There is a direct relationship between the level of fixed broadband coverage and the level of urbanisation of the region: in Põhja-Eesti and Kirde-Eesti where rural population is below 10%, broadband availability is the highest, exceeding 85%, whereas coverage is lower in the remaining three regions, where the proportion of rural households is over 30%.

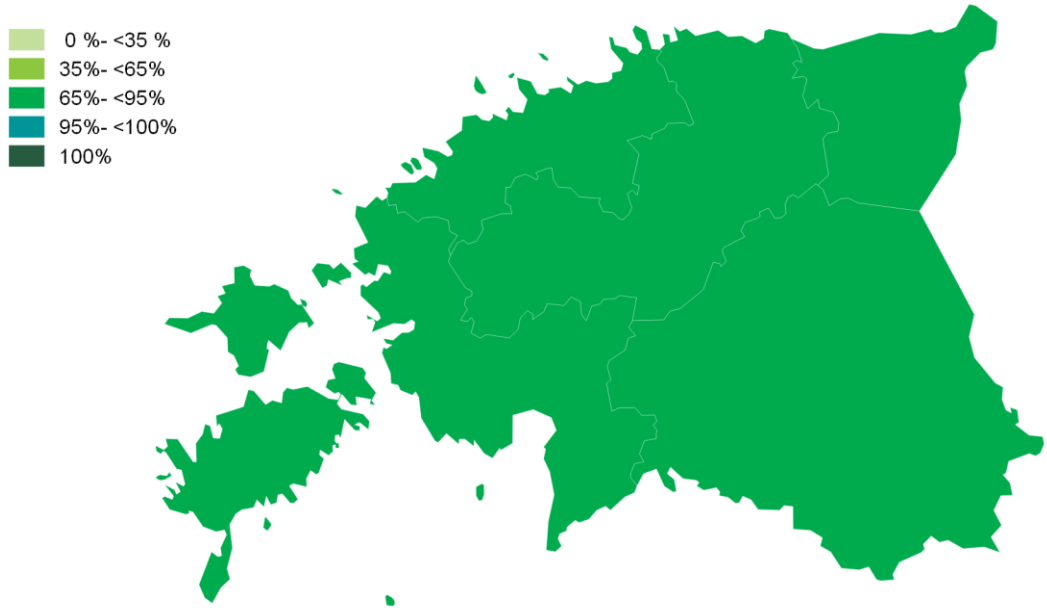
Estonia: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Availability of NGA services in rural areas is similar to fixed broadband coverage levels. The lowest coverage was recorded in the region of Kesk-Eesti where high-speed broadband was available to only 69.6% of households. Meanwhile, 89.4% of homes were passed by NGA broadband in the capital region of Põhja-Eesti, recording a year-on-year increase of two percentage points.

Estonia: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.8.3 Data tables for Estonia

Statistic	National
Population	1,313,271
Persons per household	2.2
Rural proportion	21.3%

	Estonia 2017		Estonia 2016		Estonia 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	69.3%	32.4%	73.7%	36.6%	73.6%	35.9%	94.1%	86.3%
VDSL	55.1%	21.7%	55.2%	20.9%	49.6%	18.8%	53.4%	32.5%
FTTP	50.7%	16.8%	48.5%	15.5%	47.5%	15.2%	26.8%	11.3%
WiMAX	1.7%	8.0%	3.3%	15.5%	9.4%	43.1%	18.0%	18.2%
Cable	56.1%	15.2%	54.4%	14.9%	54.0%	14.5%	45.1%	11.4%
DOCSIS 3.0	55.6%	12.7%	51.7%	11.9%	51.7%	11.6%	44.7%	10.8%
HSPA	97.7%	97.7%	98.8%	98.0%	98.9%	98.0%	97.9%	92.4%
LTE	98.5%	98.5%	98.8%	96.0%	84.3%	80.6%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	95.6%	-	94.5%	-			90.8%	-
Satellite	75.4%	75.4%	75.4%	75.4%	75.4%	75.4%	99.4%	99.4%
Overall broadband	99.6%	99.7%	99.5%	99.9%	99.5%	99.4%	99.9%	99.4%
Overall fixed broadband	89.5%	72.9%	90.9%	73.0%	86.8%	73.0%	97.4%	92.4%
NGA broadband	80.4%	37.8%	79.1%	36.0%	78.1%	33.8%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	71.3%	-	-	-	-	-	57.8%	-
At least 2 Mbps	84.9%	-	86.8%	-	86.8%	-	96.0%	-
At least 30 Mbps	78.6%	-	76.9%	-	76.3%	-	79.0%	-
At least 100 Mbps	61.1%	-	58.7%	-	58.3%	-	55.1%	-

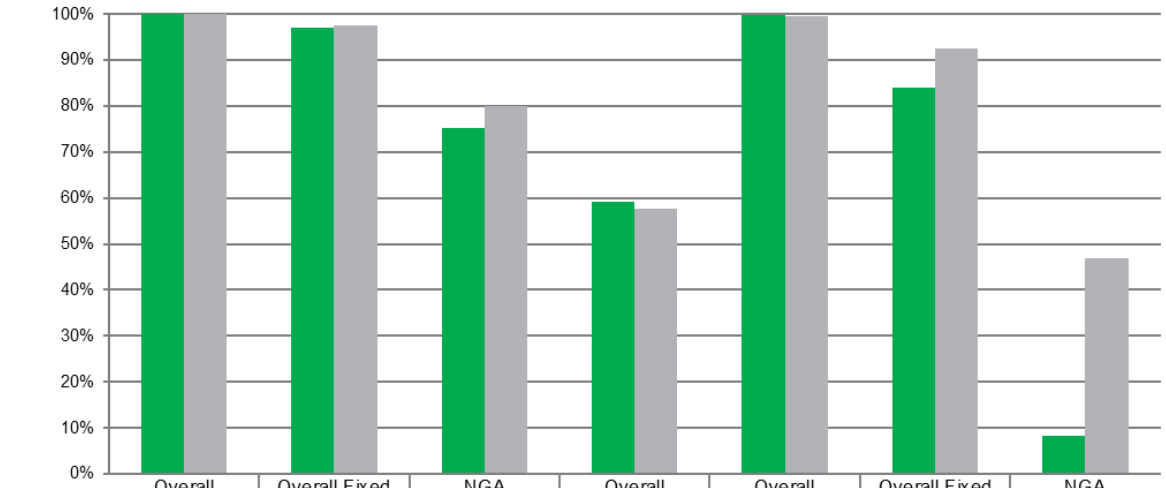
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.9 Finland

5.9.1 National coverage by broadband technology

During the twelve months to mid-2017, overall broadband coverage in Finland remained universal. Fixed broadband coverage and NGA broadband coverage improved year-on-year, however remained below the EU average. While fixed broadband coverage was close to the EU average level of 97.4%, there was a more significant difference in terms of NGA coverage, which at 75.1% remained 4.9 percentage points below the EU average. In rural areas, both fixed and NGA broadband availability recorded minimal growth, while overall broadband coverage decreased.

Finland: Coverage by technology combination, 2017

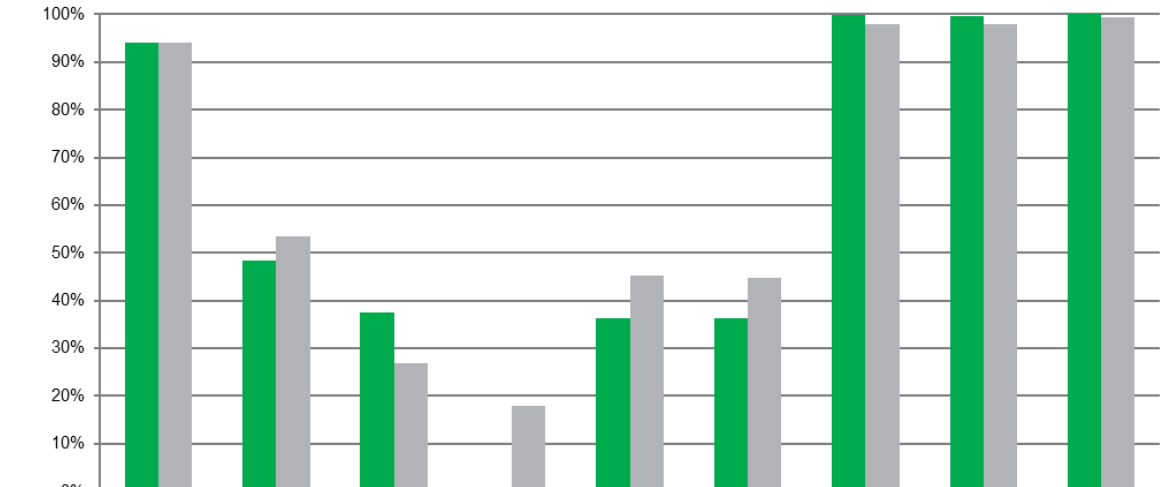


	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Finland	99.9%	97.0%	75.1%	59.1%	99.7%	84.0%	8.3%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

As in the previous edition of this study, the majority of the individual technologies in Finland remained relatively unchanged, with the exception of DOCSIS 3.0, which recorded a decline in availability of 1.6 percentage points.

Finland: Coverage by technology, total, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Finland	94.0%	48.5%	37.5%	0.0%	36.2%	36.2%	99.9%	99.6%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

DSL remained the most prevalent fixed broadband technology, with availability of 94.0%, slightly below the EU average. As in the previous edition of the study, no WiMAX coverage was recorded in Finland, due to the reallocation of WiMAX towards LTE networks.

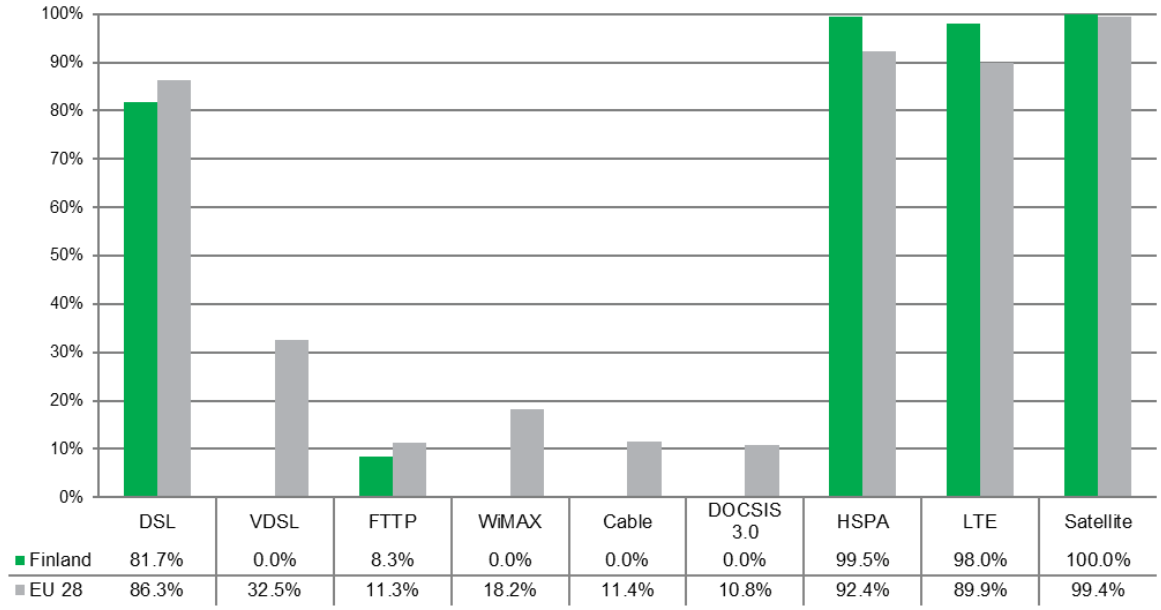
In the twelve months to the end of June 2017, VDSL continued to be the NGA technology with the highest coverage in Finland, reaching 48.5% of households. As mentioned, DOCSIS 3.0 recorded a decrease in availability, passing 36.2% of homes by mid-2017, allowing FTTP to become the second most widespread NGA technology. The availability of FTTP networks improved by 0.6 percentage points in the twelve months to mid-2017, covering 37.5% of the Finnish households.

Over the twelve months to the end of June 2017, LTE availability remained broadly unchanged, having already reached near-universal coverage levels in the previous years. Average LTE coverage improved by 1.1 percentage points, reaching 98.3% of Finns. Meanwhile, HSPA availability in Finland remained above the EU average of 92.4%, covering 99.9% of households.

Having recorded a significant improvement over the previous study period, rural broadband in Finland remained broadly unchanged over the twelve months to mid-2017.[22] VDSL and DOCSIS 3.0 technologies remained absent in rural areas. DSL covered 81.7% of households, but remained below the EU average of 86.3%. By mid-2017, FTTP availability was also unchaged, passing 8.3% of rural homes.

Throughout the study period, operators continued to improve coverage of their mobile networks in order to reach households in sparsely populated areas. By the end of 2016, DNA completed the rollout of its shared LTE network with Telia. The project, started in 2015, aimed to cover 50% of the country's territory with LTE networks, focussing primarily in the Northern and Eastern regions of Finland that account for 15% of the total inhabitants.[23] Thanks to such initatives, the availability of both mobile broadband technologies in rural areas remained above the EU average. By mid-2017, HSPA services were available to 99.5% of the rural population, while LTE networks reached 98.0% of households.

Finland: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Finland	81.7%	0.0%	8.3%	0.0%	0.0%	0.0%	99.5%	98.0%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

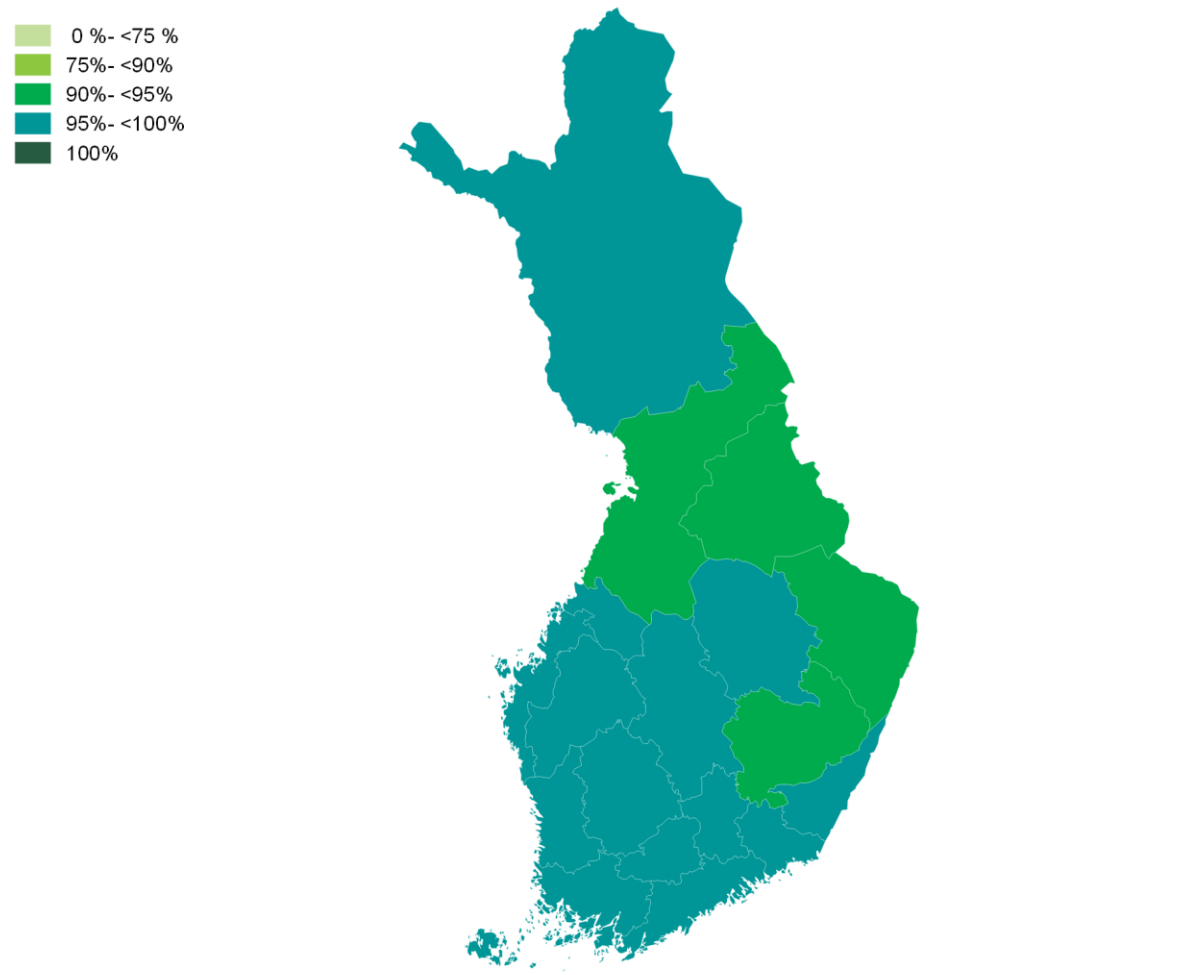
[22] Rural broadband availability in Finland improved significantly after the Finnish government introduced the initiative "Broadband 2015", aimed at deploying high-speed broadband access networks in areas deemed unattractive by operators: https://www.viestintavirasto.fi/en/steeringandsupervision/broadband2015subsidies.html

[23] https://www.telegeography.com/products/commsupdate/articles/2016/11/08/dna-confirms-completion-of-shared-network-rollout/

5.9.2 Regional coverage by broadband technology

As in previous years, the majority of the regions in Finland enjoyed fixed broadband coverage above 95%, with four regions having coverage between 90.8% and 94.9%: Etelä-Savo, Pohjois-Pohjanmaa, Pohjois-Karjala and Kainuu. A notable highlight of this market is the lack of correlation between the level of fixed broadband coverage and the degree of urbanisation in particular regions. For example, the region of Pohjanmaa has the highest fixed broadband coverage in the country at 99.9%, whilst being the NUTS3 region with the third highest proportion of rural households.

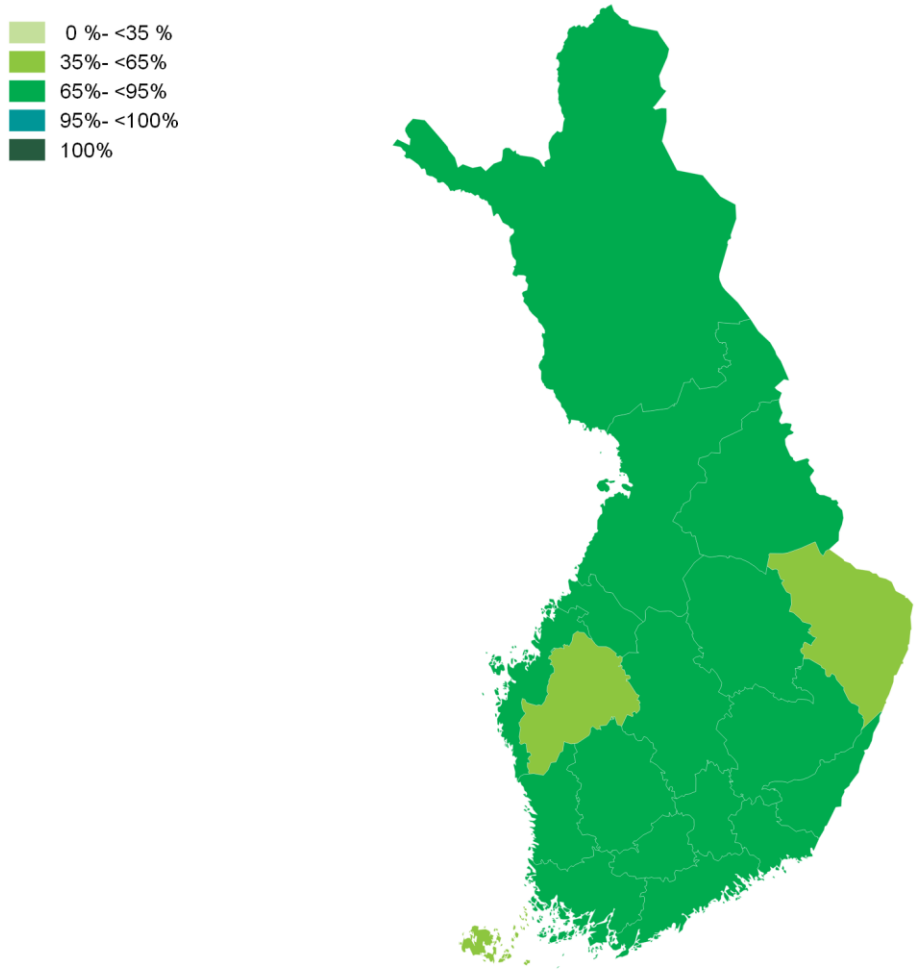
Finland: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Pohjanmaa is the region with the second highest NGA coverage. Päijät-Häme has the highest availability of NGA services, at 82.8%, while Helsinki-Uusimaa is third with 80.1%. NGA availability in Finland exceeds 70% in all but three regions: Pohjois-Karjala, Etelä-Pohjanmaa and Åland, the latter with NGA coverage of only 46.0%, remaining unchanged since the previous edition of this study.

Finland: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.9.3 Data tables for Finland

Statistic	National
Population	5,487,308
Persons per household	2.1
Rural proportion	18.5%

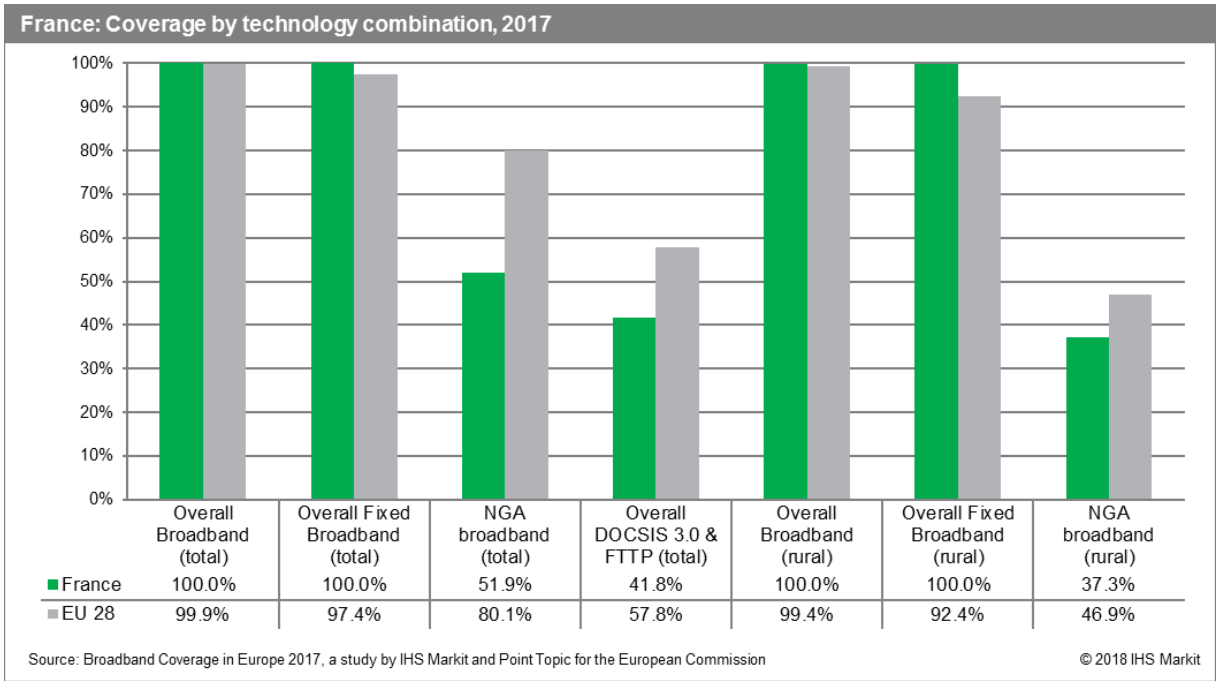
	Finland 2017		Finland 2016		Finland 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	94.0%	81.7%	94.0%	81.7%	94.0%	80.2%	94.1%	86.3%
VDSL	48.5%	0.0%	48.4%	0.0%	48.4%	0.0%	53.4%	32.5%
FTTP	37.5%	8.3%	37.5%	8.2%	37.4%	8.2%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	2.3%	1.1%	18.0%	18.2%
Cable	36.2%	0.0%	37.8%	0.0%	44.4%	0.0%	45.1%	11.4%
DOCSIS 3.0	36.2%	0.0%	37.8%	0.0%	44.4%	0.0%	44.7%	10.8%
HSPA	99.9%	99.5%	100.0%	100.0%	100.0%	100.0%	97.9%	92.4%
LTE	99.6%	98.0%	100.0%	100.0%	92.1%	60.1%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	98.3%	-	97.0%	-			90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.9%	99.7%	100.0%	100.0%	100.0%	100.0%	99.9%	99.4%
Overall fixed broadband	97.0%	84.0%	97.0%	84.0%	97.0%	83.9%	97.4%	92.4%
NGA broadband	75.1%	8.3%	74.6%	8.2%	75.1%	8.2%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	59.1%	-	-	-	-	-	57.8%	-
At least 2 Mbps	96.5%	-	96.5%	-	96.5%	-	96.0%	-
At least 30 Mbps	66.0%	-	66.7%	-	66.8%	-	79.0%	-
At least 100 Mbps	43.4%	-	32.5%	-	33.7%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.10 France

5.10.1 National coverage by broadband technology

By mid-2017, France had complete coverage for overall broadband and fixed broadband at a total and rural level. Following this achievement, the focus is on increasing the proportion of French homes passed by NGA technologies. Despite a 4.9 percentage point increase at a national level, and a 6.4 percentage point growth in rural areas, France remained below the EU average for NGA coverage at a national and rural level.

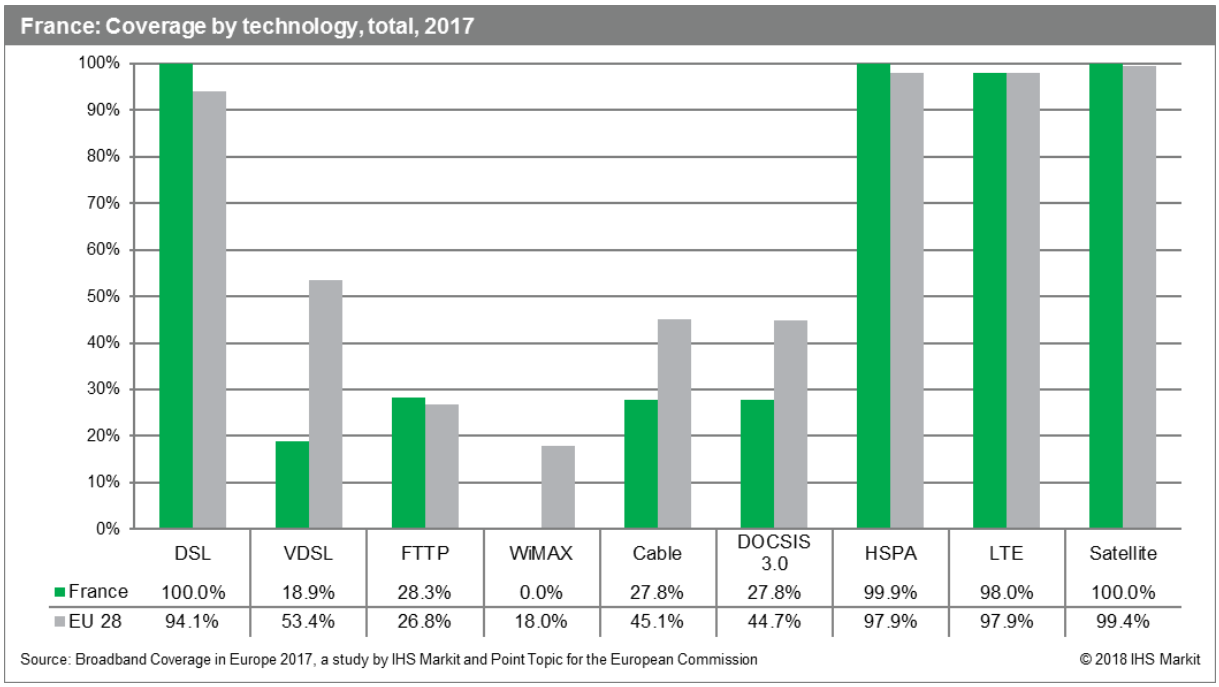


With universal coverage, DSL remained the most widespread fixed broadband technology with regards to coverage of French households. However, as in previous years, the percentage of DSL networks upgraded to VDSL remained limited. During the twelve-month period to mid-2017, VDSL coverage expanded by 0.8 percentage points to reach 18.9% of households, remaining the least pervasive NGA technology in France.

FTTP networks replaced DOCSIS 3.0 as the most widespread NGA technology in France, as incumbent operator Orange, as well as alternative providers Bouygues, Iliad and SFR, continued to rollout FTTP services during the period.[24][25][26][27] As a result, the proportion of French homes passed by FTTP networks increased by 7.5 percentage points in the twelve-month period, reaching 28.3% of households. This was slightly ahead of DOCSIS 3.0 coverage, which remained at 27.8%.

Examining mobile broadband technologies, French LTE coverage registered a 4.2 percentage point increase in the twelve months to the end of June 2017, reaching 98.0% of households. As a result, French LTE coverage moved above the EU average (97.9%). Analysing the average availability of LTE services from all operators, 88.6% of French households on average had access to LTE networks. This marked a 10.4 percentage point increase compared to mid-2016, however France remained below the EU average of 90.8% for this metric.

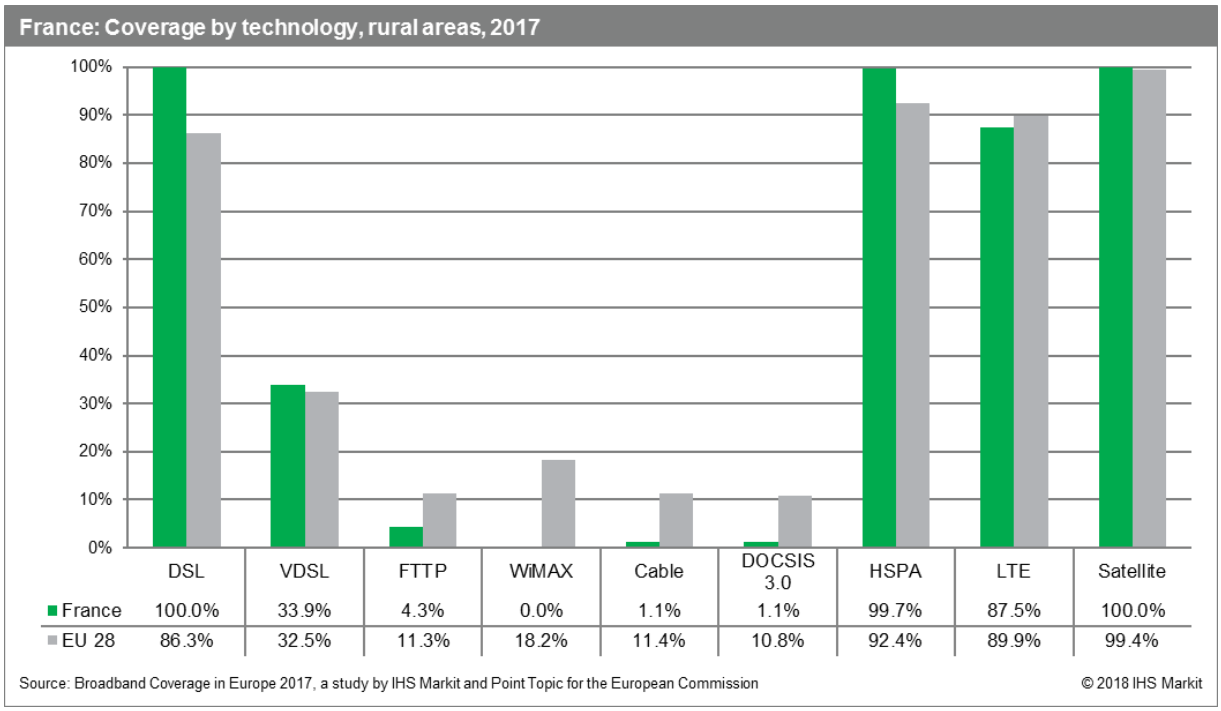
[24] https://www.orange.com/en/content/download/45349/1348218/version/2/file/ID%202017%20Presentation%20-%20EN%20-%20vDef.pdf (Orange Investor Presentation, December 2017)
[25] http://www.bouygues.com/wp-content/uploads/2017/09/presentation_s1-2017_maj_060917.pdf
[26] http://www.iliad.fr/finances/2017/CP_010917_Eng.pdf
[27] http://altice.net/sites/default/files/pdf/ALTICE_Q2-2017-Results-Presentation.pdf



As was the case at a national level, France also recorded universal coverage of DSL networks in rural areas, due to a 0.3 percentage point increase in availability. On the other hand, the proportion of rural homes passed by cable networks remained limited at 1.1%, meaning rural DOCSIS 3.0 coverage was also minimal.

Looking at other NGA technologies in rural areas, VDSL coverage grew by 5.1 percentage points, covering 33.9% of rural households. As a result, VDSL remained the most widespread rural NGA technology in France. The reach of FTTP services in rural areas continued to be limited, expanding by 2.0 percentage points in the twelve months to reach 4.3% of rural households. Further expansion in rural FTTP services is expected with public initiative networks, known as RIP ('Reseaux d'Initiative Publique'), being deployed by operators in low-density areas. For instance, Orange aims to pass 10 million homes in such areas with FTTP services by 2022.[28]

[28] https://www.orange.com/en/content/download/45349/1348218/version/2/file/ID%202017%20Presentation%20-%20EN%20-%20vDef.pdf (Orange Investor Presentation, December 2017)



Expanding mobile network coverage in rural areas is central to “Loi Macron”, the economic reforms passed in February 2015. This required mobile network operators to rollout 2G and 3G/4G networks in unserved areas by 2016 and 2017, respectively.[29] Consequently, France witnessed improvements in both rural HSPA and LTE coverage. Rural HSPA networks recorded an increase of 0.7 percentage points, passing 99.7% of rural homes. In addition, rural LTE coverage expanded by 25.8 percentage points to reach 87.5% of rural households. Nevertheless, French rural LTE coverage remained below the EU average (89.9%). As a result, French operators have made commitments to continue investing in improving rural LTE coverage, in return for extending spectrum licenses and easing of planning procedures.[30]

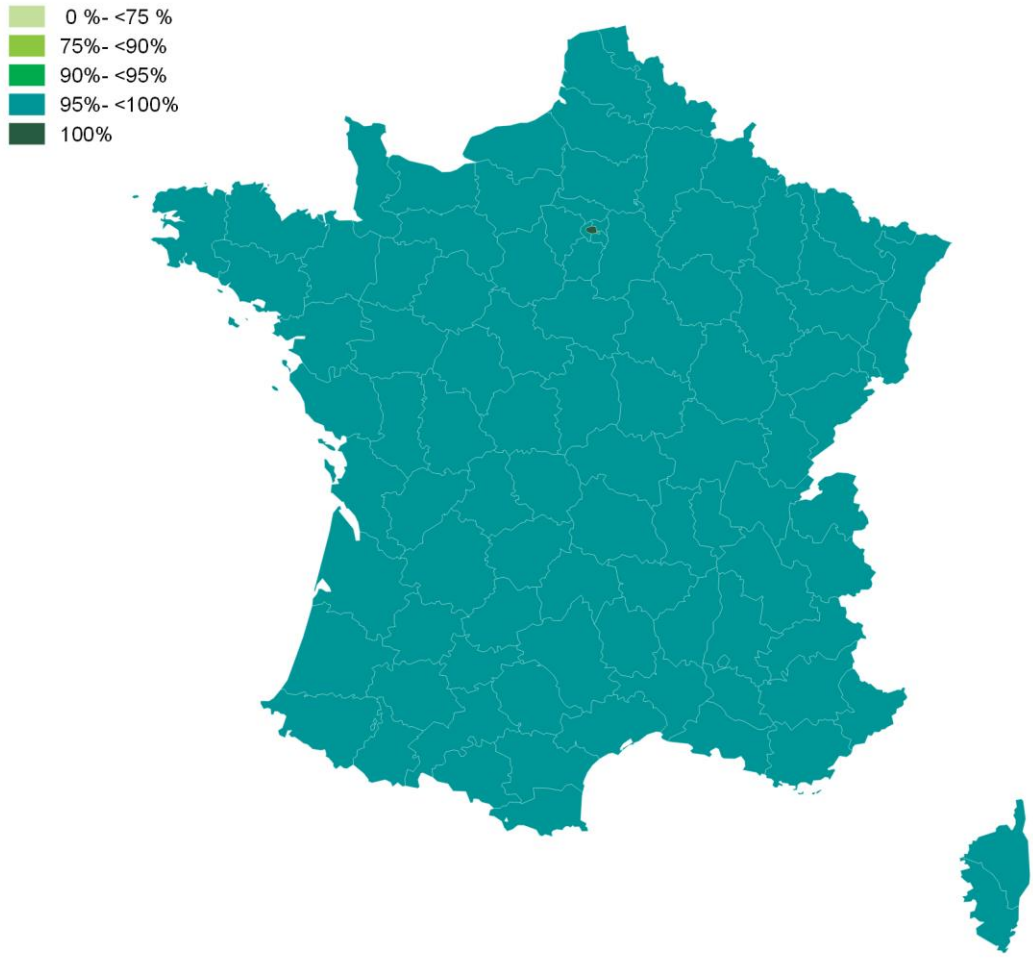
[29] https://www.telegeography.com/products/commsupdate/articles/2015/04/20/french-government-approves-amendment-mandating-rural-mobile-expansion/

[30] https://www.mobileworldlive.com/featured-content/home-banner/french-operators-vow-to-invest-e3b-in-lte-expansion/

5.10.2 Regional coverage by broadband technology

The availability of fixed broadband service was relatively unchanged in France during the twelve-month period, with all regions recording at least 99% coverage.

France: Overall fixed broadband coverage, 2017

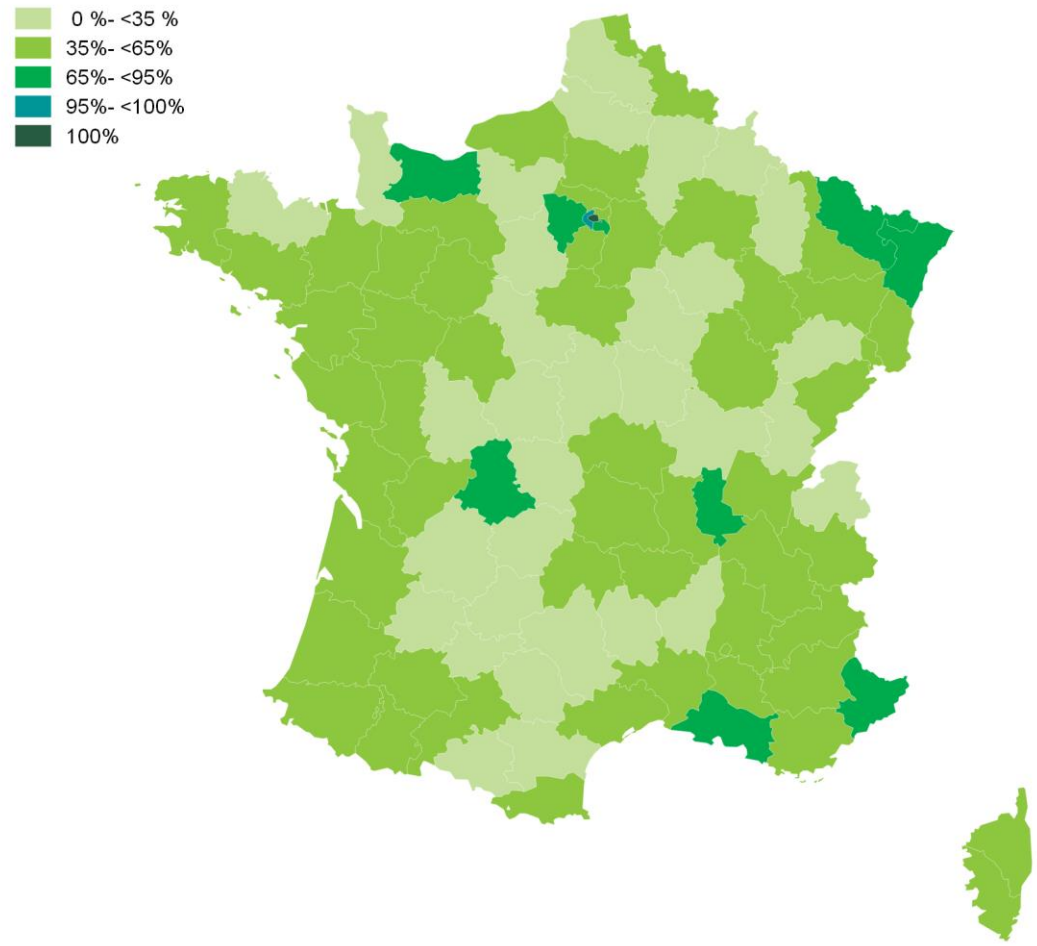


Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In contrast, considerable variations remain in terms of NGA coverage. NGA availability remained limited in several regions, including Guyane (11.2%), Meuse (18.0%), Yonne (20.6%), Nièvre (21.9%) and Eure (22.4%). On the other hand, Paris recorded complete NGA coverage, whilst the Hauts-de-Seine region, which constitutes the broader Paris metropolitan area, recorded 97.6% availability of NGA services. However, no other regions recorded NGA coverage above 90%, highlighting the disparity in NGA coverage between the capital and other regions.

By mid-2017, nine regions registered recorded NGA coverage levels in the 65%-95% category – Alpes-Maritimes, Bas-Rhin, Bouches-du-Rhône, Calvados, Haute-Vienne, Moselle, Rhône, Val-de-Marne and Yvelines.

France: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

The following broadband coverage levels were recorded in French regions outside mainland Europe:

Coverage data for French NUTS 3 areas outside mainland Europe

NUTS 3	Description	Overall fixed broadband coverage	NGA broadband coverage
FR910	Guadeloupe	100.0%	57.7%
FR920	Martinique	100.0%	45.6%
FR930	Guyane	100.0%	11.2%
FR940	Réunion	100.0%	48.4%

5.10.3 Data tables for France

Statistic	National
Population	66,506,754
Persons per household	2.2
Rural proportion	15.6%

	France 2017		France 2016		France 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	100.0%	99.9%	99.6%	99.5%	98.6%	94.1%	86.3%
VDSL	18.9%	33.9%	18.2%	28.9%	16.7%	21.1%	53.4%	32.5%
FTTP	28.3%	4.3%	20.8%	2.3%	15.5%	2.0%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	18.2%
Cable	27.8%	1.1%	27.9%	1.2%	29.5%	0.7%	45.1%	11.4%
DOCSIS 3.0	27.8%	1.1%	27.8%	1.2%	29.5%	0.7%	44.7%	10.8%
HSPA	99.9%	99.7%	99.9%	99.0%	99.8%	98.7%	97.9%	92.4%
LTE	98.0%	87.5%	93.8%	61.7%	77.5%	5.3%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	88.6%	-	*78.3%*	-	-	-	90.8%	-
Satellite	100.0%		100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	100.0%	100.0%	99.9%	100.0%	99.8%	99.9%	99.4%
Overall fixed broadband	100.0%	100.0%	100.0%	99.7%	99.8%	99.0%	97.4%	92.4%
NGA broadband	51.9%	37.3%	47.0%	30.9%	44.8%	23.0%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	41.8%	-	-	-	-	-	57.8%	-
At least 2 Mbps	97.5%	-	97.4%	-	97.1%	-	96.0%	-
At least 30 Mbps	55.5%	-	50.0%	-	41.3%	-	79.0%	-
At least 100 Mbps	39.2%	-	33.9%	-	28.4%	-	55.1%	-

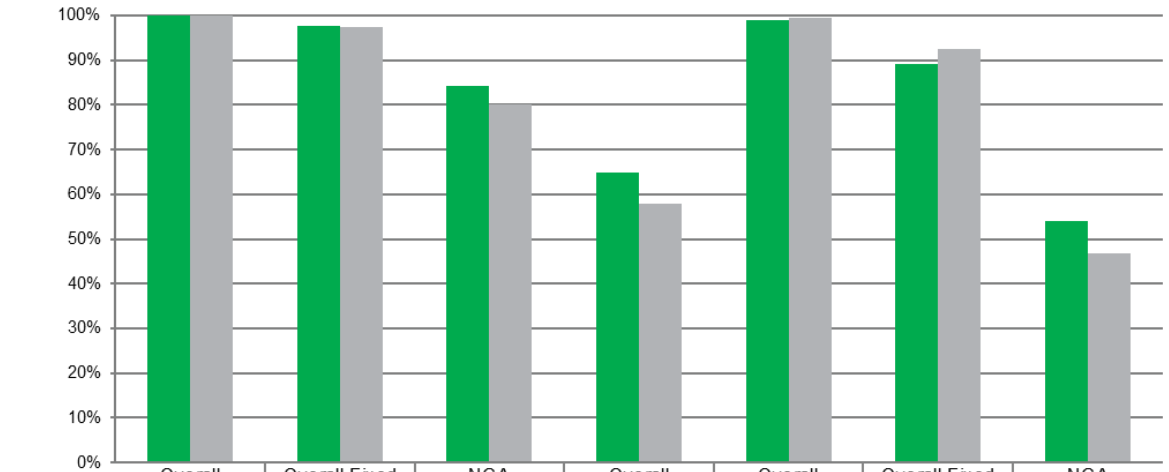
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA. The data includes both overseas territories as well as mainland France.

5.11 Germany

5.11.1 National coverage by broadband technology

During the twelve months to June 2017, overall broadband coverage and overall fixed broadband coverage was relatively unchanged in Germany at a total and rural level. By mid-2017, Germany was above the EU average for overall broadband coverage at a total level. However, overall broadband coverage in rural areas (98.8%) was slightly below the EU average (99.4%). Likewise, overall fixed broadband coverage in rural areas (89.1%) was below the EU average of 92.4%. In terms of NGA coverage, Germany registered a 2.4 percentage point improvement at a total level, as well as 5.0 percentage point increase at a rural level. As a result, German NGA coverage remained above the EU average at a national and rural level.

Germany: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Germany	99.9%	97.7%	84.1%	64.9%	98.8%	89.1%	53.9%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

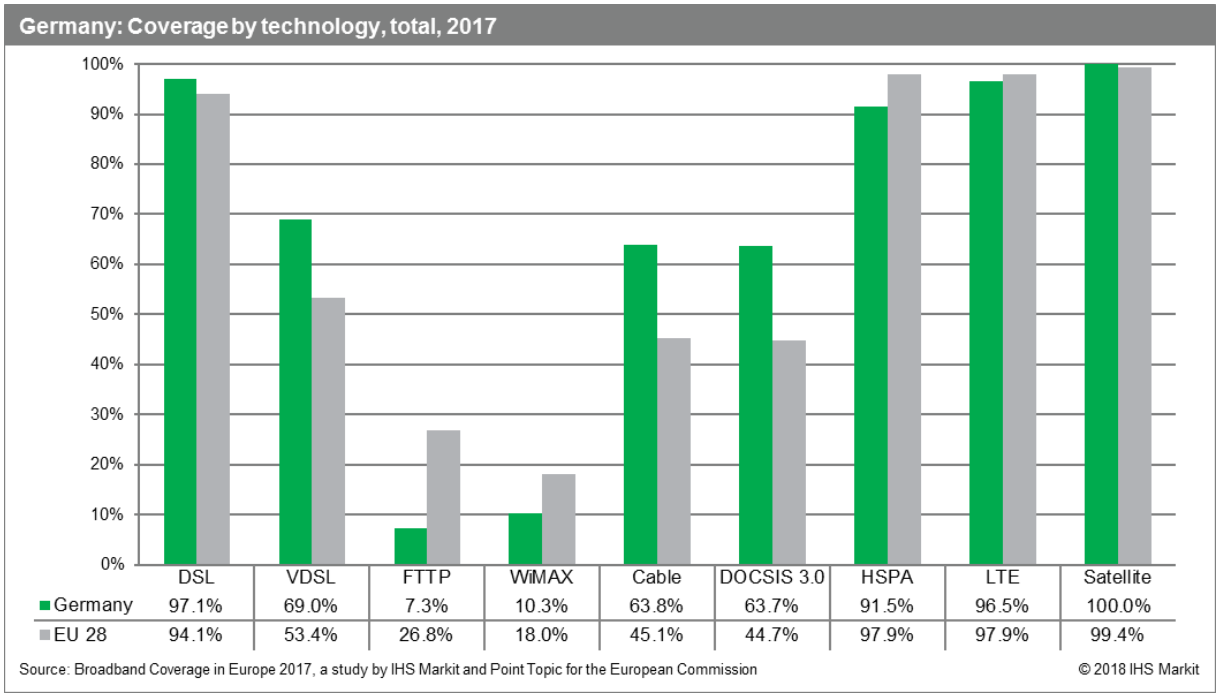
Examining individual broadband technologies, DSL remained the most widespread broadband access technology in terms of coverage, reaching 97.1% of German households. Meanwhile, at 63.8%, standard cable coverage in Germany continued to exceed the EU average.

Looking at NGA technologies, VDSL replaced DOCISIS 3.0 as the dominant NGA technology in Germany. In mid-2017, VDSL coverage increased by 10.2 percentage points to reach 69.0% of German households. In comparison, growth of DOCSIS 3.0 networks was more limited, at 0.2 percentage points, reaching 63.7% of German households. With the majority of cable networks upgraded to DOCSIS 3.0, Vodafone and Liberty Global's Unitymedia plan to start deploying DOCSIS 3.1 technology, enabling download speeds of up to 1Gbps.[31][32] The proportion of homes passed by FTTP services remained limited in Germany, rising by 0.2 percentage points to 7.3% of homes, as Germany remained below the EU average of 26.8%. However, investment in FTTP networks is set to increase over the next few years, with incumbent Deutsche Telekom and utility firm UWE plan to connect over a million households in the north-west of Germany with FTTP services[33].

Examining mobile broadband technologies, Germany recorded the lowest HSPA coverage (91.5%) out of the 31 study countries. Germany also ranked below the EU average in terms of LTE coverage

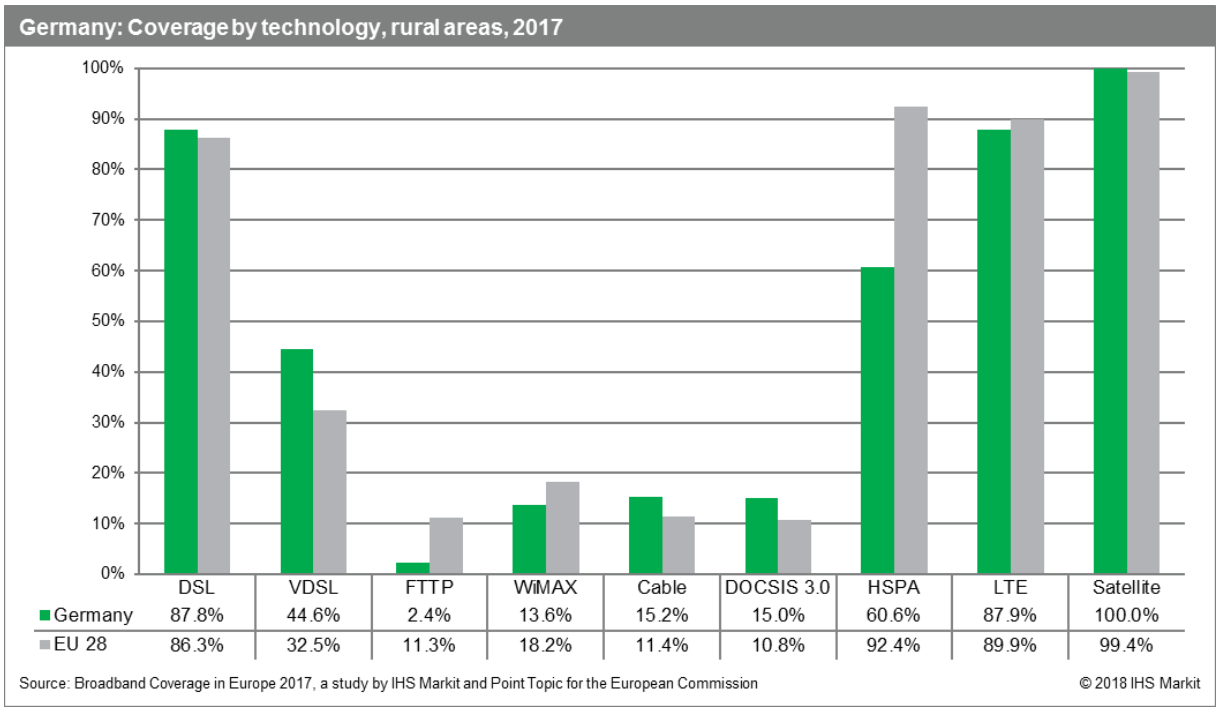
[31] http://www.vodafone.com/content/index/media/vodafone-group-releases/2017/vodafone-germany-gigabit-investment-plan.html#
[32] https://newsroom.unitymedia.de/pressemitteilungen/unitymedia-und-stadt-bochum-bauen-erste-gigabit-city-deutschlands/#view
[33] https://www.ewe.com/en/media/press-releases/2017/12/ewe-and-deutsche-telekom-to-cooperate-on-fiberoptic-expansion-in-germanys-northwestewe-ag

(97.9%), as LTE networks reached 96.5% of German households. Looking at average LTE operator coverage, by mid-2017 LTE networks of all operators were on average available to 87.7% of Germans.



In rural areas, DSL continued to be the most widespread fixed broadband technology, with 87.8% of rural households having access to DSL services. At 15.2%, rural cable coverage was unchanged compared to the previous edition of the study. Considering NGA technologies in rural areas, VDSL services registered an improvement of 8.3 percentage points to reach 44.6% of rural households. DOCSIS 3.0 was the next most pervasive NGA technology in rural Germany, passing 15.0% of rural homes. FTTP networks remained limited in rural areas, expanding by 0.7 percentage points during the period to cover 2.4% of rural households. Rural FTTP deployment is set to increase, as Vodafone has announced plans to collaborate with local municipalities to deploy FTTP networks to one million rural households.[34]

[34] http://www.vodafone.com/content/index/media/vodafone-group-releases/2017/vodafone-germany-gigabit-investment-plan.html#

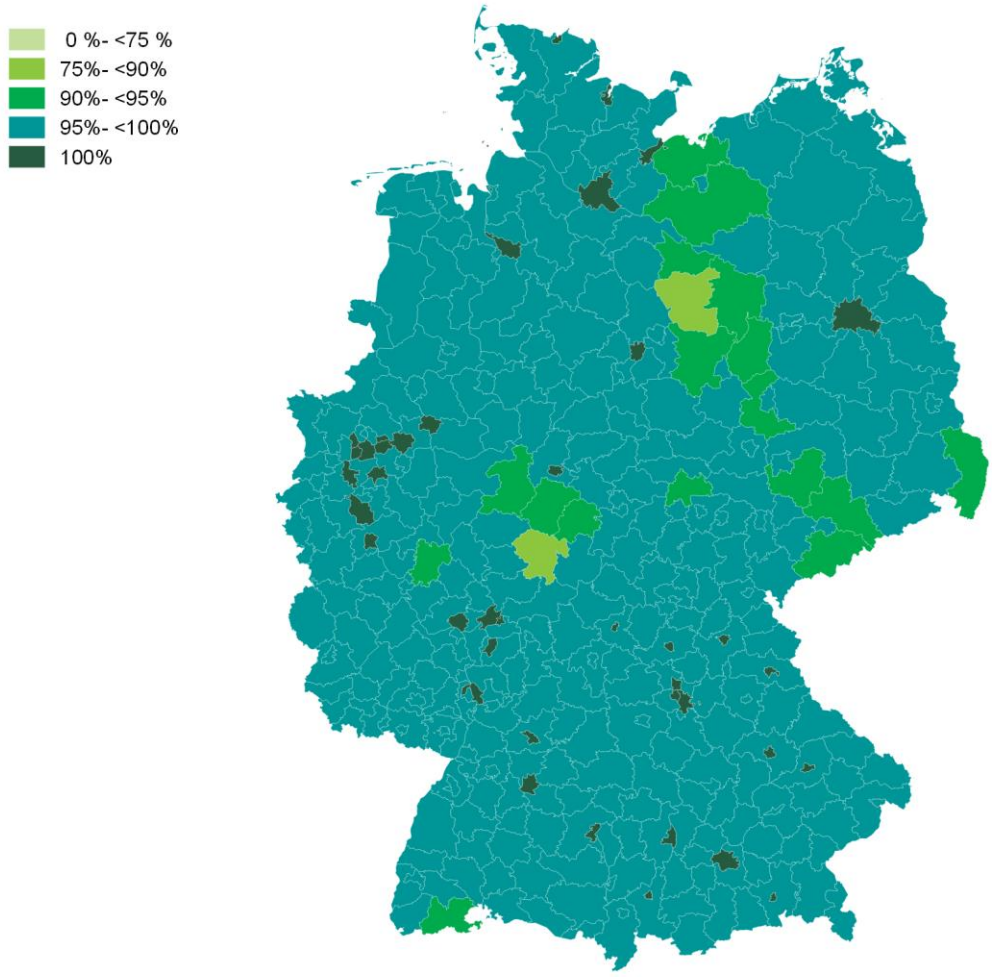


With regards to the coverage of mobile broadband technologies in rural areas, Germany was below the EU average for HSPA and LTE coverage. HSPA networks were available to 60.6% of rural households, which was the lowest out of all of the study countries. In previous years, German mobile network operators focussed on deploying LTE networks in underserved rural areas, rather than rolling out HSPA networks. Therefore, in mid-2017, LTE coverage was higher than HSPA coverage in rural Germany, reaching 87.9% of rural households.

5.11.2 Regional coverage by broadband technology

There continued to be some variation in fixed broadband coverage among German regions. A number of regions recorded complete fixed broadband coverage, including Berlin and Hamburg. Vogelsbergkreis and Altmarkkreis Salzwedel registered the lowest fixed broadband coverage at 88.1% and 89.0%, respectively.

Germany: Overall fixed broadband coverage, 2017

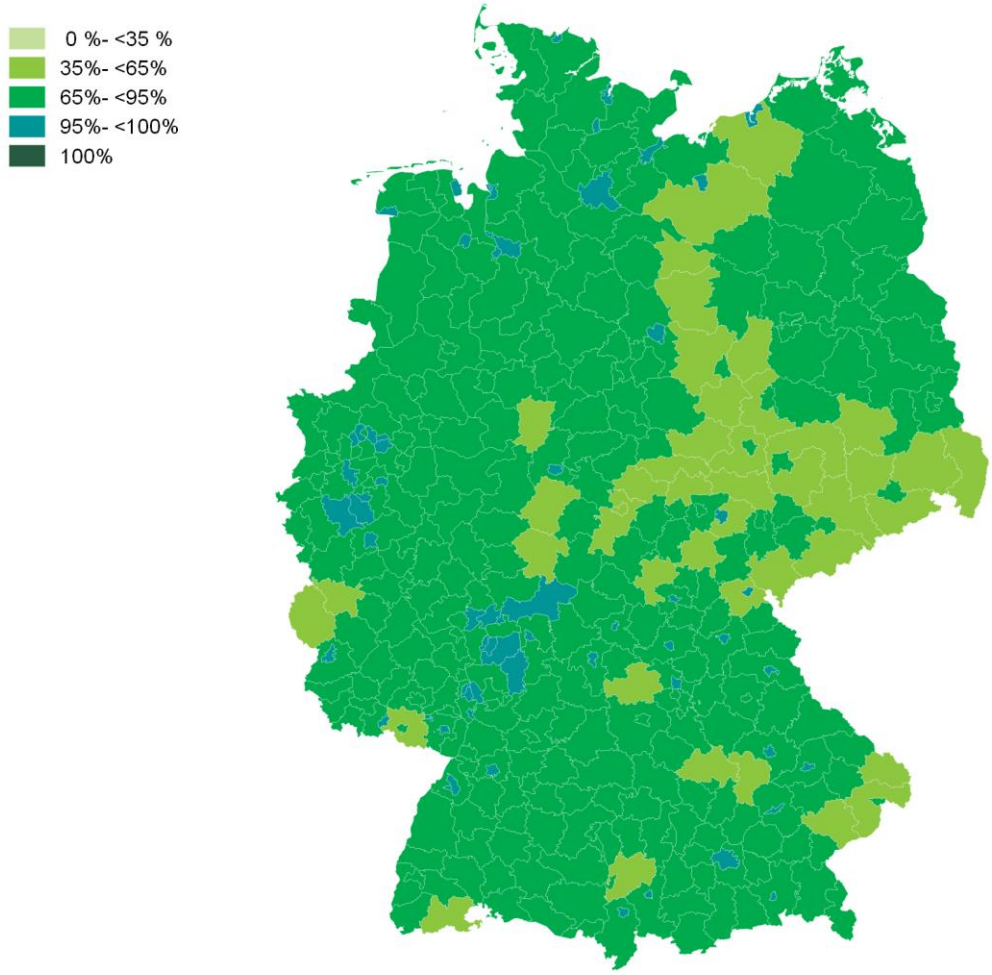


Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In mid-2017, Vogelsbergkreis reported the lowest NGA coverage at 36.8%, whilst seven other regions also recorded NGA availability below 50%. Yet, most urban areas recorded NGA coverage levels that exceeded 90%. In three regions (Darmstadt, Leverkusen and Rosenheim), the proportion of homes passed by NGA services was above 99%.

During the twelve-month period, several regions across Germany registered considerable improvements in terms of NGA coverage. Frankfurt (Oder) reported the largest increase, at 39.4 percentage points, as NGA services passed 85.2% of homes in the region. Moreover, a number of other regions, including Kassel (Landkreis), Kronach, Ilm-Kreis, Neckar-Odenwald-Kreis and Schwandorf, witnessed NGA growth of more than 30 percentage points.

Germany: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.11.3 Data tables for Germany

Statistic	National
Population	82,133,941
Persons per household	2.1
Rural proportion	8.6%

	Germany 2017		Germany 2016		Germany 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	97.1%	87.8%	97.1%	87.6%	96.6%	86.0%	94.1%	86.3%
VDSL	69.0%	44.6%	58.8%	36.3%	48.5%	28.5%	53.4%	32.5%
FTTP	7.3%	2.4%	7.1%	1.7%	6.6%	1.4%	26.8%	11.3%
WiMAX	10.3%	13.6%	10.0%	13.7%	10.4%	14.2%	18.0%	18.2%
Cable	63.8%	15.2%	63.7%	15.2%	63.2%	14.8%	45.1%	11.4%
DOCSIS 3.0	63.7%	15.0%	63.5%	14.9%	62.7%	14.4%	44.7%	10.8%
HSPA	91.5%	60.6%	92.1%	61.6%	91.5%	59.6%	97.9%	92.4%
LTE	96.5%	87.9%	96.6%	87.8%	94.0%	82.5%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	87.7%	-	86.0%	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.9%	98.8%	99.9%	98.8%	99.9%	98.8%	99.9%	99.4%
Overall fixed broadband	97.7%	89.1%	*97.7%*	*89.0%*	*97.4%*	*88.2%*	97.4%	92.4%
NGA broadband	84.1%	53.9%	81.8%	48.9%	*81.4%*	36.4%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	64.9%	-	-	-	-	-	57.8%	-
At least 2 Mbps	97.1%	-	*97.1%*	-	*96.8%*	-	96.0%	-
At least 30 Mbps	84.1%	-	80.7%	-	76.7%	-	79.0%	-
At least 100 Mbps	65.4%	-	64.9%	-	63.5%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA

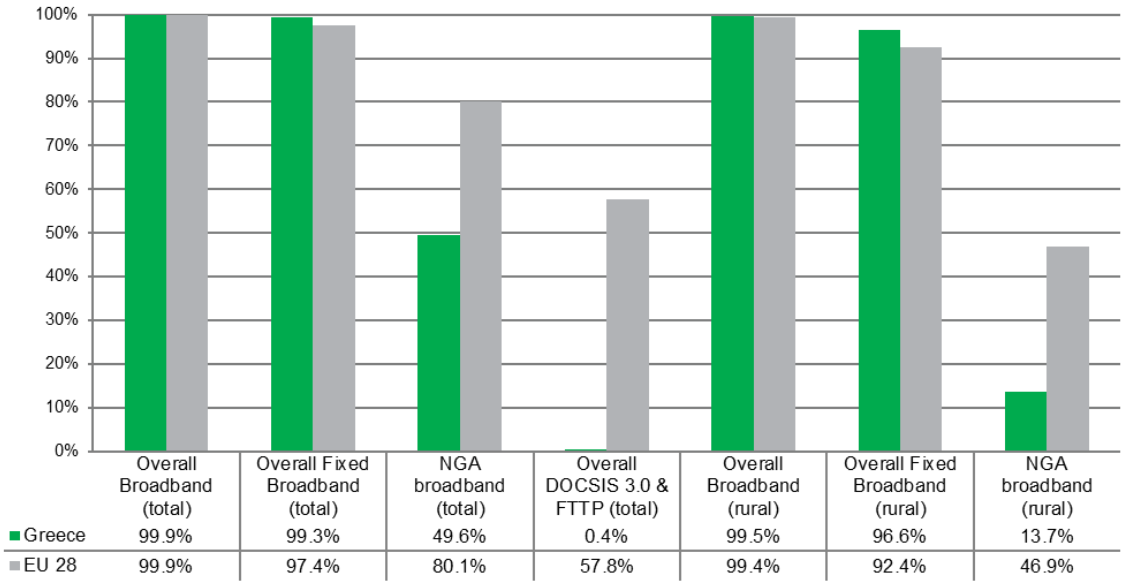
All restatements are highlighted in italics.

5.12 Greece

5.12.1 National coverage by broadband technology

Overall broadband coverage and overall fixed broadband coverage remained relatively unchanged at a total and rural level, as Greece recorded near-universal coverage and exceeded the EU average in the aforementioned coverage combinations. Despite an increase in coverage, the availability of NGA broadband services remained below the EU average at a total and rural level. NGA coverage at a total level expanded by 5.4 percentage points to reach 49.6%, while there was a 12.4 percentage point increase in rural NGA coverage to cover 13.7% of rural households.

Greece: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Greece	99.9%	99.3%	49.6%	0.4%	99.5%	96.6%	13.7%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

DSL remained the most dominant fixed broadband access technology in Greece, with coverage at 99.3%, unchanged from previous years. DSL technology is particularly important in Greece, as cable networks are absent in the country and WiMAX coverage, at 0.2%, is very limited.

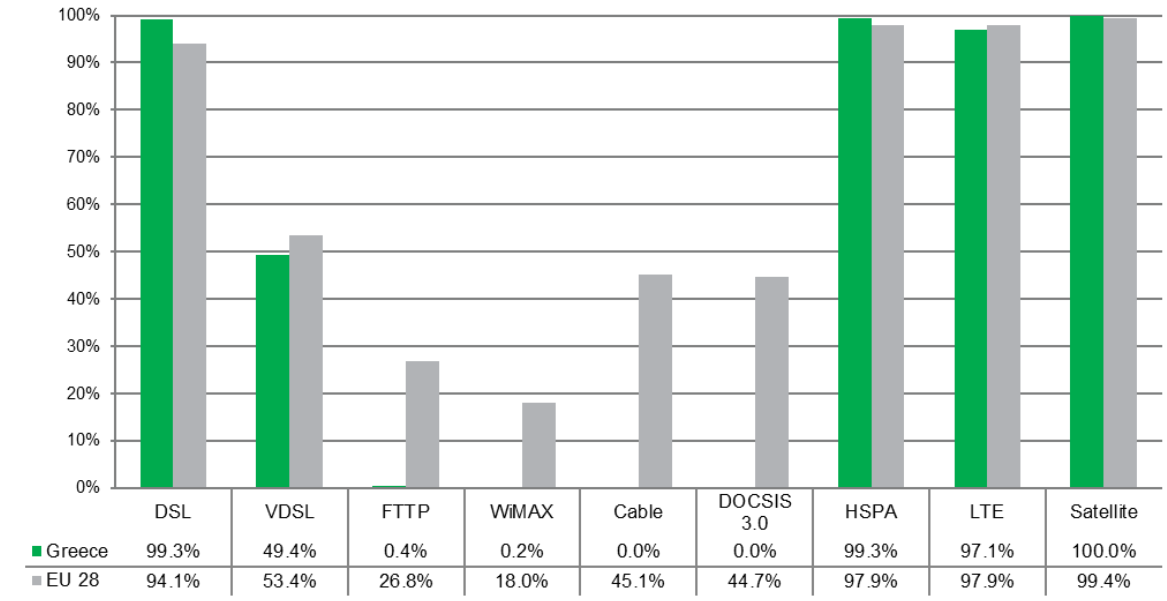
Examining individual NGA technologies, VDSL remained the only widespread NGA technology in Greece. VDSL coverage increased by 5.4 percentage points to reach 49.4% of households, but remained below the EU average of 53.4%. During the period, Greek operators continued to explore VDSL vectoring to boost attainable speeds on existing copper networks.[35] In terms of FTTP services, Greece did not report an increase in FTTP availability, yet coverage is expected to increase in the upcoming years following investments in fibre optic infrastructure from alternative operators Forthnet and Vodafone.[36][37]

Looking at mobile broadband coverage, HSPA networks maintained a near universal coverage level of 99.3%, a level reached already in 2013. Moreover, there was steady growth in LTE coverage, at 3.6 percentage points, as 97.1% of Greek homes passed were passed by the technology. In terms of the average LTE coverage of all network operators in Greece, LTE services were made available on average to 88.0% of Greek households, compared to 79.8% in mid-2016. Further LTE deployment can be expected, with incumbent operator OTE agreeing a EUR 150 million bilateral term loan with the European Investment Bank (EIB), in addition to an agreement with the European Bank for

[35] https://www.eett.gr/opencms/opencms/admin_EN/News/news_0454.html
[36] https://www.telegeography.com/products/commsupdate/articles/2017/05/15/forthnet-secures-eur500m-investment/
[37] http://www.vodafone.gr/portal/client/news/pressReleaseClient!pressReleaseDetails.action?pressReleaseId=40499&dateFrom=&dateUntil=&request_locale=en&lang=en_EN

Reconstruction and Development (EBRD) to raise a further EUR 150 million, in order to expand its mobile coverage in Greece.[38]

Greece: Coverage by technology, total, 2017

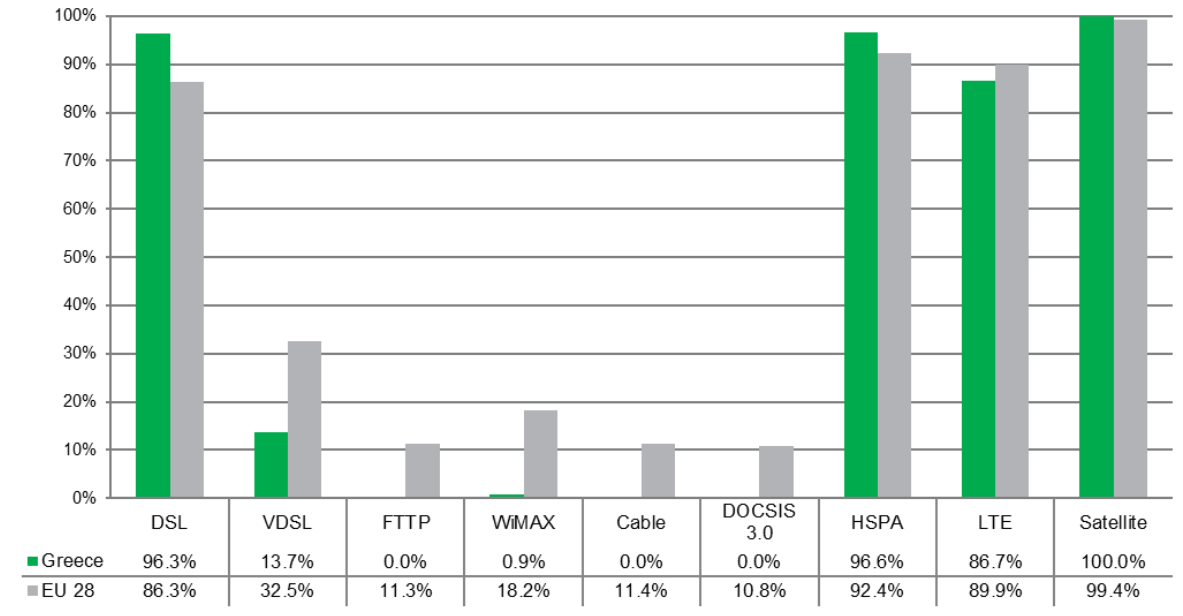


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Greece	99.3%	49.4%	0.4%	0.2%	0.0%	0.0%	99.3%	97.1%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

As was the case in the previous edition of the study, DSL was the only fixed broadband access technology available to rural households across Greece. Rural DSL coverage was unchanged compared to mid-2016, passing 96.3% of rural homes at the end of June 2017. Greece witnessed growth in rural VDSL services during the period, rising from 1.3% in mid-2016 to 13.7% in mid-2017. Considering rural mobile network coverage, the percentage of rural homes passed by HSPA networks remained unchanged at 96.6%. On the other hand, LTE coverage registered an improvement of 15.8 percentage points, with 86.7% of rural homes passed by LTE networks by mid-2017. Nevertheless, Greece continued to be below the EU average for rural LTE coverage of 89.9%.

Greece: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Greece	96.3%	13.7%	0.0%	0.9%	0.0%	0.0%	96.6%	86.7%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

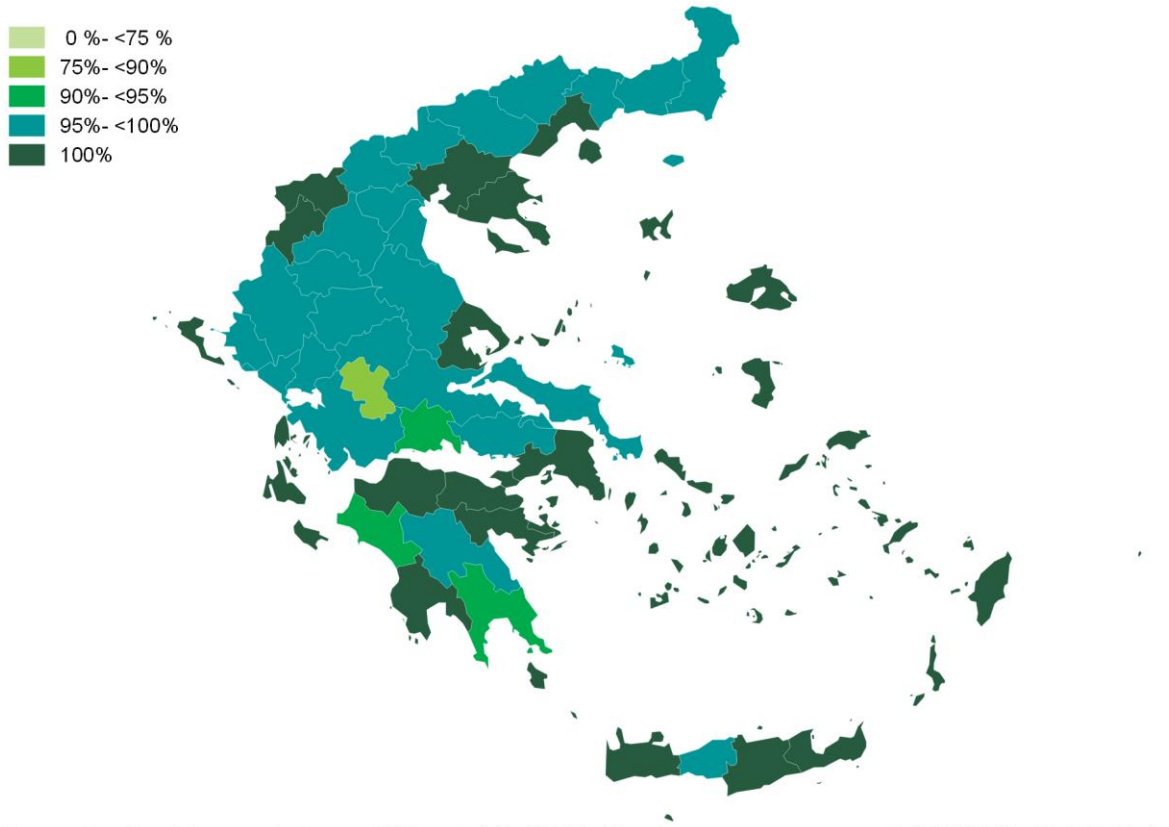
[38] http://www.eib.org/infocentre/press/releases/all/2017/2017-192-eib-signs-eur-150m-financing-agreement-with-greeces-ote-group-mobile-arm-cosmote-sa-further-efsi-support-in-greece.htm

5.12.2 Regional coverage by broadband technology

As in 2016, Evrytania had the lowest fixed broadband coverage in Greece at 89.9%. By mid-2017, two other regions had coverage levels lower than 95%: Ileia and Fokida, Most other regions recorded fixed broadband coverage rates exceeding 98%.

Greek island regions, such as Kerkyra, Lefkada and Zakynthos, tended to report complete or almost complete fixed broadband coverage, with more variation seen in mainland regions.

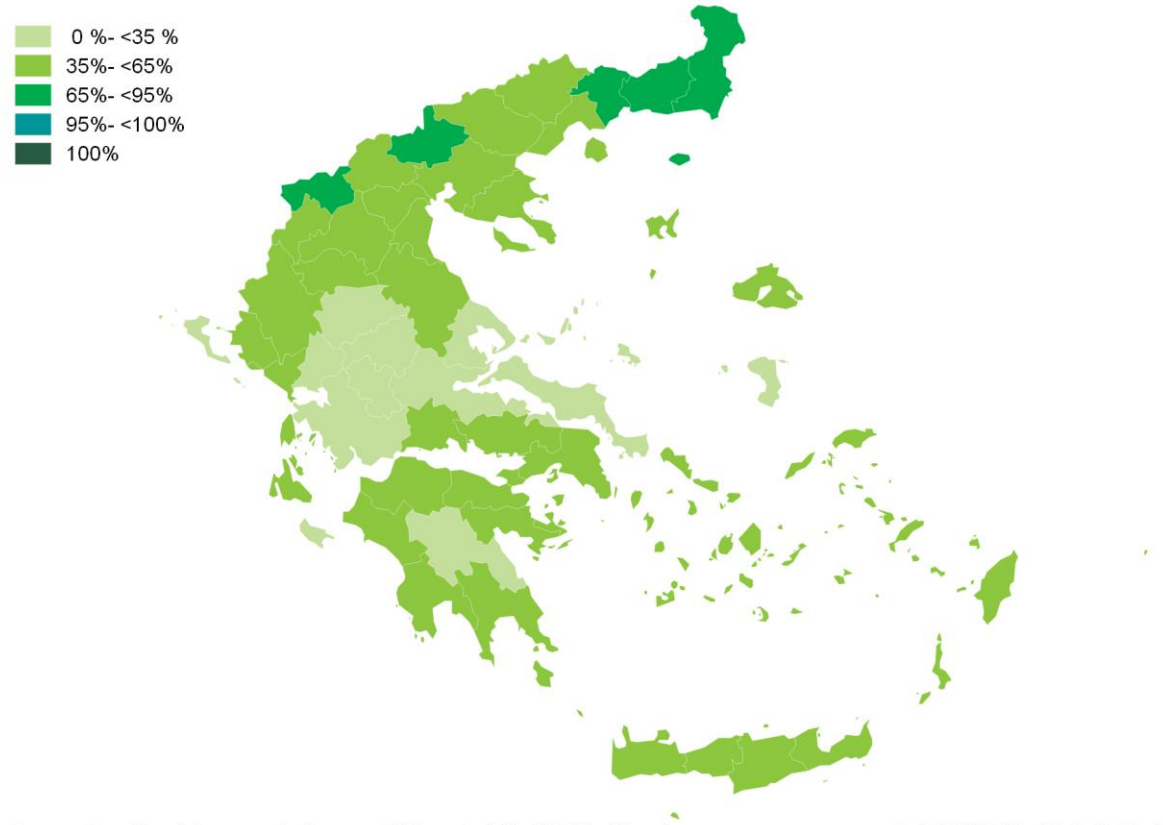
Greece: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In comparison, there were wider differences between regions in terms of NGA availability. Trikala had the lowest NGA coverage in Greece, with 21.6% of households reached by NGA services. On the other hand, NGA broadband was available to 84.5% of households in Xanthi. Moreover, in total, seventeen regions had NGA coverage exceeding 50% compared with only six regions in mid-2016. During the twelve-month period, Kilkis recorded the most substantial year-on-year increase in NGA broadband coverage (30 percentage points).

Greece: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.12.3 Data tables for Greece

Statistic	National
Population	10,812,009
Persons per household	2.6
Rural proportion	20.1%

	Greece 2017		Greece 2016		Greece 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.3%	96.3%	99.3%	96.3%	99.3%	96.3%	94.1%	86.3%
VDSL	49.4%	13.7%	44.0%	1.3%	36.1%	0.5%	53.4%	32.5%
FTTP	0.4%	0.0%	0.4%	0.0%	0.4%	0.0%	26.8%	11.3%
WiMAX	0.2%	0.9%	0.2%	0.8%	0.1%	0.5%	18.0%	18.2%
Cable	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	45.1%	11.4%
DOCSIS 3.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	44.7%	10.8%
HSPA	99.3%	96.6%	99.3%	96.6%	99.3%	96.7%	97.9%	92.4%
LTE	97.1%	86.7%	93.5%	70.9%	79.7%	36.1%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	88.0%	-	79.8%	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.9%	99.5%	99.9%	99.4%	99.9%	99.3%	99.9%	99.4%
Overall fixed broadband	99.3%	96.6%	99.3%	96.5%	99.3%	96.5%	97.4%	92.4%
NGA broadband	49.6%	13.7%	44.2%	1.3%	36.3%	0.5%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	0.4%	-	-	-	-	-	57.8%	-
At least 2 Mbps	98.1%	-	98.1%	-	97.7%	-	96.0%	-
At least 30 Mbps	45.9%	-	40.9%	-	33.2%	-	79.0%	-
At least 100 Mbps	0.4%	-	0.4%	-	0.4%	-	55.1%	-

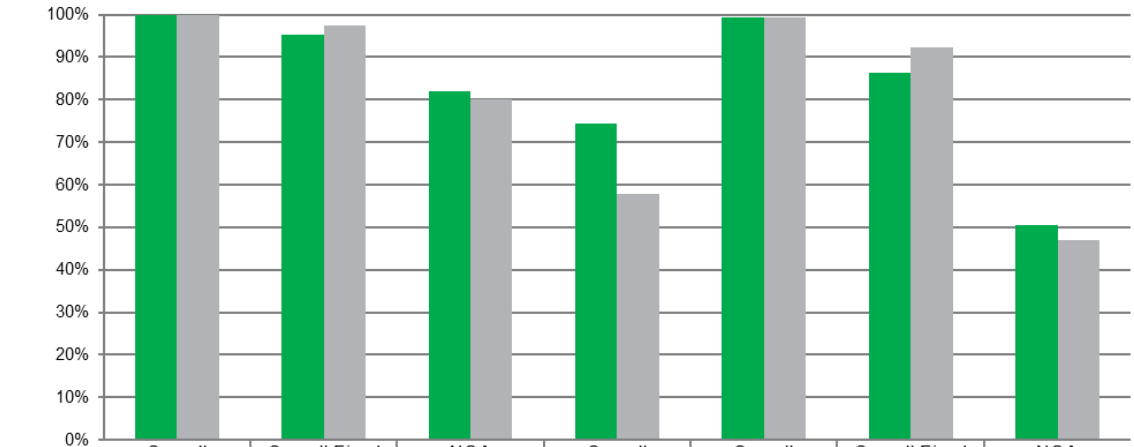
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.13 Hungary

5.13.1 National coverage by broadband technology

Over the twelve months to mid-2017, all broadband categories in Hungary recorded improvements in coverage. Overall broadband coverage reached 99.8% of households on a national level, and increased by 0.8 percentage points in rural areas, levelling with the EU average of 99.4%. Fixed broadband coverage remained unchanged on a national level, passing 95.3% of homes. On a rural level, the fixed broadband category improved by 0.4 percentage points, reaching 86.2% of households. In terms of NGA technologies, Hungary exceeded the average levels for coverage in the EU both on a national and rural level. National NGA broadband coverage improved by 1.5 percentage points, reaching 82.0% of the total households, while rural NGA coverage recorded an improvement of 3.5 percentage points, passing 50.5% of rural homes. These developments are partly due to the efforts of incumbent Magyar Telekom, which expanded its high-speed network in 2016-2017.[39][40] This trend is expected to continue, with the Hungarian government announcing plans to deploy a high-speed network in 139 Hungarian districts.[41]

Hungary: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Hungary	99.8%	95.2%	82.0%	74.4%	99.4%	86.2%	50.5%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Examining individual technologies, DSL remained the most prevalent fixed broadband technology, passing 90.5% of homes. Cable broadband outperformed the EU average by 25.1 percentage points, reaching 70.2% of households in Hungary. Availability of cable broadband services improved by 2.2 percentage points in the twelve-month period.

Over the twelve months to mid-2017, DOCSIS 3.0 coverage improved by 1.8 percentage points, reaching 66.8% of households. VDSL was the second most widespread NGA broadband technology, improving by 2.1 percentage points to reach 40.2% of households. However, VDSL coverage in Hungary remained below the EU average of 53.4%. FTTP coverage remained close to the EU levels, reaching 26.4% of the total households, registering a year-on-year increase of 2.4 percentage points.

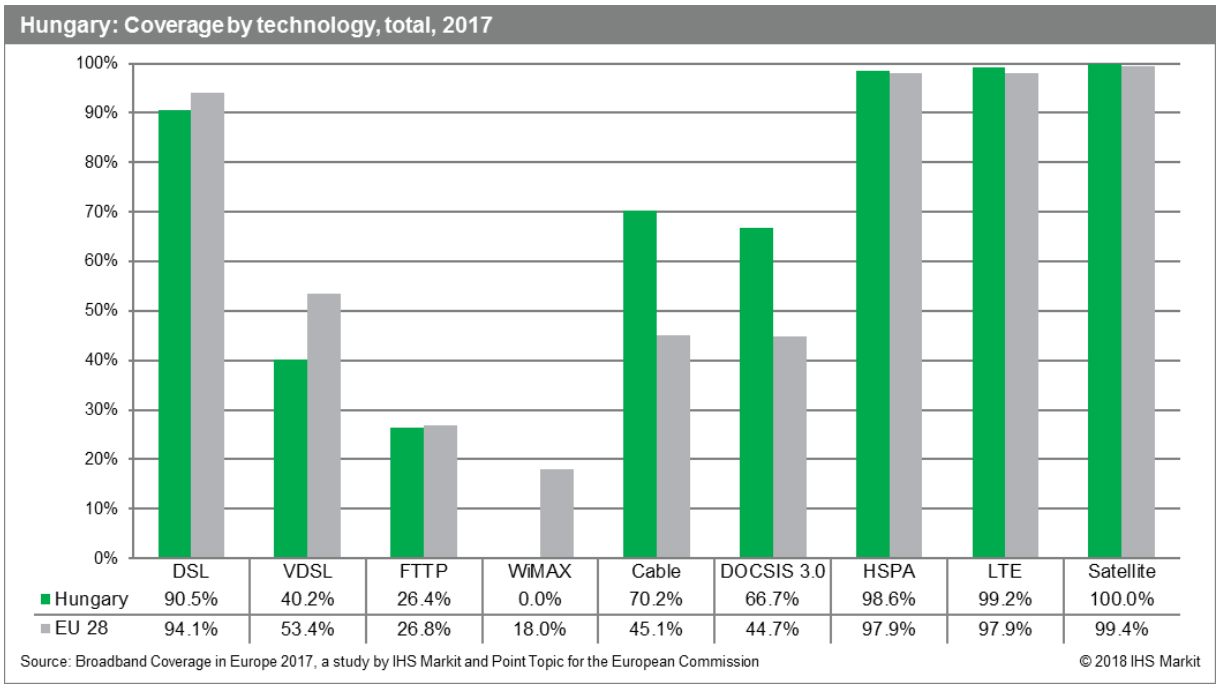
Mobile broadband coverage in Hungary improved over the twelve months to mid-2017. Both HSPA and LTE networks recorded an increase in availability, with HSPA reaching 98.6% of households, and LTE reaching near universal coverage at 99.2%. After achieving reported nationwide coverage of 98% by the end of 2016, Telenor Hungary continued to deploy LTE-A networks, particularly in the capital

[39] https://bbj.hu/business/mtel-commits-to-further-network-development_120298

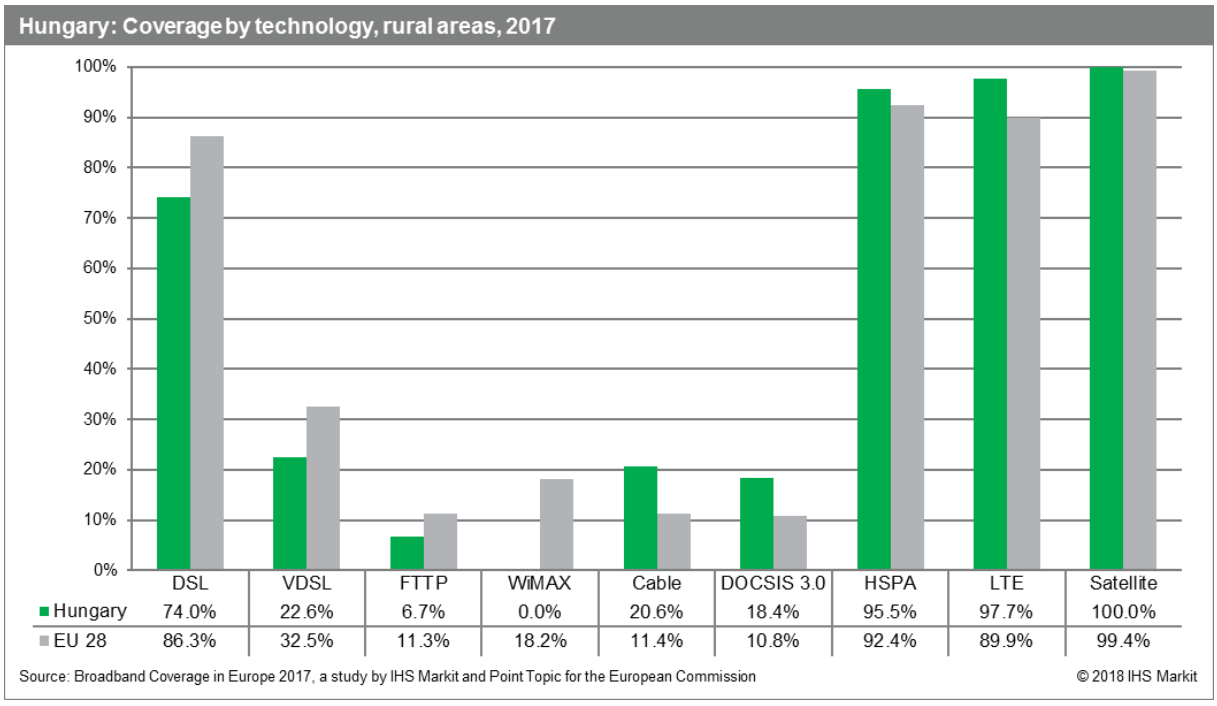
[40] https://bbj.hu/business/magyar-telekom-broadband-expands-to-28-mln-households_127363

[41] https://www.telegeography.com/products/commsupdate/articles/2016/12/01/hungary-commencing-superfast-network-rollout-in-139-districts-in-february/

Budapest.[42] When considering an average coverage of all LTE network operators, on average LTE services were available to 91.5% of Hungarians at mid-2017.



DSL remained the most prevalent fixed broadband technology in rural areas, passing 74.0% of homes, following a slight year-on-year increase. VDSL services were the second most widespread broadband technology in rural Hungary, improving 0.3 percentage points to reach 22.6% of homes. However, rural VDSL in Hungary remained lower than the EU average. Cable broadband was available to 20.6% of rural homes, up from 19.9% in mid-2016. FTTP growth remained limited, improving by 0.2 percentage points to reach 6.7% of rural homes. In contrast, DOCSIS 3.0 coverage continued to exceed the EU average by 7.6 percentage points, passing 18.4% of rural homes.



[42] https://www.telegeography.com/products/commsupdate/articles/2016/12/09/telenors-deep-indoor-lte-coverage-to-hit-84-9-by-year-end-in-budapest/

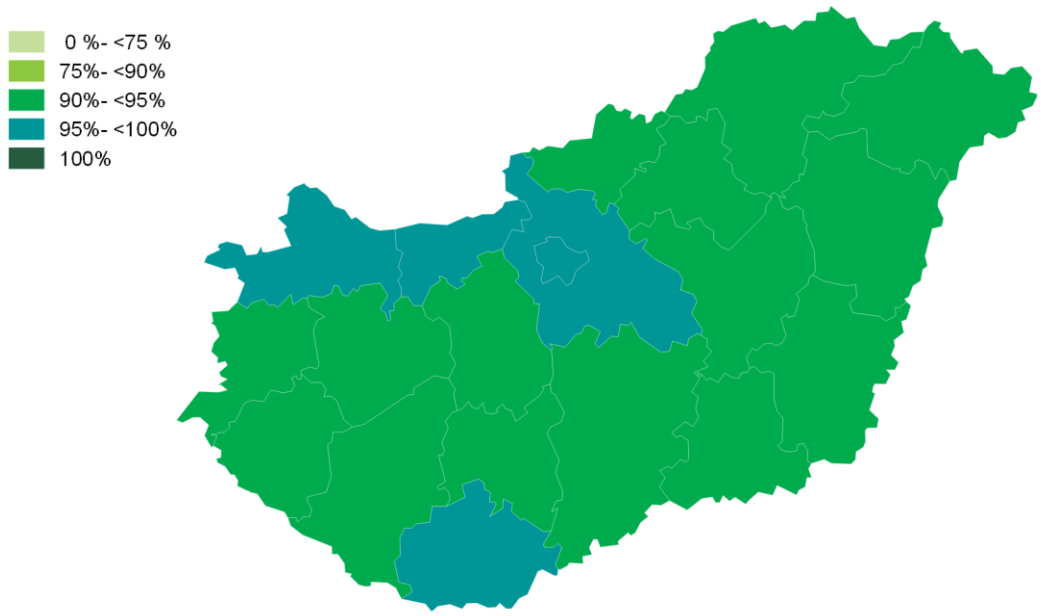
LTE coverage in rural areas improved by 1.5 percentage points during the twelve-month period, reaching 97.7% of households. Due to the limited availability of NGA broadband in some rural areas of Hungary, network operators offer LTE solutions as an alternative to fixed broadband. One example is the alternative operator Telenor Hungary, who continued to improve LTE coverage in sparsely populated rural areas.[43]

[43] https://www.telegeography.com/products/commsupdate/articles/2017/02/20/telenor-hungary-expands-150mbps-lte-to-small-villages/

5.13.2 Regional coverage by broadband technology

On a regional level, fixed broadband coverage exceeded 95% in regions with the highest percentage of urban population: Budapest, Pest, Komarom-Esztergom, Baranya, and Gyor-Moson-Sopron. In Budapest, fixed broadband coverage reached 98.7%.

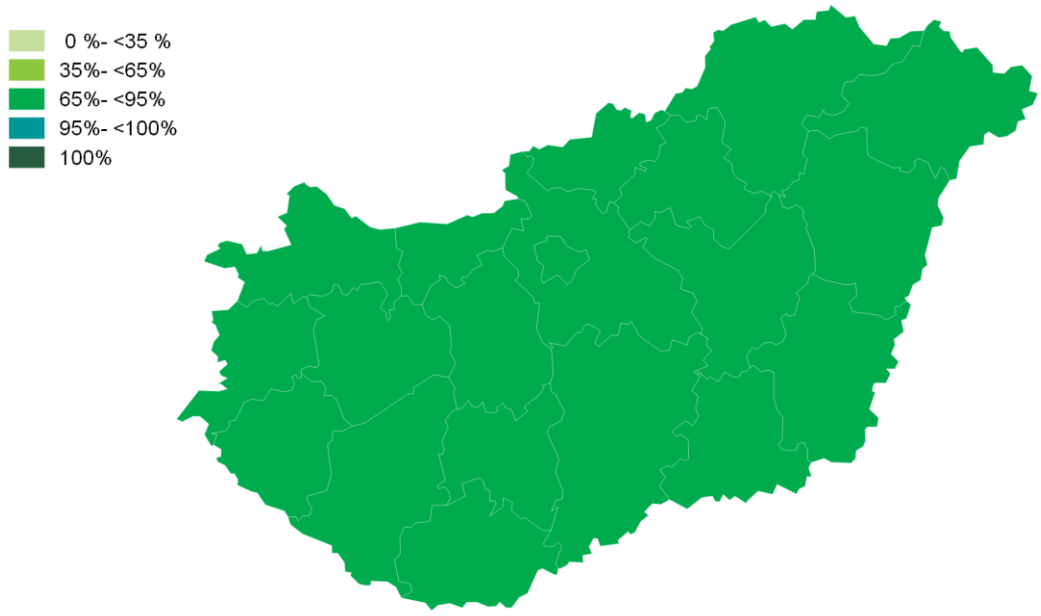
Hungary: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

NGA coverage across Hungary increased in almost all regions. Somogy, the region with the lowest coverage over the past years, recorded an increase of two percentage points in 2017, reaching 65.7%. Budapest remains the region with the highest NGA coverage, standing at 93.8%.

Hungary: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.13.4 Data tables for Hungary

Statistic	National
Population	9,830,485
Persons per household	2.2
Rural proportion	31.7%

	Hungary 2017		Hungary 2016		Hungary 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	90.5%	74.0%	90.5%	74.0%	90.5%	73.8%	94.1%	86.3%
VDSL	40.2%	22.6%	38.1%	22.3%	28.0%	14.7%	53.4%	32.5%
FTTP	26.4%	6.7%	24.0%	6.4%	21.5%	4.2%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	18.2%
Cable	70.2%	20.6%	68.0%	19.9%	66.1%	19.8%	45.1%	11.4%
DOCSIS 3.0	66.7%	18.4%	65.0%	18.2%	63.2%	18.2%	44.7%	10.8%
HSPA	98.6%	95.5%	98.3%	94.7%	98.3%	94.6%	97.9%	92.4%
LTE	99.2%	97.7%	98.6%	96.2%	95.0%	84.1%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	91.5%	-	92.4%	-			90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.8%	99.4%	99.6%	98.7%	99.1%	97.3%	99.9%	99.4%
Overall fixed broadband	95.2%	86.2%	95.2%	85.9%	95.2%	85.5%	97.4%	92.4%
NGA broadband	82.0%	50.5%	80.6%	46.9%	78.2%	37.1%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	74.4%	-	-	-	-	-	57.8%	-
At least 2 Mbps	94.8%	-	94.8%	-	94.8%	-	96.0%	-
At least 30 Mbps	80.0%	-	78.2%	-	76.9%	-	79.0%	-
At least 100 Mbps	70.4%	-	68.4%	-	67.7%	-	55.1%	-

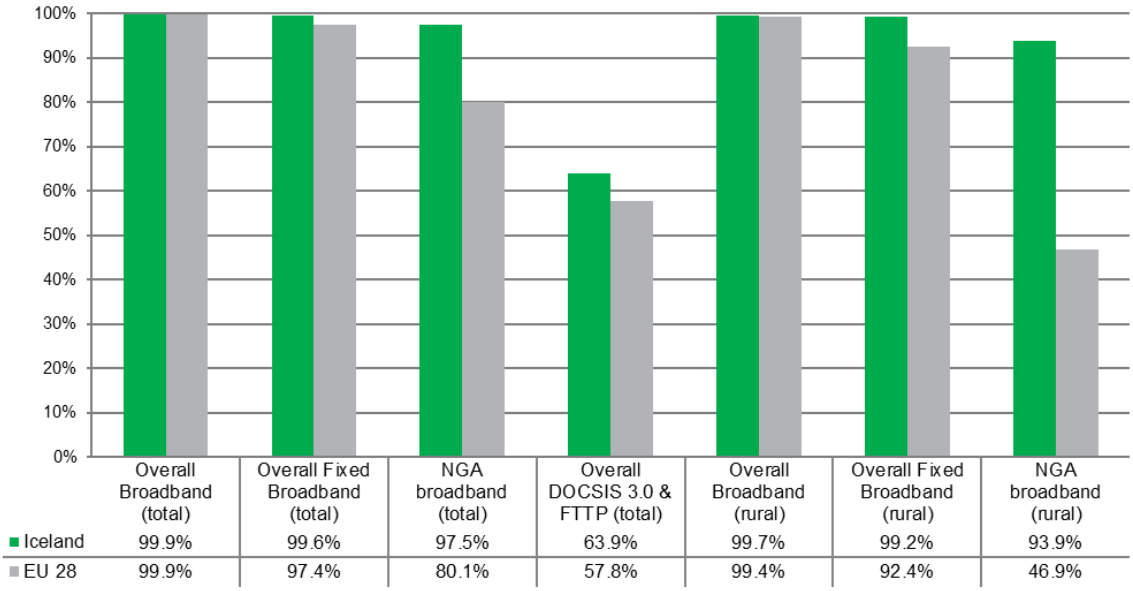
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.14 Iceland

5.14.1 National coverage by broadband technology

Iceland exceeded the EU average for all combination categories. By mid-2017, Iceland reported near-universal coverage in relation to overall broadband and fixed broadband. Examining NGA coverage, there was a 1.8 percentage point increase at a total level, reaching 97.5% of households. Rural NGA coverage growth was more substantial, at 6.2 percentage points, as at least one NGA technology passed 93.9% of rural Icelandic homes. This was substantially above the EU average of 46.9% for rural NGA coverage.

Iceland: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Iceland	99.9%	99.6%	97.5%	63.9%	99.7%	99.2%	93.9%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

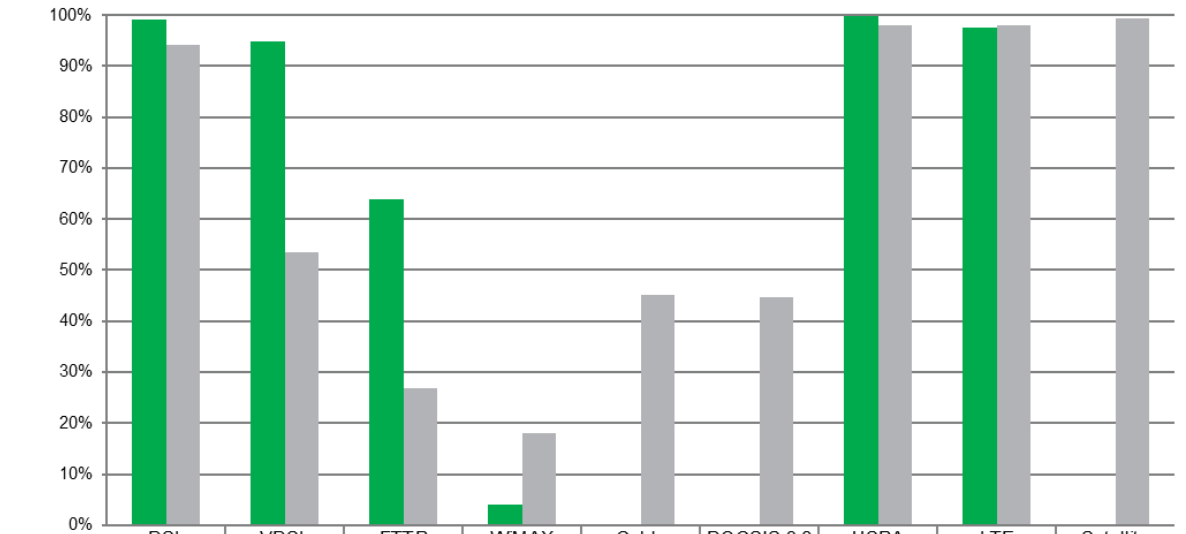
In relation to individual broadband technologies, DSL networks passed 99.2% of homes, an increase of 2.2 percentage points. With cable networks absent in Iceland, and limited WiMAX coverage (4.0%), VDSL was the second most pervasive fixed broadband technology. At 94.9%, VDSL networks reported growth of 4.7 percentage points during the period, as Iceland became the study country with the highest VDSL coverage. Growth in FTTP services in Iceland was more measured, with a single percentage point increase meaning that FTTP coverage reached 63.9% of households. A number of operators in Iceland, including incumbent Mila, Reykjavik Energy's subsidiary GR (Gagnaveita Reykjavikur) and Vodafone have invested in FTTP services.[44][45]

By mid-2017, 99.8% of Icelandic households had access to at least one HSPA network. Moreover, the availability of LTE services increased by 1.7 percentage points during the twelve months to the end of June 2017, covering 97.5% of households. Analysing average LTE operator coverage, LTE services were available on average to 94.7% of Icelandic households.

[44] http://www.visir.is/g/2016161009436/tuttugufalt-hradari-tengingar-fra-2007

[45] https://www.telegeography.com/products/commsupdate/articles/2017/01/09/vodafone-extends-500mbps-fibre-optic-services-to-northern-iceland/

Iceland: Coverage by technology, total, 2017

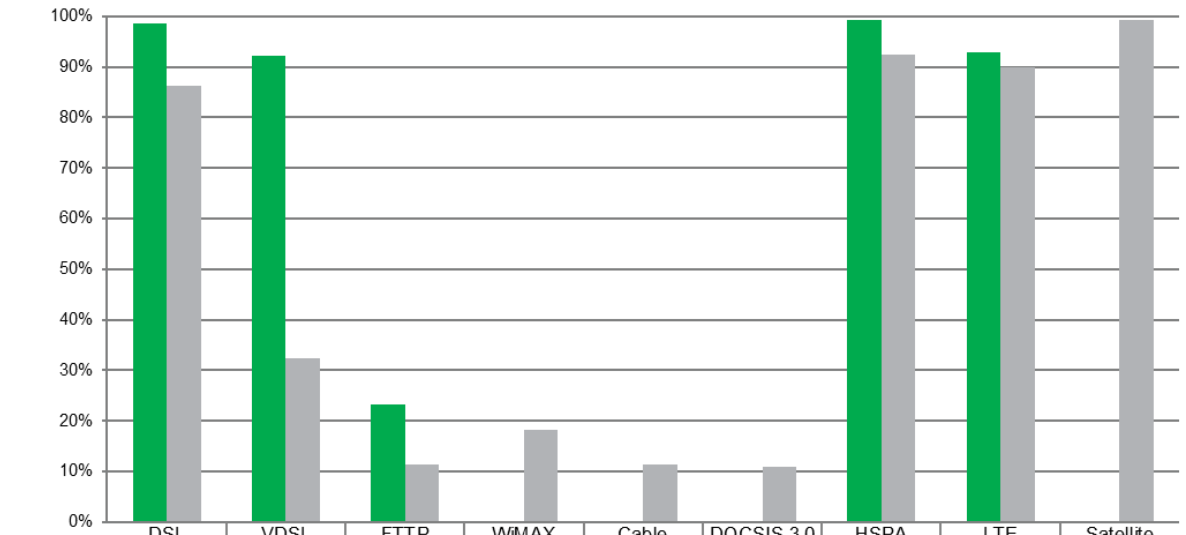


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Iceland	99.2%	94.9%	63.9%	4.0%	0.0%	0.0%	99.8%	97.5%	0.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Examining rural broadband availability, DSL networks passed 98.5% of rural Icelandic homes, a 4.2 percentage point increase. Iceland also reported a rise in the availability of VDSL services, which increased by 8.4 percentage points to reach 92.3% of households. As a result, Iceland replaced Luxembourg as the study country with the highest rural VDSL coverage. Rural FTTP deployment in Iceland, at 23.2%, remained above the EU average, whilst WiMAX services remained absent from rural areas.

Iceland: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Iceland	98.5%	92.3%	23.2%	0.0%	0.0%	0.0%	99.3%	93.0%	0.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

As was the case in mid-2016, HSPA networks provided near universal coverage to reach 99.3% of rural households. Rural LTE coverage continued to increase, rising by 4.2 percentage points during the period, with at least one LTE network passing 93.0% of rural homes across Iceland by mid-2017.

5.14.2 Regional coverage by broadband technology

During the twelve months to mid-2017, overall fixed broadband coverage improved by 1.1 percentage points between the two Icelandic regions, as the less densely populated Landsbyggd recorded a 3 percentage point increase in fixed broadband availability. Fixed broadband coverage in Höfudborgarsvædi, at 99.8%, remained unchanged during the period.

Iceland: Overall fixed broadband coverage, 2017

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

With near-universal NGA coverage in Höfudborgarsvædi achieved in mid-2016, NGA growth in Iceland was driven by improvements in the Landsbyggd region, where NGA availability increased from 90.5% to 93.3% of households.

Iceland: NGA broadband coverage, 2017

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.14.3 Data tables for Iceland

Statistic	National
Population	332,529
Persons per household	2.5
Rural proportion	35.5%

	Iceland 2017		Iceland 2016		Iceland 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.2%	98.5%	97.0%	94.3%	96.2%	90.2%	94.1%	86.3%
VDSL	94.9%	92.3%	90.2%	83.9%	85.8%	73.2%	53.4%	32.5%
FTTP	63.9%	23.2%	62.8%	24.0%	53.4%	2.3%	26.8%	11.3%
WiMAX	4.0%	0.0%	4.0%	0.0%	4.0%	7.0%	18.0%	18.2%
Cable	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	45.1%	11.4%
DOCSIS 3.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	44.7%	10.8%
HSPA	99.8%	99.3%	99.5%	99.2%	98.6%	96.1%	97.9%	92.4%
LTE	97.5%	93.0%	95.9%	88.7%	85.0%	57.5%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	94.7%	-	93.2%	-	-	-	90.8%	-
Satellite	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.4%	99.4%
Overall broadband	99.9%	99.7%	99.8%	99.6%	99.3%	98.0%	99.9%	99.4%
Overall fixed broadband	99.6%	99.2%	98.5%	95.8%	98.1%	94.6%	97.4%	92.4%
NGA broadband	97.5%	93.9%	95.7%	87.7%	90.8%	74.3%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	63.9%	-	-	-	-	-	57.8%	-
At least 2 Mbps	99.6%	-	99.3%	-	98.0%	-	96.0%	-
At least 30 Mbps	96.6%	-	91.7%	-	89.9%	-	79.0%	-
At least 100 Mbps	76.1%	-	75.2%	-	53.4%	-	55.1%	-

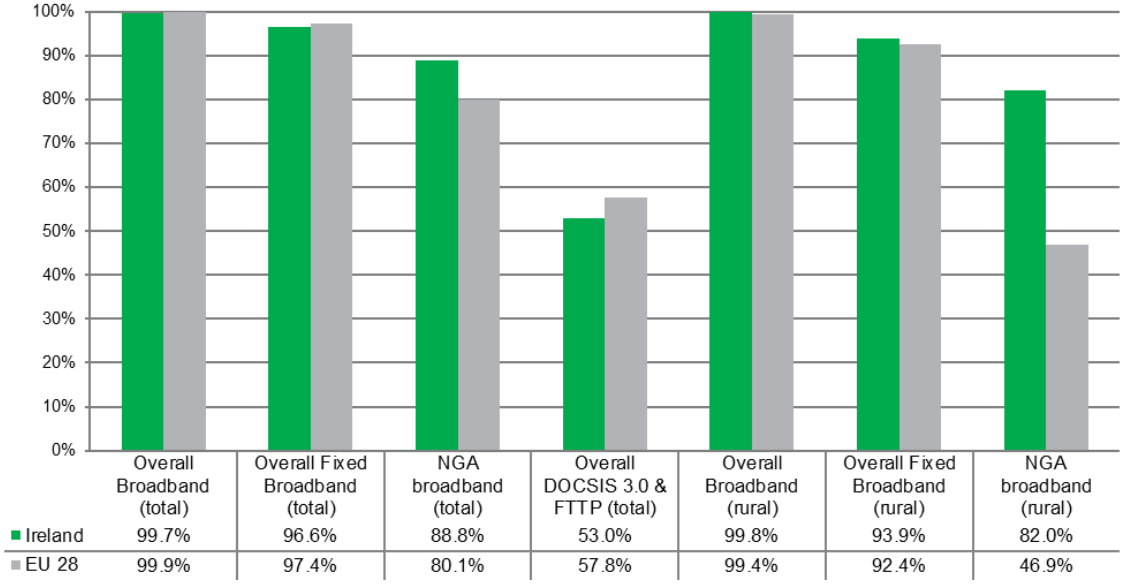
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.15 Ireland

5.15.1 National coverage by broadband technology

Overall broadband coverage and overall fixed broadband coverage in Ireland continued to be slightly below the EU average at a total level, despite a slight increase in coverage for both combination categories. At a rural level, overall broadband coverage and overall fixed broadband coverage in Ireland narrowly exceeded the EU average, as overall broadband coverage in rural areas increased by 0.8 percentage points, whilst overall fixed broadband coverage in rural areas expanded by 0.6 percentage points. There was a far greater coverage increase in terms of NGA coverage, with a 7.2 percentage point increase taking NGA coverage at a national level to 88.8%, thus exceeding the EU average (80.1%). There was also rapid expansion in rural NGA coverage in Ireland, increasing from 50.3% to 82.0%, meaning rural NGA availability was also above the EU average (46.9%).

Ireland: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Ireland	99.7%	96.6%	88.8%	53.0%	99.8%	93.9%	82.0%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

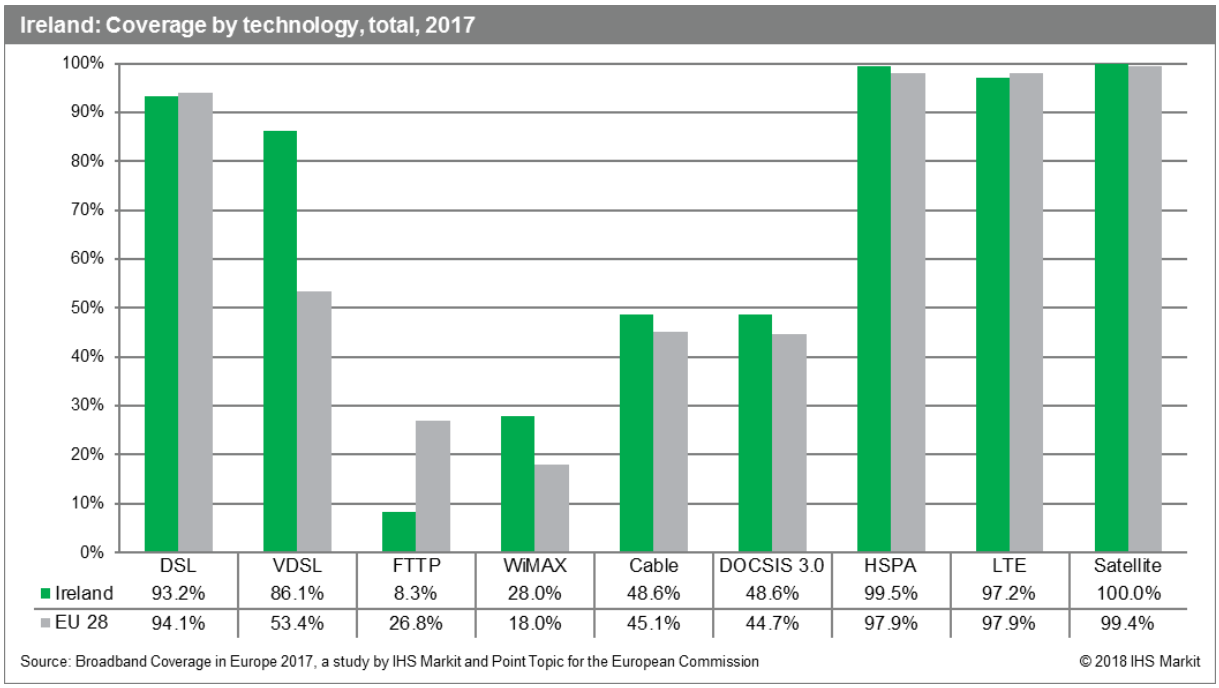
Looking at individual broadband technologies, DSL coverage increased by 0.6 percentage points to cover 93.2% of households, but remained below the EU average (94.1%). Cable coverage also increased during the period, rising from 43.3% to 48.6% of Irish households. As a result, Irish cable coverage was above the EU average (45.1%).

Considering individual NGA technologies, VDSL services increased by 5.5 percentage points and reached 86.1% of households, remaining the most widespread NGA technology. Ireland saw a similar uplift in DOCSIS 3.0 coverage, which passed 48.6% of homes by mid-2017, due to Virgin Media's network expansion in the UK and Ireland.[46] Growth in FTTP networks was more limited, at 2.8 percentage points, as FTTP reached 8.3% of households, underpinned by investment from incumbent operator Eir in addition to Siro, the fibre joint venture between Vodafone and the Electricity Supply Board.[47][48]

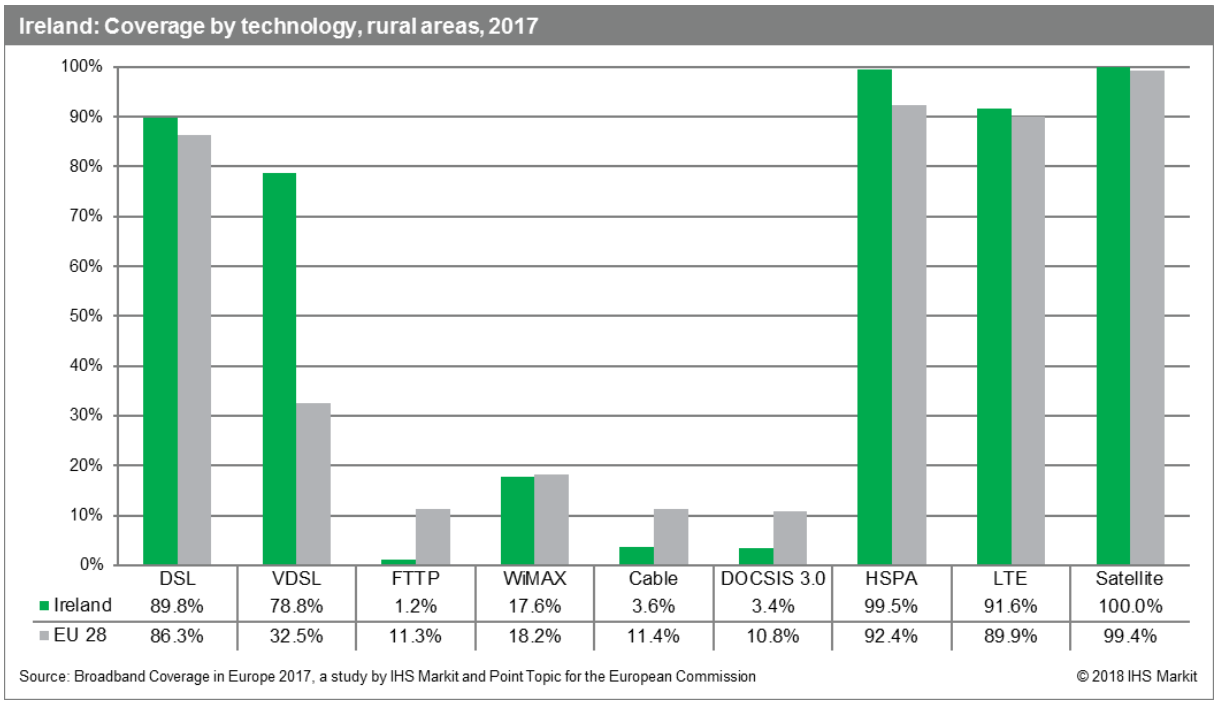
[46] http://www.virginmedia.com/corporate/media-centre/press-releases/virgin-media-and-liberty-global-announce-largest-investment-in-uks-internet-infrastructure-for-more-than-a-decade.html

[47] https://www.eir.ie/pressroom/eir-statement-on-Fibre-to-the-Home-Rollout-04.04.17/

[48] https://www.esb.ie/docs/default-source/investor-relations-documents/annual-report-and-financial-statements-2017.pdf?sfvrsn=2%20



Examining mobile networks coverage, HSPA services maintained a near universal coverage level, passing 99.5% of homes. There was a small uplift in LTE availability during the period, as coverage increased from 96.8% to 97.2%, but remained below the EU average (97.9%). In terms of average LTE service availability, when average coverage of all LTE network operators is considered, LTE services were available to 92.1% of households as of mid-2017.



By mid-2017, DSL remained the most pervasive fixed broadband technology in rural areas, rising by 1.9 percentage points to cover 89.8% of rural households. Cable coverage increased slightly to 3.6%, but remained limited in rural areas. There was dramatic growth in rural VDSL coverage, equivalent to 29.9 percentage points, with VDSL reaching 78.8% of rural households. Concerning other NGA technologies, there was a percentage point growth in DOCSIS 3.0 coverage, whilst there was no expansion in rural FTTP coverage, as availability remained at 1.2% of rural households. Nevertheless, rural FTTP coverage is expected to increase in the future. Ireland's National Broadband Plan aims to deploy FTTP

services to an additional 500,000 rural premises, with wholesale operator Enet the sole remaining bidder in the final government tender.[49]

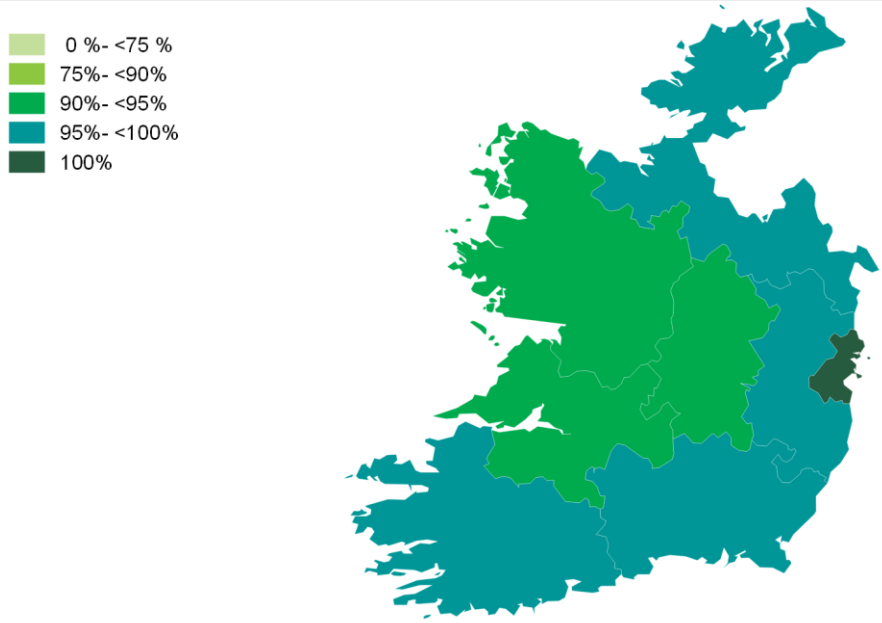
Examining rural coverage of mobile broadband technologies, Ireland witnessed a slight uplift (1.5 percentage points) in HSPA coverage to reach 99.5% of rural households. Whilst rural HSPA coverage was slightly above the EU average, the negligible growth in Irish rural LTE coverage in the twelve months to mid-2017 meant that Ireland remained below the EU average for rural LTE availability of 97.9%.

[49] https://www.enet.ie/news/178/91/enet-led-consortium-submits-NBP-Detailed-Solution-to-DCCAE/d,Sample.html

5.15.2 Regional coverage by broadband technology

Regional fixed broadband coverage in Ireland continued to be quite varied at the end of June 2017. Whilst all households in Dublin had fixed broadband access, fixed networks passed 92.1% of homes in West Ireland.

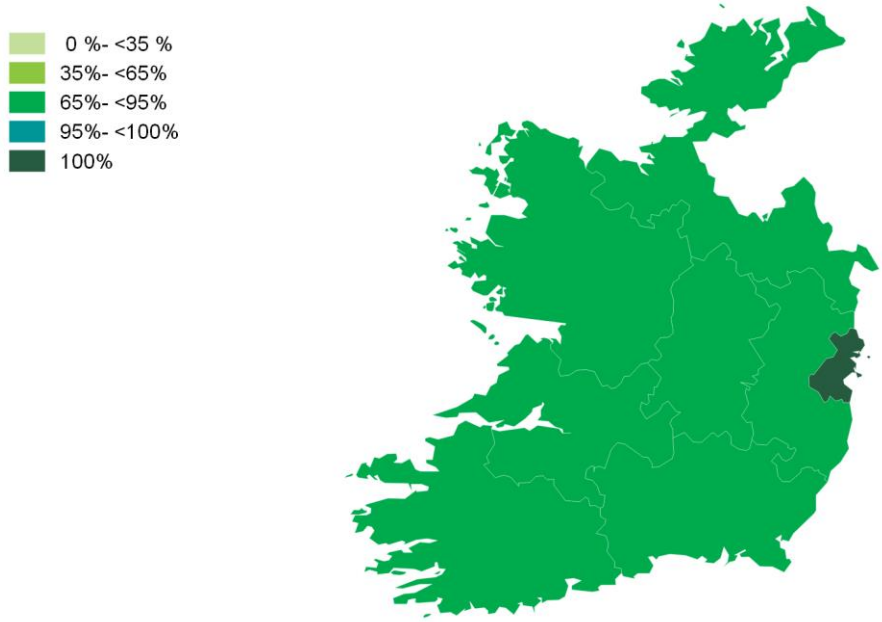
Ireland: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

By mid-2017, with the exception of Mid-East of Ireland, all other regions had at least 80% coverage of NGA services. As in 2016, Dublin recorded complete availability of NGA services.

Ireland: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.15.3 Data tables for Ireland

Statistic	National
Population	4,724,720
Persons per household	2.7
Rural proportion	33.8%

	Ireland 2017		Ireland 2016		Ireland 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	93.2%	89.8%	92.5%	87.9%	92.5%	86.8%	94.1%	86.3%
VDSL	86.1%	78.8%	80.6%	48.9%	70.6%	44.2%	53.4%	32.5%
FTTP	8.3%	1.2%	5.5%	1.2%	4.5%	0.0%	26.8%	11.3%
WiMAX	28.0%	17.6%	26.6%	20.4%	26.6%	20.4%	18.0%	18.2%
Cable	48.6%	3.6%	43.3%	2.6%	42.7%	2.6%	45.1%	11.4%
DOCSIS 3	48.6%	3.4%	43.1%	2.4%	42.0%	2.4%	44.7%	10.8%
HSPA	99.5%	99.5%	99.2%	97.9%	94.6%	85.4%	97.9%	92.4%
LTE	97.2%	91.6%	96.7%	91.2%	90.1%	73.0%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	92.1%	-	*91.8%*	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.7%	99.8%	99.6%	99.0%	97.6%	95.0%	99.9%	99.4%
Overall fixed broadband	96.6%	93.9%	96.3%	93.3%	96.3%	93.3%	97.4%	92.4%
NGA broadband	88.8%	82.0%	81.6%	50.3%	79.7%	44.9%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	53.0%	-	-	-	-	-	57.8%	-
At least 2 Mbps	96.2%	-	95.9%	-	95.9%	-	96.0%	-
At least 30 Mbps	87.5%	-	77.2%	-	69.5%	-	79.0%	-
At least 100 Mbps	52.3%	-	44.9%	-	43.3%	-	55.1%	-

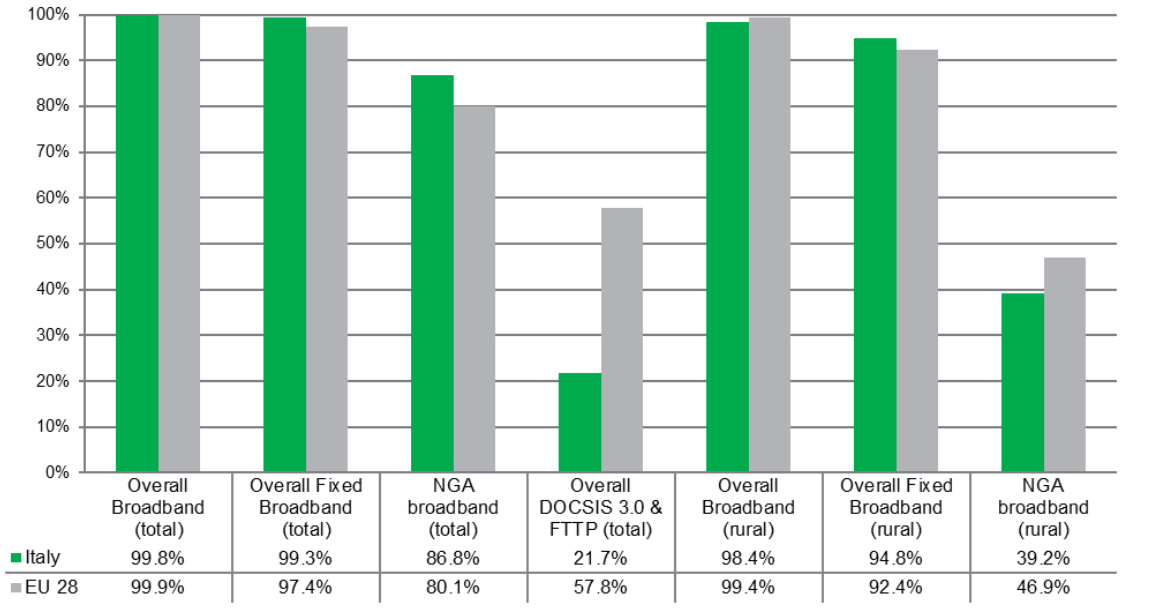
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA

5.16 Italy

5.16.1 National coverage by broadband technology

At the end of June 2017, overall broadband and fixed broadband coverage in Italy was unchanged at a total level. However, at a rural level, there was a 0.2 percentage point increase in overall broadband coverage, as well as a 0.7 percentage point increase in overall fixed broadband coverage. Moreover, Italy reported a considerable increase in NGA broadband coverage, at both a total and rural level. At a total level, NGA coverage expanded by 14.5 percentage points to reach 86.8% of households, as Italy moved above the EU average (80.1%). Moreover, Italian rural NGA coverage increased by 23.2 percentage points during the period, reaching 39.2% of rural households, but remained below the EU average in terms of NGA coverage in rural areas (46.9%).

Italy: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Italy	99.8%	99.3%	86.8%	21.7%	98.4%	94.8%	39.2%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

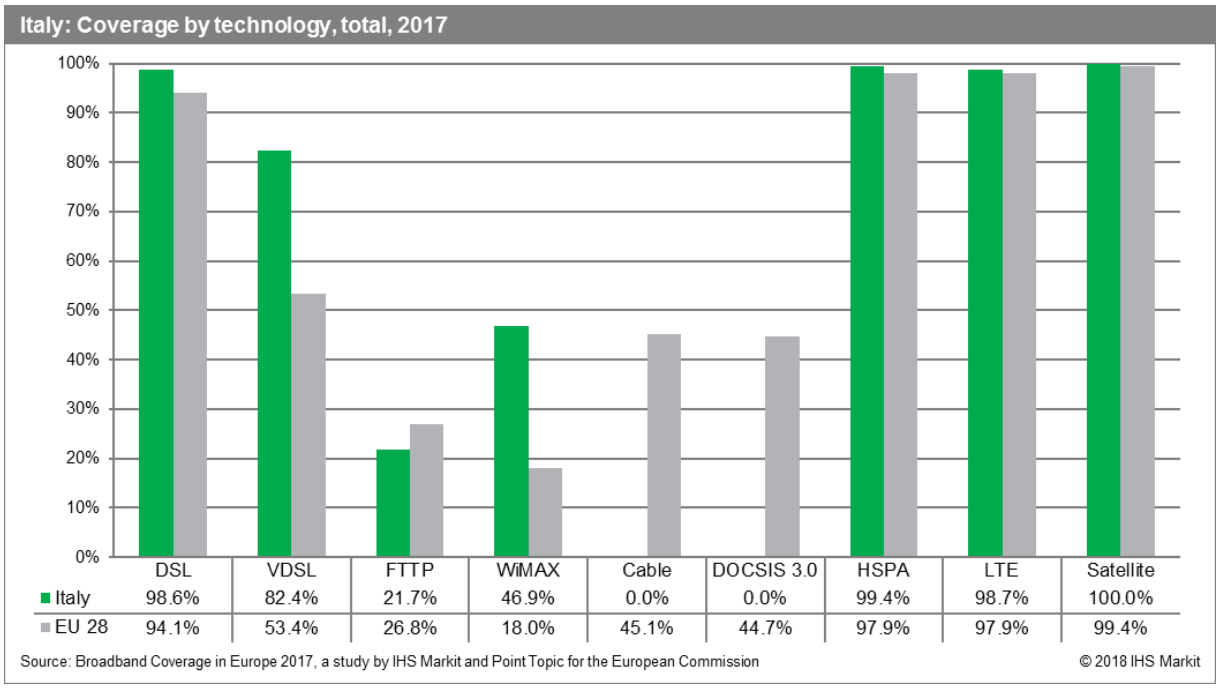
Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Looking at individual broadband technologies, DSL coverage remained relatively unchanged during the period, passing 98.6% of homes. Instead, Italian operators concentrated on upgrading DSL networks, contributing to a 16 percentage point increase in VDSL coverage during the period. With cable networks absent in Italy, FTTP is the only other NGA technology available to Italian households. FTTP network coverage continued to rise steadily, expanding by 2.9 percentage points, to pass 21.7% of households. Further growth can be expected as Open Fiber, a subsidiary of Enel, an Italian utility firm, confirmed its plan to pass 9.5 million homes by 2021 with its wholesale FTTP network following the acquisition of Metroweb.[50] In addition, incumbent operator Telecom Italia is also deploying FTTP networks, and stated that its FTTP service is available in 70 municipalities as of June 2017.[51]

Examining mobile networks coverage, HSPA networks maintained a near universal coverage level of 99.4%, a level reached back in 2015. LTE coverage improved slightly, at 0.5 percentage points, as LTE networks reached 98.7% of Italian households. Furthermore, on average, after taking into account coverage of all LTE operators, 88.7% of Italians were able to use LTE services as of June 2017.

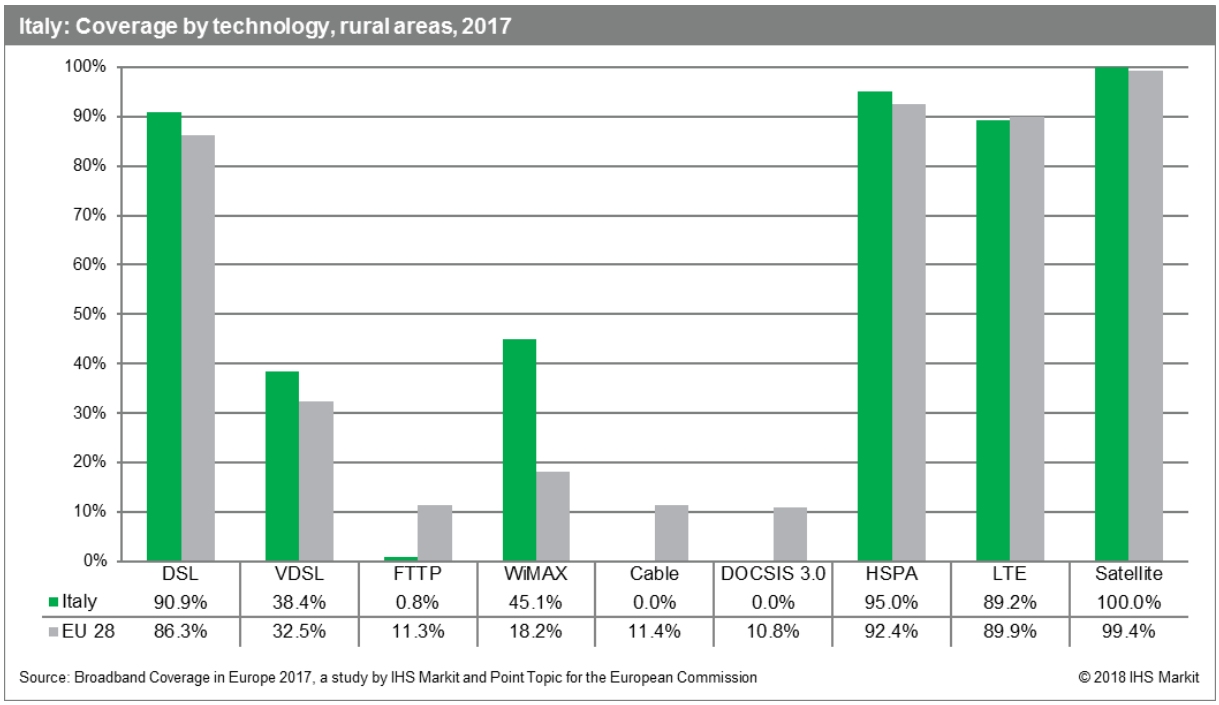
[50] https://www.enel.com/media/press/d/2016/10/enel-signs-agreement-for-the-acquisition-of-metroweb

[51] http://www.telecomitalia.com/tit/en/archivio/media/note-stampa/market/2017/NS-TIM-1000-Mega.html



In terms of rural coverage, DSL remained the key technology providing fixed broadband access, increasing by 1.6 percentage points to reach 90.9% of rural Italian households. WiMAX also continued to be an important technology in rural Italy, covering 45.1% of rural households. Looking at rural NGA technologies, VDSL coverage increased by 23.2 percentage points to reach 38.4% of rural households, moving above the EU average of 32.5%. The only other rural NGA technology in Italy, FTTP, remained at 0.8% coverage during the period, as FTTP services remained primarily available in North Italian cities, such as Milan, Bologna and Turin. However, this is expected to change, with Enel's Open Fiber planning to deploy an FTTP network in rural areas after winning the first government tender to deploy ultrafast broadband in areas of market failure.[52]

Rural HSPA coverage was relatively unchanged at 95.0%, staying above the EU average (92.4%). On the other hand, rural LTE coverage remained below the EU average (89.9%), despite an increase of 3.7 percentage points in the twelve months to mid-2017.

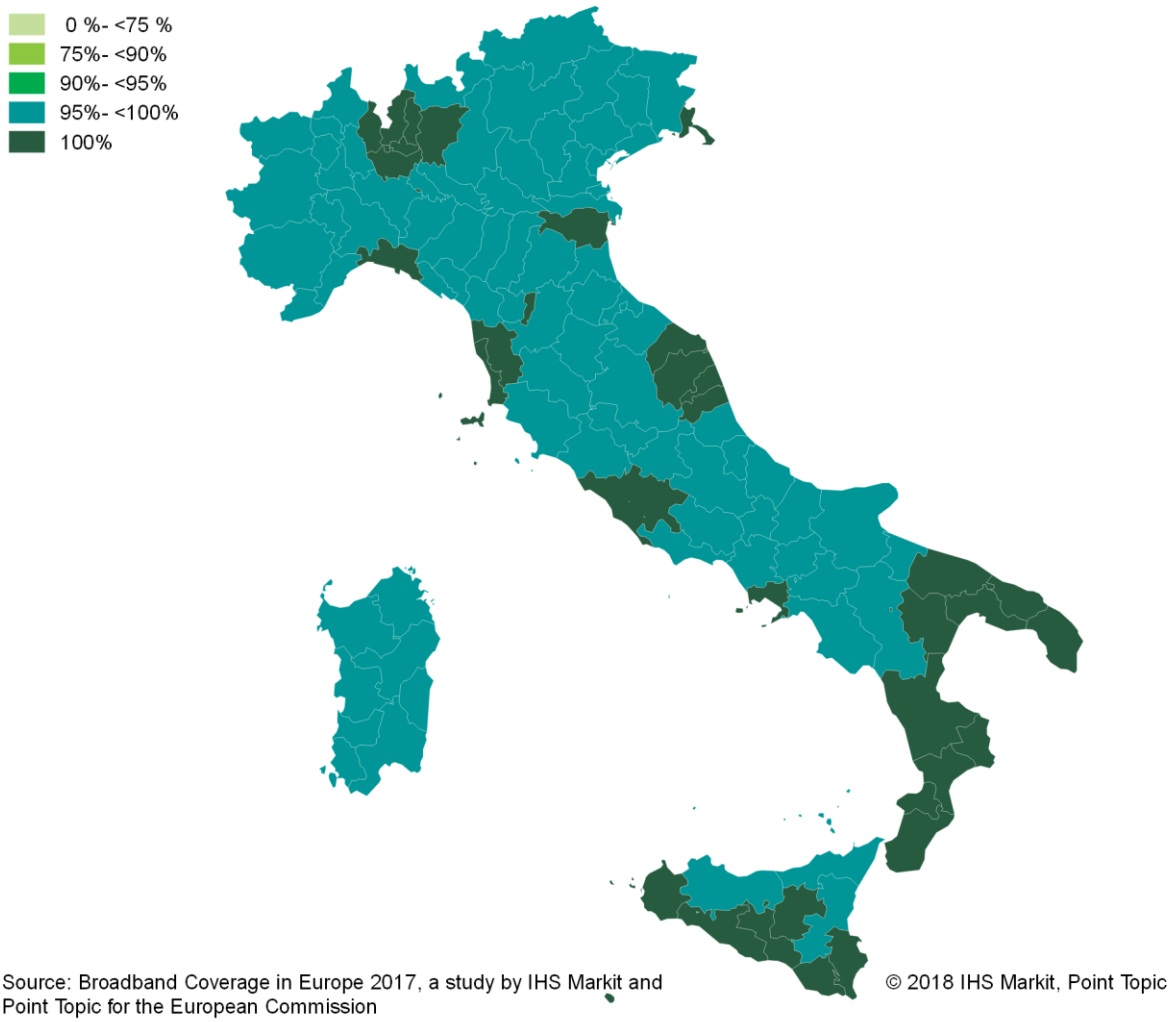


[52] http://bandaultralarga.italia.it/en/open-fiber-won-the-first-infratel-tender/

5.16.2 Regional coverage by broadband technology

As was the case in the previous iteration of the study, there was relatively little regional variation in terms of fixed broadband coverage in Italy. With the exception of Massa-Carrara, Pordenone, Treviso and Udine, all regions registered fixed broadband coverage levels above 97%.

Italy: Overall fixed broadband coverage, 2017

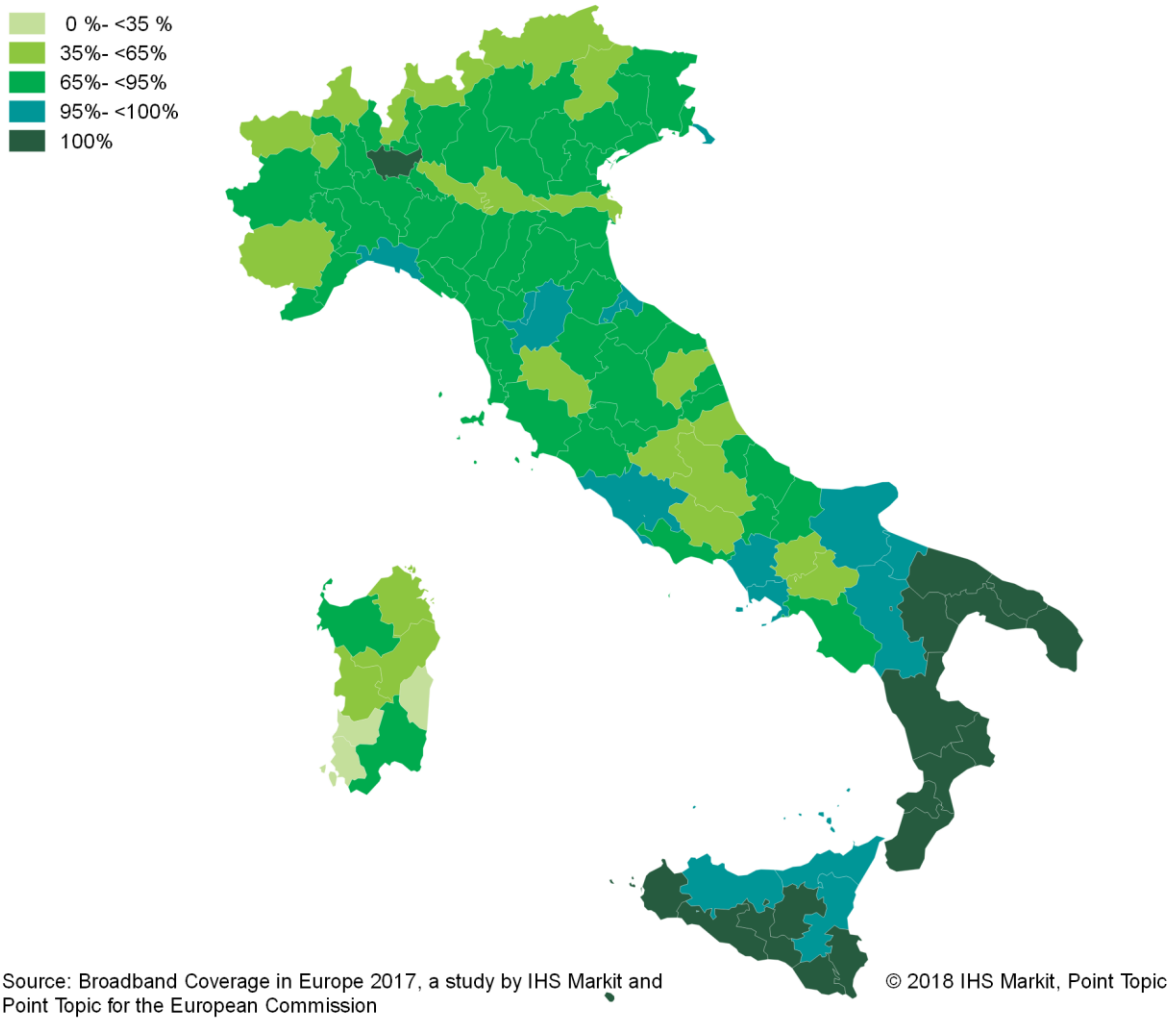


Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Unlike fixed broadband coverage, there was substantial variation in NGA availability among Italian regions. NGA networks were absent in Ogliastra, whilst less than a third of homes in two regions (Carbonia-Iglesias and Medio Campidano) were passed by NGA services.

On the other hand, seventeen regions had complete NGA coverage, including Milan and Bari. Furthermore, NGA coverage exceeded 98% in a further six regions, including Naples. Other major urban areas such as Bologna, Genoa and Rome all experienced high NGA availability (between 94-97%).

Italy: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.16.3 Data tables for Italy

Statistic	National
Population	60,665,551
Persons per household	2.4
Rural proportion	12.1%

	Italy 2017		Italy 2016		Italy 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	98.6%	90.9%	98.4%	89.4%	98.4%	89.4%	94.1%	86.3%
VDSL	82.4%	38.4%	66.4%	15.2%	32.8%	3.1%	53.4%	32.5%
FTTP	21.7%	0.8%	18.8%	0.8%	16.4%	0.0%	26.8%	11.3%
WiMAX	46.9%	45.1%	46.9%	45.1%	47.0%	47.1%	18.0%	18.2%
Cable	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	45.1%	11.4%
DOCSIS 3.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	44.7%	10.8%
HSPA	99.4%	95.0%	99.4%	94.9%	98.3%	86.3%	97.9%	92.4%
LTE	98.7%	89.2%	98.2%	85.5%	89.7%	26.8%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	88.7%	-	86.2%	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.8%	98.4%	99.8%	98.2%	99.6%	96.7%	99.9%	99.4%
Overall fixed broadband	99.3%	94.8%	99.3%	94.0%	99.3%	94.0%	97.4%	92.4%
NGA broadband	86.8%	39.2%	72.3%	16.0%	41.0%	3.1%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	21.7%	-	-	-	-	-	57.8%	-
At least 2 Mbps	98.5%		98.2%	-	98.1%	-	96.0%	-
At least 30 Mbps	86.2%		71.8%	-	43.6%	-	79.0%	-
At least 100 Mbps	21.7%		18.8%	-	16.4%	-	55.1%	-

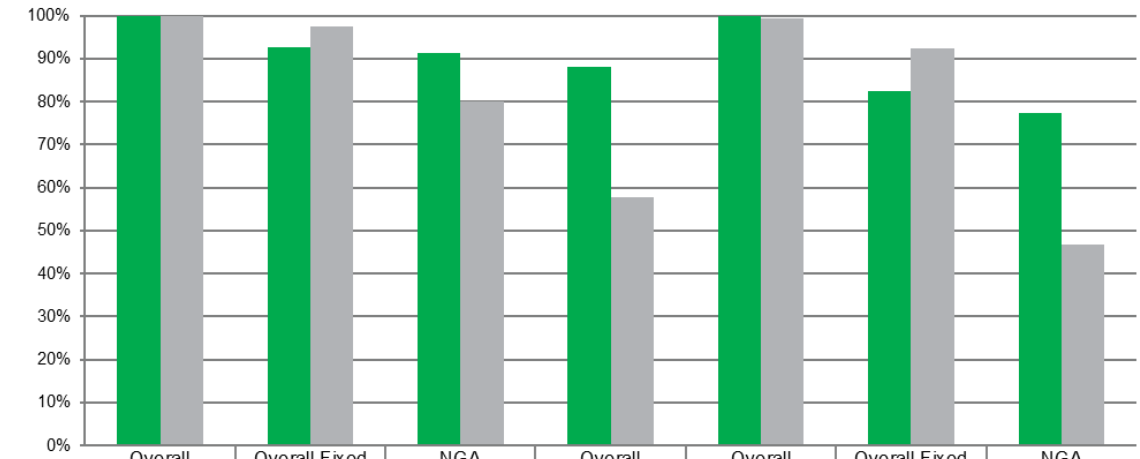
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.17 Latvia

5.17.1 National coverage by broadband technology

By mid-2017, Latvia recorded universal overall broadband coverage, as was the case in the previous year. Moreover, fixed broadband coverage remained lower than the EU average at both a national and rural level, reaching 92.7% of total Latvian households and 82.4% of rural Latvian households. NGA broadband coverage remained higher than the average EU coverage due to the well-developed FTTP infrastructure in Latvia. NGA broadband technologies were available to 91.3% of the total households, exceeding the EU average by 11.3 percentage points. In rural areas, NGA broadband reached 77.4% of households, surpassing the EU average by 30.5 percentage points.

Latvia: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Latvia	100.0%	92.7%	91.3%	88.1%	100.0%	82.4%	77.4%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Examining individual technologies, over the twelve months to the end of June 2017, DSL decreased by 1.7 percentage points. With only 40.1% of households having access to DSL, Latvia was the study country with the lowest DSL availability. Despite a year-on-year increase of 1.4 percentage points, VDSL availability also remained low, covering only 19.1% of the Latvian homes. Cable also remained below the EU average, covering 34.7% of Latvian households. Despite a decrease of 3.5 percentage points, WiMAX availability in Latvia remained significantly above the EU average, at 41.3%.

The most noteworthy feature of the Latvian market is that it is the country with the second highest FTTP availability (after Portugal). Fibre-optic technologies passed over 85.3% of households, making FTTP the prevalent fixed broadband technology, with availability 3.2 times higher than the EU average of 26.8%. As mentioned in previous reports, the structure of the Latvian market is highly determined by the incumbent Lattelecom, who has been developing the country's FTTP-dominant broadband infrastructure since 2009.[53] Due to the rapid development of FTTP, availability of the remaining NGA technologies is lower than the EU average. Only 19.1% of the Latvian households had access to VDSL, while DOCSIS 3.0 is available to 29.0%.

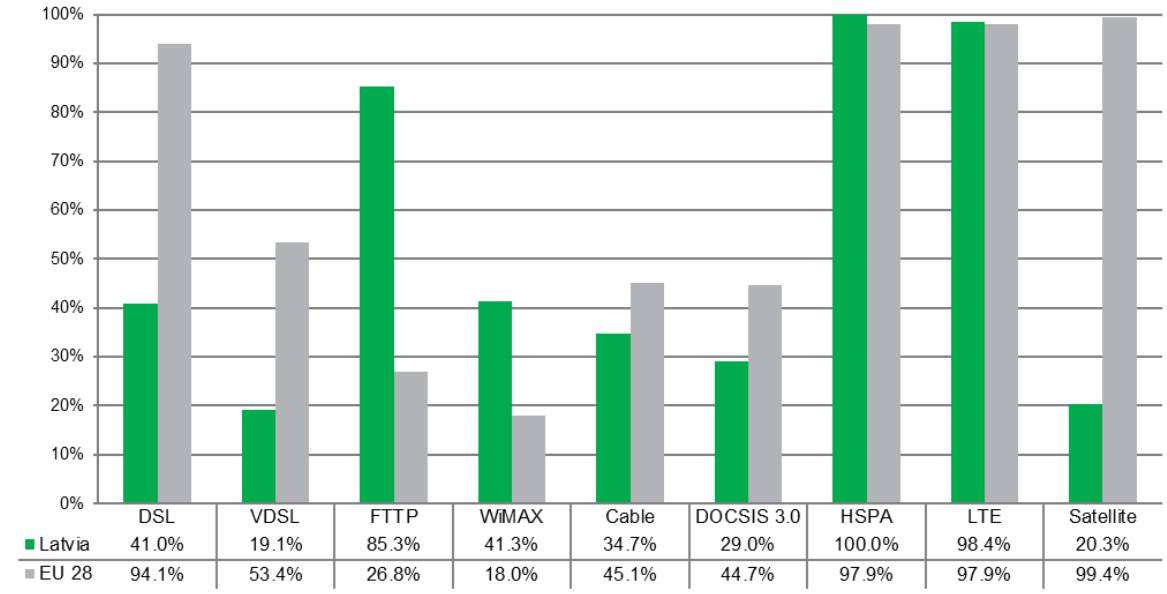
HSPA coverage remained universal over the twelve months to mid-2017, while LTE availability improved by 5.5 percentage points, surpassing the EU average and reaching 98.4% of Latvian homes. With LTE broadband nearing ubiquitous coverage, operators focused on rolling out LTE-A networks. Tele2 Latvia continued to deploy LTE-A base stations across Latvia, and reported coverage of 70% of the population by September 2017.[54] When considering an average coverage of all LTE network operators, on average LTE services were available to 97.7% of Latvians at mid-2017.

[53] http://www.csimagazine.com/news-30-01-2009-lattelcom.php

[54] https://www.tele2.lv/tele2/tele2-jaunumi/jaunums/tele2-ieverojami-palielina-mobila-intern/

As in the other two Baltic countries, Estonia and Lithuania, satellite broadband availability in Latvia remained limited, covering only 20.3% of the country's households.

Latvia: Coverage by technology, total, 2017



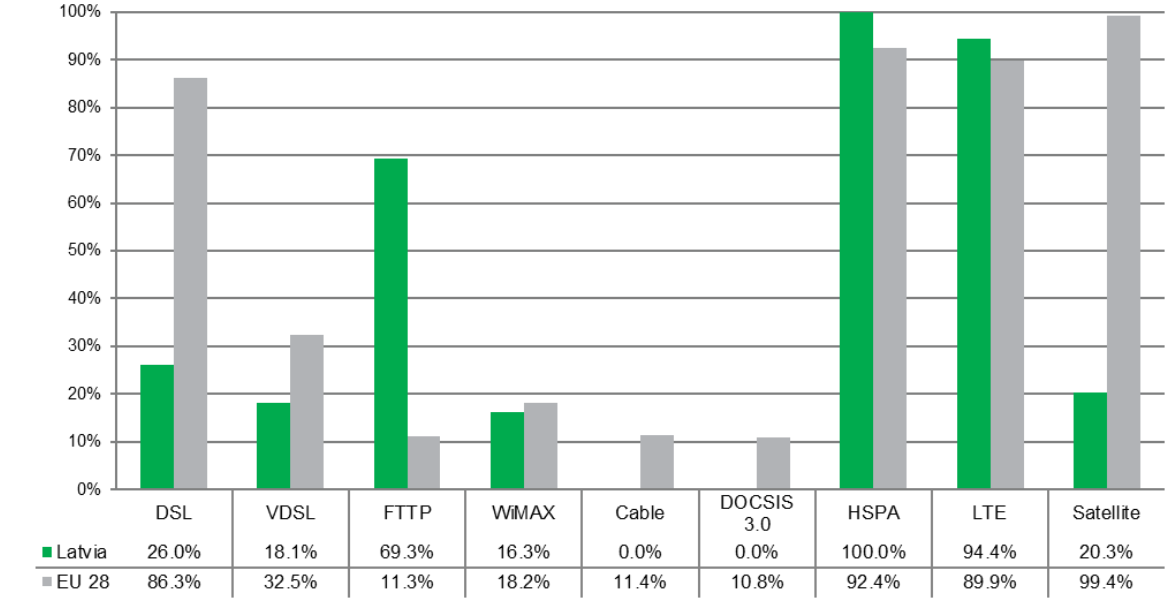
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Latvia	41.0%	19.1%	85.3%	41.3%	34.7%	29.0%	100.0%	98.4%	20.3%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In rural areas, FTTP remains the most widespread technology, covering 69.3% of rural households, over 6 times the EU average. VDSL availability remained unchanged, passing 18.1% of rural homes in Latvia. Meanwhile, DOCSIS 3.0 remained absent from rural areas. Following these developments, non-NGA technologies in Latvia declined over the study period. DSL decreased by nearly 2 percentage points and was available to only 26.0% of the rural households, while WiMAX broadband availability reduced from 24.7% to 16.3%.

Availability of LTE broadband in rural areas improved by 8.7 percentage points over the twelve months to the end of June 2017, reaching 94.4% of homes.

Latvia: Coverage by technology, rural areas, 2017



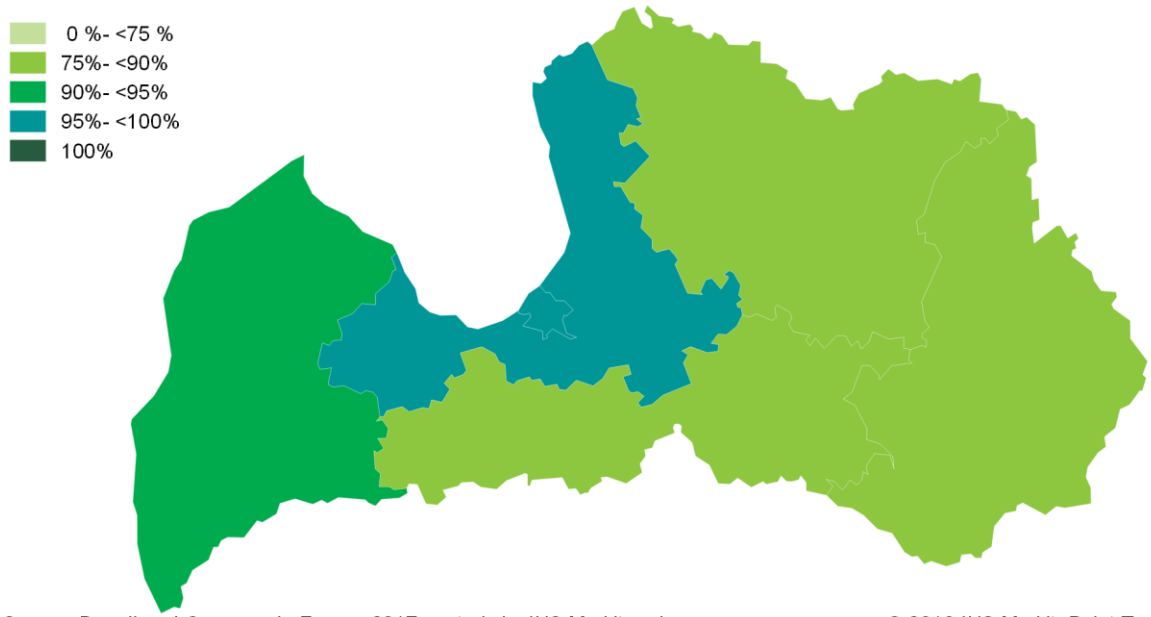
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Latvia	26.0%	18.1%	69.3%	16.3%	0.0%	0.0%	100.0%	94.4%	20.3%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.17.2 Regional coverage by broadband technology

There was a lot of variation in fixed broadband coverage across the different regions in Latvia. The capital, Riga, had the highest fixed broadband availability at 99.5%. However, the regions with the highest percentage of rural households – the Eastern regions of Zemgale, Vidzeme and Latgale – had fixed broadband coverage below 90%, with availability in the latter as low as 80.9%.

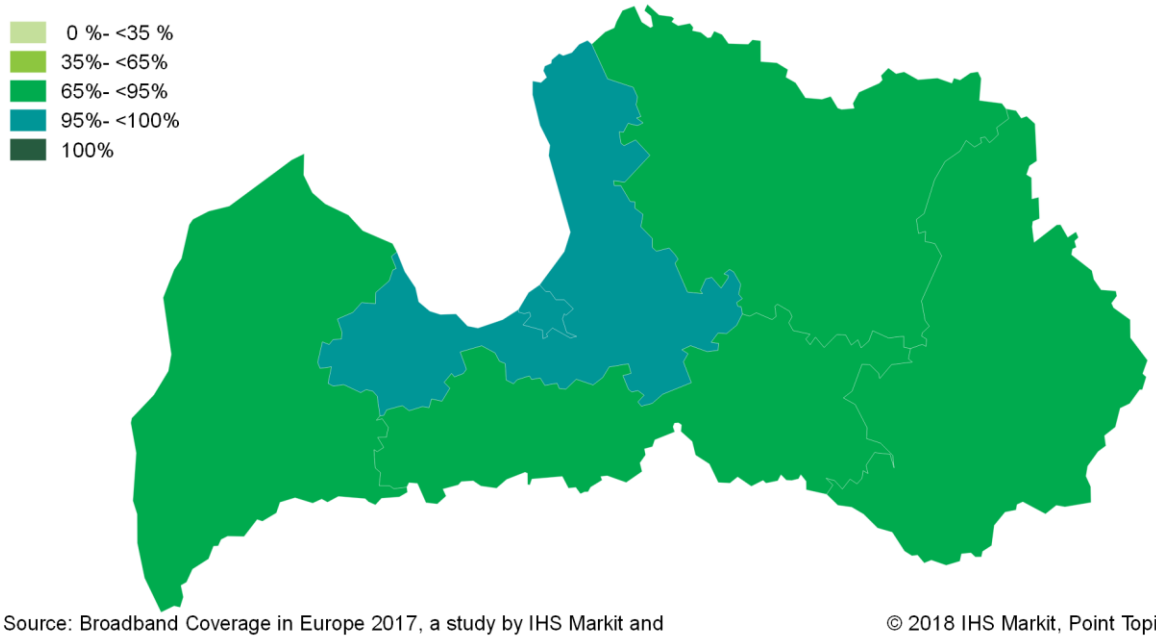
Latvia: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Analysing regional NGA coverage, high-speed broadband was available in Riga and the surrounding region of Pieriga, while the rest of the country had coverage between 71.3% and 93.8%, the lowest being in Latgale.

Latvia: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.17.3 Data tables for Latvia

Statistic	National
Population	1,986,096
Persons per household	2.6
Rural proportion	28.0%

	Latvia 2017		Latvia 2016		Latvia 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	41.0%	26.0%	42.7%	28.0%	42.3%	9.0%	94.1%	86.3%
VDSL	19.1%	18.1%	17.6%	17.7%	14.8%	0.0%	53.4%	32.5%
FTTP	85.3%	69.3%	85.2%	69.3%	85.0%	67.3%	26.8%	11.3%
WiMAX	41.3%	16.3%	44.8%	24.7%	44.9%	24.1%	18.0%	18.2%
Cable	34.7%	0.0%	34.7%	0.0%	34.5%	0.0%	45.1%	11.4%
DOCSIS 3.0	29.0%	0.0%	29.0%	0.0%	28.8%	0.0%	44.7%	10.8%
HSPA	100.0%	100.0%	100.0%	100.0%	99.2%	97.3%	97.9%	92.4%
LTE	98.4%	94.4%	93.0%	85.6%	89.0%	61.4%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	97.7%	-	90.7%	-			90.8%	-
Satellite	20.3%	20.3%	20.3%	20.3%	20.3%	20.3%	99.4%	99.4%
Overall broadband	100.0%	100.0%	100.0%	100.0%	99.6%	98.7%	99.9%	99.4%
Overall fixed broadband	92.7%	82.4%	92.6%	83.3%	92.5%	77.8%	97.4%	92.4%
NGA broadband	91.3%	77.4%	91.1%	77.0%	90.7%	67.3%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	88.1%	-	-	-	-	-	57.8%	-
At least 2 Mbps	92.6%	-	92.6%	-	92.5%	-	96.0%	-
At least 30 Mbps	90.7%	-	90.4%	-	89.8%	-	79.0%	-
At least 100 Mbps	86.9%	-	86.8%	-	86.4%	-	55.1%	-

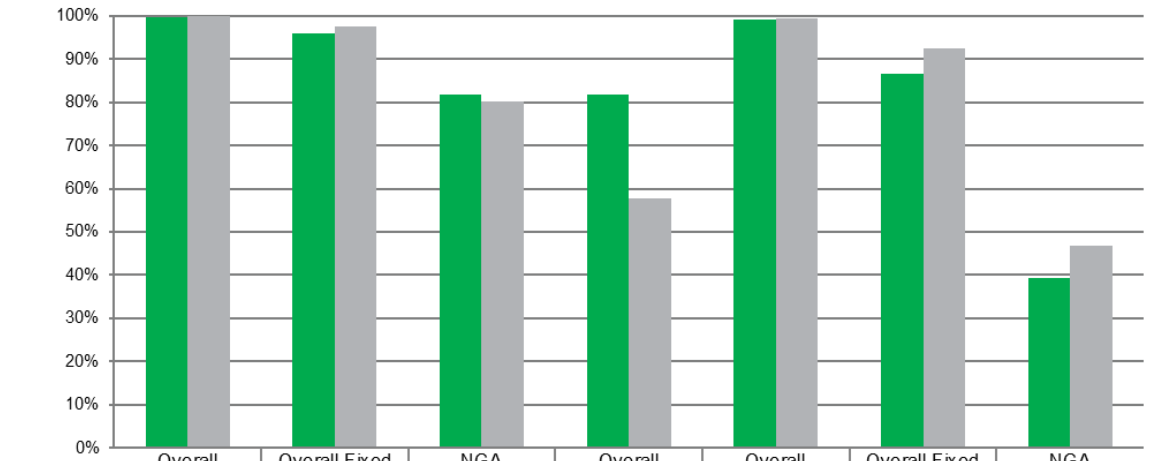
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.18 Lithuania

5.18.1 National coverage by broadband technology

Overall broadband coverage in Lithuania remained unchanged over the twelve months to mid-2017, reaching 99.8% of Lithuanian households, slightly below the EU average of 99.9%. Similarly, availability of fixed broadband services remained stable at 95.9% on a national level and at 86.5% in rural areas, both also below EU average. NGA networks recorded a slight improvement, reaching 81.6% of Lithuanian homes, 1.5 percentage points above the average NGA availability in the EU. Despite good national coverage, NGA broadband technologies were only available to 39.4% of rural households, 7.5 percentage points below the EU average.

Lithuania: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Lithuania	99.8%	95.9%	81.6%	81.6%	99.2%	86.5%	39.4%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In relation to coverage of individual technologies, over the twelve months to the end of June 2017, DSL remained significantly below the EU average, passing 69.9% of homes. This is underpinned by the fact that Lithuania is characterised by very high FTTP levels compared to the rest of the surveyed countries, which accounts for lower levels of non-NGA technologies. Another specific feature of the Lithuanian market is the high level of WiMAX coverage, which continued to be available to over 9 out of 10 homes (91.0%), more than 5 times higher than the EU average. Concerning cable broadband, this technology was available to over half the Lithuanian households, at 52.3%.

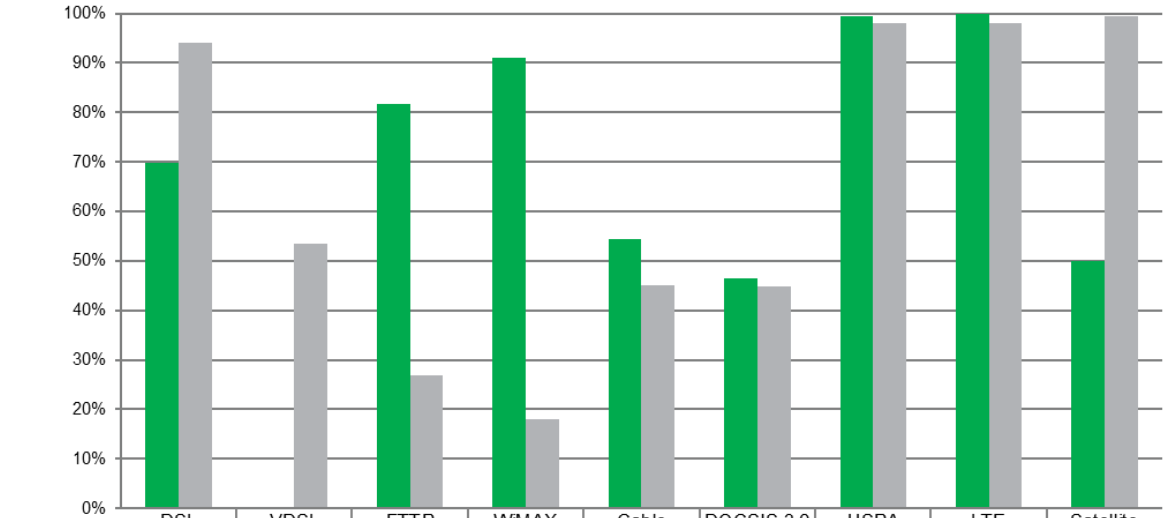
As mentioned, FTTP remained the dominant NGA technology in this market. Achieving coverage of 81.6%, FTTP in Lithuania soared 54.8 percentage points above the EU average. Coverage of DOCSIS 3.0 networks exceeded the EU average, reaching 46.4% of the Lithuanian households. However, it should be noted that there is a significant overlap of DOCSIS 3.0 and FTTP networks, meaning that Lithuania's overall NGA coverage was equal to that of homes passed by fibre-optic networks.

There were minor improvements in HSPA and LTE coverage. HSPA broadband was available to 99.5% of Lithuanian households. Meanwhile, LTE recorded a stronger improvement over the twelve months to mid-2017, reaching 99.8% of the total homes, achieving almost universal coverage. All operators in Lithuania continued improving their LTE coverage during the twelve months to mid-2017. At the end of 2016, Bite Lithuania was completing its LTE network expansion, bringing reported coverage to 95.0% of the country's population.[55] Meanwhile, Omnitel, who has been offering LTE-A services since 2014, invested in installing new base stations to bring LTE coverage to the eastern fringes of Lithuania,

[55] https://www.telegeography.com/products/commsupdate/articles/2016/10/03/bite-4g-coverage-to-reach-95-of-lithuanians-by-year-end/

bordering with Belarus, reporting national coverage of 97%.[56] Telecentras (Lithuanian Radio and Television Centre), commercially known under the brand MEZON, also continued building up its LTE infrastructure together with developing LTE-A coverage.[57] Concerning average LTE operator coverage, this metric improved by 2.2 percentage points since mid-2016, reaching 97.7% of households.

Lithuania: Coverage by technology, total, 2017

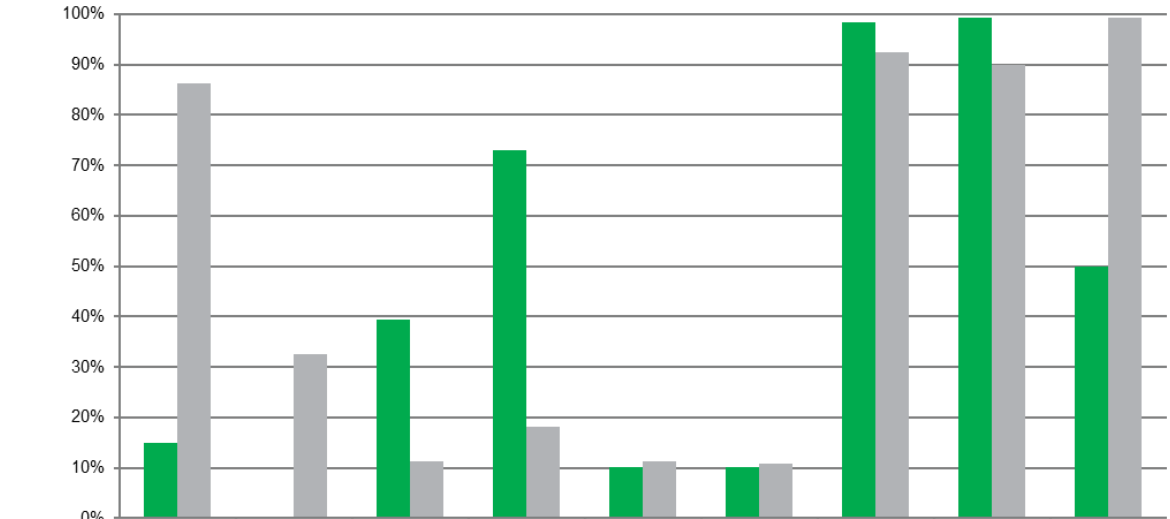


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Lithuania	69.9%	0.0%	81.6%	91.0%	54.3%	46.4%	99.5%	99.8%	50.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Looking at rural broadband availability, WiMAX remained the key technology over the twelve months to the end of June 2017. It was available to 73.0% of the rural households in Lithuania, adding 2.6 percentage points since mid-2016. FTTP was the second most prevalent technology, with 39.4% availability, recording a slight increase in the period. FTTP coverage in rural areas of Lithuania was 3.5 times higher than the EU average. As on a national level, DSL in rural areas remained low, passing only 15% of households. Rural LTE availability improved by 1.3 percentage points, reaching nearly universal coverage of 99.4%.

Lithuania: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Lithuania	15.0%	0.0%	39.4%	73.0%	10.2%	10.2%	98.4%	99.4%	50.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

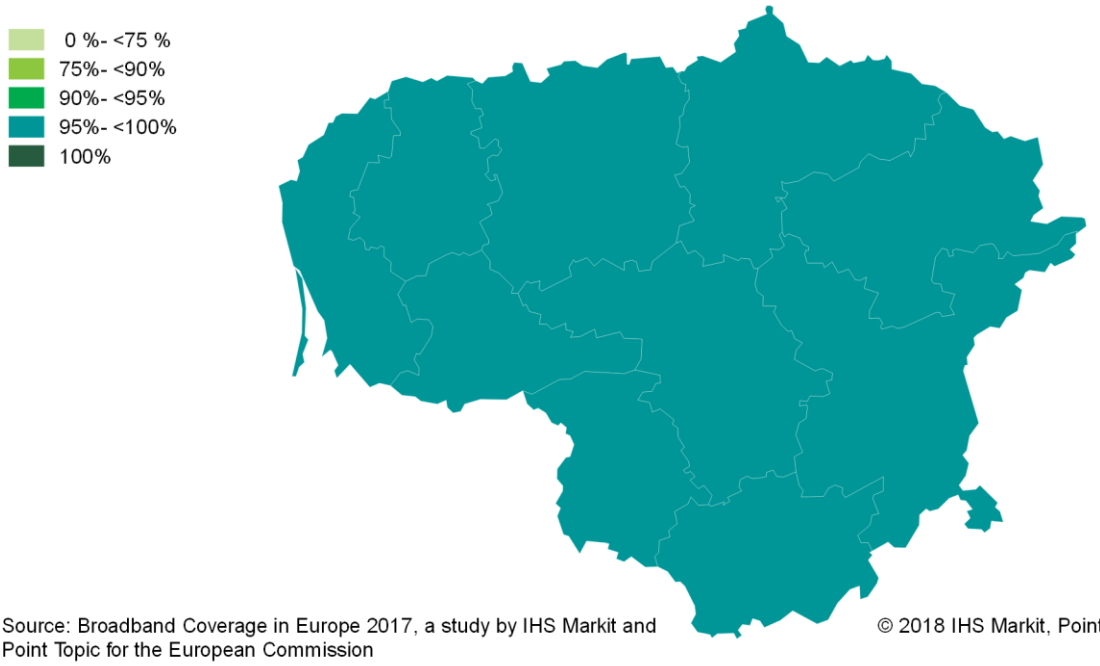
Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

[56] https://www.telegeography.com/products/commsupdate/articles/2016/10/31/omnitel-brings-4g-coverage-to-eastern-border/
[57] https://www.telegeography.com/products/commsupdate/articles/2016/12/15/telecentras-lte-footprint-reaches-170-towns/

5.18.2 Regional coverage by broadband technology

Similar to last year, fixed broadband coverage in Lithuania exceeded 95% in all regions, with coverage being lowest in the region of Utenos at 95% and highest in the Kauno region at 97.0%. The capital region of Vilniaus had 95.6% fixed broadband availability.

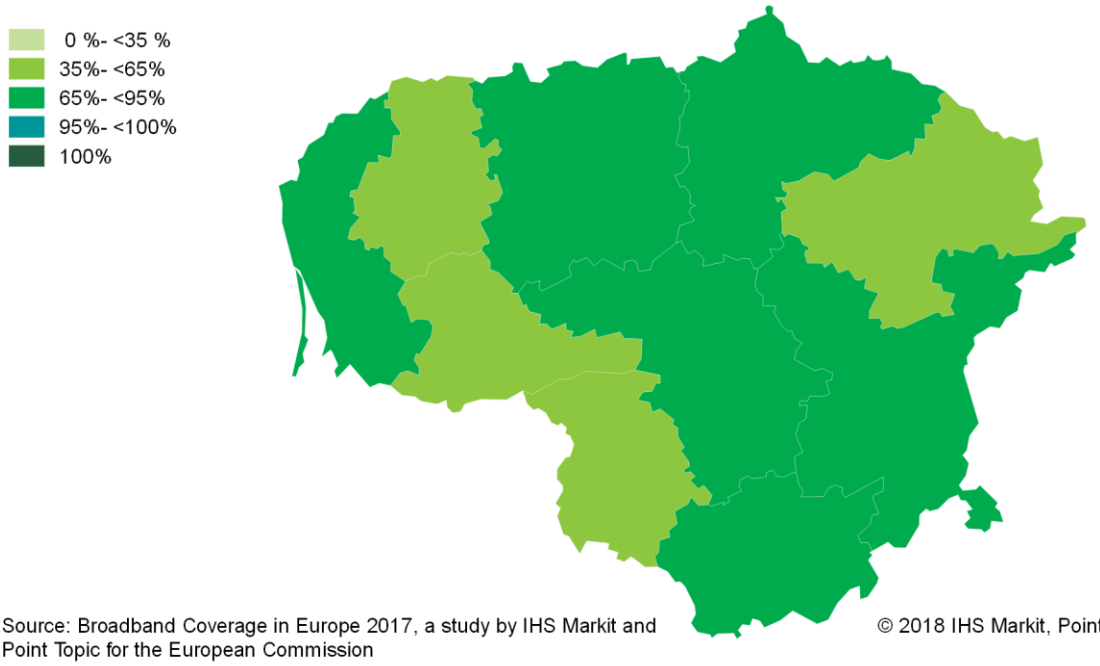
Lithuania: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

NGA coverage in Lithuania remained varied across the different regions, ranging from 51.4% in the Utenos region to 94.1% in the region of Kauno.

Lithuania: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.18.3 Data tables for Lithuania

Statistic	National
Population	2,921,262
Persons per household	2.3
Rural proportion	30.3%

	Lithuania 2017		Lithuania 2016		Lithuania 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	69.9%	15.0%	69.8%	15.7%	69.8%	15.7%	94.1%	86.3%
VDSL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	53.4%	32.5%
FTTP	81.6%	39.4%	81.4%	38.8%	81.4%	38.8%	26.8%	11.3%
WiMAX	91.0%	73.0%	91.0%	70.5%	91.0%	70.5%	18.0%	18.2%
Cable	54.3%	10.2%	54.0%	9.2%	54.0%	9.2%	45.1%	11.4%
DOCSIS 3.0	46.4%	10.2%	46.3%	9.2%	46.3%	9.2%	44.7%	10.8%
HSPA	99.5%	98.4%	99.4%	98.1%	99.4%	98.1%	97.9%	92.4%
LTE	99.8%	99.4%	99.4%	98.1%	99.4%	98.1%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	97.7%	-	95.7%	-			90.8%	-
Satellite	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	99.4%	99.4%
Overall broadband	99.8%	99.2%	99.7%	99.0%	99.7%	99.0%	99.9%	99.4%
Overall fixed broadband	95.9%	86.5%	95.9%	86.5%	95.9%	86.5%	97.4%	92.4%
NGA broadband	81.6%	39.4%	81.4%	38.8%	81.4%	38.8%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	81.6%	-	-	-	-	-	57.8%	-
At least 2 Mbps	97.9%	-	97.7%	-	97.7%	-	96.0%	-
At least 30 Mbps	94.0%	-	91.0%	-	91.0%	-	79.0%	-
At least 100 Mbps	81.6%	-	81.4%	-	81.4%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

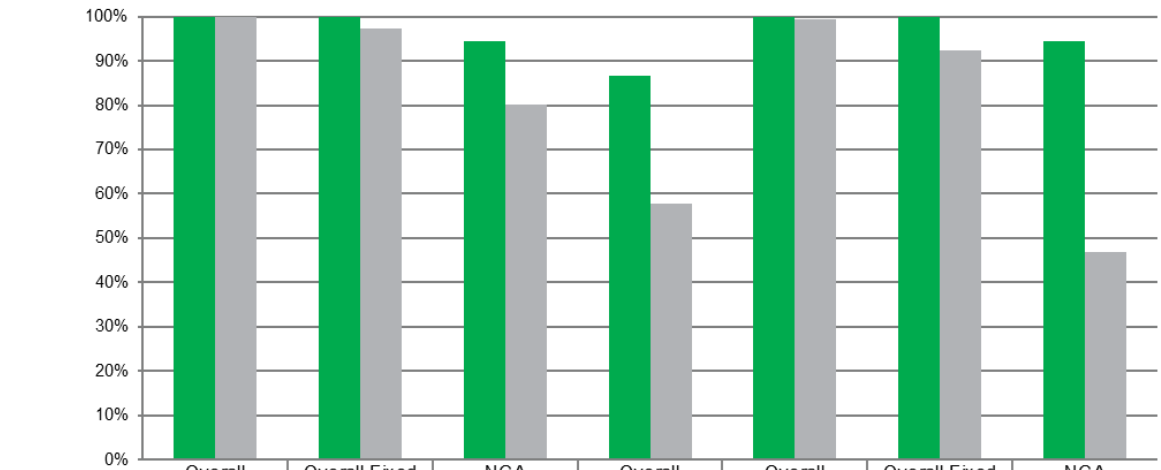
5.19 Luxembourg

5.19.1 National coverage by broadband technology

Given the high coverage levels already achieved in previous years, Luxembourg witnessed limited change concerning the technology combination categories. There continued to be universal coverage of both overall broadband and overall fixed broadband at a total level, in addition to near universal coverage of both overall broadband and overall fixed broadband at a rural level. NGA coverage at a total level improved by 0.2 percentage points to reach 94.6% of households, whilst at a rural level, NGA coverage grew by 0.4 percentage points, covering 94.5% of rural households. As was the case in the previous edition of the study, Luxembourg exceeded the EU average for all technology combination categories.

Luxembourg benefits from the fact that it covers a geographically small area in comparison to its neighbours. Therefore, extending NGA technologies such as FTTP and DOCSIS 3.0 has been somewhat easier in Luxembourg than in other European countries.

Luxembourg: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Luxembourg	100.0%	100.0%	94.6%	86.6%	99.9%	99.9%	94.5%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Looking at the individual technologies, Luxembourg outperformed the EU average for coverage of all technologies, with the exception of WiMAX, which is not present in the country. There continued to be universal DSL coverage in Luxembourg, whilst VDSL networks reached 87.2% of households.

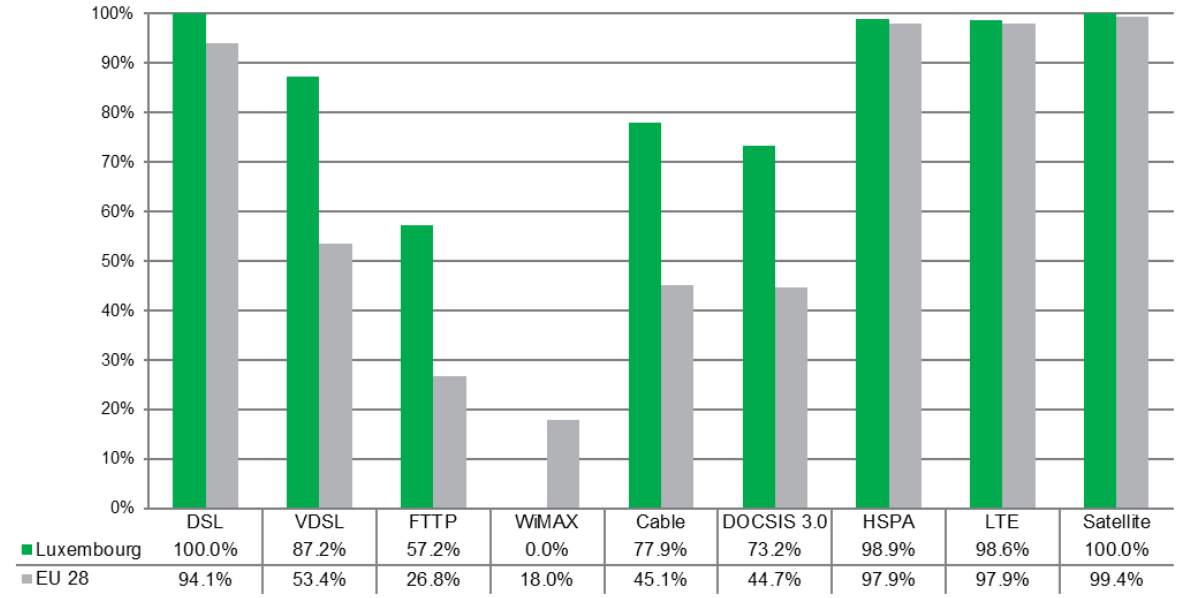
Cable networks reached 77.9% of households in Luxembourg, with the majority of these cable networks upgraded to DOCSIS 3.0, which passed 73.2% of homes. In terms of other NGA technologies, growth of FTTP services remained consistent with previous years, increasing by 5.7 percentage points to reach 57.2% of households. This is more than twice the EU average (26.8%), underpinned by investments from incumbent operator, P&T, and alternative operator, Tango.

As was the case in mid-2016, HSPA networks provided near universal coverage (98.9%). LTE networks recorded an increase of 0.5 percentage points, reaching 98.6% of households, whilst the average LTE coverage of all operators reached 98.3% by mid-2017. Mobile network operators, including Tango[58] and Orange[59], have continued to invest in LTE-Advanced technology, enabling greater speeds to be achieved over LTE networks.

[58] http://www.wort.lu/en/lifestyle/first-quarter-2015-faster-4g-network-for-luxembourg-next-year-says-tango-548efa080c88b46a8ce48144

[59] https://corporate.orange.lu/en/page/our-network

Luxembourg: Coverage by technology, total, 2017



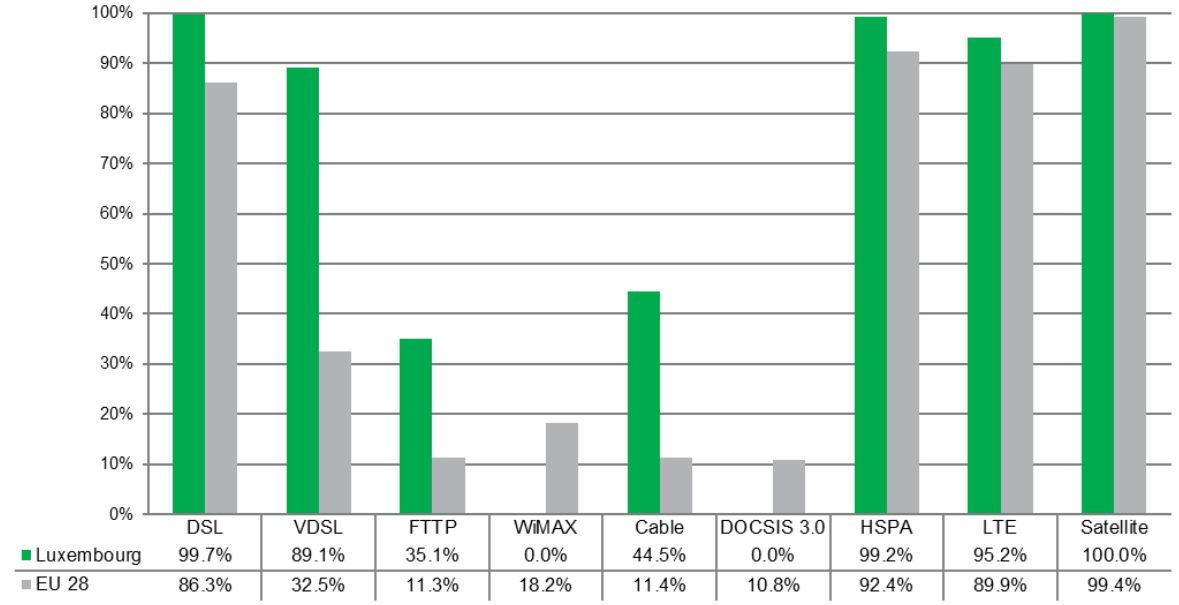
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Luxembourg	100.0%	87.2%	57.2%	0.0%	77.9%	73.2%	98.9%	98.6%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

The rural coverage of individual broadband technologies remained relatively unchanged throughout the twelve months to the end of June 2017. By mid-2017, Luxembourg had near universal coverage of DSL networks, whilst VDSL networks reached 89.1% of rural households. Rural VDSL coverage in Luxembourg was behind only Iceland (92.3%) among the study countries. Moreover, cable network passed 44.5% of rural homes, whilst FTTP coverage reached 35.1% of households. As was the case in previous years, DOCSIS 3.0 and WiMAX networks continued to be unavailable to rural households.

A 3.9 percentage point growth in rural LTE coverage meant 95.2% of rural households in Luxembourg had access to LTE services by mid-2017. Rural HSPA coverage in Luxembourg remained unchanged (99.2%), but continued to be well above the EU average of 92.4%.

Luxembourg: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Luxembourg	99.7%	89.1%	35.1%	0.0%	44.5%	0.0%	99.2%	95.2%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

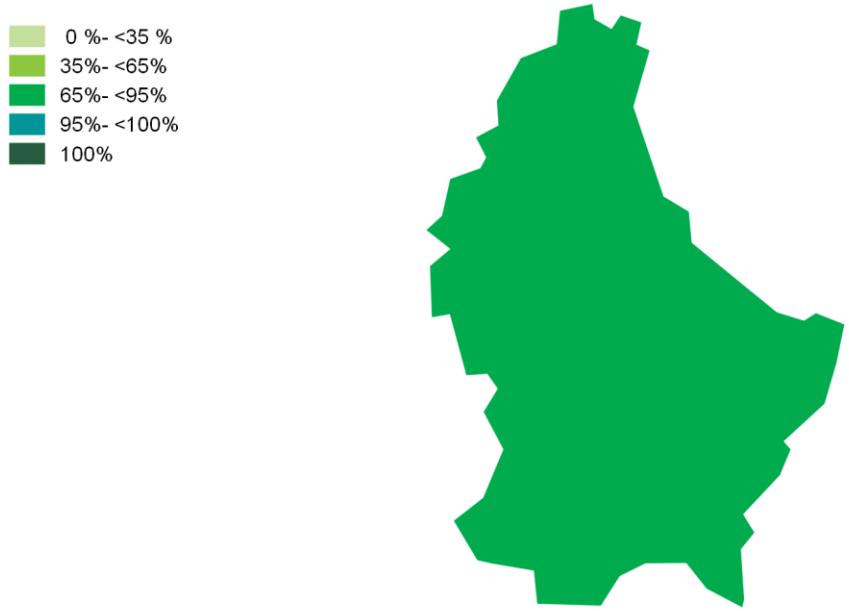
Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.19.2 Regional coverage by broadband technology

Luxembourg: Overall fixed broadband coverage, 2017

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Luxembourg: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.19.3 Data tables for Luxembourg

Statistic	National
Population	576,249
Persons per household	2.5
Rural proportion	11.5%

	Luxembourg 2017		Luxembourg 2016		Luxembourg 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	99.7%	100.0%	99.7%	100.0%	99.9%	94.1%	86.3%
VDSL	87.2%	89.1%	88.2%	88.2%	88.8%	88.3%	53.4%	32.5%
FTTP	57.2%	35.1%	51.5%	*35.0%*	47.1%	*29.0%*	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	18.2%
Cable	77.9%	44.5%	78.6%	46.3%	80.5%	42.1%	45.1%	11.4%
DOCSIS 3.0	73.2%	0.0%	74.3%	0.0%	75.2%	0.0%	44.7%	10.8%
HSPA	98.9%	99.2%	98.9%	99.2%	99.6%	99.6%	97.9%	92.4%
LTE	98.6%	95.2%	98.1%	91.3%	96.2%	91.2%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	98.3%	-	95.4%	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	99.9%	100.0%	100.0%	100.0%	100.0%	99.9%	99.4%
Overall fixed broadband	100.0%	99.9%	100.0%	100.0%	100.0%	100.0%	97.4%	92.4%
NGA broadband	94.6%	94.5%	94.4%	94.1%	94.4%	94.1%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	86.6%	-	-	-	-	-	57.8%	-
At least 2 Mbps	100.0%	-	100.0%	-	100.0%	-	96.0%	-
At least 30 Mbps	93.2%	-	94.1%	-	94.4%	-	79.0%	-
At least 100 Mbps	86.6%	-	89.7%	-	87.6%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA

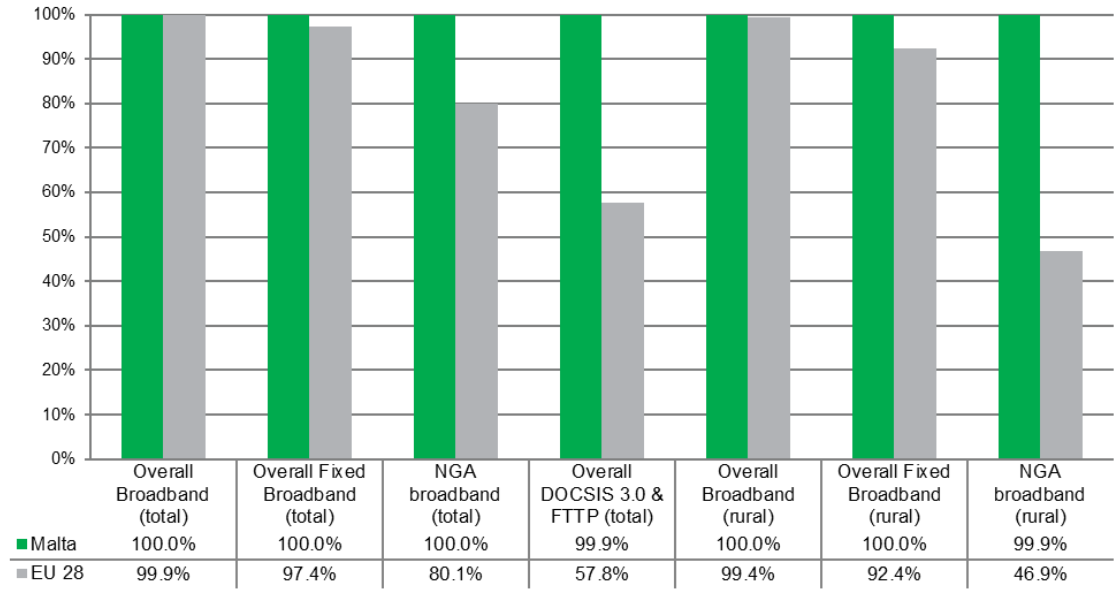
All restatements are highlighted in italics.

5.20 Malta

5.20.1 National coverage by broadband technology

As was the case last year, Malta recorded no change in coverage for any of the three coverage combination categories. Malta remained the only country with near universal coverage across all coverage combination categories, at both a national and rural level.

Malta: Coverage by technology combination, 2017

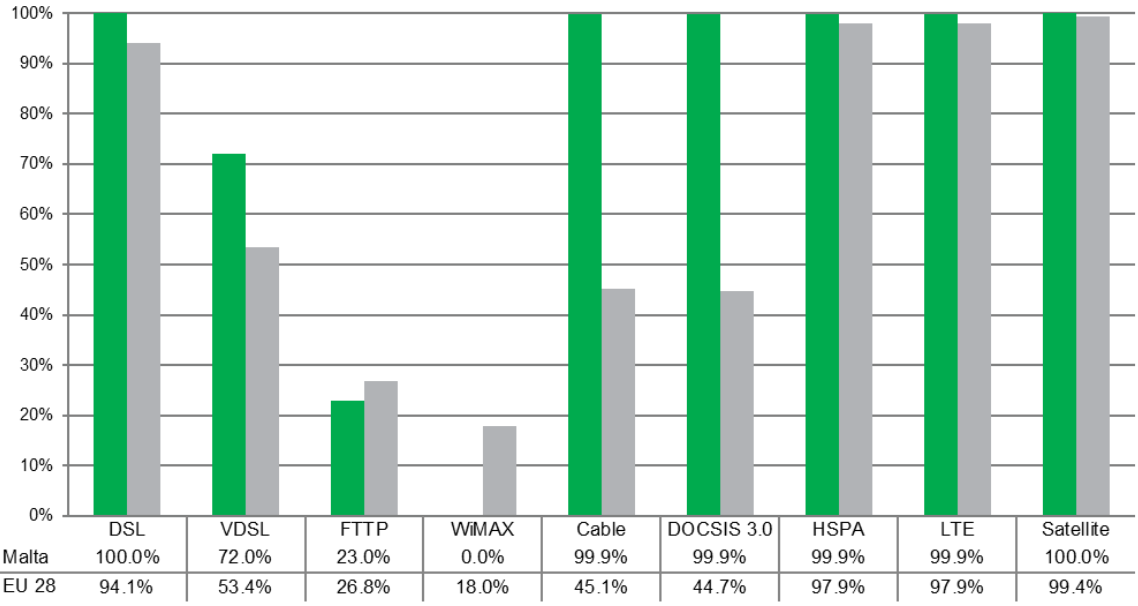


	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Malta	100.0%	100.0%	100.0%	99.9%	100.0%	100.0%	99.9%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

As highlighted in previous editions of this study, Malta has a number of geographical advantages, which enables it to achieve universal broadband coverage above the EU average. For instance, Malta is a small, very densely populated island with a small rural population (only 1% of households were identified as rural).

Malta: Coverage by technology, total, 2017



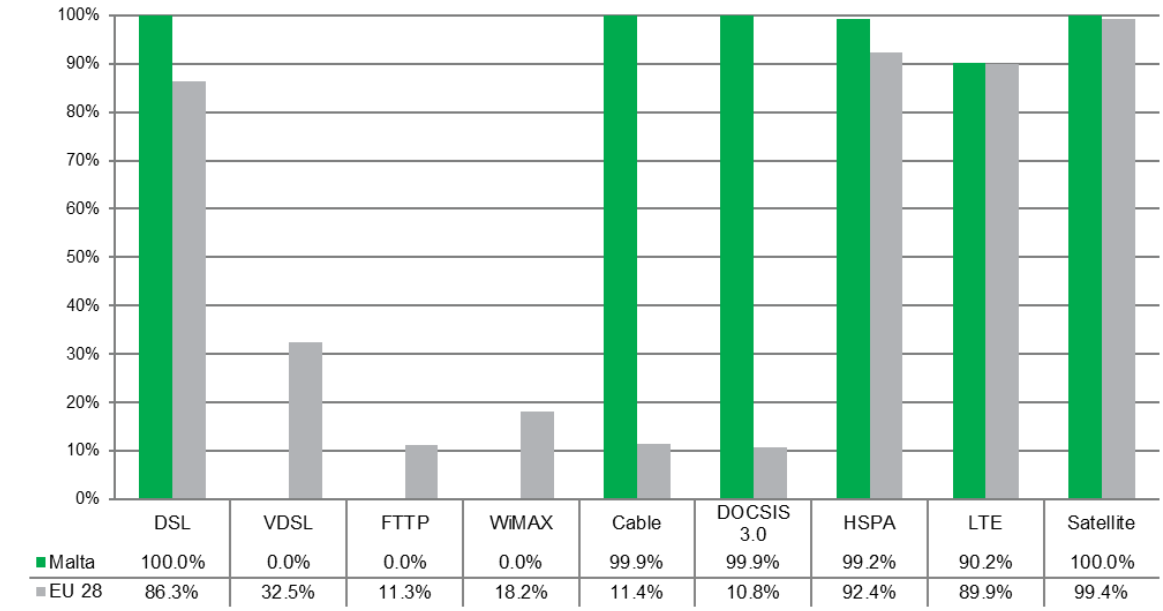
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Malta	100.0%	72.0%	23.0%	0.0%	99.9%	99.9%	99.9%	99.9%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Examining individual technologies, Malta reported complete coverage across a number of fixed broadband access technologies, including DSL, Cable and DOCSIS 3.0. In terms of other fixed broadband technologies, the proportion of homes passed by VDSL networks remained unchanged at 72.0%. Moreover, FTTP coverage improved by 7.0 percentage points to reach 23.0% of households, underpinned by telecom operator GO's EUR 50 million investment in FTTP networks.[60] As was the case last year, there was no WiMAX coverage in Malta, as provision of WiMAX services ceased during the twelve months leading up to June 2016. Vodafone Malta, the sole provider of WiMAX technology, discontinued its WiMAX service and migrated existing customers to fixed broadband services.[61]

In terms of mobile technologies, Malta recorded near universal coverage of HSPA and LTE networks in the previous iteration of the study. Therefore, there was limited mobile network coverage growth, with LTE coverage increasing by 0.4 percentage points to cover 99.9% of households. With near universal LTE coverage, mobile network operators GO and Vodafone Malta deployed LTE-Advanced services during the period, enabling greater speeds to be achieved over LTE networks. [62][63]

Malta: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Malta	100.0%	0.0%	0.0%	0.0%	99.9%	99.9%	99.2%	90.2%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

When examining rural broadband coverage in Malta, it is important to note the small number (less than 1%) of Maltese households considered rural. As a result, Malta registered complete rural coverage for DSL, cable, and satellite broadband. VDSL and FTTP networks remained absent from rural areas, therefore, DOSCIS 3.0 remained the sole NGA access technology available to rural households. DOCSIS 3.0 networks maintained a near universal coverage level of 99.9%, a level already achieved in 2014.

During the period, mobile network operators continued to deploy LTE services in rural areas with rural LTE coverage growing by 39.1 percentage points, covering 90.2% of rural households.

[60] https://www.go.com.mt/-/go-investing-over-50-million-euros-to-launch-internet-of-the-future#.WrDu9MPFJhE

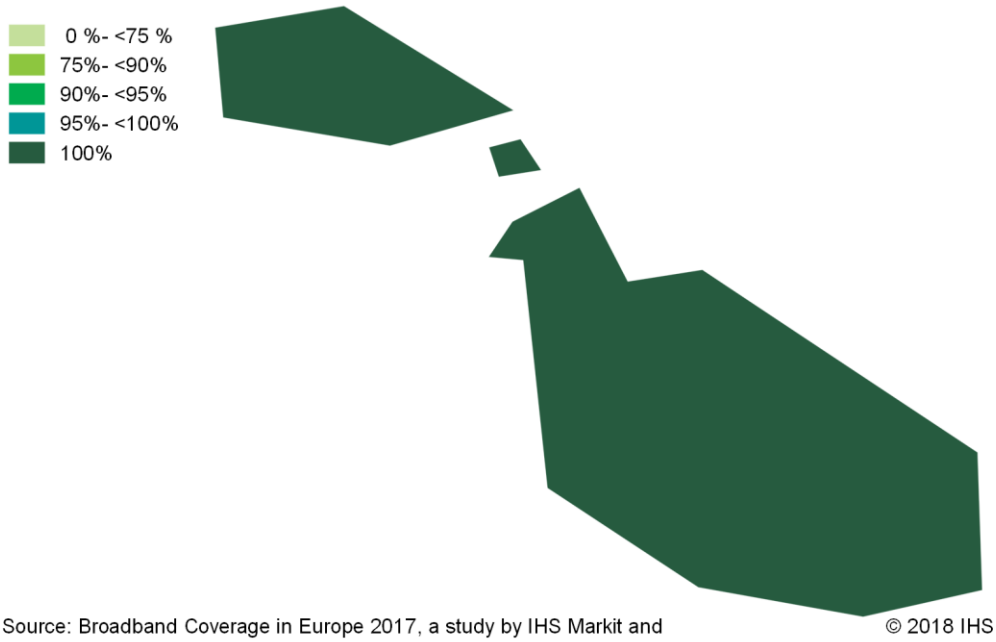
[61] https://www.vodafone.com.mt/file.aspx?f=11685

[62] https://www.go.com.mt/-/go-first-to-demonstrate-4g-in-malta

[63] https://www.vodafone.com.mt/Vodafone-news-details/1987

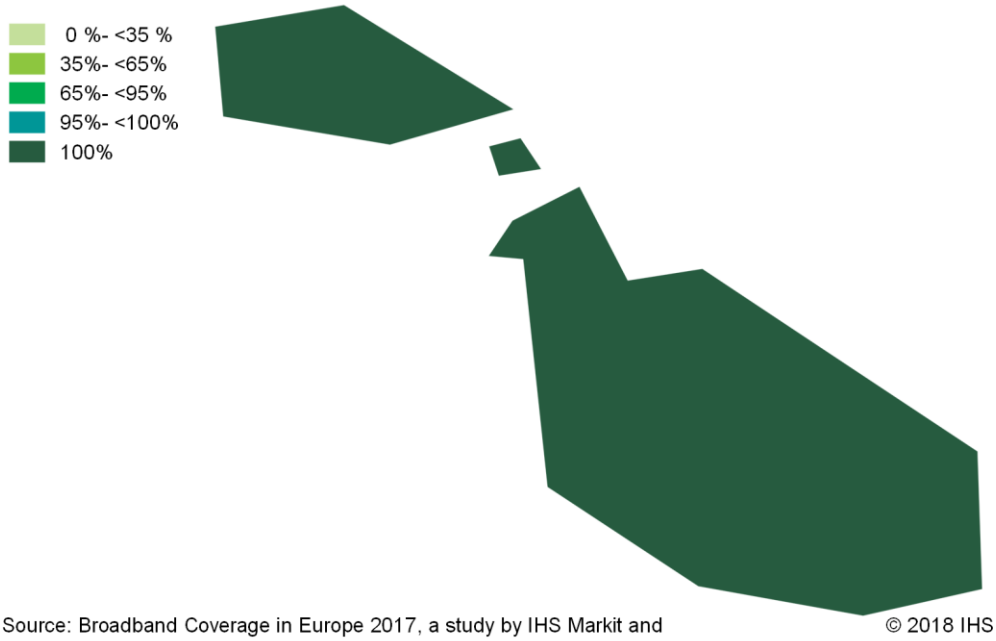
5.20.2 Regional coverage by broadband technology

Malta: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Malta: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.20.3 Data tables for Malta

Statistic	National
Population	434,403
Persons per household	2.6
Rural proportion	1.0%

	Malta 2017		Malta 2016		Malta 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	94.1%	86.3%
VDSL	72.0%	0.0%	72.0%	0.0%	72.0%	0.0%	53.4%	32.5%
FTTP	23.0%	0.0%	16.0%	0.0%	10.4%	0.0%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	18.0%	18.2%
Cable	99.9%	99.9%	99.9%	99.9%	100.0%	100.0%	45.1%	11.4%
DOCSIS 3.0	99.9%	99.9%	99.9%	99.9%	100.0%	99.9%	44.7%	10.8%
HSPA	99.9%	99.2%	99.9%	99.2%	99.0%	99.0%	97.9%	92.4%
LTE	99.9%	90.2%	99.5%	51.1%	72.0%	0.0%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	99.4%	-	*99.3%*	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.4%
Overall fixed broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	97.4%	92.4%
NGA broadband	100.0%	99.9%	100.0%	99.9%	100.0%	99.9%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	99.9%	-	-	-	-	-	57.8%	-
At least 2 Mbps	100.0%	-	99.8%	-	99.8%	-	96.0%	-
At least 30 Mbps	99.9%	-	99.4%	-	99.5%	-	79.0%	-
At least 100 Mbps	99.9%	-	99.4%	-	99.4%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

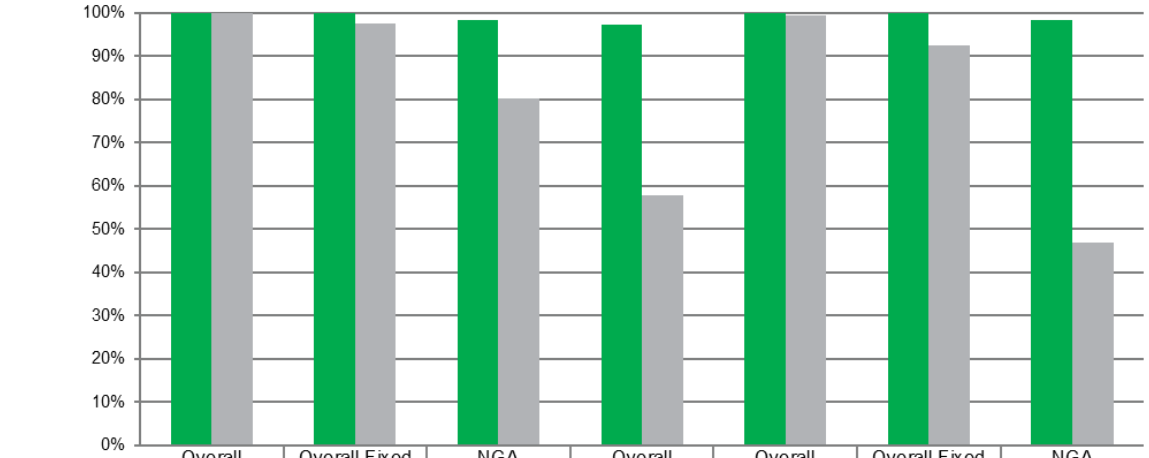
* In the DESI, a figure for end 2015 was published.

5.21 Netherlands

5.21.1 National coverage by broadband technology

Broadband coverage levels for all combination categories in the Netherlands remained unchanged in the twelve months to the end of June 2017. By mid-2017, the Netherlands reported complete coverage in relation to overall broadband and fixed broadband at a national and rural level. Meanwhile, NGA coverage was near-complete with regards to national and rural coverage, at 98.3% and 98.4%, respectively. This ensured that the Netherlands remained one of the leaders among the study countries in terms of NGA coverage, behind only Malta at a rural level and Malta, Switzerland and Belgium at a national level.

Netherlands: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Netherlands	100.0%	100.0%	98.3%	97.3%	100.0%	100.0%	98.4%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

The Netherlands exceeded the EU average for all individual broadband technologies, except for WiMAX, which is not present in the Netherlands. DSL remained the most widespread broadband technology, achieving universal coverage. VDSL coverage increased by 4.7 percentage points reaching nearly three-quarters (74.9%) of Dutch households at the end of June 2017. Throughout the year, the incumbent KPN has increased the speed of connections over its copper network via a range of technologies, including VDSL vectoring and VPlus.[64][65] KPN is also the sole owner of the wholesale fibre operator Reggefiber, which is deploying FTTP networks across the Netherlands. During the twelve-month period to mid-2017, Netherlands witnessed a slight 0.7 percentage point increase of homes passed by FTTP, reaching 31.9% of households. However, these increases did not make any difference to the overall NGA coverage levels suggesting that FTTP networks were deployed in areas that already had a VDSL or DOCSIS 3.0 presence.

In terms of cable technologies, the availability of cable networks and DOCSIS 3.0 remained unchanged, at 95.1% of households. With near-universal coverage of DOCSIS3.0, the leading cable operator VodafoneZiggo (formerly Ziggo) plans to implement DOCSIS 3.1 standards in the next few years, enabling download speeds of 1Gbps.[66]

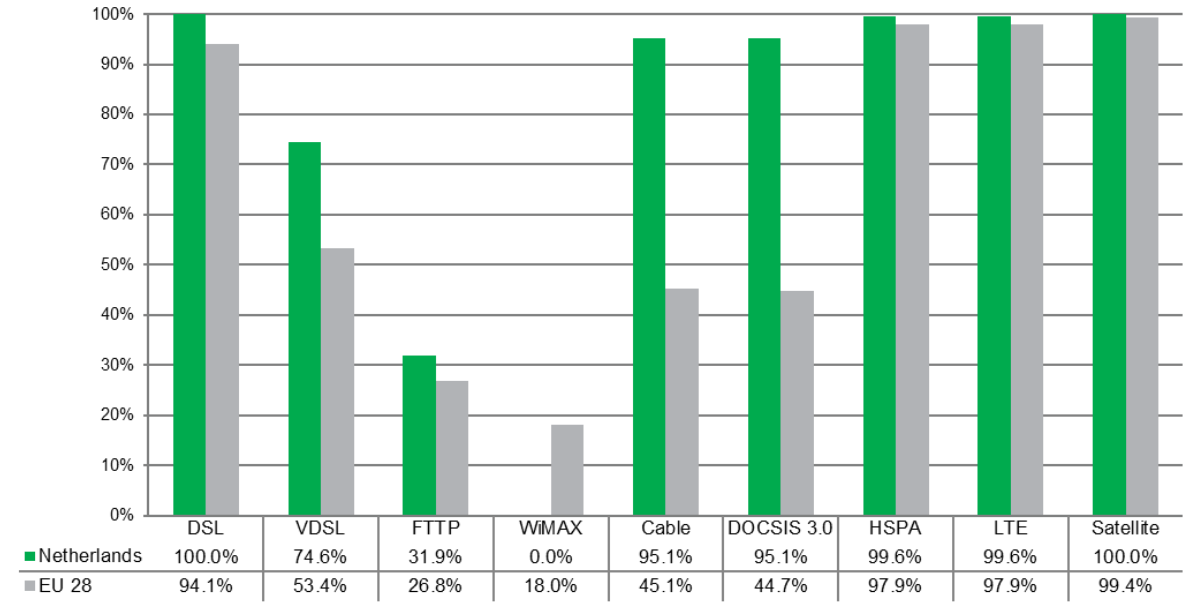
At the end of June 2017, the Netherlands continued to lead the study countries in terms of mobile coverage. This is unsurprising given the high availability levels reached already in previous years. The Netherlands reached nearly universal LTE coverage with 99.6% of homes being passed by the high-speed mobile networks, similar to the level of average coverage of all LTE network operators.

[64] https://www.providers.nl/392/kpn-investeert-in-vdsl-vectoring-techniek/

[65] https://www.providers.nl/3104/kpn-begint-levering-vplus-verbinding-tot-200mbits/

[66] http://www.digitaltveurope.net/205622/upc-netherlands-doubles-upload-speeds-for-broadband/

Netherlands: Coverage by technology, total, 2017



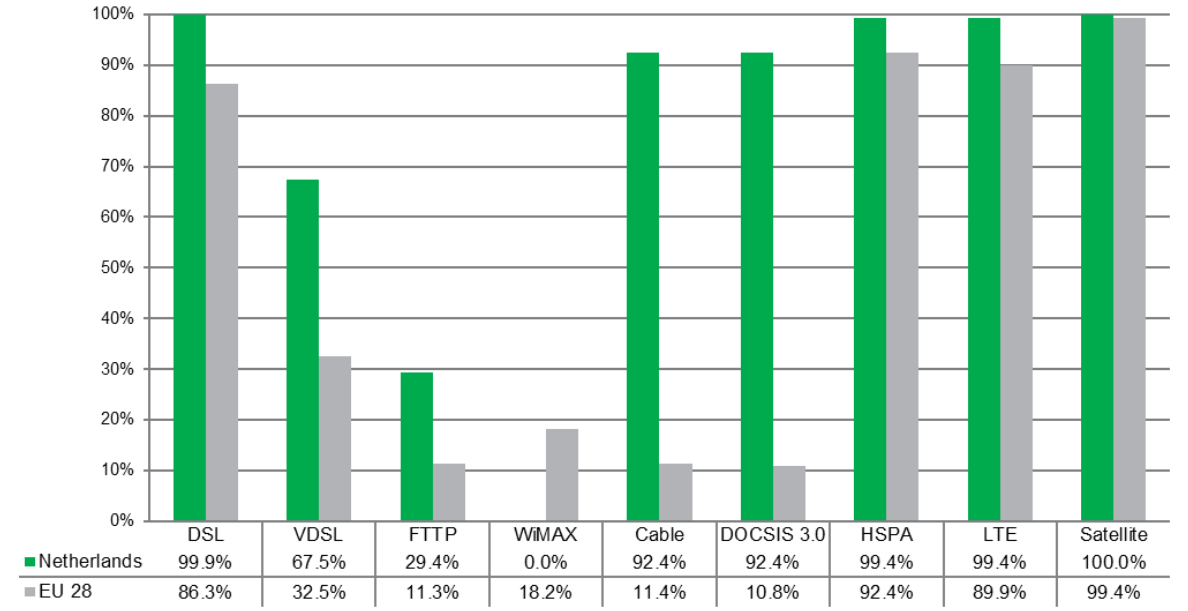
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Netherlands	100.0%	74.6%	31.9%	0.0%	95.1%	95.1%	99.6%	99.6%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Broadband coverage in rural areas was relatively unchanged, when compared with the previous year. As was the case in mid-2016, 99.9% of rural homes had access to DSL broadband services and 92.5% of rural homes were passed by cable networks. In terms of NGA technologies, while rural DOCSIS 3.0 coverage remained unchanged, rural VDSL availability grew slightly by 2.5 percentage points to reach 67.5% of rural households at the end of June 2017. Following a 1 percentage point increase compared to the end of June 2016, FTTP services were available to 29.4% of rural households.

Mobile broadband coverage in rural areas was unchanged in the twelve months to the end of June 2016. Given the high levels of coverage reached in the previous year, at 98.2%, both HSPA and LTE rural coverage in the Netherlands remained above the EU average.

Netherlands: Coverage by technology, rural areas, 2017



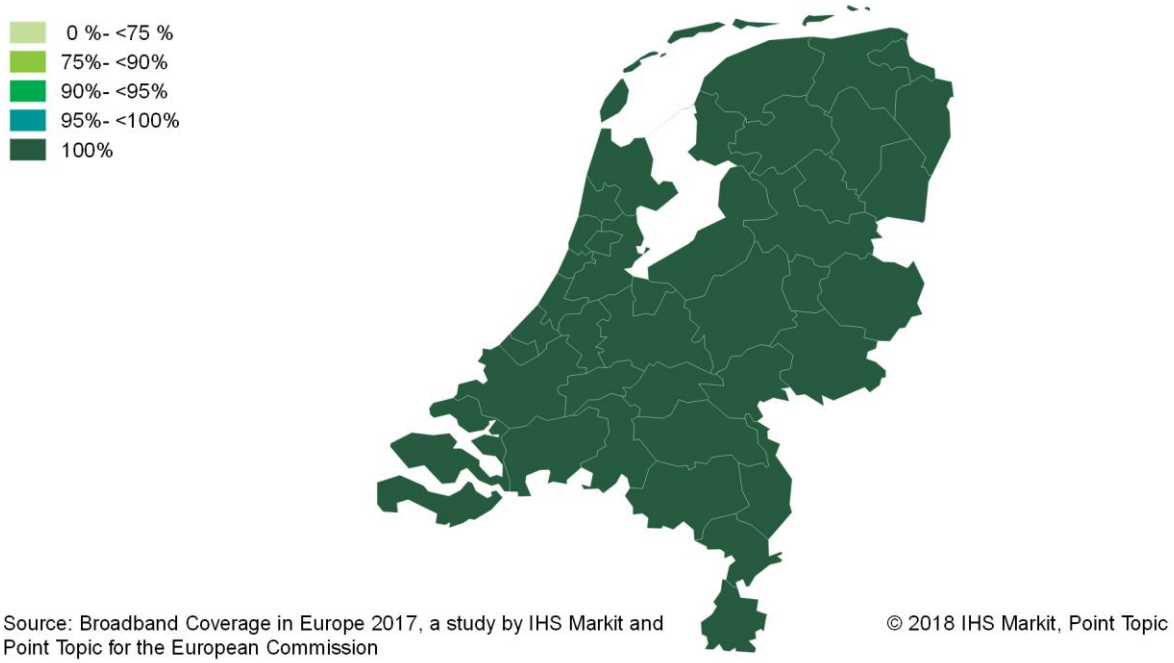
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Netherlands	99.9%	67.5%	29.4%	0.0%	92.4%	92.4%	99.4%	99.4%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.21.2 Regional coverage by broadband technology

Fixed broadband coverage remained unchanged across the individual regions with all households being able to access fixed broadband services at the end of June 2017.

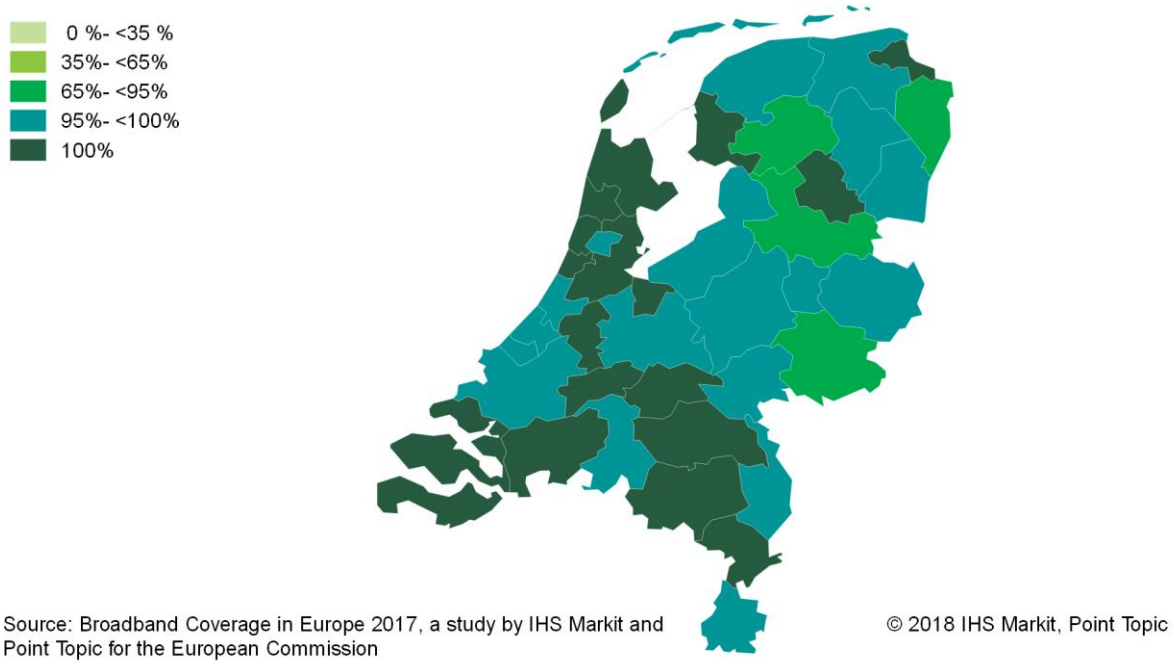
Netherlands: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

NGA coverage was slightly more varied in the individual regions. Eighteen regions recorded complete NGA availability, while the lowest NGA coverage continued to be in Oost-Groningen region, where nearly 90% of households had access to high-speed broadband.

Netherlands: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.21.3 Data tables for Netherlands

Statistic	National
Population	16,979,120
Persons per household	2.2
Rural proportion	8.2%

	Netherlands 2017		Netherlands 2016		Netherlands 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	99.9%	100.0%	99.9%	100.0%	99.9%	94.1%	86.3%
VDSL	74.6%	67.5%	69.9%	64.9%	69.9%	64.7%	53.4%	32.5%
FTTP	31.9%	29.4%	31.2%	28.4%	29.7%	27.1%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	18.2%
Cable	95.1%	92.4%	95.1%	92.5%	95.1%	92.4%	45.1%	11.4%
DOCSIS 3.0	95.1%	92.4%	95.1%	92.5%	95.1%	92.4%	44.7%	10.8%
HSPA	99.6%	99.4%	99.6%	98.2%	99.6%	98.3%	97.9%	92.4%
LTE	99.6%	99.4%	99.6%	98.2%	99.6%	98.3%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	99.6%	-	90.6%	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.4%
Overall fixed broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	97.4%	92.4%
NGA broadband	98.3%	98.4%	98.3%	97.9%	98.3%	97.8%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	97.3%	-	-	-	-	-	57.8%	-
At least 2 Mbps	100%	-	100.0%	-	100.0%	-	96.0%	-
At least 30 Mbps	98.2%	-	98.2%	-	98.2%	-	79.0%	-
At least 100 Mbps	98.2%	-	98.2%	-	98.1%	-	55.1%	-

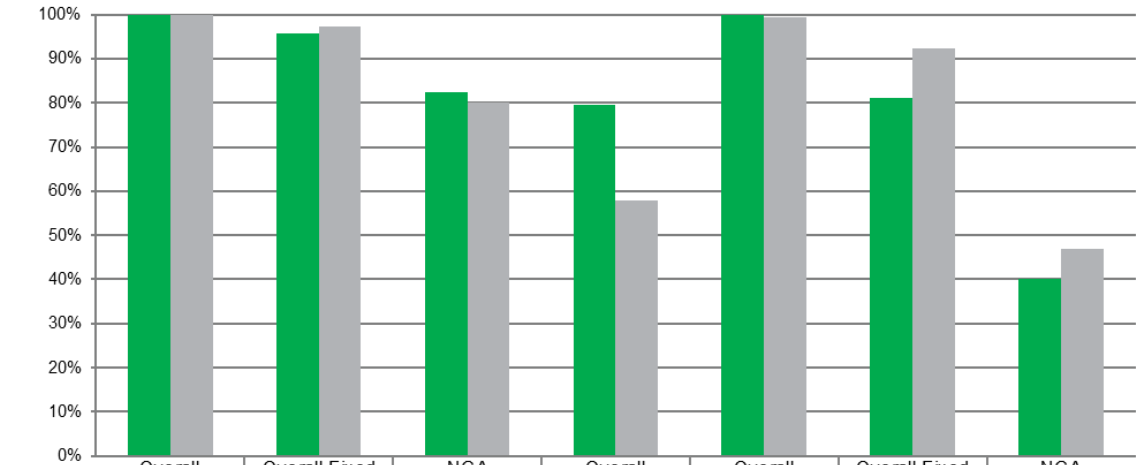
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.22 Norway

5.22.1 National coverage by broadband technology

As in the previous study period, by the end of June 2017, overall broadband coverage in Norway remained universal. There was a minimal decline in the availability of this combination category, mainly due to increasing population, which was not compensated by the speed of deployment of new technologies. In rural areas, overall broadband coverage exceeded the EU average by 0.5 percentage points. Fixed broadband availability was below the EU average, passing 95.7% of the total Norwegian households and 81.0% of the rural homes. In terms of NGA technologies, Norway was above the EU average, with high-speed broadband technologies available to 82.4% of the total households. In rural areas, NGA availability increased by 7.3 percentage points since mid-2016, standing only 6.7 percentage points below the EU average of 46.9%.

Norway: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Norway	100.0%	95.7%	82.4%	79.6%	99.9%	81.0%	40.2%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

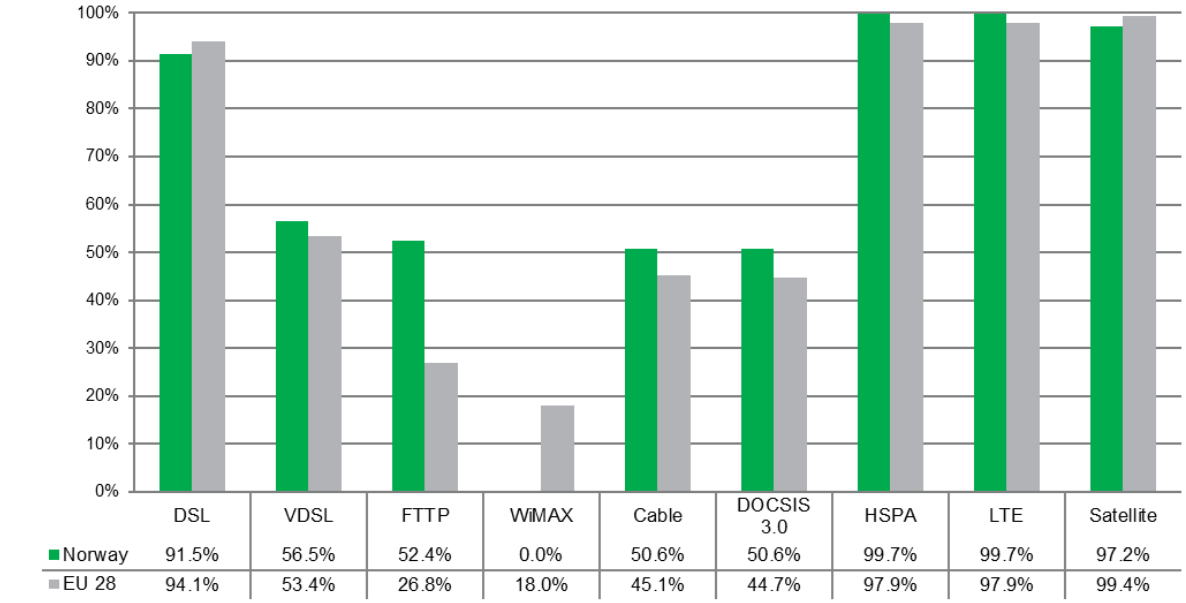
Analysing individual technologies, DSL coverage improved by 0.9 percentage points, reaching 91.5% of households by the end of June 2017. Despite increased availability nationwide, DSL in Norway remained below the EU average of 94.1%. VDSL witnessed a significant improvement over the twelve months to mid-2017, gaining 6.6 percentage points and exceeding the EU average of 53.4% by 3.1 percentage points. By mid-2017, cable coverage reached 50.6% of households and, as stated in the previous edition of this study, all cable networks in Norway were updated to DOCSIS 3.0.

FTTP in Norway continued to grow, in part due to the efforts of the country's largest FTTP service provider Telenor, who continued investing in fibre-optic networks.[67] By the end of June 2017, FTTP coverage improved by 6.1 percentage points, reaching 52.4% of households in Norway – almost double the EU average of 26.9%.

Mobile broadband also witnessed an improvement in availability over the study period. HSPA recorded a slightly stronger improvement in coverage compared with LTE and, ultimately, both technologies were available to 99.7% of Norwegian households at the end of June 2017. The average LTE coverage for all operators in this market remained universal. Similar to other countries where LTE coverage is ubiquitous, operators in Norway are focusing on developing their LTE-Advanced networks.

[67] https://www.telenor.com/wp-content/uploads/2017/06/Telenor-Group-Q2-2017-presentation-4d32c233c46305b4316a2c6ec817f369.pdf

Norway: Coverage by technology, total, 2017



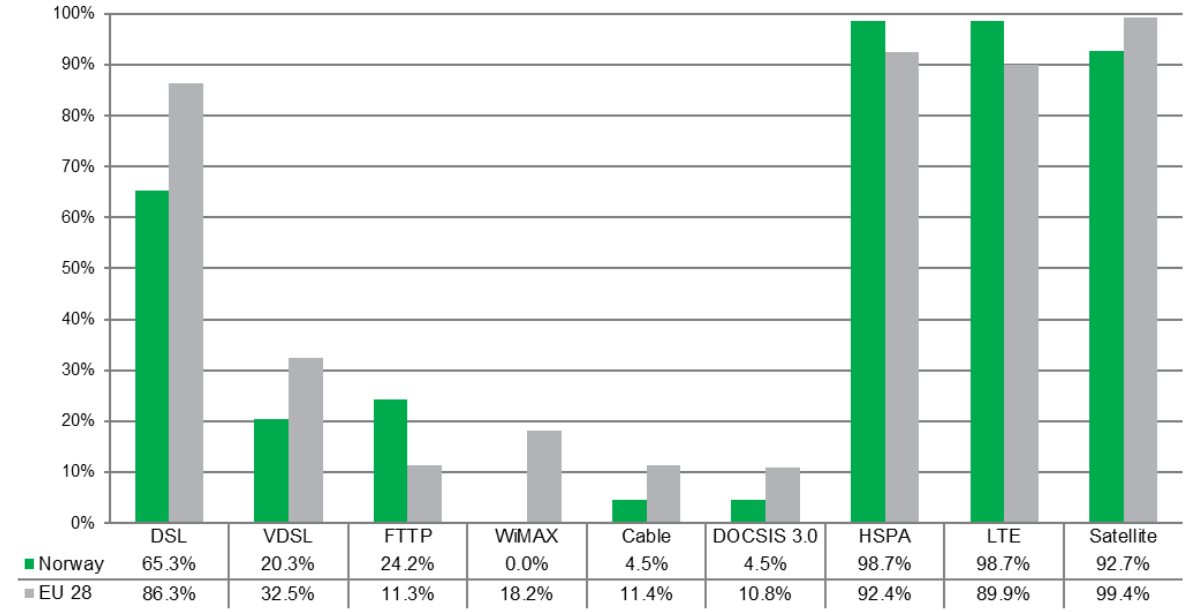
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Norway	91.5%	56.5%	52.4%	0.0%	50.6%	50.6%	99.7%	99.7%	97.2%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In terms of rural coverage, DSL continued to be the prevalent fixed broadband technology in rural Norway, passing 65.3% of homes, significantly below the EU average of 86.3%. While total DSL coverage in the country improved, rural DSL coverage in Norway recorded a drop of 2.3 percentage points over the twelve months to the end of June 2017 as operators focussed on improving NGA coverage. VDSL availability improved by 2.4 percentage points during the twelve-month period, reaching 20.3% of rural homes. Despite this improvement, VDSL levels in rural Norway are still below the EU average of 32.5%. Availability of DOCSIS 3.0 technology improved slightly year-on-year, reaching 4.5% of the rural homes but remained below the EU average of 10.8%. FTTP availability also increased over the study period, reaching 24.3% - more than double the EU average of 11.3%.

Looking at mobile coverage in rural areas, HSPA and LTE networks reached 98.7% of households, both exceeding the EU average for these technologies.

Norway: Coverage by technology, rural areas, 2017



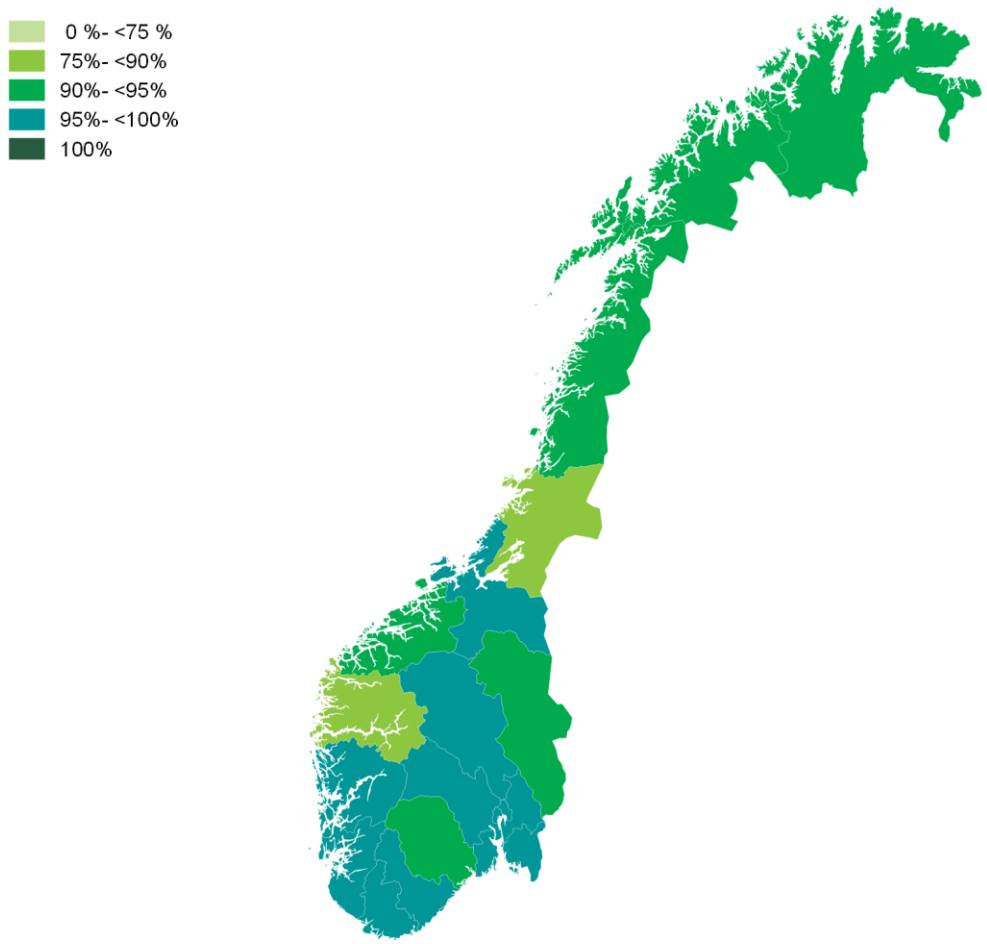
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Norway	65.3%	20.3%	24.2%	0.0%	4.5%	4.5%	98.7%	98.7%	92.7%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.22.2 Regional coverage by broadband technology

Overall fixed broadband coverage in Norway is especially varied due to the country's geographical characteristics and the population distribution. The five regions with rural population below 6% (Oslo, Vestfold, Akershus, Rogaland and Østfold) have the highest levels of fixed broadband availability, from 97.6% in Østfold to 99.6% in Oslo. The regions with lowest access to fixed technologies are Nord-Trøndelag with 89.3% and Sogn og Fjordane with 77.3% of households passed. The proportion of rural households in both regions is above 80%.

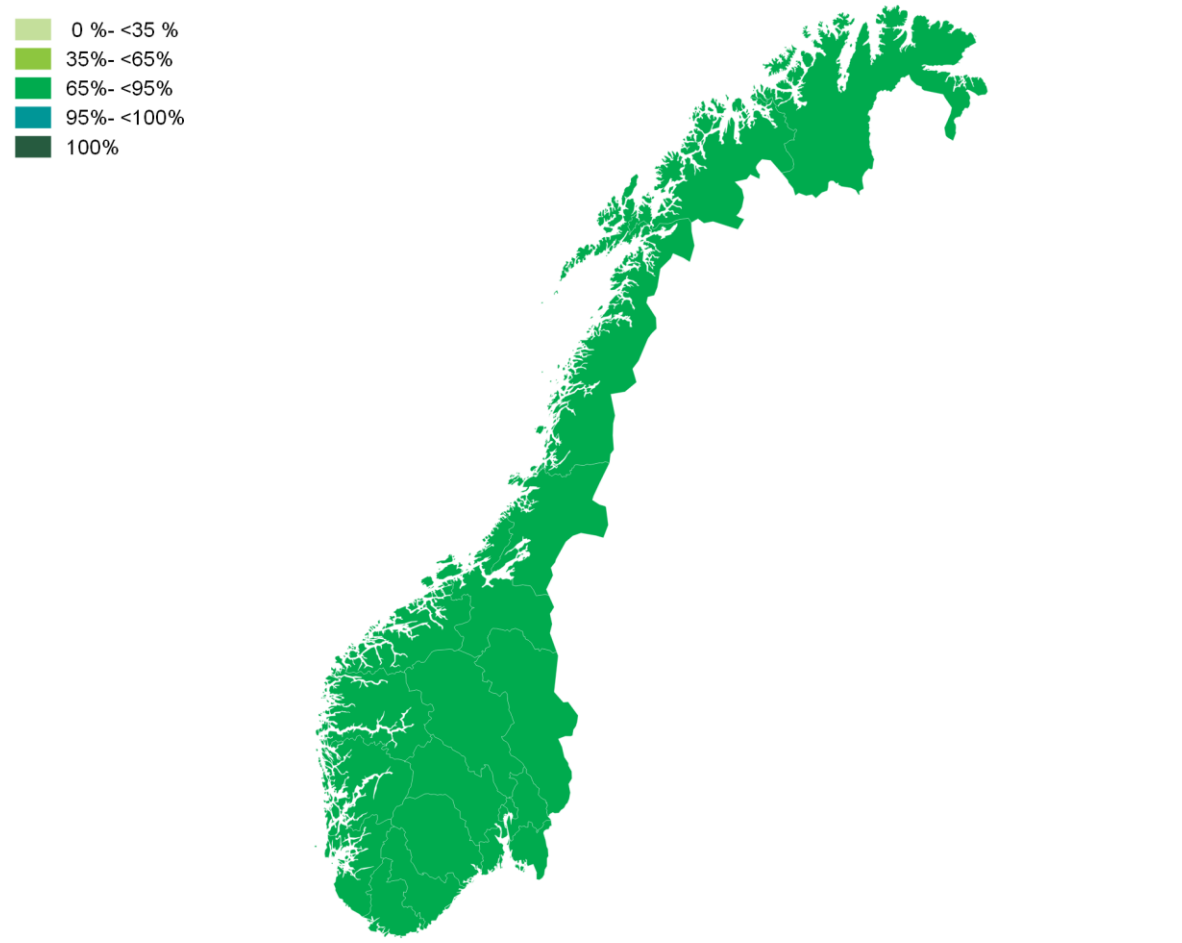
Norway: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Regional NGA coverage became less varied over the twelve months to mid-2017, compared with the previous study period. Availability of NGA technologies in all regions during the examined period varied between 73.4% in Hedmark and 93.2% in Oslo.

Norway: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.22.3 Data tables for Norway

Statistic	National
Population	5,210,721
Persons per household	2.0
Rural proportion	21.3%

	Norway 2017		Norway 2016		Norway 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	91.5%	65.3%	90.6%	67.6%	89.5%	67.4%	94.1%	86.3%
VDSL	56.5%	20.3%	49.9%	17.9%	47.3%	15.6%	53.4%	32.5%
FTTP	52.4%	24.2%	46.3%	20.5%	41.1%	18.4%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	18.2%
Cable	50.6%	4.5%	50.6%	3.7%	50.6%	2.7%	45.1%	11.4%
DOCSIS 3.0	50.6%	4.5%	50.6%	3.7%	50.3%	2.4%	44.7%	10.8%
HSPA	99.7%	98.7%	99.0%	95.9%	99.0%	95.6%	97.9%	92.4%
LTE	99.7%	98.7%	99.7%	98.5%	99.6%	98.3%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	100.0%	-	100.0%	-			90.8%	-
Satellite	97.2%	92.7%	*97.2%*	*92.7%*	*97.2%*	*92.7%*	99.4%	99.4%
Overall broadband	100.0%	99.9%	100.0%	100.0%	100.0%	97.8%	99.9%	99.4%
Overall fixed broadband	95.7%	81.0%	95.3%	79.2%	94.7%	77.4%	97.4%	92.4%
NGA broadband	82.4%	40.2%	81.0%	32.9%	79.6%	32.2%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	79.6%	-	-	-	-	-	57.8%	-
At least 2 Mbps	100.0%	-	100.0%	-	*100.0%*	-	96.0%	-
At least 30 Mbps	83.8%	-	*82.4%*	-	*78.6%*	-	79.0%	-
At least 100 Mbps	79.8%	-	*77.6%*	-	*73.0%*	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

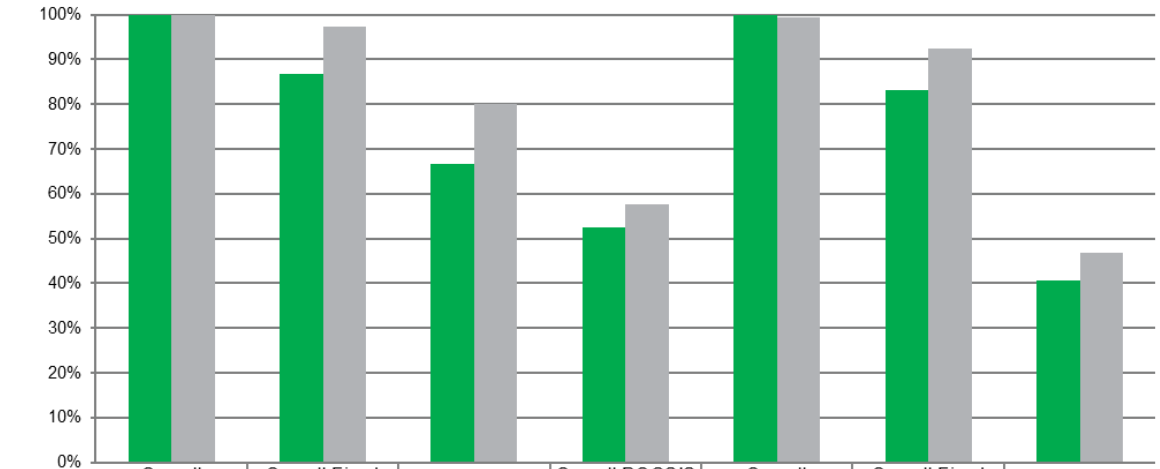
All restatements are highlighted in italics.

5.23 Poland

5.23.1 National coverage by broadband technology

Overall broadband coverage in Poland, which was nearly universal by mid-2016, remained largely unchanged over the latest study period, reaching 99.9% of Polish households. This trend was also maintained in rural areas, where overall broadband availability was 99.8%. However, coverage of fixed and NGA technologies remained lower than the average EU level. Fixed broadband increased by 0.4 percentage points on a national level to reach 86.8% of total households, remaining 10.6 percentage points below the EU average. This gap was slightly lower in rural areas, where fixed technologies were 9.4 percentage points below the EU average, available to 83.1% of rural households. In terms of NGA coverage, despite a year-on-year increase of 2.6 percentage points on a national level, coverage remained significantly below the EU average of 80.1%, reaching only 66.7% of Polish households. In rural areas, NGA technologies increased by 3.4 percentage points, reaching 40.6% of rural households, slightly closer to the average EU level (46.9%).

Poland: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Poland	99.9%	86.8%	66.7%	52.5%	99.8%	83.1%	40.6%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

By mid-2017, all individual fixed broadband technologies in Poland recorded lower coverage compared with the EU average. DSL remained the leading broadband technology in terms of availability, reaching 75.9% of households in Poland, significantly below the EU average (94.1%), as Poland remained one of the six study countries where DSL availability was below 80%. Availability of WiMAX technologies remained negligible over the study period, with coverage improving slightly to reach 1.9% of households.

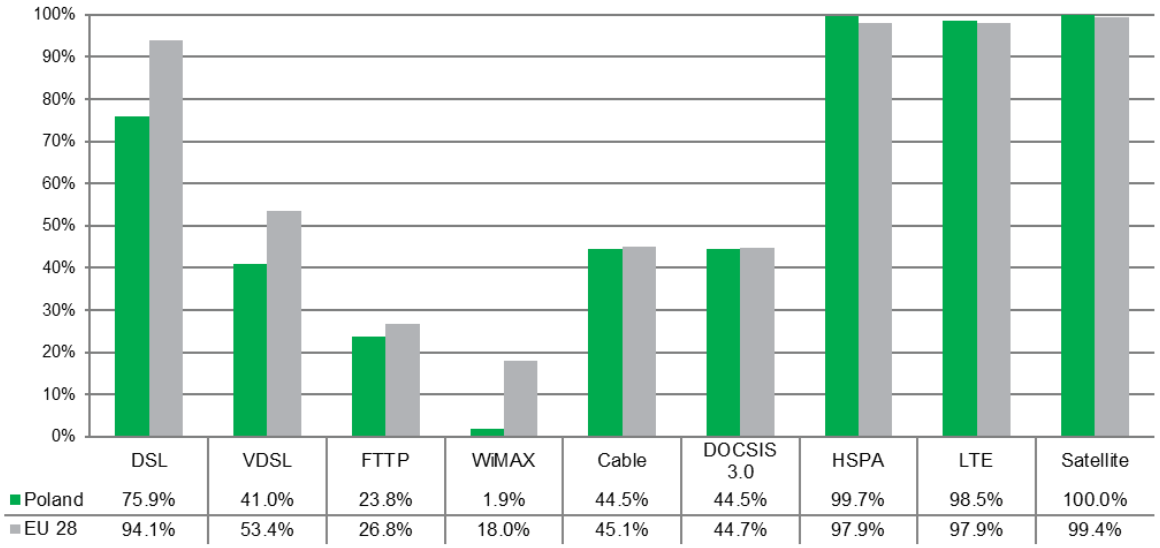
DOCSIS 3.0 was the prevalent NGA technology in Poland over the twelve months to the end of June 2017, reaching 44.5% of households. As was the case in the previous iteration of this study, all cable networks in Poland were upgraded to DOCSIS 3.0. Over the twelve months to mid-2017, VDSL services recorded a slight drop. By mid-2017, VDSL broadband was available to 41.0% of Polish households. FTTP recorded the most significant growth in this market, improving by 7.3 percentage points to reach 23.8% of the Polish homes, steadily bridging the gap with the EU average of 26.8%. These developments were largely underpinned by the efforts of the incumbent operator Orange Polska in expanding its existing FTTP network. Since the operator announced plans to reach 3.5 million homes by 2018, growth in fibre-optic broadband availability is expected to continue.[68] As of the end of June 2017, 3.2 million households were passed by FTTP networks.

LTE coverage improved by 1 percentage point over the twelve months to mid-2017, reaching 99.6% of Polish homes, surpassing the EU average. Operators continued deploying LTE base stations to expand

[68] https://www.orange.com/en/news/2016/mai/In-Poland-Orange-extends-its-fiber-optic-network

network availability. By the end of 2016, Orange Polska reported to have reached 98% national LTE coverage.[69] T-Mobile also continued to invest in its network expansion, focusing on improving urban LTE availability.[70] Examining average LTE coverage across all operators, on average LTE reached 91.0% of Polish households, registering a slight improvement since mid-2016.

Poland: Coverage by technology, total, 2017

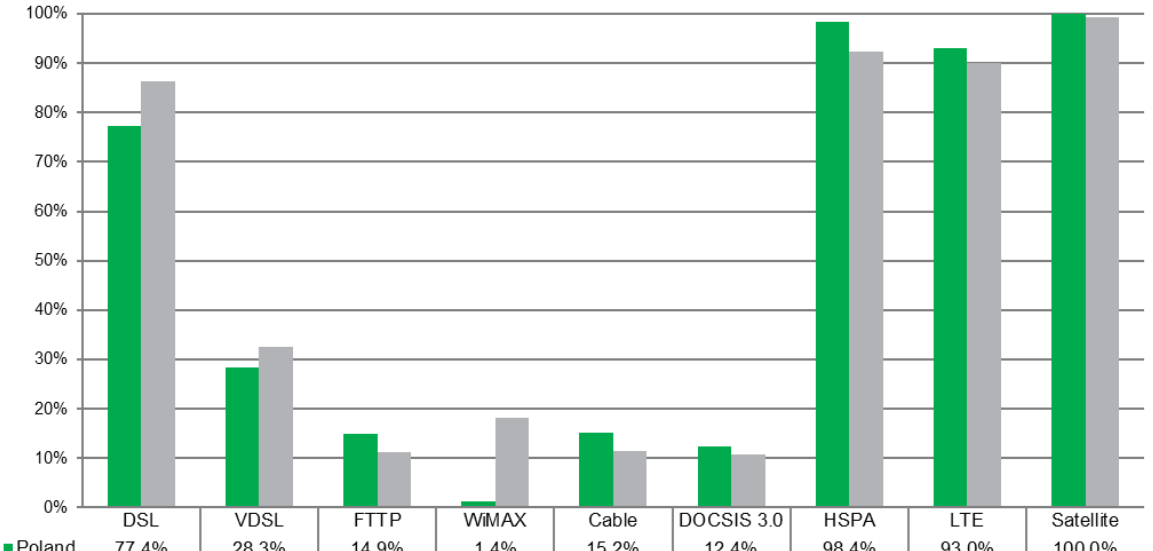


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Poland	75.9%	41.0%	23.8%	1.9%	44.5%	44.5%	99.7%	98.5%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Availability of fixed broadband networks in rural areas of Poland reflects the developments at a national level. DSL was the prevalent fixed broadband technology, reaching 77.4% of rural homes, 8.9 percentage points below the EU average. Cable broadband was available to 15.2% of rural households, surpassing the EU average of 11.4%. FTTP coverage also improved in rural areas, expanding by 3.4 percentage points, remaining ahead of the EU average by passing 14.9% of rural homes.

Poland: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Poland	77.4%	28.3%	14.9%	1.4%	15.2%	12.4%	98.4%	93.0%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

[69] http://www.orange-ir.pl/node/11567

[70] https://www.telegeography.com/products/commsupdate/articles/2017/03/30/t-mobile-poland-continues-4g-network-expansion/

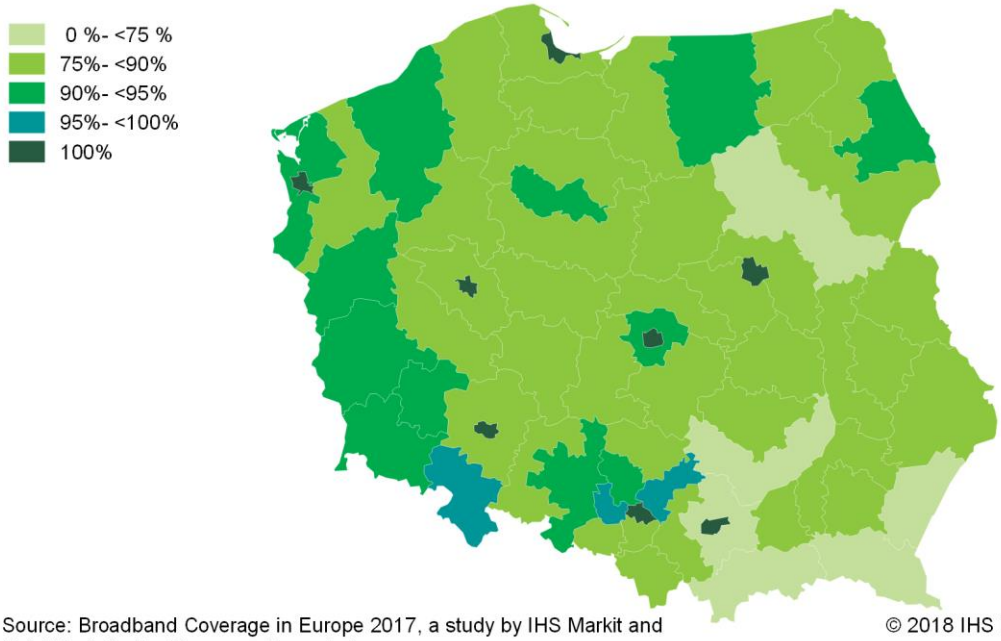
Nonetheless, VDSL remained the leading NGA technology in terms of coverage, reaching 28.3% of rural homes in Poland. Over the twelve months to the end of June 2017, VDSL remained below the EU average of 32.5%, despite recording a year-on-year increase of 2.5 percentage points.

LTE services in rural areas of Poland continued growing at a more moderate pace, increasing by 4.6 percentage points by mid-2017 to reach 93.0% of rural households.

5.23.2 Regional coverage by broadband technology

There is significant variance between the different regions of Poland in terms of fixed broadband availability. The country's urban centers with less than 1% rural households: Warszawa, Poznan, Lódz, Trojmiejski, Wroclaw, Kraków, Szczecin and the Katowicki region all had universal fixed coverage. However, six Polish regions reported fixed broadband availability below 75%, with coverage being the lowest in Krakowski, at 63.5%.

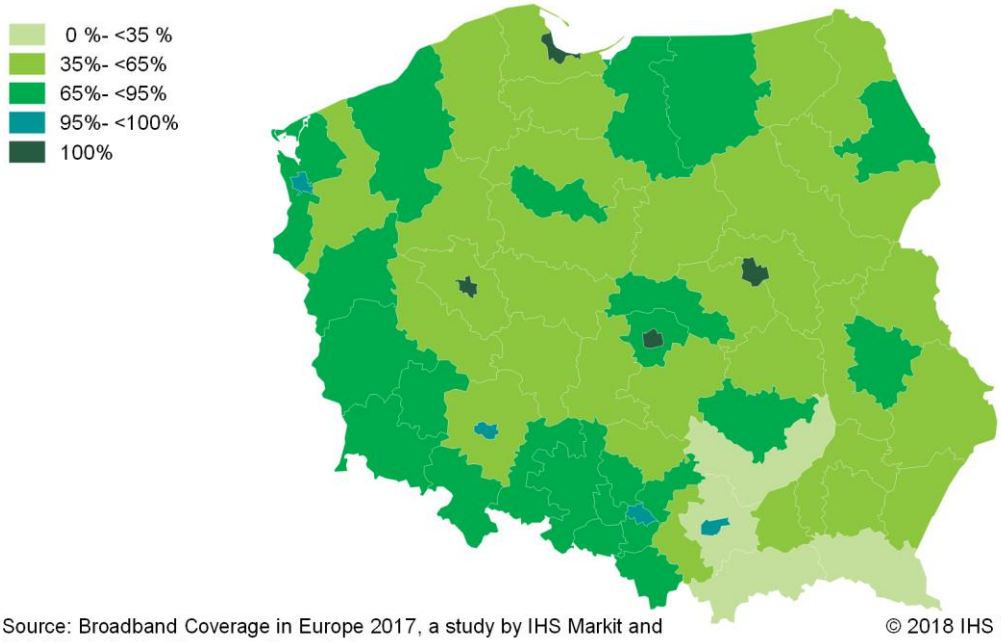
Poland: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

This variance is more noticeable when examining NGA technologies. There is complete coverage in Warszawa, Lódz and Poznan as well as the region of Trojmiejski. However, less than 30% of households in the regions of Nowosadecki and Krakowski had access to high-speed NGA broadband.

Poland: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.23.3 Data tables for Poland

Statistic	National
Population	37,848,985
Persons per household	2.8
Rural proportion	20.7%

	Poland 2017		Poland 2016		Poland 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	75.9%	77.4%	75.7%	77.2%	76.2%	77.0%	94.1%	86.3%
VDSL	41.0%	28.3%	41.7%	25.8%	42.7%	25.8%	53.4%	32.5%
FTTP	23.8%	14.9%	16.5%	11.5%	9.0%	5.8%	26.8%	11.3%
WiMAX	1.9%	1.4%	1.8%	1.4%	2.4%	1.8%	18.0%	18.2%
Cable	44.5%	15.2%	43.6%	15.2%	42.0%	14.9%	45.1%	11.4%
DOCSIS 3.0	44.5%	12.4%	43.6%	12.3%	40.0%	11.1%	44.7%	10.8%
HSPA	99.7%	98.4%	99.5%	97.8%	99.5%	97.8%	97.9%	92.4%
LTE	98.5%	93.0%	97.6%	88.4%	75.9%	5.7%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	91.0%	-	90.7%	-			90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.9%	99.8%	99.9%	99.8%	99.8%	99.5%	99.9%	99.4%
Overall fixed broadband	86.8%	83.1%	86.4%	82.5%	86.2%	81.5%	97.4%	92.4%
NGA broadband	66.7%	40.6%	64.1%	37.2%	60.7%	33.8%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	52.5%	-	-	-	-	-	57.8%	-
At least 2 Mbps	81.2%	-	*81.0%*	-	81.0%	-	96.0%	-
At least 30 Mbps	53.4%	-	*53.4%*	-	53.5%	-	79.0%	-
At least 100 Mbps	37.7%	-	*29.9%*	-	22.0%	-	55.1%	-

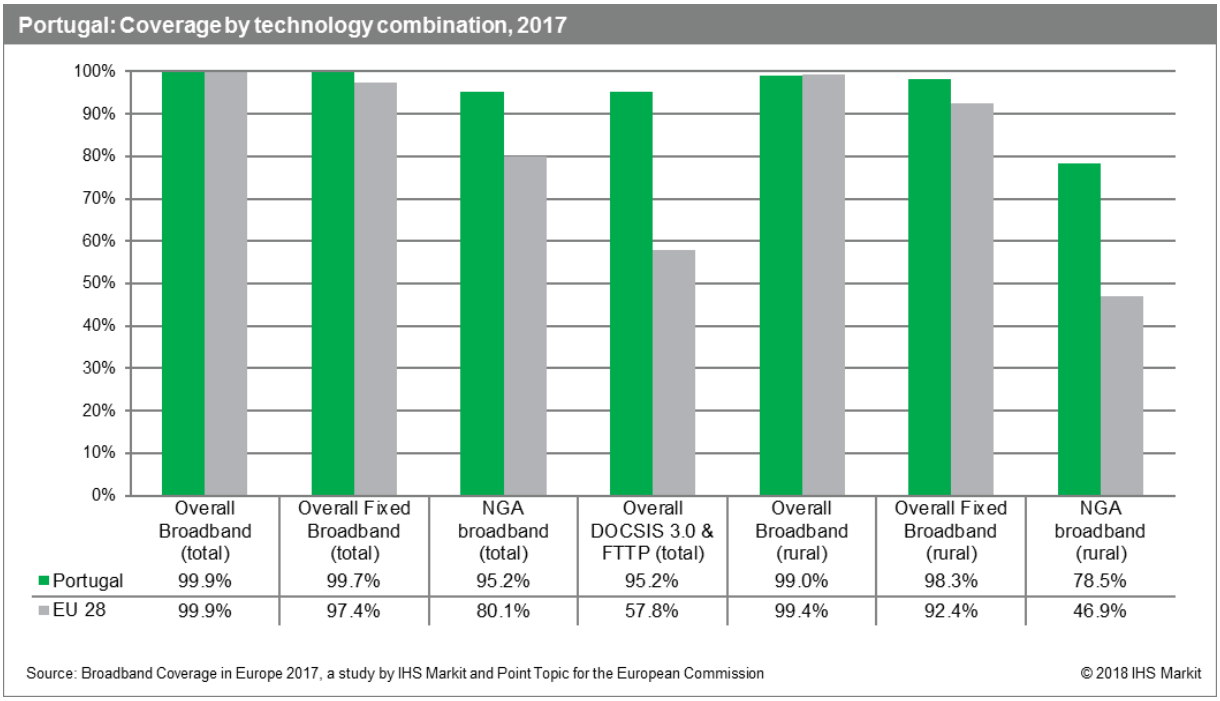
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

All restatements are highlighted in italics.

5.24 Portugal

5.24.1 National coverage by broadband technology

As was the case in previous iterations of the study, Portugal remained above the EU average in all combination categories. Overall broadband and fixed broadband recorded almost complete fixed broadband coverage, with 99.7% of all Portuguese homes being passed by at least one fixed network and 98.3% of rural households having access to fixed broadband services in mid-2017. Looking at NGA broadband, the proportion of total homes passed by NGA technologies remained relatively unchanged at 95.2%. However, there was a greater change in rural NGA coverage, which increased by 4.9 percentage points to cover 78.5% of rural households.

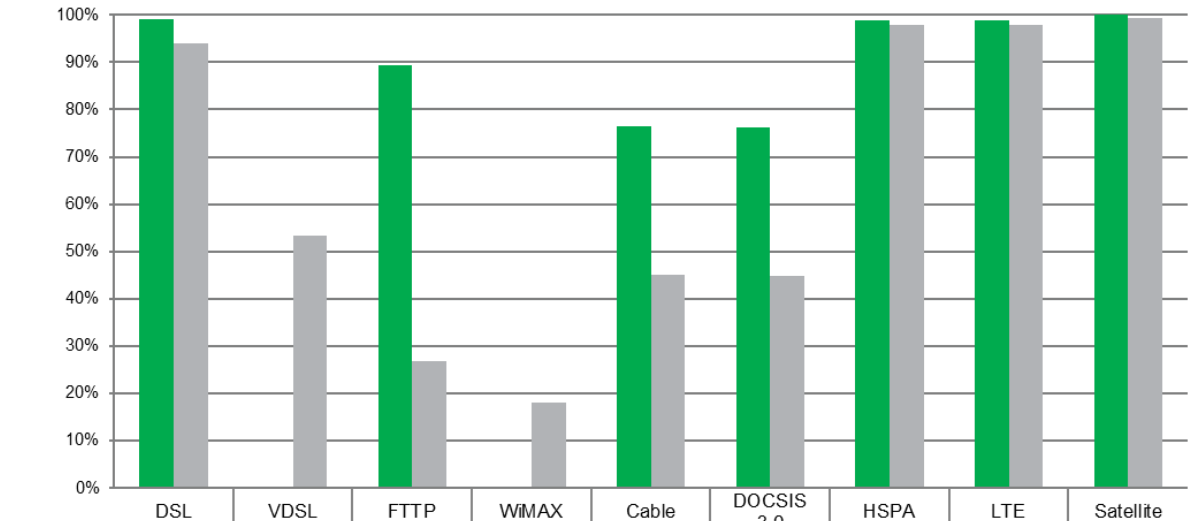


Examining the coverage of individual technologies, Portugal had near universal DSL coverage (99.2%). However, Portuguese operators have opted not to upgrade DSL networks to VDSL and, instead, focussed on FTTP deployment. Consequently, Portugal had the highest FTTP availability among the study countries, with FTTP coverage improving by 3.2 percentage points during the period to reach 89.4% of Portuguese households. As highlighted in previous iterations of the study, Portugal has been able to benefit from lower labour costs and an underground duct system installed over 30 years ago, which both contribute to lowering the costs of FTTP deployment. It has thus been feasible for the incumbent Portugal Telecom and other network operators to prioritise FTTP rollout. In addition, Portuguese operators continue to co-operate, with Vodafone and NOS's fibre network sharing agreement[71] the latest in a series of deals aimed at accelerating FTTP availability, whilst reducing the associated costs of deployment. As well as high FTTP availability, Portugal also has above-average DOCSIS 3.0 coverage (76.3%).

In relation to mobile technologies, both HSPA and LTE networks reached high coverage levels in the 2016 study. Consequently, the proportion of homes passed by mobile technologies remained relatively unchanged throughout the twelve months to the end of June 2017. LTE coverage reached 98.9% of households, whilst HSPA networks covered 98.8% of households. When average coverage of LTE networks of all mobile network operators is considered, on average 93.6% of Portuguese households had access to LTE services by mid-2017.

[71] http://www.vodafone.com/content/index/media/vodafone-group-releases/2017/vodafone-portugal-and-nos-fibre-network-share-agreement-in-portugal.html

Portugal: Coverage by technology, total, 2017



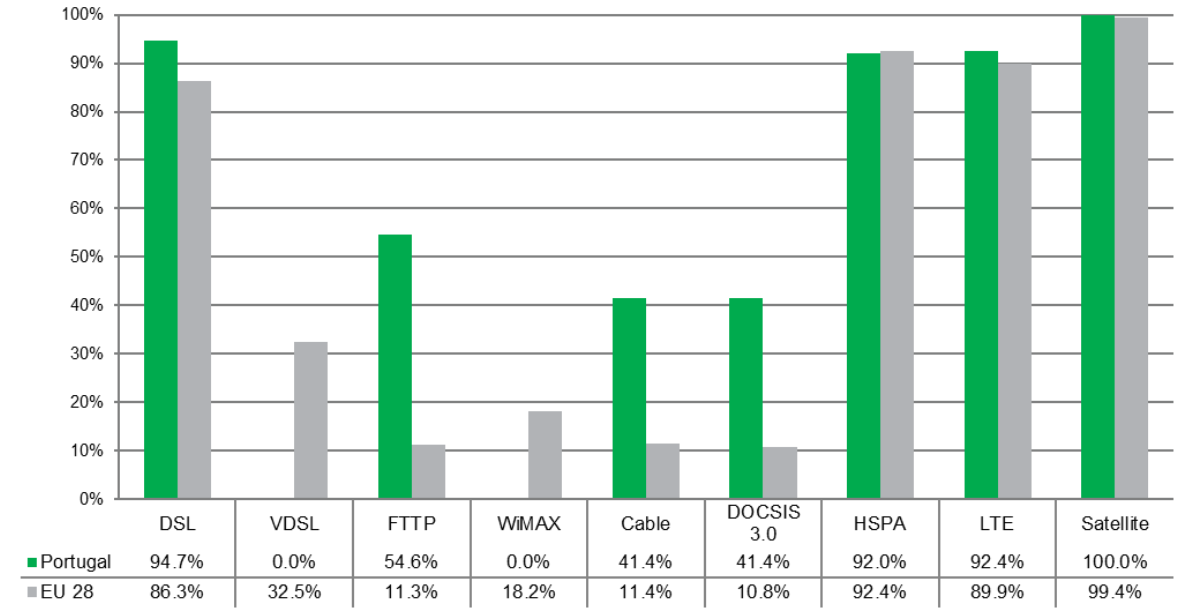
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Portugal	99.2%	0.0%	89.4%	0.0%	76.5%	76.3%	98.8%	98.9%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In terms of coverage in rural areas, the proportion of homes passed by DSL networks remained at 94.7%. Cable network coverage reached 41.4%, with all rural cable networks upgraded to DOCSIS 3.0. Looking at other NGA technologies in rural areas, Portugal registered a 7.7 percentage point increase in FTTP networks. Rural FTTP coverage in Portugal (54.6%) was over four times the EU average (11.3%) and, therefore, was the key NGA technology in rural areas. This is a result of continued rural FTTP deployment by regional indirect access providers, dstelecomand Fibroglobal.

Rural HSPA and LTE networks maintained similar coverage levels to the 2016 study, passing 92.0% and 92.4% of rural homes, respectively.

Portugal: Coverage by technology, rural areas, 2017



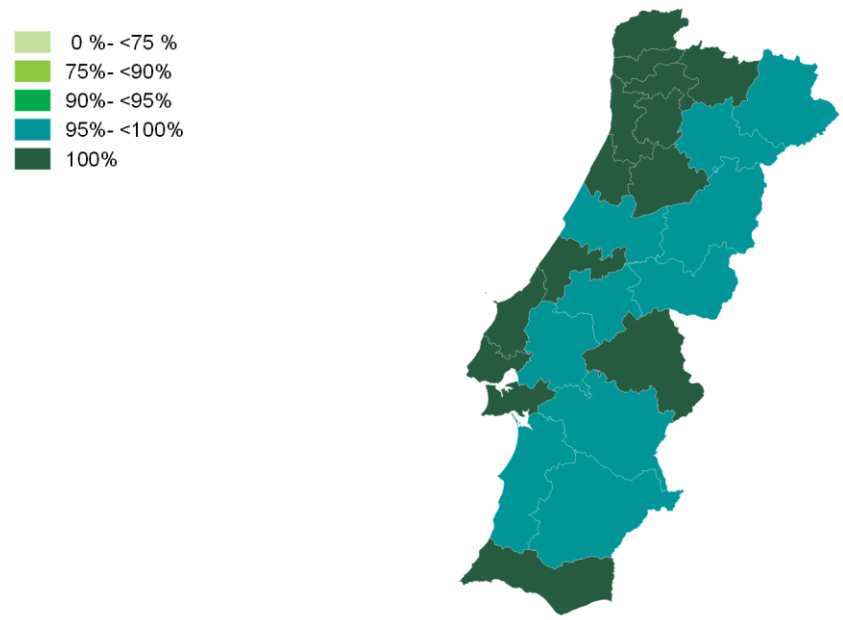
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Portugal	94.7%	0.0%	54.6%	0.0%	41.4%	41.4%	92.0%	92.4%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.24.2 Regional coverage by broadband technology

By mid-2017, there were no notable differences between the individual regions in terms of fixed broadband coverage. Fifteen regions registered complete fixed broadband coverage, while in the remaining eleven regions fixed broadband availability was between 97.5% and 99.5%.

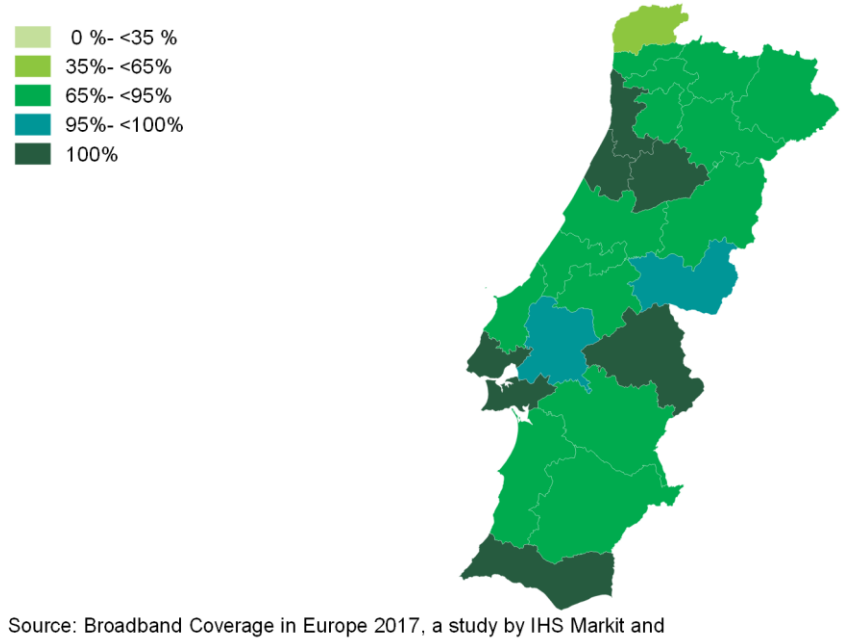
Portugal: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In contrast, there were some considerable differences in NGA coverage between regions in Portugal. At 56.4%, Alto Minho was the only region where NGA availability was below two-thirds of households. In addition, two other regions (Alentejo Litoral and Tâmega e Sousa) had NGA broadband coverage below 80%. Thirteen regions had NGA coverage between 85 and 95%, whilst seven regions had complete NGA availability.

Portugal: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

The following broadband coverage levels were recorded in Portuguese regions outside mainland Europe:

Coverage data for Portuguese NUTS 3 areas outside mainland Europe			
NUTS 3	**Description**	Overall fixed broadband coverage	NGA broadband coverage
P200	**Região Autónoma dos Açores**	100.00%	100.00%
P300	**Região Autónoma da Madeira**	100.00%	88.4%

5.24.3 Data tables for Portugal

Statistic	National
Population	10,341,330
Persons per household	2.6
Rural proportion	15.1%

	Portugal 2017		Portugal 2016		Portugal 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.2%	94.7%	99.2%	94.7%	99.1%	97.3%	94.1%	86.3%
VDSL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	53.4%	32.5%
FTTP	89.4%	54.6%	86.1%	46.9%	75.4%	30.2%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	18.2%
Cable	76.5%	41.4%	*76.3%*	42.1%	*76.7%*	43.9%	45.1%	11.4%
DOCSIS 3.0	76.3%	41.4%	*76.3%*	42.1%	*76.7%*	43.9%	44.7%	10.8%
HSPA	98.8%	92.0%	98.8%	91.8%	96.8%	84.4%	97.9%	92.4%
LTE	98.9%	92.4%	98.8%	92.0%	94.3%	67.0%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	93.6%	-	93.5%	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.9%	99.0%	99.9%	99.1%	99.8%	98.9%	99.9%	99.4%
Overall fixed broadband	99.7%	98.3%	99.8%	98.4%	99.8%	98.8%	97.4%	92.4%
NGA broadband	95.2%	78.5%	95.0%	73.5%	90.9%	64.1%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	95.2%	-	-	-	-	-	57.8%	-
At least 2 Mbps	98.7%	-	98.8%	-	98.1%	-	96.0%	-
At least 30 Mbps	93.5%	-	93.8%	-	90.9%	-	79.0%	-
At least 100 Mbps	90.7%	-	*87.4%*	-	*86.7%*	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA

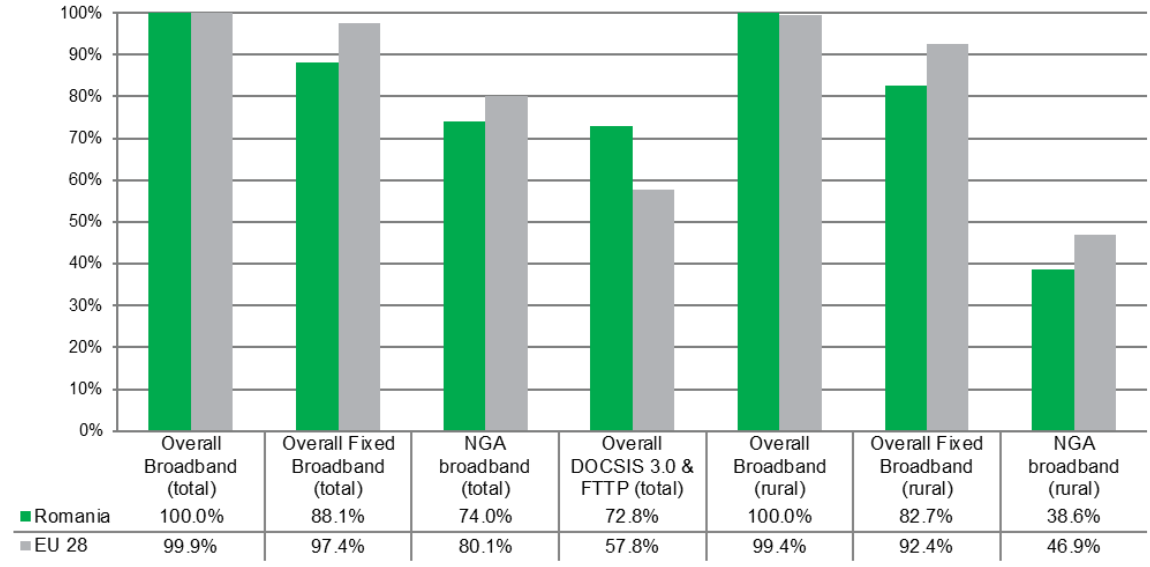
All restatements are highlighted in italics.

5.25 Romania

5.25.1 National coverage by broadband technology

By mid-2017, overall broadband coverage in Romania was universal. Fixed and NGA coverage, however, remained below the EU average both on a national and rural level. At the end of June 2017, fixed broadband technologies passed 88.2% of Romanian households, which represented a 0.5 percentage point decrease compared to mid-2016. This development is largely due to a decrease in DSL coverage which was not compensated by the growth in coverage of the remaining fixed technologies. In rural areas, fixed broadband was available to 82.7% of households, recording a slight year-on-year uplift. Analysing NGA coverage, this combination category was available to 74.0% of Romanian households, expanding by 2.3 percentage points since mid-2016. In rural areas, NGA availability grew by 5 percentage points to reach 38.6% of rural households.

Romania: Coverage by technology combination, 2017

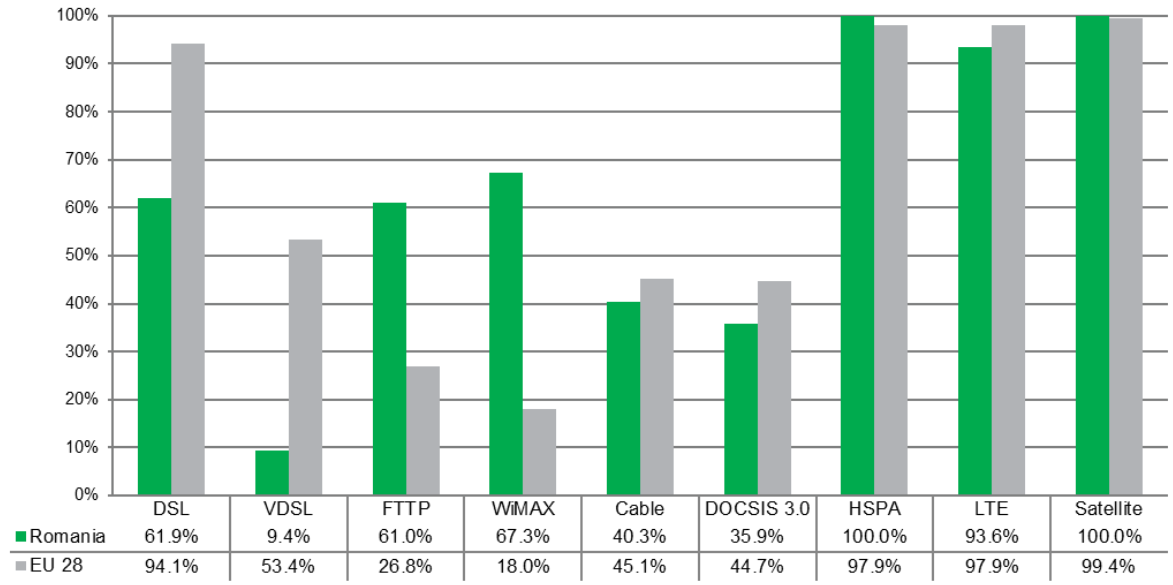


	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Romania	100.0%	88.1%	74.0%	72.8%	100.0%	82.7%	38.6%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Taking a closer look at individual technologies, availability of most fixed broadband technologies was below the EU average.

Romania: Coverage by technology, total, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Romania	61.9%	9.4%	61.0%	67.3%	40.3%	35.9%	100.0%	93.6%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

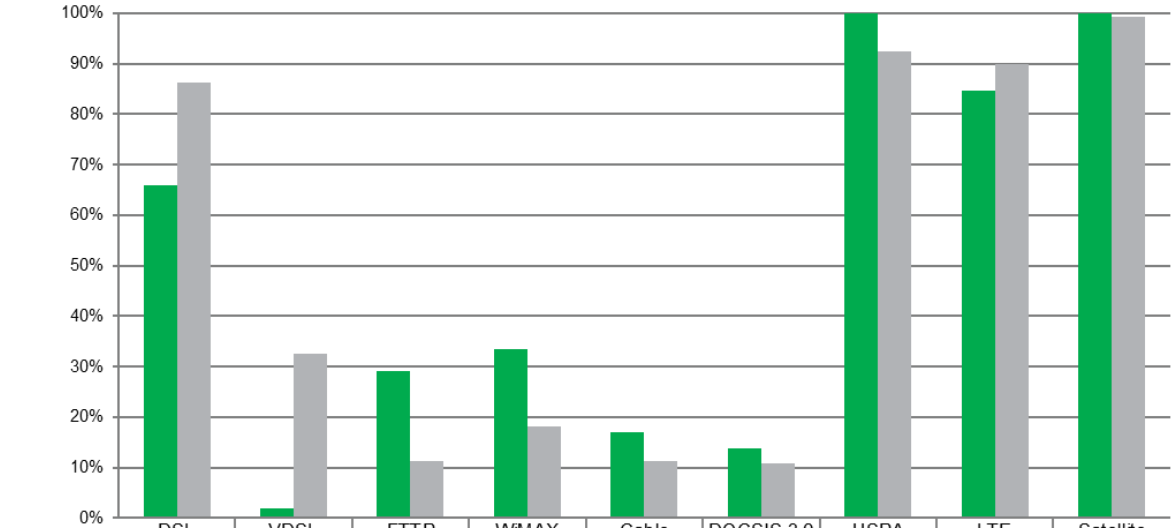
Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

At the end of June 2017, DSL declined by 4 percentage points compared to the previous period, reaching 61.9% of households. The main development in Romania in terms of fixed broadband coverage came from cable networks, which increased by 8 percentage points in the period, passing 35.9% of homes.

Examining NGA technologies, VDSL coverage in Romania decreased due to a strategic shift by the country's sole VDSL provider, Telekom Romania, who prioritised investing in FTTP network upgrades in order to retain its competitive advantage over the market.[72] At 61.0%, FTTP coverage in Romania was 2.3 times higher than the EU average, passing over 4.5 million homes. DOSCIS 3.0 availability further improved over the twelve months to mid-2017, reaching 35.9% of the total households following a year-on-year increase of 5.3 percentage points. However, it remained below the EU average for this type of technology, which was 44.7%.

The largest coverage improvement in Romania's broadband technologies was seen in LTE networks, which increased by 18.4 percentage points to reach nearly 94% of the country's households at the end of June 2017. These developments followed the decision in the second half of 2016 by Romania's regulatory authority (ANCOM) to fine mobile operators Orange, Vodafone and Telekom Romania for failing to meet wireless broadband coverage targets in rural areas by April 2016.[73] During the study period, all operators extended the reach of their LTE networks and improved the signal quality. Vodafone launched dual-carrier LTE-Advanced (LTE-A) services across all Romanian administrative centres and their surrounding areas, increasing the available LTE bandwidth, download speeds and indoor coverage.[74] Orange Romania also expanded its LTE network which, by mid-2017, recorded 100% coverage in urban areas.[75] Consequently, the average coverage achieved by operators in Romania surged by 27.3 percentage points to 72.0%.

Romania: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Romania	66.0%	1.9%	29.1%	33.4%	17.0%	13.8%	100.0%	84.8%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

DSL remained the prevalent fixed technology in rural areas, reaching 66.0% of households at the end of June 2017. DSL recorded improvements in rural parts of the country, despite an overall decline in coverage at a national level. Looking at other fixed broadband technologies, cable coverage in rural areas exceeded the average EU level, passing 17.0% of rural homes. WiMAX broadband decreased slightly, but remained the second most widespread technology, passing 33.4% of rural homes. The third

[72] The National Authority for Management and Regulation in Communications of Romania (ANCOM), http://www.ancom.org.ro/en/

[73] http://www.ancom.org.ro/en/ancom-aplica-amenzi-operatorilor-de-telefonie-mobila-pentru-nendeplinirea-obliga539iilor-de-acoperire-_5607

[74] https://www.telegeography.com/products/commsupdate/articles/2016/09/06/vodafone-romania-launches-dual-carrier-lte-a-in-372-localities-orange-expands-quad-play-packages-nationwide/

[75] https://www.romaniajournal.ro/orange-expands-4g-coverage-in-1300-localities/

most widely available broadband technology was FTTP, which passed 29.1% of rural households, over 2.6 times the EU average. Looking at other NGA technologies, DOCSIS 3.0 exceeded the EU average by 3 percentage points, reaching 13.8% of households. Meanwhile, VDSL coverage remained limited, passing less than 2% of rural homes.

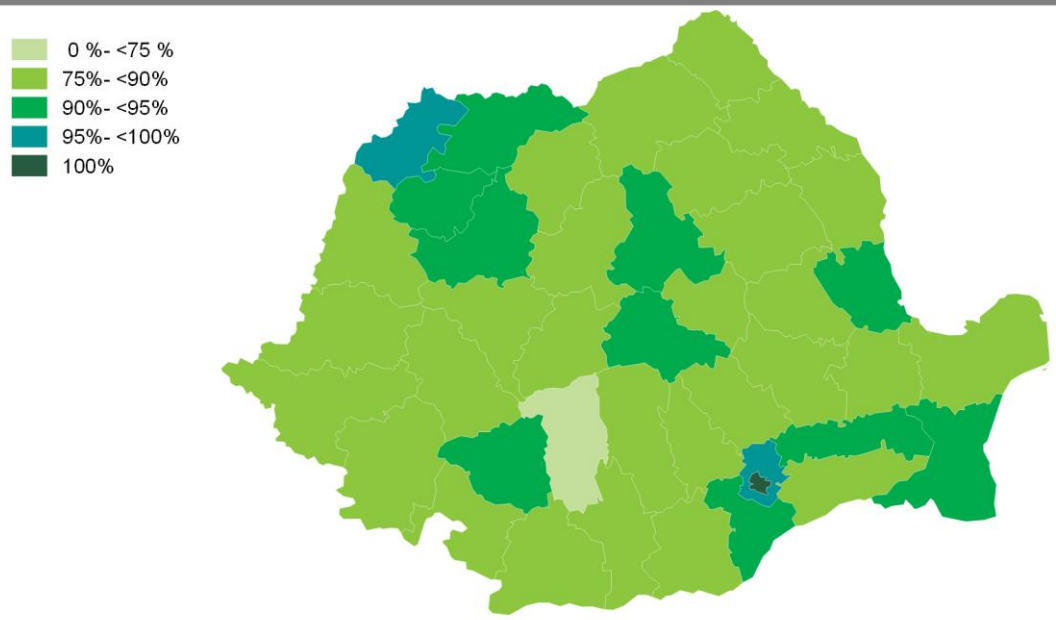
Examining mobile technologies, HSPA coverage in Romania remained universal. While LTE availability continued to be below the EU average, LTE coverage in Romania demonstrated rapid improvements over the study period, gaining 35.2 percentage points. With LTE broadband available to 87.8% of households, Romania had rapidly bridged the gap with the EU average (89.9%) at the end of the period, underpinned by the efforts of mobile operator Orange Romania, which announced rural LTE coverage of 81% at the start of 2017.[76]

[76] https://www.telegeography.com/products/commsupdate/articles/2017/02/09/orange-romania-4g-coverage-now-available-in-6723-localities/

5.25.2 Regional coverage by broadband technology

Fixed broadband coverage across the Romanian regions remained varied extent during the twelve months to mid-2017. Availability of fixed broadband technologies in all areas of the country was above 75%, except in Vâlcea where it was 73.1%. Fixed coverage was universal in the capital Bucharest and reached 96.3% and 95.1% respectively in the regions of Ilfov and Satu Mare.

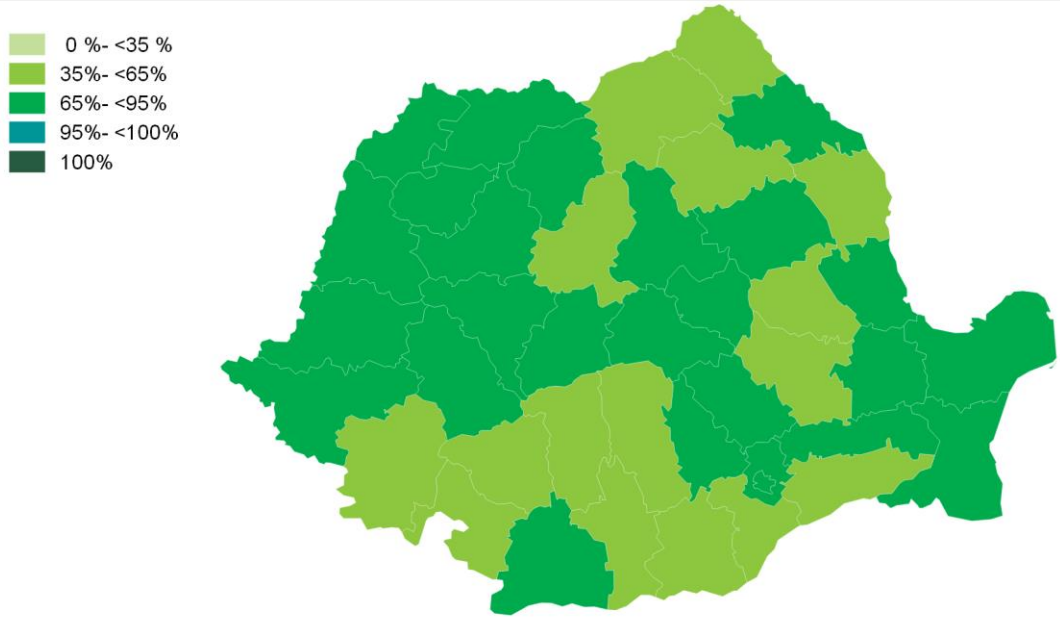
Romania: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In terms of NGA availability, high-speed broadband technologies exceeded 65% coverage in 26 Romanian regions. Over the study period, availability in the lowest-covered region of Vâlcea improved from 35% to 38%. Meanwhile, the highest availability of NGA technologies remained in Bucharest, where it reached 94.7% of households.

Romania: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.25.3 Data tables for Romania

Statistic	National
Population	19,870,647
Persons per household	2.7
Rural proportion	21.0%

	Romania 2017		Romania 2016		Romania 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	61.9%	66.0%	65.9%	65.7%	68.3%	63.7%	94.1%	86.3%
VDSL	9.4%	1.9%	11.0%	2.1%	11.8%	1.8%	53.4%	32.5%
FTTP	61.0%	29.1%	59.7%	26.7%	58.2%	25.0%	26.8%	11.3%
WiMAX	67.3%	33.4%	67.4%	33.5%	65.5%	31.2%	18.0%	18.2%
Cable	40.3%	17.0%	32.3%	11.7%	30.9%	9.3%	45.1%	11.4%
DOCSIS 3.0	35.9%	13.8%	30.6%	9.7%	28.9%	7.3%	44.7%	10.8%
HSPA	100.0%	100.0%	100.0%	100.0%	99.8%	99.5%	97.9%	92.4%
LTE	93.6%	84.8%	75.2%	49.5%	66.1%	33.8%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	72.0%	-	44.7%	-			90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	100.0%	100.0%	100.0%	99.9%	99.7%	99.9%	99.4%
Overall fixed broadband	88.1%	82.7%	88.6%	82.3%	88.8%	80.5%	97.4%	92.4%
NGA broadband	74.0%	38.6%	71.7%	33.6%	70.4%	29.5%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	72.8%	-	-	-	-	-	57.8%	-
At least 2 Mbps	94.2%	-	*92.6%*	-	99.9%	-	96.0%	-
At least 30 Mbps	67.9%	-	*66.9%*	-	73.0%	-	79.0%	-
At least 100 Mbps	64.9%	-	*63.4%*	-	72.2%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

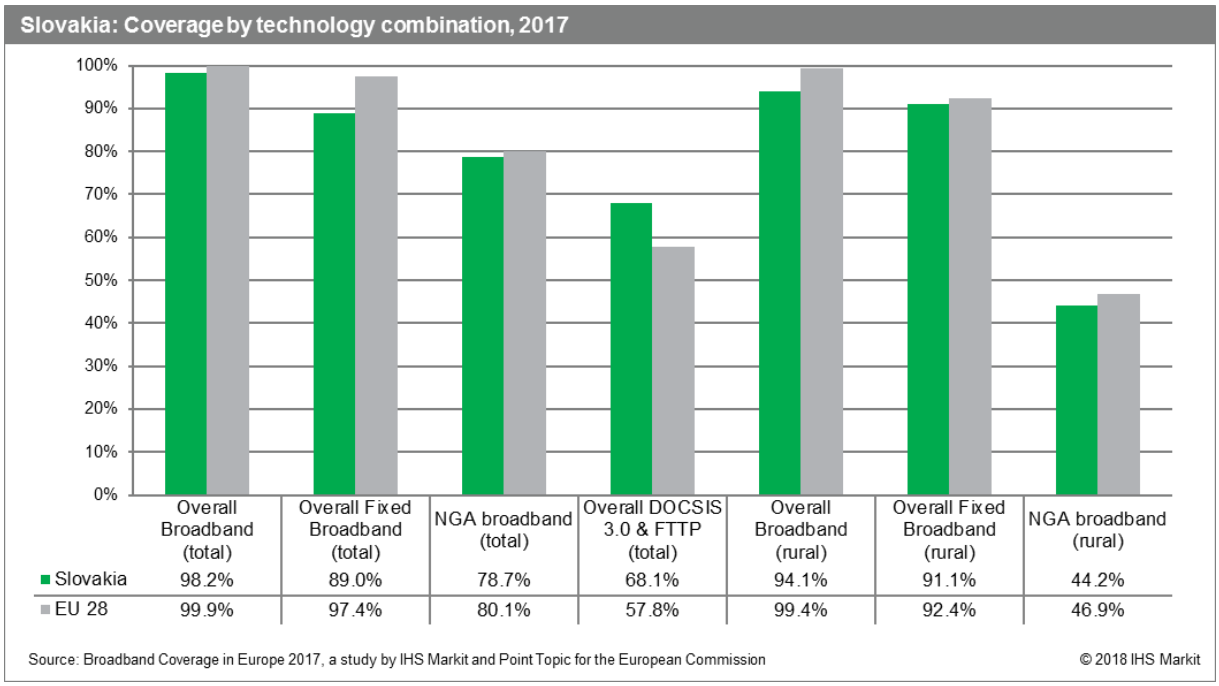
All restatements are highlighted in italics.

Part of the connections classified as FTTP in the previous edition of this study deployed by Romania's leading broadband provider, RCS&RDS were EoC – Ethernet over Coaxial technology implemented by the operator after acquiring other networks and before upgrading to FTTH. In the current study these connections were reclassified as Cable (as revised by the operator and confirmed by Romania's NRA, ANCOM). This resulted in an increased cable coverage and a slight decrease in FTTP levels.

5.26 Slovakia

5.26.1 National coverage by broadband technology

Despite remaining below the EU average, availability of the overall broadband, overall fixed broadband and NGA broadband combination categories improved compared to the previous iteration of this study, as nearly all technologies (except cable) increased over the study period. Overall broadband coverage improved by 2.2 percentage points, reaching 98.2% of Slovakian homes at the end of June 2017. There was strong growth in NGA broadband, which increased by 3.2 percentage points year-on-year, passing 78.7% of Slovakian homes. As a result, overall fixed broadband availability expanded by a percentage point, reaching 91.1% of households. NGA improvement was more significant in rural areas, where coverage increased by 5.8 percentage points, making NGA broadband services available to 44.2% of the rural population.



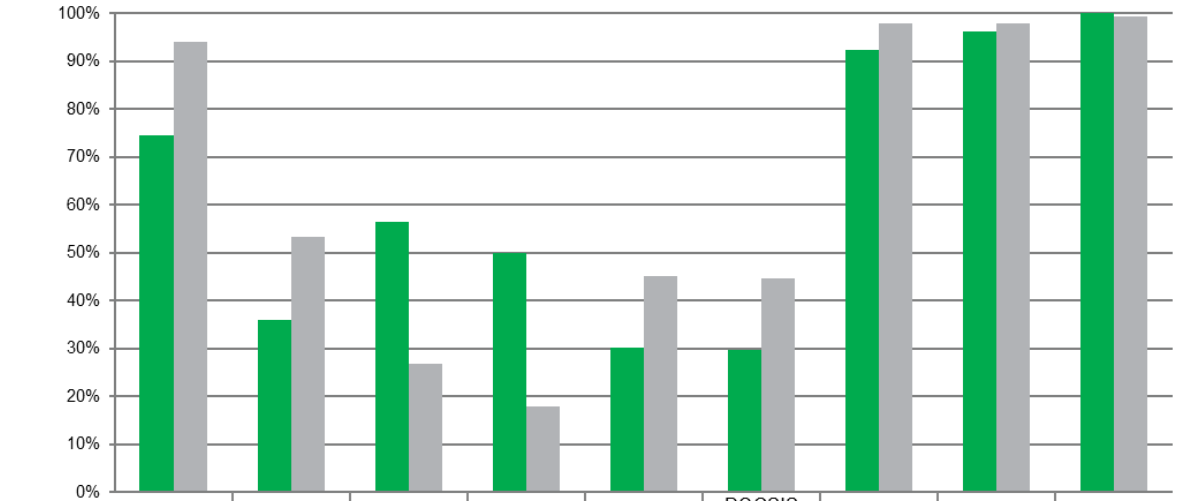
Considering individual technologies, DSL continued to be the prevalent fixed broadband technology in terms of availability, covering 74.6% of households in Slovakia. Despite a year-on-year increase in coverage, DSL remained below the EU average of 94.1%. During the twelve months to the end of June 2017, cable was the only broadband technology in Slovakia that recorded a decrease in availability. By mid-2017, cable services were available to 30.2% of Slovakian households, 15 percentage points below the EU average. WiMAX availability remained at 49.9%, significantly above the EU average (18.0%).

VDSL networks reported the most significant growth of all broadband technologies in this market, adding 7.4 percentage points. Despite this increase, VDSL services remained significantly below the EU average of 53.4%, passing slightly over a third of homes in Slovakia (36.1%). In turn, FTTP continued to be the most widespread NGA technology in the Slovakian market, passing 56.4% of households, nearly two times higher than the EU average. FTTP coverage continued to expand due to the efforts of incumbent Slovak Telekom and alternative operator Orange Slovakia. Both operators continued deploying FTTP networks over the study period, and Orange announced plans to bring FTTP services to residents of approximately 60 cities in Slovakia by the end of 2018.[77] Meanwhile, DOCSIS 3.0 coverage recorded a 1.8 percentage point increase, reaching 29.7% of households, 15.1 percentage points below the EU average. UPC remained the main cable operator in Slovakia, offering download speeds of up to 500 Mbps to provide an alternative to the high-speed FTTP broadband offered by Slovak Telekom and Orange Slovakia.[78]

[77] https://www.telegeography.com/products/commsupdate/articles/2016/09/22/orange-slovakia-plans-eur35m-ftth-expansion/
[78] https://www.upc.sk/internet/ponuka/internet-500/

Examining mobile broadband coverage, availability of LTE networks expanded in the twelve-month period, increasing by 6 percentage points to reach 96.3% of Slovakian households. All operators improved their LTE footprint in this market over the twelve months to mid-2017. By the end of 2016, the incumbent Slovak Telekom developed its LTE network to reach over 85% of the country's population. The operator, who started providing LTE-Advanced in mid-2015, continued extending the coverage of its network to additional territories, including parts of Bratislava and Senec.[79] Meanwhile, O2 exceeded its end-of-year 2016 LTE target of covering 66% of Slovakia's population, reaching 70% instead. This is a noteworthy improvement considering that at the beginning of 2016, O2's LTE services were only available to one quarter of the population.[80] The Slovak alternative operator SWAN[81] also continued expanding its LTE footprint, aiming to reach 80% of the country's population by the end of 2017.[82] Following these developments, the average LTE coverage achieved by operators in Slovakia reached 81.5%, up by 10.6 percentage points since mid-2016.

Slovakia: Coverage by technology, total, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Slovakia	74.6%	36.1%	56.4%	49.9%	30.2%	29.7%	92.3%	96.3%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

In terms of broadband availability in rural areas, DSL remained the most widespread fixed broadband technology, covering 69.5% of rural homes. It was followed by WiMAX, which was available to 50.0% of rural households, exceeding the EU average by over 30 percentage points. Cable coverage in rural areas of Slovakia remained insignificant, passing only 0.9% of homes.

VDSL was the prevalent NGA technology in rural areas, covering 32.9% of households, slightly above EU average. Availability of this technology improved by 5.2 percentage points over the twelve-month period. Meanwhile, 14.1% of rural homes had access to FTTP services, 2.9 percentage points above the EU average. Lastly, DOCSIS 3.0 coverage in rural areas remained negligible at 0.3%.

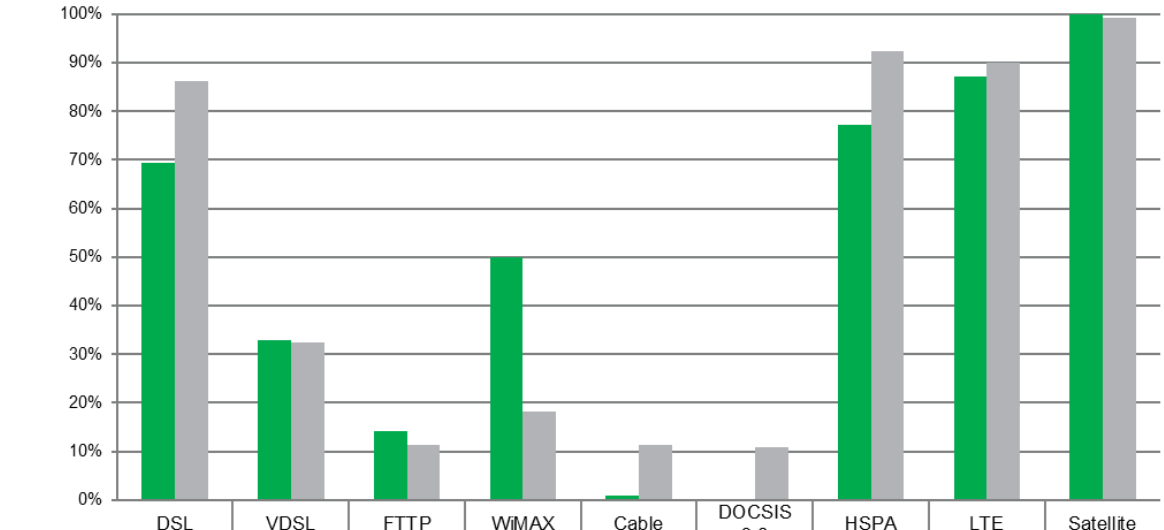
[79] https://www.slovanet.net/sk/biznis/tlacove-spravy/2016/ts20160808.html

[80] https://www.o2.cz/file_conver/522266/O2_Czech_Republic_Investor_presentation_February_2017.pdf

[81] https://www.telecompaper.com/news/slovak-investors-agree-merger-of-swan-benestra--1197330

[82] https://www.telegeography.com/products/commsupdate/articles/2017/01/19/swan-mobile-targets-80-lte-population-coverage-by-end-2017/

Slovakia: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Slovakia	69.5%	32.9%	14.1%	50.0%	0.9%	0.3%	77.1%	87.1%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

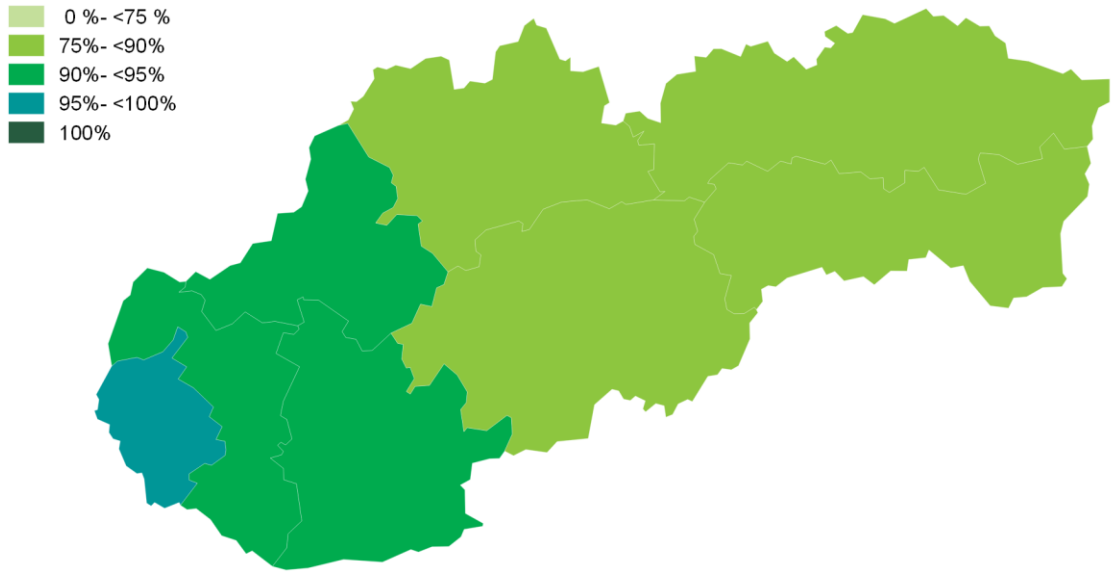
Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

LTE coverage maintained rapid growth in rural areas, improving by 20.7 percentage points year-on-year. By the end of June 2017, LTE was available to 87.1% of rural households in Slovakia, slightly below the EU average of 89.9%. HSPA services, however, remained low at 77.1%, or 15.3 percentage points below the EU average.

5.26.2 Regional coverage by broadband technology

In Slovakia, overall fixed broadband coverage remained highest in the capital Bratislava at 97.8% and the surrounding regions where it exceeded 92%. However, coverage of fixed technologies in the remaining four regions to the East remained lower, registering availability between 80.5% and 87.3%.

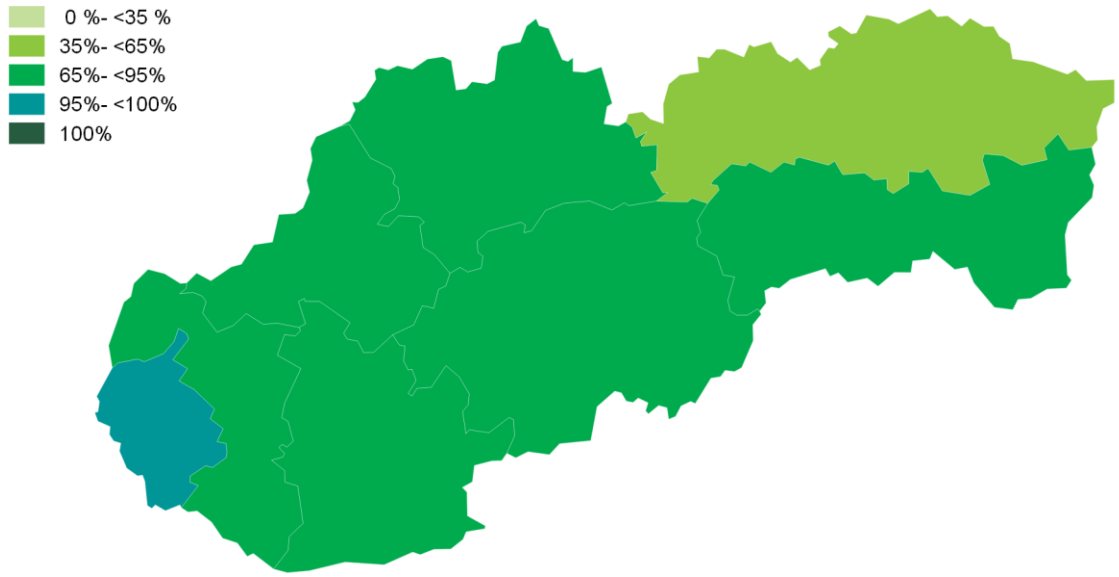
Slovakia: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

The capital region of Bratislava also recorded the highest levels for NGA coverage, where it reached 96.6% of households. Regarding the rest of the country, NGA technology was available to over 73% of households, except in the Presovsky region where NGA technologies passed 62.7% of homes.

Slovakia: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.26.3 Data tables for Slovakia

Statistic	National
Population	5,421,349
Persons per household	2.8
Rural proportion	28.8%

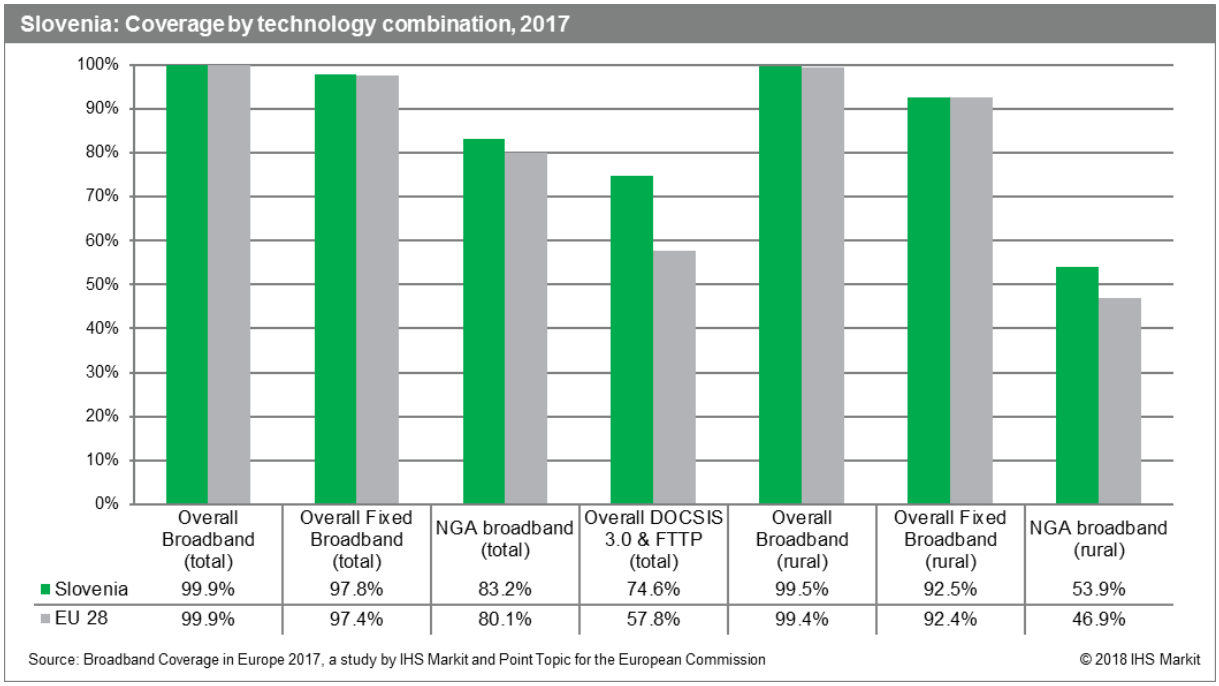
	Slovakia 2017		Slovakia 2016		Slovakia 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	74.6%	69.5%	72.5%	71.2%	71.2%	66.0%	94.1%	86.3%
VDSL	36.1%	32.9%	28.7%	27.7%	16.9%	11.9%	53.4%	32.5%
FTTP	56.4%	14.1%	53.7%	12.5%	50.4%	12.2%	26.8%	11.3%
WiMAX	49.9%	50.0%	50.0%	50.0%	50.0%	50.0%	18.0%	18.2%
Cable	30.2%	0.9%	30.4%	0.8%	28.8%	0.6%	45.1%	11.4%
DOCSIS 3.0	29.7%	0.3%	27.9%	0.4%	25.3%	0.0%	44.7%	10.8%
HSPA	92.3%	77.1%	90.7%	78.5%	91.8%	71.7%	97.9%	92.4%
LTE	96.3%	87.1%	90.3%	66.4%	61.2%	8.5%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	81.5%	-	*70.9%*	-			90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	98.2%	94.1%	95.9%	91.6%	95.9%	91.6%	99.9%	99.4%
Overall fixed broadband	89.0%	91.1%	88.0%	91.1%	86.3%	83.0%	97.4%	92.4%
NGA broadband	78.7%	44.2%	75.5%	38.4%	67.1%	23.5%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	68.1%	-	-	-	-	-	57.8%	-
At least 2 Mbps	88.7%	-	87.6%	-	86.3%	-	96.0%	-
At least 30 Mbps	78.4%	-	75.1%	-	66.1%	-	79.0%	-
At least 100 Mbps	67.2%	-	64.1%	-	57.0%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.27 Slovenia

5.27.1 National coverage by broadband technology

Overall broadband availability in Slovenia remained unchanged over the study period, having already achieved nearly universal coverage in the previous iteration of the study. Looking at overall fixed broadband, this combination category exceeded the EU average by 0.4 percentage points. However, the most noticeable improvement was witnessed by the NGA broadband combination category, which grew by 1.6 percentage points on a total level, with NGA broadband networks accessible to 83.2% of Slovenian households. This development was more prominent in rural areas, where NGA broadband reached 53.9% of rural households, surpassing the EU average by 7 percentage points.



Considering individual broadband technologies, nearly all technologies (except WiMAX) recorded levels higher than the EU average at the end of the study period. DSL remained the most widespread broadband technology, passing 95.8% of homes. Cable increased by 1.8 percentage points year-on-year, covering 60.3% of households in Slovenia, over 15 percentage points higher than the EU average. As mentioned, WiMAX coverage remained low at only 2.6%.

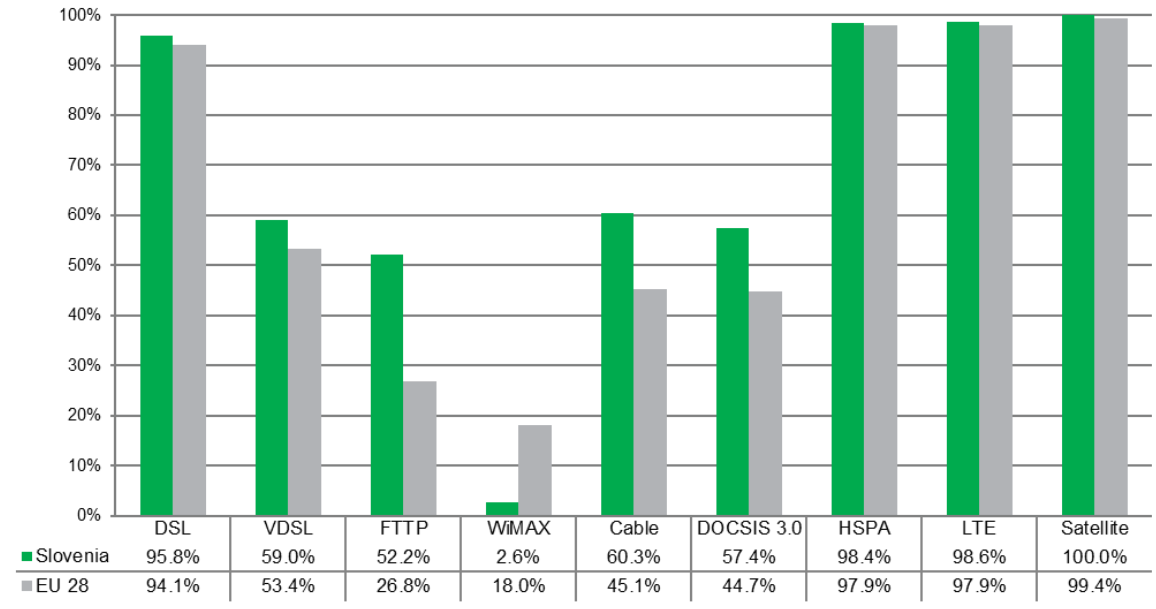
Taking a closer look at NGA technologies, developments in this market are outlined by the Slovenian government's initiative Slovenia 2020, envisioning a Next-Generation Broadband Network Development plan with the objective to provide broadband internet access at a minimum speed of 100Mbps to 96% of households by the end of 2020 and speeds of minimum 30Mbps to the rest of the households.[83] Due to investments undertaken towards achieving this goal, NGA availability in Slovenia improved in the period, with the most significant growth seen in VDSL coverage, which increased by 5.6 percentage points. By the end of June 2017, 59.0% of Slovenian households had access to VDSL, 5.6 percentage points higher than the EU average. Coverage of DOCSIS 3.0 improved by 3.7 percentage points, reaching 57.4% of homes, significantly ahead of the EU average of 44.7%. Meanwhile, FTTP services recorded a slower growth, increasing by only 1.8 percentage points to pass 52.2% of homes in Slovenia by mid-2017. Nonetheless, FTTP availability in this market was nearly two times higher than the EU average (26.8%).

LTE coverage, which by mid-2016 had already exceeded the average EU levels, improved at a slower rate compared with previous years. By the end of June 2017, LTE availability increased by 1.2 percentage points, reaching 98.6% of Slovenian homes. Looking at the average LTE coverage achieved

[83] http://www.mju.gov.si/fileadmin/mju.gov.si/pageuploads/DID/Informacijska_druzba/pdf/DSI_2020_3-2016_pic1.pdf

by operators in Slovenia, on average 96.1% of households had access to LTE broadband, signifying an increase of 5.9 percentage points since the previous iteration of this study.

Slovenia: Coverage by technology, total, 2017

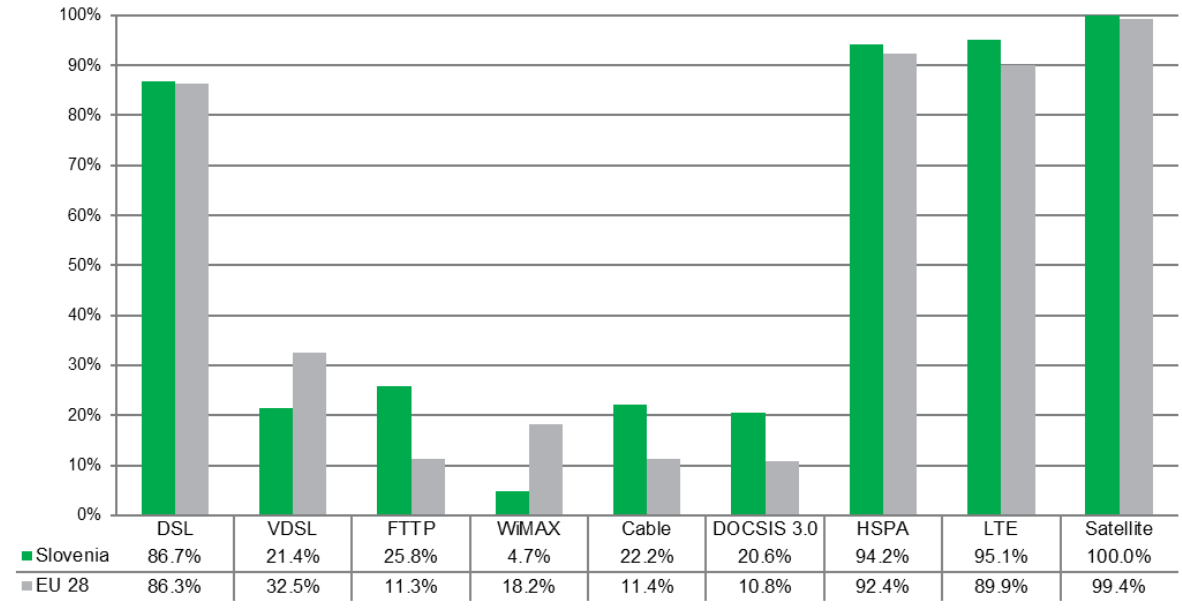


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Slovenia	95.8%	59.0%	52.2%	2.6%	60.3%	57.4%	98.4%	98.6%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Focusing on coverage in rural parts of Slovenia, the prevalent fixed broadband technology was DSL. DSL services were available to 86.7% of rural households in Slovenia by mid-2017. Cable coverage was nearly double the EU average of 11.4%, reaching 22.2% of rural households. In terms of availability of NGA technologies, VDSL was the only technology in this market with rural coverage lower than the EU average. FTTP and DOCSIS 3.0, both recorded significantly higher levels than the EU average. Over 25.8% of rural households in Slovenia had access to FTTP, signifying a 2.4 percentage point increase since mid-2016. Meanwhile, DOCSIS 3.0 increased by 1.8 percentage points and was available to 20.6% of rural households. Both mobile technologies, HSPA and LTE, recorded improved availability. LTE increased by 4.2 percentage points, reaching 95.1% of rural homes, while HSPA was available to 94.2% of households in rural areas.

Slovenia: Coverage by technology, rural areas, 2017



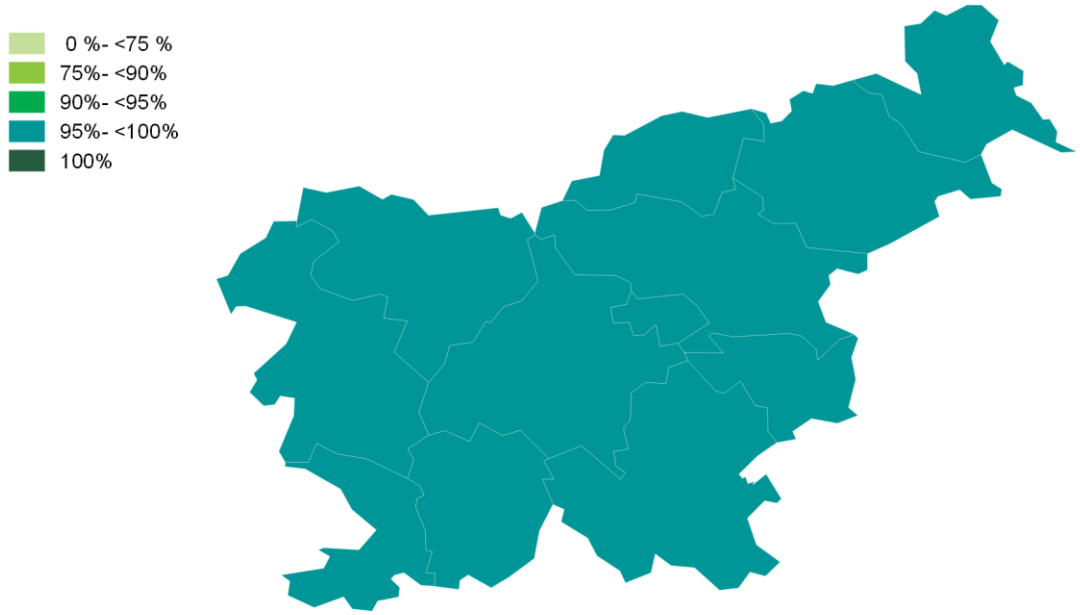
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Slovenia	86.7%	21.4%	25.8%	4.7%	22.2%	20.6%	94.2%	95.1%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.27.2 Regional coverage by broadband technology

Fixed broadband coverage across Slovenia remained stable across all twelve regions, ranging from 99.1% in the region of Gorenjska to 95% in the Posavska reigon.

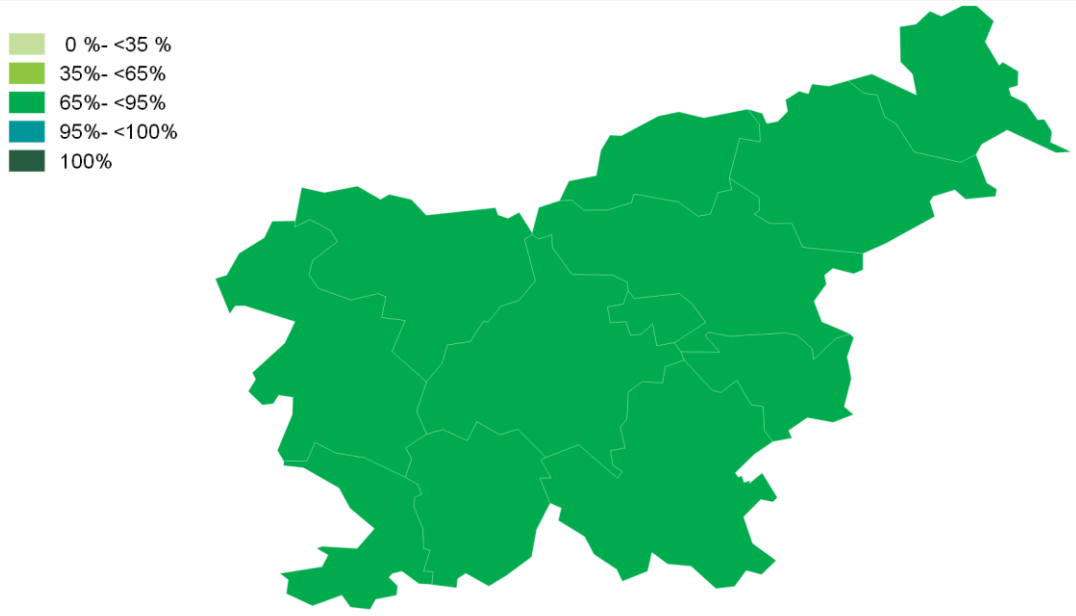
Slovenia: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

NGA coverage ranged between 75.6% in Jugovzhodna Slovenija to 86.1% in Osrednjeslovenska. By mid-2017, Slovenia was one of the countries with the lowest regional variance in terms of availability of fixed and NGA broadband technologies.

Slovenia: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.27.3 Data tables for Slovenia

Statistic	National
Population	2,059,443
Persons per household	2.4
Rural proportion	23.3%

	Slovenia 2017		Slovenia 2016		Slovenia 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	95.8%	86.7%	95.8%	86.7%	90.9%	82.3%	94.1%	86.3%
VDSL	59.0%	21.4%	53.4%	19.4%	52.8%	16.3%	53.4%	32.5%
FTTP	52.2%	25.8%	50.4%	23.5%	45.0%	20.2%	26.8%	11.3%
WiMAX**	2.6%	4.7%	2.6%	4.8%	0.3%	1.1%	18.0%	18.2%
Cable	60.3%	22.2%	58.6%	21.5%	58.4%	21.5%	45.1%	11.4%
DOCSIS 3.0	57.4%	20.6%	53.7%	18.8%	52.4%	18.3%	44.7%	10.8%
HSPA	98.4%	94.2%	98.1%	93.1%	98.0%	91.5%	97.9%	92.4%
LTE	98.6%	95.1%	97.4%	90.9%	95.7%	81.2%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	96.1%	-	*90.1%*	-			90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.9%	99.5%	99.8%	99.3%	99.7%	99.1%	99.9%	99.4%
Overall fixed broadband	97.8%	92.5%	97.7%	92.2%	95.5%	90.1%	97.4%	92.4%
NGA broadband	83.2%	53.9%	81.6%	50.2%	80.8%	49.8%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	74.6%	-	-	-	-	-	57.8%	-
At least 2 Mbps	97.7%	-	*97.5%*	-	*97.6%*	-	96.0%	-
At least 30 Mbps	83.2%	-	*81.6%*	-	*78.1%*	-	79.0%	-
At least 100 Mbps	74.3%	-	72.2%	-	68.7%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

**There is no national WiMAX provider present in Slovenia and WiMAX technology is only used in small, mostly rural areas as part of an Open Access Network initiative aimed at increasing coverage of white spot areas.

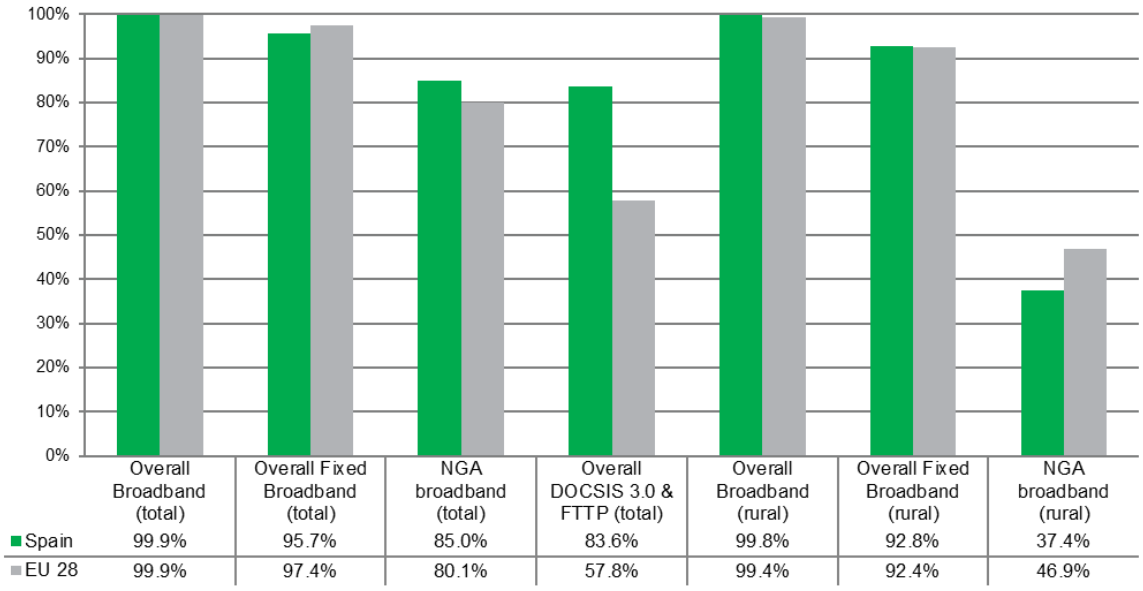
All restatements are highlighted in italics.

5.28 Spain

5.28.1 National coverage by broadband technology

During the twelve months to the end of June 2017, overall broadband and fixed broadband coverage in Spain remained relatively unchanged, on both national and rural levels, compared to mid-2016. Consequently, Spain exceeded the EU average for overall broadband coverage at both a national and rural level, but remained slightly below the EU average for the overall fixed broadband combination category at a total level. Spanish NGA coverage expanded by 4.2 percentage points to reach 85.0% of households, as Spain's NGA coverage remained above the EU average of 80.1%. At a rural level, Spanish NGA coverage increased by 9.6 percentage points but, at 37.4%, remained below the EU average (46.9%). By mid-2017, overall DOCSIS 3.0 and FTTP coverage in Spain was 25.8 percentage points higher than the EU average of 57.8%.

Spain: Coverage by technology combination, 2017



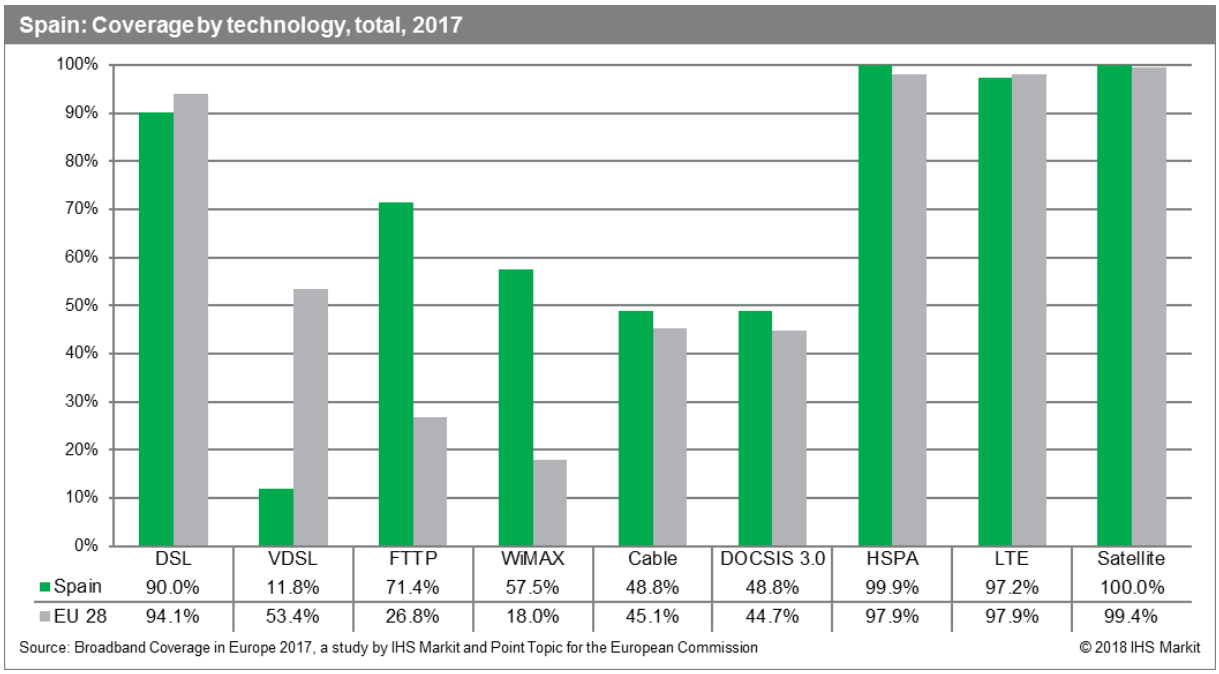
	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Spain	99.9%	95.7%	85.0%	83.6%	99.8%	92.8%	37.4%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

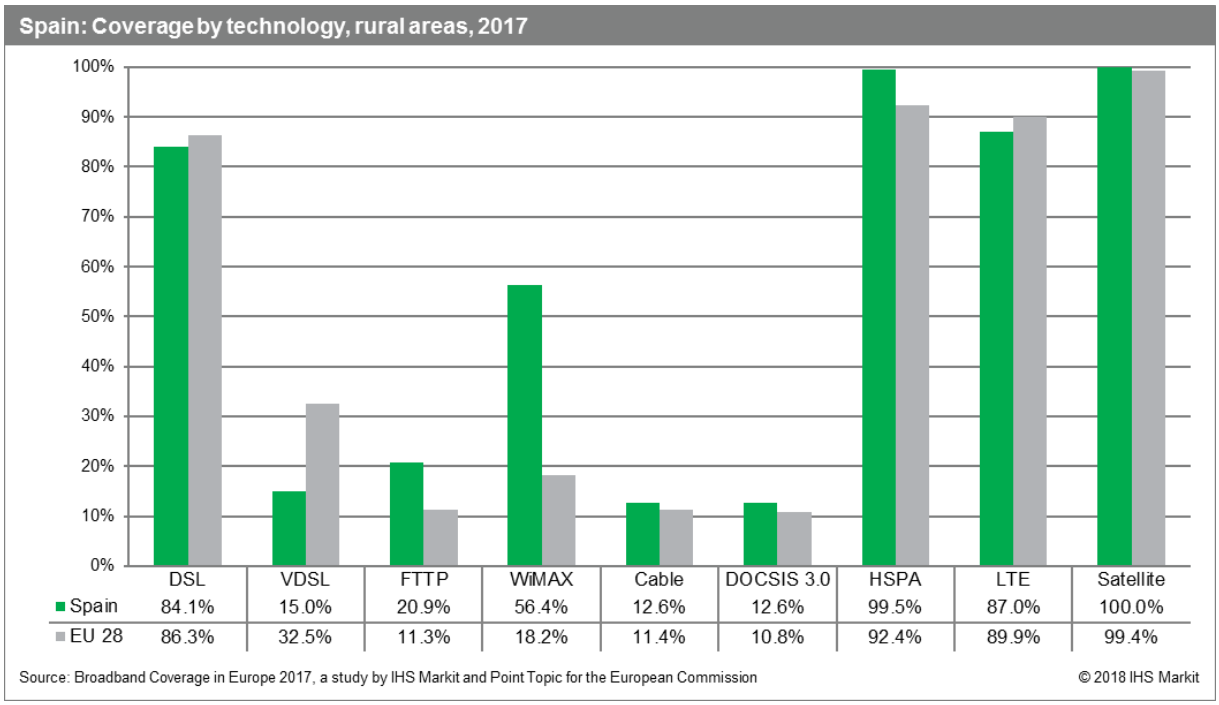
As was the case in the 2016 study, most broadband access technologies registered marginal increases or had coverage that remained the same during the twelve months to mid-2017. This was the case for DSL services and cable networks, which continued to pass 90.0% and 48.8% of homes, respectively. VDSL coverage remained static, at 11.8% of households, highlighting the low proportion of DSL networks that had been upgraded to VDSL. WiMAX coverage expanded slightly during the twelve months to the end of June 2017, rising from 54.2% to 57.5% of households.

During the period, the largest increase in coverage was from FTTP networks, which improved 8.6 percentage points to pass 71.4% of homes. Spain's high levels of FTTP availability reflects the decision of operators to prioritise FTTP network deployment over upgrades of legacy networks to VDSL. Furthermore, there also continued to be strong collaboration between Spanish operators, highlighted by the use of network sharing agreements in order to reduce the cost of deployment.[84][85] Looking forward, further FTTP deployment is expected, with alternative operator Orange Spain planning to accelerate its fibre rollout in 2018.[86]

[84] http://www.grupomasmovil.com/wp-content/uploads/2017/02/11012017_MASMOVIL-Group-broadens-its-fibre-optic-proposal-to-reach-6.5-million-households.pdf
[85] https://www.telefonica.com/en/web/press-office/-/telefonica-and-vodafone-sign-a-commercial-agreement-for-wholesale-access-to-fibre-optics
[86] https://www.orange.com/en/Press-Room/press-releases/press-releases-2017/Orange-reaffirms-its-strategy-and-accelerates-in-its-drive-to-build-solid-sustainable-value-creation-for-all-stakeholders



In terms of mobile technologies, HSPA coverage remained stable, reaching 99.9% of households. On the other hand, LTE network coverage increased by 2.8 percentage points during the period, covering 97.2% of households. Despite this increase, Spain's LTE coverage remained slightly below the EU average of 97.9%. When the average coverage of LTE networks of all mobile network operators is considered, on average 92.3% of people in Spain had access to LTE services at the end of June 2017.



In rural areas, DSL continued to be the most widespread fixed broadband technology, with 84.1% availability. However, the proportion of DSL networks upgraded to VDSL technology remained low. By mid-2017, only 15.0% of rural households had access to VDSL. As a result, with coverage growth of 11.1 percentage points in rural areas, FTTP services became the most widespread NGA technology in rural Spain.

Examining other technologies in rural areas, DOCSIS 3.0 coverage increased in tandem with cable coverage, at 2.0 percentage points during the twelve months to June 2017, reaching 12.6% of rural households. There was also an improvement in WiMAX coverage, equivalent to 5.0 percentage points.

By mid-2017, Spain had the third highest rural WiMAX coverage among the study countries, reaching 56.4% of rural households.

Examining rural mobile broadband coverage, Spain recorded slight growth in HSPA coverage, increasing by 0.8 percentage points during the twelve months to mid-2017. Spanish rural HSPA coverage (99.5%) was above the EU average of 92.4%. However, despite increasing by 13.7 percentage points, at 87.0%, rural LTE coverage was below the EU average of 89.9%.

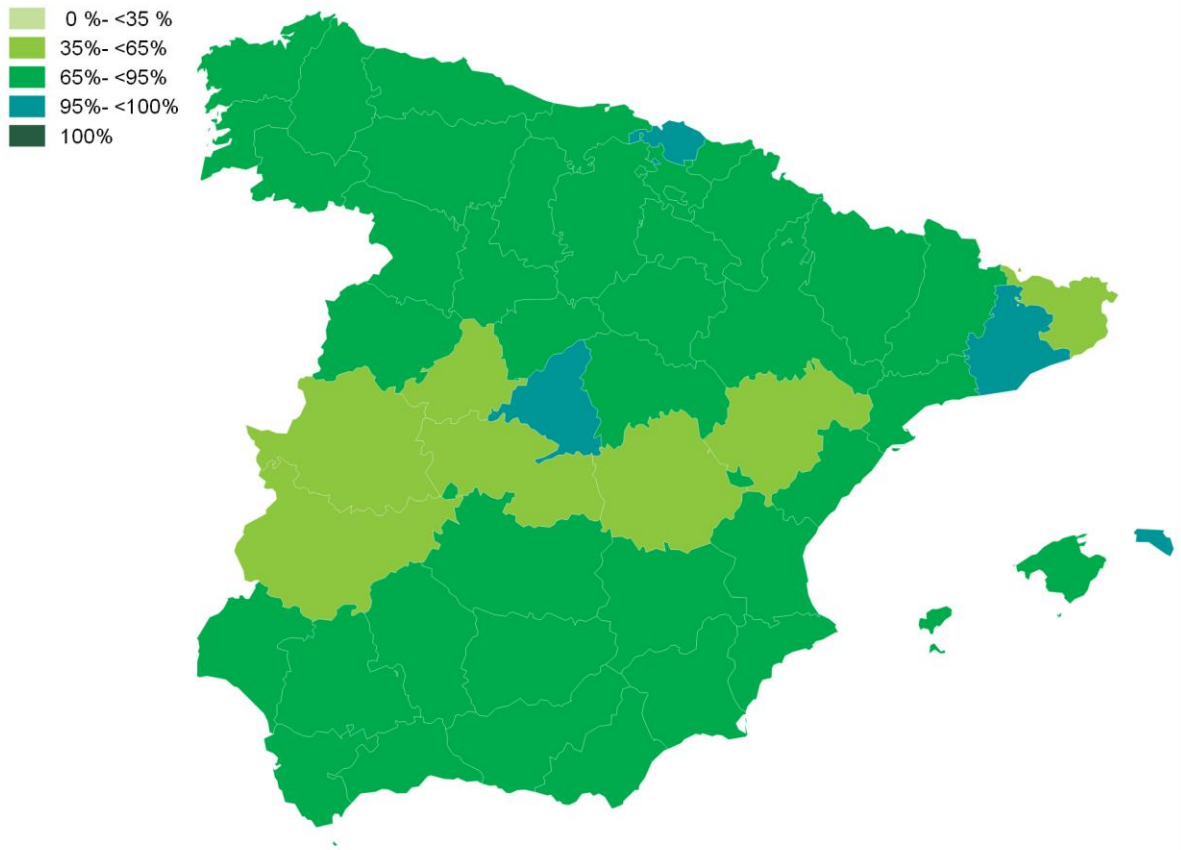
5.28.2 Regional coverage by broadband technology

As in previous iterations of the study, availability of fixed broadband services varied considerably between the individual regions.

Spain: Overall fixed broadband coverage, 2017

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Spain: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

By mid-2017, four regions (Barcelona, Bizkaia, Madrid and Menorca) recorded NGA availability above 95%. The lowest coverage was recorded in Fuerteventura (22.6%), while NGA broadband services in La Gomera and La Palma also passed less than a third of homes. In addition, the overseas provinces and the Mediterranean Islands also recorded lower availability of NGA services.

The following broadband coverage levels were recorded in Spanish regions outside mainland Europe:

Coverage data for Spanish NUTS 3 areas outside mainland Europe

NUTS 3	Description	Overall fixed broadband coverage	NGA broadband coverage
ES630	Ceuta (ES)	98.5%	93.4%
ES640	Melilla (ES)	100.00%	100.0%
ES703	El Hierro	70.4%	37.2%
ES704	Fuerteventura	95.7%	22.6%
ES705	Gran Canaria	90.6%	88.7%
ES706	La Gomera	72.0%	25.5%
ES707	La Palma	90.5%	32.2%
ES708	Lanzarote	94.0%	69.3%
ES709	Tenerife	93.7%	81.8%

5.28.3 Data tables for Spain

Statistic	National
Population	46,440,099
Persons per household	2.6
Rural proportion	18.5%

	Spain 2017		Spain 2016		Spain 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	90.0%	84.1%	90.1%	83.9%	88.5%	80.5%	94.1%	86.3%
VDSL	11.8%	15.0%	11.8%	15.2%	11.0%	14.1%	53.4%	32.5%
FTTP	71.4%	20.9%	62.8%	9.7%	52.8%	5.6%	26.8%	11.3%
WiMAX	57.5%	56.4%	54.2%	51.5%	57.1%	49.8%	18.0%	18.2%
Cable	48.8%	12.6%	48.8%	10.6%	47.8%	9.8%	45.1%	11.4%
DOCSIS 3.0	48.8%	12.6%	48.8%	10.6%	47.8%	9.8%	44.7%	10.8%
HSPA	99.9%	99.5%	99.7%	98.7%	99.7%	98.4%	97.9%	92.4%
LTE	97.2%	87.0%	94.4%	73.3%	79.1%	26.8%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	92.3%	-	85.9%	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	99.9%	99.8%	99.9%	99.4%	99.8%	99.2%	99.9%	99.4%
Overall fixed broadband	95.7%	92.8%	95.5%	92.1%	95.1%	91.1%	97.4%	92.4%
NGA broadband	85.0%	37.4%	80.8%	27.7%	76.6%	23.9%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	83.6%	-	-	-	-	-	57.8%	-
At least 2 Mbps	95.7%	-	95.5%	-	95.1%	-	96.0%	-
At least 30 Mbps	85.0%	-	80.8%	-	76.6%	-	79.0%	-
At least 100 Mbps	83.6%	-	79.1%	-	74.2%	-	55.1%	-

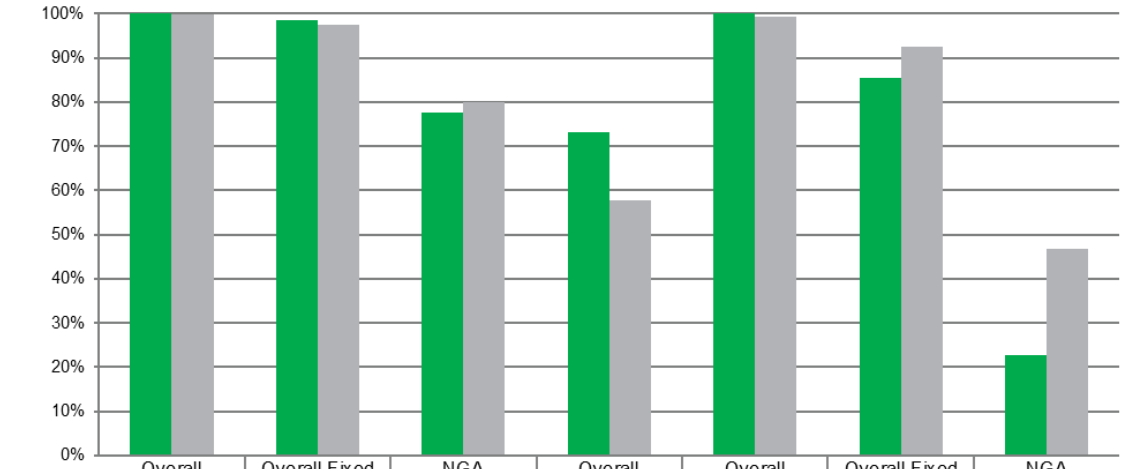
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.29 Sweden

5.29.1 National coverage by broadband technology

As in previous years, Sweden outperformed the EU average for the overall and fixed broadband combination categories. Over the twelve months to mid-2017, overall broadband coverage in Sweden remained universal, whereas 98.5% of homes were passed by at least one fixed broadband technology. However, the reach of NGA technologies fell below the average level for the EU of 80.1%, reaching 77.7% of the Swedish households. In terms of rural coverage, while overall broadband availability was above the EU average, availability of overall fixed broadband and NGA broadband was lower. Namely, only 22.3% of rural Swedish households had access to NGA broadband – less than half the EU average.

Sweden: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Sweden	100.0%	98.5%	77.7%	73.3%	100.0%	85.4%	22.7%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Over the twelve months to mid-2017, DSL continued to be the fixed broadband technology with the highest availability, covering 93.3% of homes in Sweden. Nonetheless, DSL recorded a year-on-year decline, as operators focussed on upgrading their fixed networks to next-generation. Nearly four of ten households had access to cable broadband (38.5%), remaining below the EU average of 45.1%.

Looking at NGA networks, FTTP remained the most significant NGA technology in Sweden. FTTP had the strongest growth over the twelve months to mid-2017, with a 4.6 percentage point increase, reaching 66.4% of households in Sweden. This development was underpinned by increased investments from operators in expanding their fibre-optic networks. The incumbent operator Telia increased its investments in super-fast FTTP in 2017, reporting that over 17 thousand more homes will gain access to speeds of up to 1Gbps.[87][88] As mentioned in last year's study, Telia's strategy is to connect 1.9m households to FTTP by 2018.[89] In terms of other NGA technologies, DOCSIS 3.0 availability recorded a slight increase, however, at 36.8%, remained below the EU average of 44.7%. Furthermore, VDSL coverage was also low at 21.0% due to operators focussing on FTTP deployment.

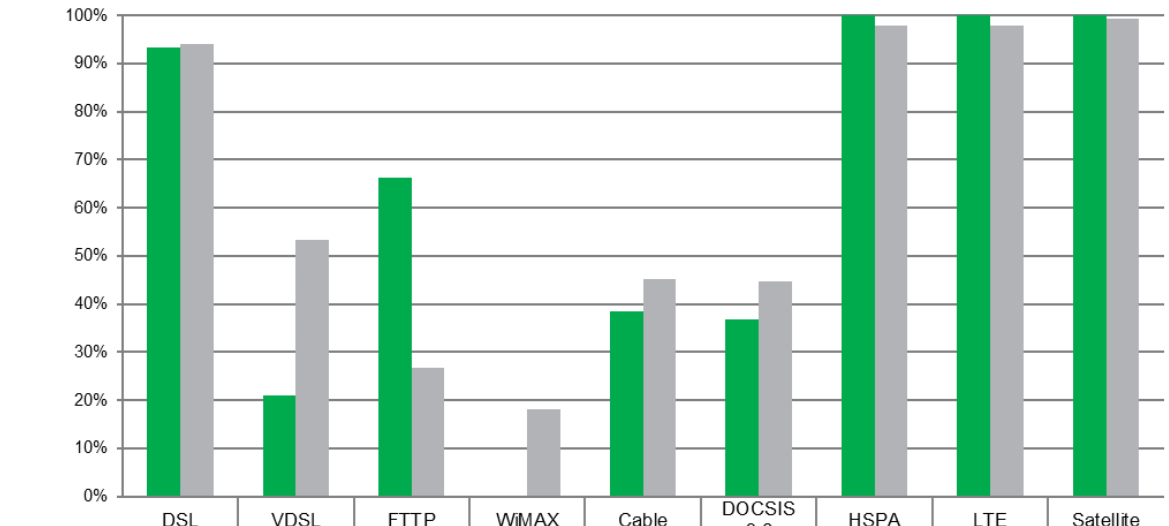
Examining mobile broadband technologies, LTE coverage remained universal throughout the twelve months to mid-2017. HSPA remained unchanged, reaching 99.9% households. After reaching ubiquitous LTE coverage, operators focussed their efforts on improving network quality, as well as coverage in hard to reach areas.

[87] https://www.telegeography.com/products/commsupdate/articles/2016/11/03/telia-to-expand-super-fast-fibre-broadband-in-2017/

[88] https://www.telegeography.com/products/commsupdate/articles/2017/01/13/telia-sweden-to-continue-super-fast-fibre-broadband-expansion/

[89] http://www.telia.se/media/2014/10/05/telia-satsar-nio-miljarder-p-fiber/066cb492-9c96-4d31-8eb5-144da57ee8af

Sweden: Coverage by technology, total, 2017

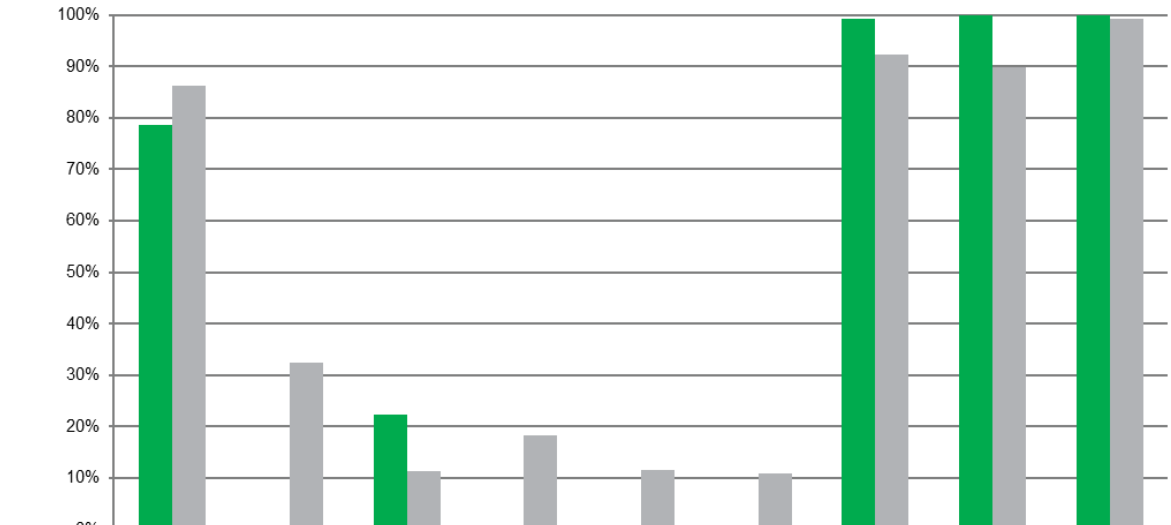


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Sweden	93.2%	21.0%	66.4%	0.0%	38.5%	36.8%	99.9%	100.0%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Looking at broadband coverage in rural areas, the majority of fixed technologies remained lower than the EU average. One exception was FTTP, which reached 22.3% of rural households, nearly twice the EU average of 11.3%. The growth in non-NGA broadband coverage has halted, with Sweden recording year-on-year drops in DSL and Cable. Compared with the previous iteration of this study, rural DSL has decreased by 7.9 percentage points, dropping below the EU average to 78.8%. VDSL and Cable coverage remain insignificant at 0.6% and 0.3% respectively. Considering the lower availability of fixed and NGA network availability in rural areas, in the second half of 2016, the government of Sweden allocated additional SEK 850 million for rural broadband access network expansion in the period between 2017-2020.[90] LTE broadband in rural areas remained universal, while HSPA coverage improved to reach 99.4% of rural households.

Sweden: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Sweden	78.7%	0.6%	22.2%	0.0%	0.3%	0.3%	99.4%	100.0%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

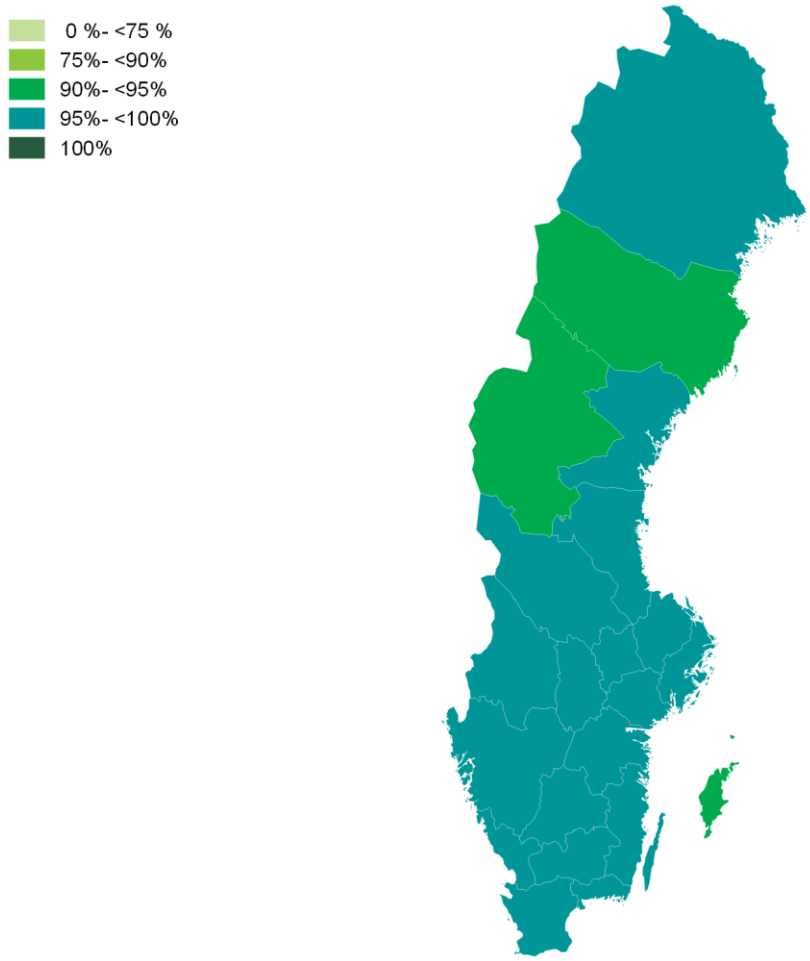
Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

[90] http://www.government.se/496173/contentassets/afe9f1cfeaac4e39abcdd3b82d9bee5d/sweden-completely-connected-by-2025-eng.pdf

5.29.2 Regional coverage by broadband technology

Overall fixed broadband coverage in all Swedish regions exceeded 92%, and was above 95% in 18 out of 21 regions in total. The highest availability of fixed broadband technologies was in Blekinge län, reaching 98.6% of households in this region. The lowest fixed broadband coverage was recorded in the region of Jämtlands län, reaching 92.3% of households.

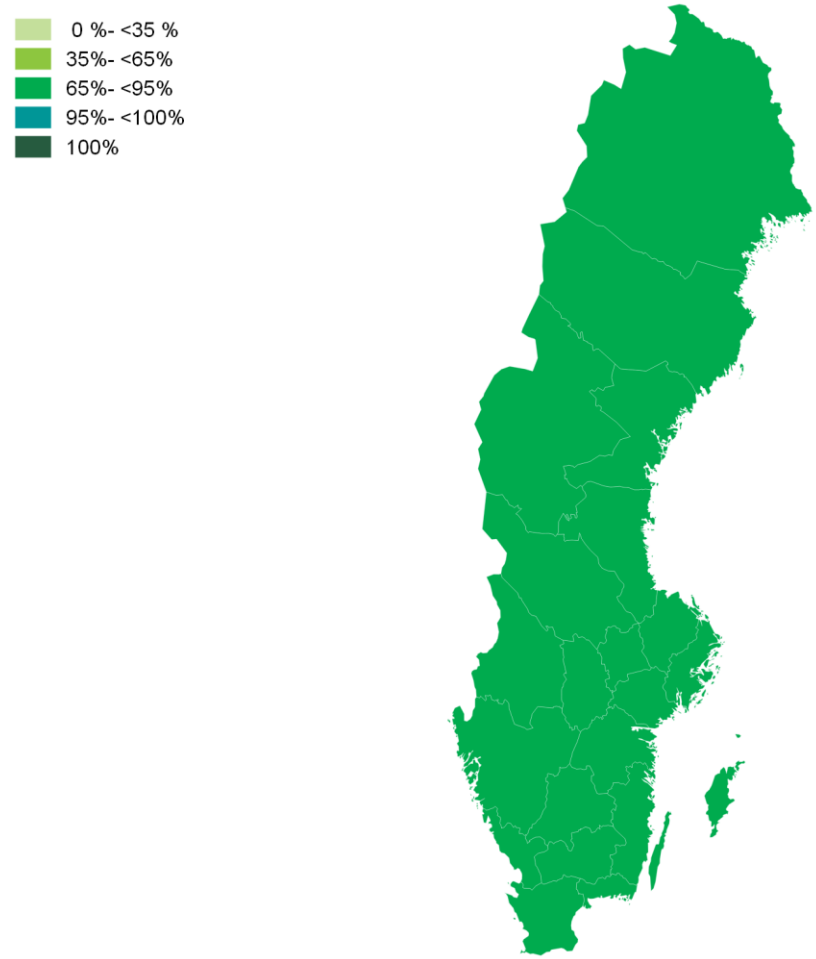
Sweden: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Compared to overall fixed technologies, there was a higher level of variance across the regions when examining NGA technologies. NGA broadband reached the highest percentage of households in the capital region of Stockholm where over 9 out of 10 homes had access to high-speed broadband. The region of Jämtlands län had the lowest availability of NGA technologies, at 73%.

Sweden: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.29.3 Data tables for Sweden

Statistic	National
Population	9,851,017
Persons per household	2.1
Rural proportion	8.9%

	Sweden 2017		Sweden 2016		Sweden 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	93.2%	78.7%	98.0%	86.6%	97.9%	89.0%	94.1%	86.3%
VDSL	21.0%	0.6%	21.9%	0.8%	18.3%	0.5%	53.4%	32.5%
FTTP	66.4%	22.2%	60.8%	20.8%	56.4%	13.7%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	18.2%
Cable	38.5%	0.3%	37.9%	0.6%	38.8%	0.1%	45.1%	11.4%
DOCSIS 3.0	36.8%	0.3%	36.2%	0.6%	34.0%	0.0%	44.7%	10.8%
HSPA	99.9%	99.4%	99.9%	99.2%	99.1%	96.5%	97.9%	92.4%
LTE	100.0%	100.0%	100.0%	100.0%	99.2%	98.0%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	100.0%	-	100.0%	-			90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	100.0%	*100.0%*	100.0%	99.5%	98.2%	99.9%	99.4%
Overall fixed broadband	98.5%	85.4%	*99.0%*	91.1%	99.0%	93.6%	97.4%	92.4%
NGA broadband	77.7%	22.7%	*75.2%*	21.5%	73.2%	*13.9%*	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	73.3%	-	-	-	-	-	57.8%	-
At least 2 Mbps	100.0%	-	*100.0%*	-	99.0%	-	96.0%	-
At least 30 Mbps	77.9%	-	*77.1%*	-	76.4%	-	79.0%	-
At least 100 Mbps	77.3%	-	68.7%	-	57.5%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

All restatements are highlighted in italics.

5.30 Switzerland

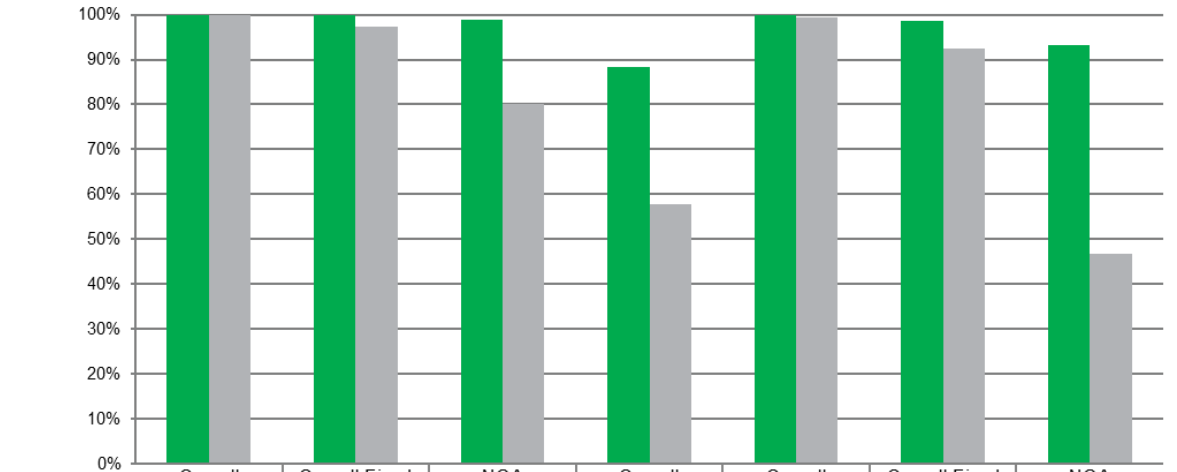
5.30.1 National coverage by broadband technology

As in the previous years, research on broadband coverage in Switzerland was included in the BCE study thanks to additional funding provided by Glasfasernetz Schweiz, a Swiss fibre optic industry association.

Switzerland continued to be one of the leaders in Europe in relation to broadband coverage. As in previous years, Switzerland reported above-average coverage levels for all coverage combination categories. Given the high broadband coverage levels achieved in previous years, it is unsurprising that there were no substantial changes in broadband coverage levels in the twelve-month period to the end of June 2017.

By mid-2017, Switzerland recorded universal, or near-universal, coverage for the overall broadband combination category on a national and rural level (100.0% and 99.8%, respectively), as well as for the fixed broadband combination category (99.8% and 99.0%, respectively). Similarly, NGA broadband availability was near-universal (99.0%) at a national level. At a rural level, NGA broadband services were available to 92.9% of rural households.

Switzerland: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Switzerland	100.0%	99.8%	99.0%	88.2%	99.9%	98.6%	93.2%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Switzerland continued to rank ahead of the EU average in terms of total coverage for each broadband technology with the exception of WiMAX, which is absent in the Swiss market. Moreover, Switzerland remained one of four countries with cable coverage above 80% of total households. In previous years, cable operators, led by UPC (formerly Cablecom), have been investing substantially in cable deployment, with this activity is set to continue in the next couple of years.[91] Switzerland's entire cable infrastructure has been upgraded to DOCSIS 3.0, meaning that cable networks serve as the key NGA technology in the country.

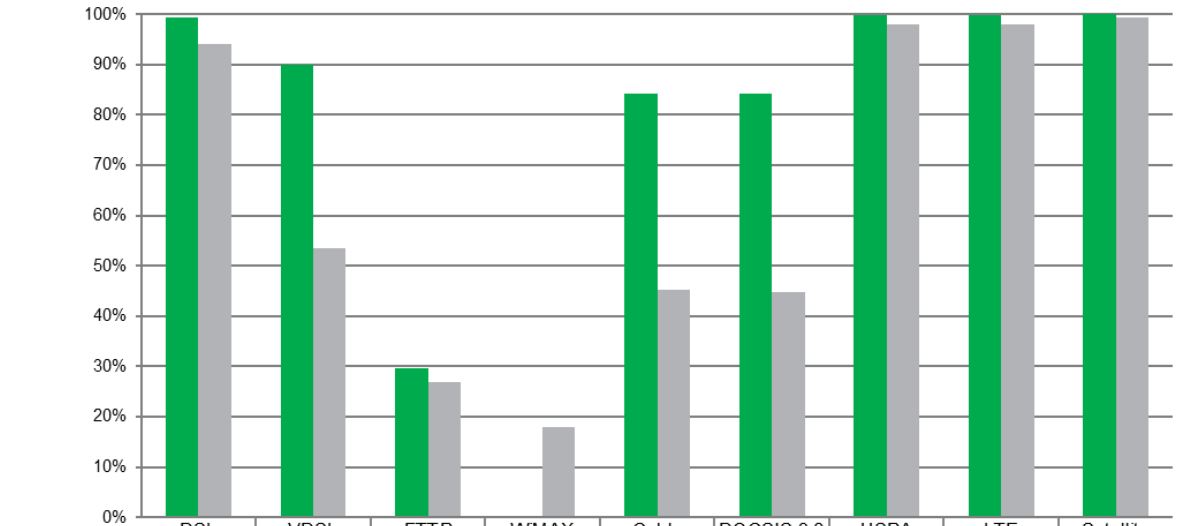
Examining other NGA technologies, Switzerland was one of three countries to record VDSL coverage of above 90%. Over the twelve-month period, VDSL coverage increased by 2.0 percentage points and at the end of June 2017, 90.0% of Swiss households had access to VDSL broadband services.

Growth in FTTP coverage was slower compared to VDSL, nevertheless, following a 0.9 percentage point increase, FTTP networks passed 29.5% of homes by mid-2017 and remained above the EU average (26.8%). These increases can be attributed to the continued large-scale deployment of both VDSL and FTTP technologies by the incumbent operator Swisscom, launched partly in reaction to the

[91] https://www.upc.at/ueber-upc/presse/pressearchiv/upc-startet-millionen-investitionsprogramm-autostrada/

increasing competition from cable providers. In addition, Swisscom was also one of the first European network operators to launch commercial deployment of G.fast technology in September 2016, which will allow the company to offer download speeds to up to 500 Mbps over its copper network.[92]

Switzerland: Coverage by technology, total, 2017

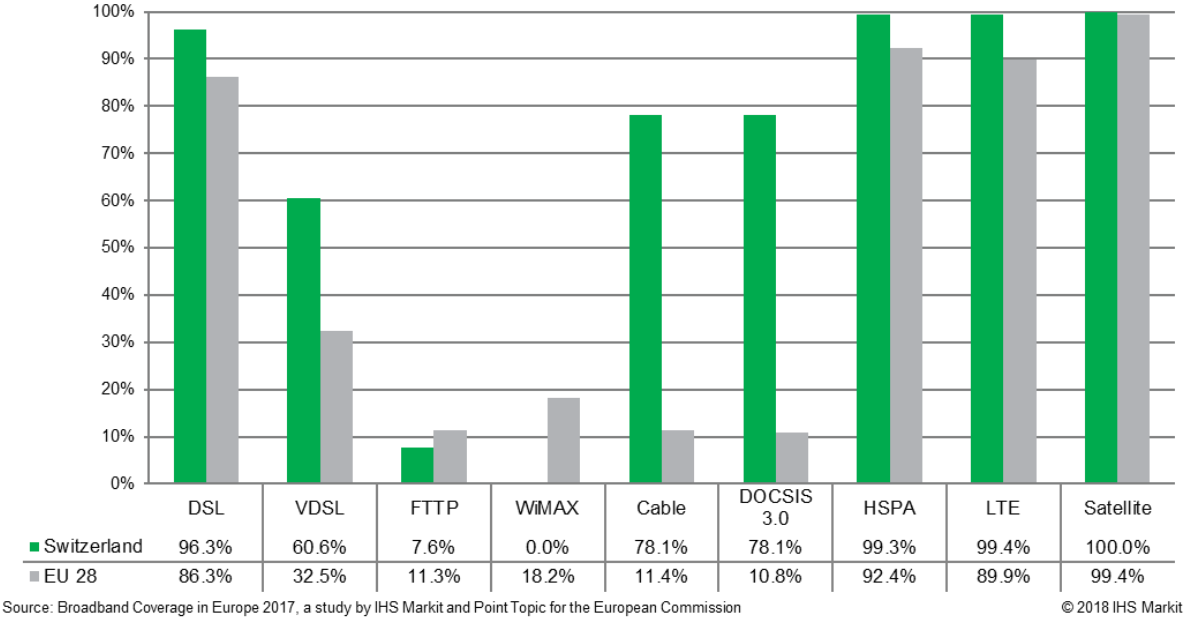


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Switzerland	99.5%	90.0%	29.5%	0.0%	84.3%	84.3%	99.8%	99.8%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

With regards to mobile broadband technologies, both HSPA and LTE technologies recorded near universal coverage levels, reaching 99.8% of Swiss households. Following widespread adoption of LTE, all three mobile network operators, Swisscom, Salt and Sunrise, have begun offering advanced LTE plans by mid-2017.

Switzerland: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Switzerland	96.3%	60.6%	7.6%	0.0%	78.1%	78.1%	99.3%	99.4%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

During the twelve-month period to mid-2017, Switzerland remained one of the leaders in Europe in terms of rural cable coverage. Cable networks passed 78.1% of rural households with all of cable networks upgraded to DOCSIS 3.0. Looking at other NGA technologies, at the end of June 2017, VDSL services

[92] https://www.swisscom.ch/en/about/medien/press-releases/2016/10/20161018-MM-Gfast.html

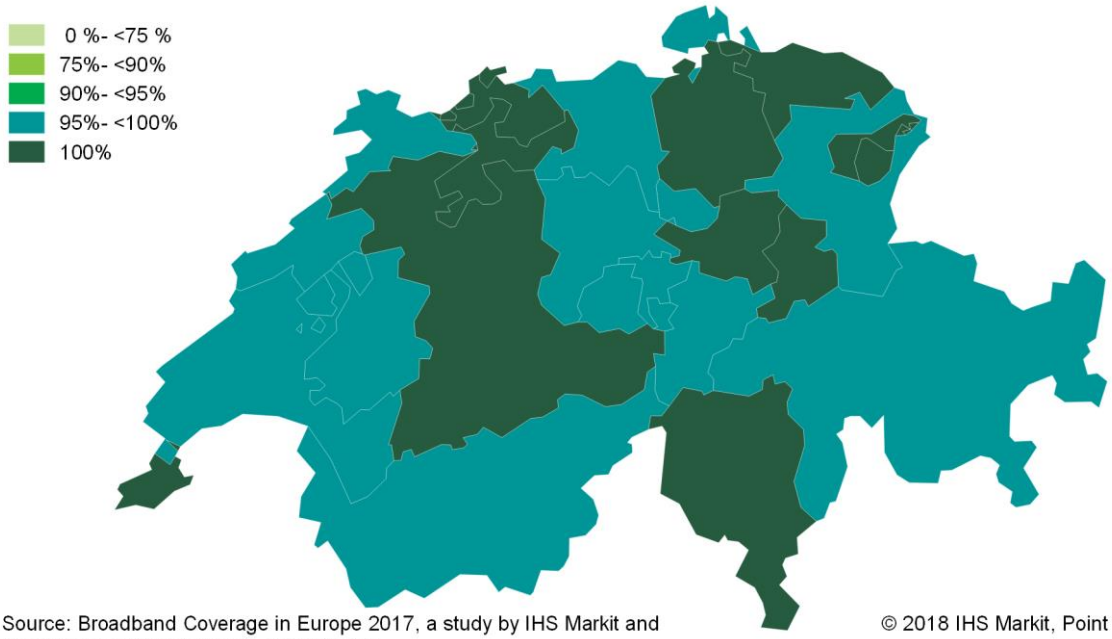
were available to 60.6% of rural households in Switzerland, a 5.1 percentage point increase compared to mid-2016. Meanwhile, 7.6% of rural households had access to FTTP broadband.

Examining mobile broadband access in rural areas, Switzerland was above the EU average for HSPA coverage by mid-2017, reaching 99.3% of rural households. Rural LTE coverage grew by 5.6 percentage points and by the end of June 2017, 99.4% of rural households across Switzerland had access to LTE services.

5.30.2 Regional coverage by broadband technology

Eighteen out of the 26 Swiss regions reported virtually complete fixed broadband coverage, with fixed coverage in all of the remaining regions exceeding 96%. Lowest coverage was recorded in the Jura and Uri regions, reaching 96.1% of households.

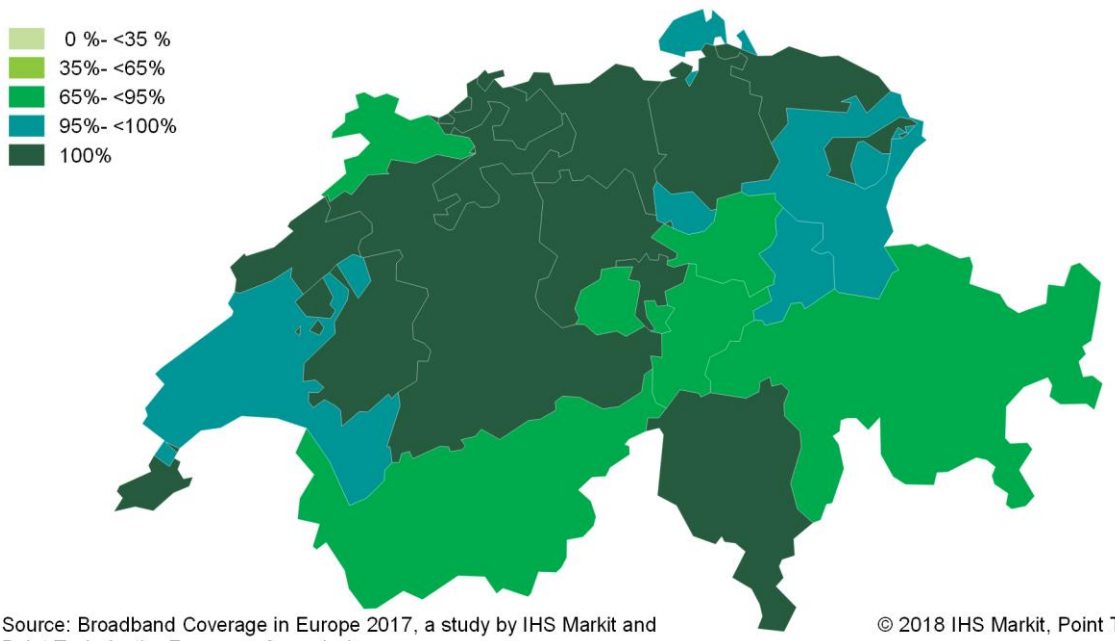
Switzerland: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Complete NGA coverage was recorded in Geneva and Basel, with over 95% of homes passed by NGA networks in majority of the remaining regions. In five regions - Valais, Jura, Obwalden, Uri, and Graubünden – NGA coverage was lower than 95%, yet no region recorded less than 90% NGA coverage.

Switzerland: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.30.3 Data tables for Switzerland

Statistic	National
Population	8,233,842
Persons per household	2.3
Rural proportion	12.8%

	Switzerland 2017		Switzerland 2016		Switzerland 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.5%	96.3%	99.5%	97.4%	99.5%	97.4%	94.1%	86.3%
VDSL	90.0%	60.6%	88.0%	55.5%	81.5%	39.7%	53.4%	32.5%
FTTP	29.5%	7.6%	28.6%	7.3%	27.0%	6.6%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.0%	18.2%
Cable	84.3%	78.1%	84.3%	78.2%	84.1%	78.0%	45.1%	11.4%
DOCSIS 3.0	84.3%	78.1%	84.3%	78.2%	84.1%	78.0%	44.7%	10.8%
HSPA	99.8%	99.3%	99.5%	98.7%	99.4%	97.6%	97.9%	92.4%
LTE	99.8%	99.4%	98.3%	93.8%	92.3%	72.2%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	98.6%	-	95.6%	-	-	-	90.8%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	99.9%	100.0%	99.8%	99.9%	99.6%	99.9%	99.4%
Overall fixed broadband	99.8%	98.6%	99.8%	99.0%	99.8%	99.0%	97.4%	92.4%
NGA broadband	99.0%	93.2%	99.0%	92.9%	98.9%	92.7%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	88.2%	-	-	-	-	-	57.8%	-
At least 2 Mbps	99.8%	-	99.8%	-	99.8%	-	96.0%	-
At least 30 Mbps	98.9%	-	98.9%	-	98.9%	-	79.0%	-
At least 100 Mbps	98.5%	-	98.5%	-	98.4%	-	55.1%	-

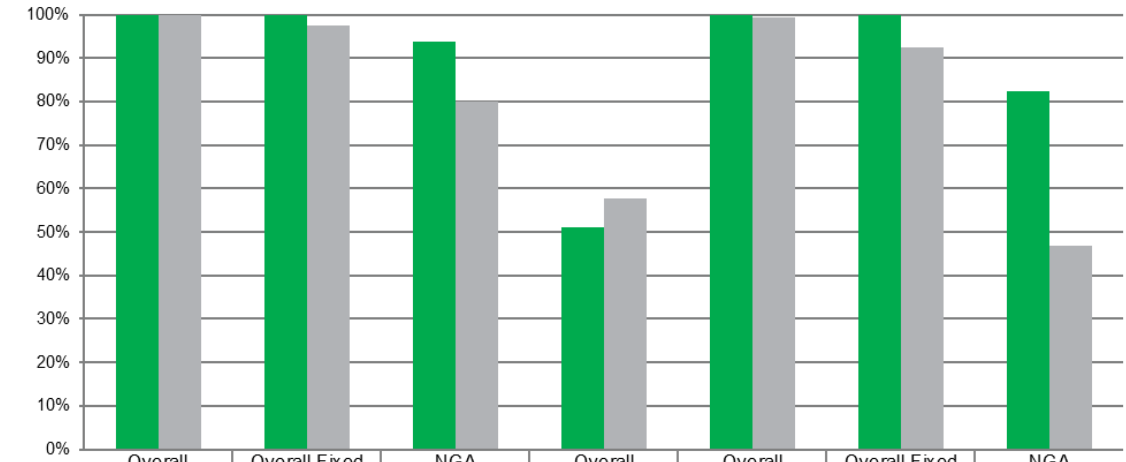
Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

5.31 United Kingdom

5.31.1 National coverage by broadband technology

As in the previous edition of the study, the United Kingdom recorded universal broadband coverage at a national level and near-universal broadband coverage at a rural level. Moreover, fixed broadband coverage recorded near identical levels as overall broadband. With regards to NGA coverage, the proportion of homes passed by NGA networks increased by 1.6 percentage points to reach 93.9%, substantially higher than the EU average (80.1%). The UK also registered an improvement in NGA coverage in rural areas, equivalent to 4.2 percentage points, as NGA broadband networks passed 82.4% of rural homes at the end of June 2017.

UK: Coverage by technology combination, 2017



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall DOCSIS 3.0 & FTTP (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
UK	100.0%	100.0%	93.9%	51.1%	99.9%	99.8%	82.4%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

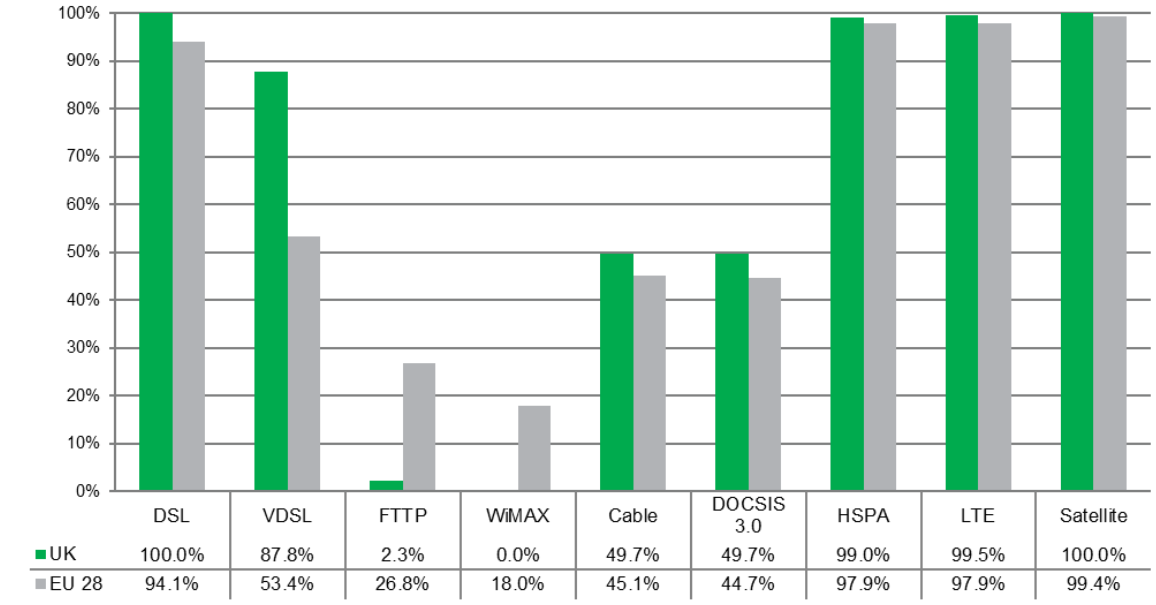
Looking at individual technologies, UK broadband coverage continued to be driven by DSL technology. VDSL remained the dominant NGA technology in the UK, with the proportion of homes passed by VDSL over 30 percentage points higher than the EU average of 53.4%. In terms of other NGA technologies, DOCSIS 3.0 networks passed nearly a half (49.7%) of UK homes. This equated to an increase of 1.9 percentage points during the period, as UK cable operator Virgin Media continued to embark upon its network expansion plan.[93]

The availability of FTTP services remained limited during the twelve-month period, increasing by only 0.5 percentage points to reach 2.3% of households at the end of June 2017. As a result, the UK was behind only Belgium and Greece in terms of FTTP coverage. In order to increase FTTP availability, the incumbent telecommunications group, BT, in addition to TalkTalk, CityFibre and Vodafone have all announced plans to deploy FTTP networks to at least one million UK households.[94][95][96]

Examining mobile network coverage, HSPA networks maintained a near universal coverage level of 99.0%, a level reached already in 2014. LTE networks also provided near universal coverage, reaching 99.5% of UK households. In terms of average coverage of all LTE network operators, on average LTE services were available to 97.5% of UK premises at the end of June 2017.

[93] http://www.virginmedia.com/corporate/media-centre/press-releases/virgin-media-and-liberty-global-announce-largest-investment-in-uks-internet-infrastructure-for-more-than-a-decade.html
[94] https://www.btplc.com/news/#/pressreleases/results-for-the-third-quarter-to-31-december-2017-2401079
[95] https://www.talktalkgroup.com/dam/jcr:1154dba7-0fcf-4557-a504-da95e545d2ff/TalkTalk%20Group%20Q3%20FY18%20.pdf
[96] https://www.cityfibre.com/news/vodafone-cityfibre-bring-gigabit-speed-fibre-uk/

UK: Coverage by technology, total, 2017



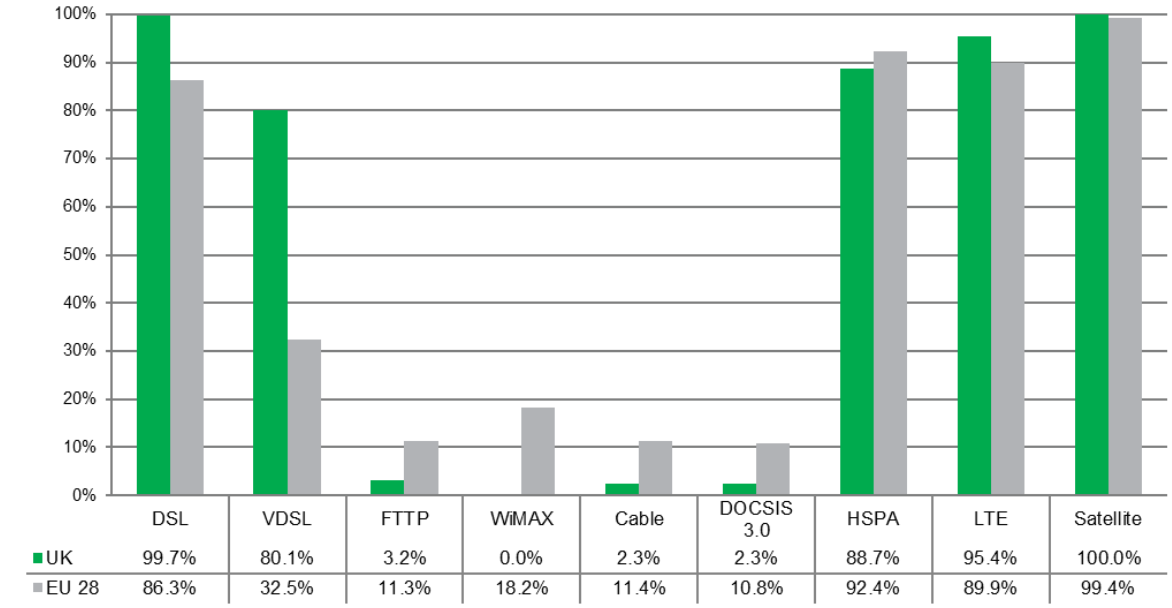
	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
UK	100.0%	87.8%	2.3%	0.0%	49.7%	49.7%	99.0%	99.5%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

By mid-2017, DSL coverage remained at near universal levels. In comparison, cable coverage was negligible (2.3%), as Virgin Media's rollout continued to focus on urban areas. Consequently, VDSL continued to be the main NGA technology in rural areas of the UK, reaching 80.1% of rural households. Rural VDSL coverage in the UK is the third highest among the study countries, behind only Iceland and Luxembourg.

Examining other NGA technologies, FTTP networks passed 3.2% of rural homes, underpinned by the efforts of local companies and initiatives, such as B4RN and Gigaclear.

UK: Coverage by technology, rural areas, 2017



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
UK	99.7%	80.1%	3.2%	0.0%	2.3%	2.3%	88.7%	95.4%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Examining mobile broadband technologies in rural areas, the coverage of both HSPA and LTE networks remained relatively unchanged during the period. At 88.7%, rural HSPA coverage was 3.7 percentage points below the EU average. However, rural LTE coverage in the UK, at 95.4%, was above the EU average (89.9%), due to the efforts of UK mobile network operators to tackle rural blackspots. In particular, mobile operator EE (part of the BT group) is focussing on rural coverage, reporting its mobile network coverage in only geographic terms and launching a fixed wireless solution using a professionally installed antenna aimed at rural areas without a reliable fixed broadband service.[9798]

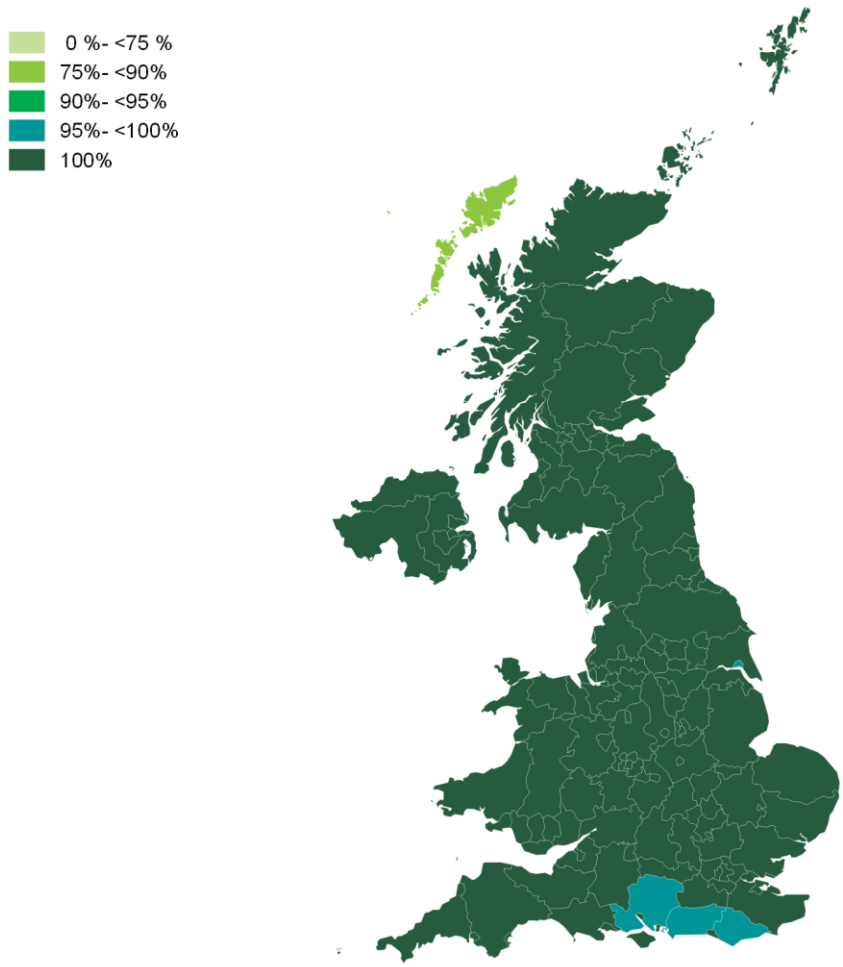
[97] http://newsroom.ee.co.uk/ee-calls-on-industry-to-get-clear-on-coverage-as-it-covers-5000-square-kilometres-of-4g-not-spots-overnight

[98] http://newsroom.ee.co.uk/ee-launches-4g-home-broadband-antenna-to-connect-more-than-580000-homes-across-the-uk/

5.31.2 Regional coverage by broadband technology

As in previous years, the UK reported complete fixed broadband coverage in almost all regions. A notable exception was Kingston upon Hull, where fixed broadband services passed 97.6% of homes, while East Sussex, West Sussex and Hampshire had 99.9% fixed broadband availability. The Western Islands (Eilean Siar) were the only region with fixed broadband coverage below 90%.

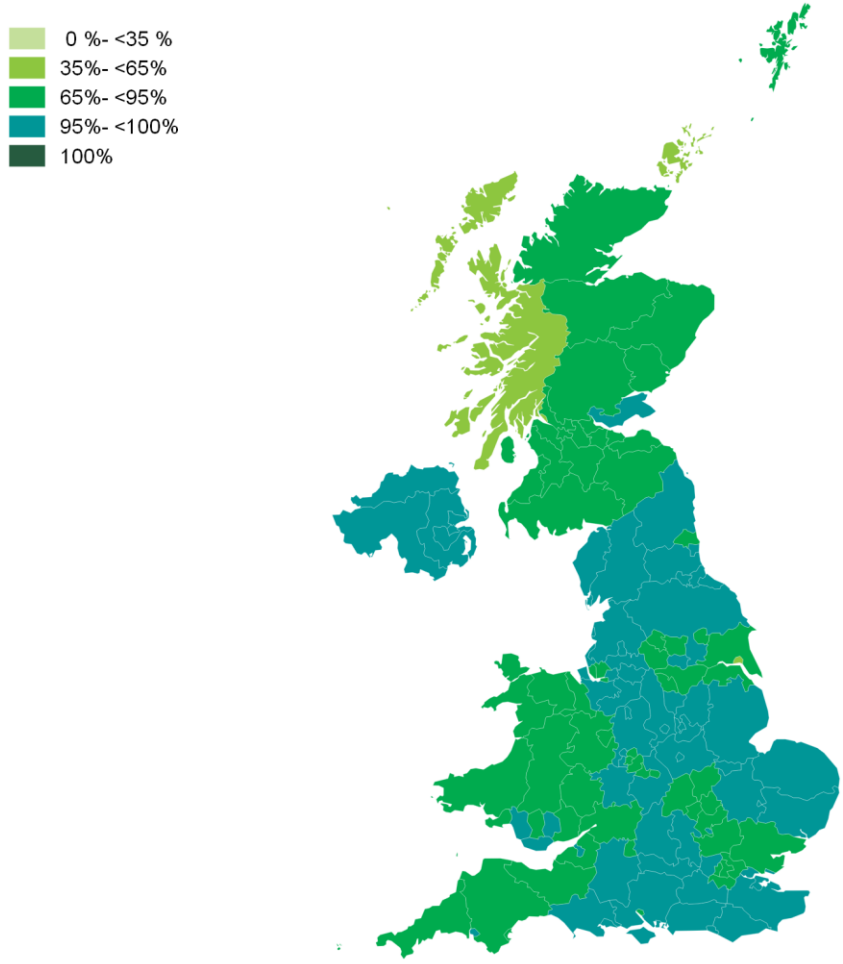
United Kingdom: Overall fixed broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

Regional NGA coverage remained varied, although most regions reached NGA coverage levels above 80%. The lowest NGA broadband coverage was recorded in Kingston upon Hull (38.6%), while Eilean Siar (Western Isles) was the only other region with NGA broadband availability below 45%. Other regions with low NGA coverage included the remote regions of Lochaber, Skye & Lochalsh, the Orkney Islands and the Shetland Islands, where between 59%-66% of households had access to NGA broadband at the end of June 2017.

United Kingdom: NGA broadband coverage, 2017



Source: Broadband Coverage in Europe 2017, a study by IHS Markit and Point Topic for the European Commission

5.31.4 Data tables for the United Kingdom

Statistic	National
Population	65,086,536
Persons per household	2.3
Rural proportion	8.5%

	UK 2017		UK 2016		UK 2015		EU28 2017	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	99.7%	100.0%	99.7%	100.0%	99.7%	94.1%	86.3%
VDSL	87.8%	80.1%	85.0%	76.0%	82.8%	43.9%	53.4%	32.5%
FTTP	2.3%	3.2%	1.8%	2.5%	1.4%	0.9%	26.8%	11.3%
WiMAX	0.0%	0.0%	0.0%	0.0%	4.2%	2.7%	18.0%	18.2%
Cable	49.7%	2.3%	47.8%	2.3%	46.9%	2.4%	45.1%	11.4%
DOCSIS 3.0	49.7%	2.3%	47.8%	2.3%	46.9%	2.4%	44.7%	10.8%
HSPA	99.0%	88.7%	99.0%	88.8%	99.0%	88.8%	97.9%	92.4%
LTE	99.5%	95.4%	99.5%	95.3%	89.5%	10.1%	97.9%	89.9%
LTE average operator coverage (DESI indicator)	97.5%	-	92.5%	-	-	-	90.8%	-
Satellite	100.0%	100%	100.0%	100.0%	100.0%	100.0%	99.4%	99.4%
Overall broadband	100.0%	99.9%	100.0%	99.9%	100.0%	99.9%	99.9%	99.4%
Overall fixed broadband	100.0%	99.8%	100.0%	99.8%	100.0%	99.8%	97.4%	92.4%
NGA broadband	93.9%	82.4%	92.3%	78.2%	90.5%	47.4%	80.1%	46.9%
Overall DOCSIS 3.0 & FTTP coverage	51.1%	-	-	-	-	-	57.8%	-
At least 2 Mbps	95.2%	-	95.1%	-	95.1%	-	96.0%	-
At least 30 Mbps	93.9%	-	84.4%	-	82.7%	-	79.0%	-
At least 100 Mbps	50.9%	-	48.9%	-	23.0%	-	55.1%	-

Note: The 2017 figures represent state of broadband coverage as of end of June 2017. The 2016 (end of June) and 2015 (end of June) figures are drawn from the previous studies conducted by IHS and VVA.

6.0 Appendices

6.1 Broadband coverage definitions

6.1.1 Technology definitions

The table below indicates the definitions of the individual broadband access technologies studied by this project. These definitions were included in the survey questionnaire.

Please note that the definitions are not designed to be rigorous definitions from an engineering point of view, but rather are intended to reflect practical definitions used by NRAs and ISPs.

Technology	Technology definition
DSL	DSL (for Digital Subscriber Line) is the basic technology used to provide broadband over conventional telephone lines. The types of DSL used for standard fixed broadband (mainly ADSL or ADSL2+) deliver download speeds of at least 2 Mbps. Not all DSL connections are capable of download speeds of 2Mbps and higher, these connections should not be reported in the survey, but we ask you to note this fact in STEP 4 - Technology definitions of the survey.
VDSL	VDSL (also called FTTC+VDSL for example) is a "Very-high-speed" version of DSL. VDSL is usually provisioned from a street cabinet which has fibre backhaul or directly from the telephone exchange in areas which are close to the exchange. Actual VDSL download speeds can vary and we ask you to note the typical VDSL connection speeds in STEP 4 - Technology definitions of the survey. This definition does not include implementations where fibre is provisioned to a large building, such as a block of flats, and the final connections are provided by VDSL within the building, which are defined as FTTP.
FTTP	FTTP (fibre-to-the-premises) is broadband provided over fibre optic cables going all the way to the home or business premises. This definition also includes "FTTB", where fibre terminates at a large building and broadband distribution within the building, to different flats for example, is by a different non-fibre technology such as VDSL.
WiMAX	WiMAX is a wireless service using one of the IEEE standards 802.16d, for fixed users and 802.16e for mobile.
Cable Modem	Cable Modem broadband is delivered over a fixed cable TV network using coaxial cable according to the earlier cable broadband standards such as DOCSIS 1, usually providing download speeds up to about 20Mbps.
DOCSIS 3.0	DOCSIS 3.0 broadband is delivered over a fixed cable TV network using coaxial cable according to the DOCSIS 3.0 standard, providing download speeds of 30Mbps and above.
HSPA	HSPA (High Speed Packet Access) is the upgraded version of 3G mobile networks capable of providing mobile broadband at a maximum download speed of at least 21.1Mbps.
LTE	LTE (Long Term Evolution) is the next-generation mobile service standardised by the 3rd Generation Partnership Project which requires separate spectrum from 3G mobile and which supports maximum downstream speeds up to at least 100Mbps.

6.1.2 Coverage definitions

The definitions included in the table below were used to determine whether households are within the coverage reach of the individual broadband technologies. These definitions were included in the survey questionnaire.

Please note that the definitions are not designed to be rigorous definitions from an engineering point of view, but rather are intended to reflect practical definitions used by NRAs and ISPs.

Technology	Coverage definition
DSL	A household has DSL coverage if it is a telephone exchange area fully enabled for DSL.
VDSL	A household has VDSL coverage if it is close enough to a VDSL-enabled cabinet or exchange to get a high-speed broadband signal.
FTTP	A household has FTTP coverage if it can be connected now to a fibre service without requiring the construction of new fibre infrastructure.
WiMAX	A household has WiMAX coverage for broadband if it can receive at least 2Mbps downstream from an existing service without requiring the construction of new WiMAX infrastructure.
Cable Modem	A household has cable modem coverage if it can be connected now to a broadband service without requiring the construction of new cable TV network infrastructure.
DOCSIS 3.0	A household has DOCSIS 3.0 coverage if it can be connected now to a DOCSIS 3.0 service without requiring the construction of new cable TV network infrastructure.
HSPA	A household has HSPA coverage if it is in the stated coverage area for at least one HSPA-upgraded 3G mobile network.
LTE	A household has LTE coverage if it is in the stated coverage area for at least one LTE mobile network.
LTE Average operator coverage	A simple average of LTE coverage of all mobile network operators active in a study country.

6.2 Broadband coverage data tables

6.2.1 Total and rural coverage by combination categories for each country

	TOTAL				RURAL		
	Overall broadband coverage	Overall fixed broadband coverage*	Overall NGA coverage**	Overall DOCSIS 3.0 & FTTP coverage	Overall broadband coverage	Overall fixed broadband coverage*	Overall NGA coverage**
AT	99.7%	99.1%	90.0%	65.8%	98.0%	94.0%	45.0%
BE	100.0%	99.9%	99.0%	96.9%	99.83%	98.4%	91.5%
BG	100.0%	95.2%	74.6%	74.6%	100.0%	82.5%	25.0%
HR	99.7%	99.3%	67.4%	34.1%	99.0%	97.3%	16.1%
CY	100.0%	100.0%	87.5%	85.1%	100.0%	100.0%	60.0%
CZ	99.5%	98.4%	88.6%	60.4%	98.8%	95.1%	58.7%
DK	100.0%	99.5%	94.6%	85.9%	100.0%	97.5%	65.5%
EE	99.6%	89.5%	80.4%	71.3%	99.7%	72.9%	37.8%
FI	99.9%	97.0%	75.1%	59.1%	99.7%	84.0%	8.3%
FR	100.0%	100.0%	51.9%	41.8%	100.0%	100.0%	37.3%
DE	99.9%	97.7%	84.1%	64.9%	98.8%	89.1%	53.9%
EL	99.9%	99.3%	49.6%	0.4%	99.5%	96.6%	13.7%
HU	99.8%	95.2%	82.0%	74.4%	99.4%	86.2%	50.5%
IS	99.9%	99.6%	97.5%	63.9%	99.7%	99.2%	93.9%
IE	99.7%	96.6%	88.8%	53.0%	99.8%	93.9%	82.0%
IT	99.8%	99.3%	86.8%	21.7%	98.4%	94.8%	39.2%
LT	99.8%	95.9%	81.6%	81.6%	99.2%	86.5%	39.4%
LV	100.0%	92.7%	91.3%	88.1%	100.0%	82.4%	77.4%
LU	100.0%	100.0%	94.6%	86.6%	99.9%	99.9%	94.5%
MT	100.0%	100.0%	100.0%	99.9%	100.0%	100.0%	99.9%
NL	100.0%	100.0%	98.3%	97.3%	100.0%	100.0%	98.4%
NO	100.0%	95.7%	82.4%	79.6%	99.9%	81.0%	40.2%
PL	99.9%	86.8%	66.7%	52.5%	99.8%	83.1%	40.6%
PT	99.9%	99.7%	95.2%	95.2%	99.0%	98.3%	78.5%
RO	100.0%	88.1%	74.0%	72.8%	100.0%	82.7%	38.6%
SK	98.2%	89.0%	78.7%	68.1%	94.1%	91.1%	44.2%
SI	99.9%	97.8%	83.2%	74.6%	99.5%	92.5%	53.9%
ES	99.9%	95.7%	85.0%	83.6%	99.8%	92.8%	37.4%
SE	100.0%	98.5%	77.7%	73.3%	100.0%	85.4%	22.7%
CH	100.0%	99.8%	99.0%	88.2%	99.9%	98.6%	93.2%
UK	100.0%	100.0%	93.9%	51.1%	99.9%	99.8%	82.4%
EU 28	99.9%	97.4%	80.1%	57.8%	99.4%	92.4%	46.9%

* Fixed broadband coverage includes DSL, VDSL, FTTP, DOCSIS 1.0/2.0, DOCSIS 3.0, WiMAX
** NGA coverage includes VDSL, FTTP, DOCSIS 3.0

6.2.2 Total coverage by technology for each country

	DSL***	VDSL	FTTP	WiMAX	Cable***	DOCSIS 3.0	HSPA	LTE	Satellite
AT	98.2%	82.2%	13.5%	12.3%	53.7%	52.8%	99.1%	99.0%	100.0%
BE	99.9%	94.0%	0.8%	14.9%	96.8%	96.8%	100.0%	100.0%	100.0%
BG	85.2%	0.0%	37.8%	0.0%	66.6%	64.2%	100.0%	91.9%	100.0%
HR	98.8%	58.2%	16.8%	0.2%	28.3%	28.3%	99.4%	94.8%	100.0%
CY	100.0%	75.0%	51.2%	0.0%	70.2%	70.2%	99.6%	78.8%	100.0%
CZ	93.1%	77.4%	37.4%	79.8%	39.2%	38.8%	97.0%	99.4%	100.0%
DK	96.1%	62.0%	62.7%	5.1%	68.8%	68.8%	100.0%	100.0%	100.0%
EE	69.3%	55.1%	50.7%	1.7%	56.1%	55.6%	97.7%	98.5%	75.4%
FI	94.0%	48.5%	37.5%	0.0%	36.2%	36.2%	99.9%	99.6%	100.0%
FR	100.0%	18.9%	28.3%	0.0%	27.8%	27.8%	99.9%	98.0%	100.0%
DE	97.1%	69.0%	7.3%	10.3%	63.8%	63.7%	91.5%	96.5%	100.0%
EL	99.3%	49.4%	0.4%	0.2%	0.0%	0.0%	99.3%	97.1%	100.0%
HU	90.5%	40.2%	26.4%	0.0%	70.2%	66.7%	98.6%	99.2%	100.0%
IS	99.2%	94.9%	63.9%	4.0%	0.0%	0.0%	99.8%	97.5%	0.0%
IE	93.2%	86.1%	8.3%	28.0%	48.6%	49.0%	99.5%	97.2%	100.0%
IT	98.6%	82.4%	21.7%	46.9%	0.0%	0.0%	99.4%	98.7%	100.0%
LT	69.9%	0.0%	81.6%	91.0%	54.3%	46.4%	99.5%	99.8%	50.0%
LV	41.0%	19.1%	85.3%	41.3%	34.7%	29.0%	100.0%	98.4%	20.3%
LU	100.0%	87.2%	57.2%	0.0%	77.9%	73.2%	98.9%	98.6%	100.0%
MT	100.0%	72.0%	23.0%	0.0%	99.9%	99.9%	99.9%	99.9%	100.0%
NL	100.0%	74.6%	31.9%	0.0%	95.1%	95.1%	99.6%	99.6%	100.0%
NO	91.5%	56.5%	52.4%	0.0%	50.6%	50.6%	99.7%	99.7%	97.2%
PL	75.9%	41.0%	23.8%	1.9%	44.5%	44.5%	99.7%	98.5%	100.0%
PT	99.2%	0.0%	89.4%	0.0%	76.5%	76.3%	98.8%	98.9%	100.0%
RO	61.9%	9.4%	61.0%	67.3%	40.3%	35.9%	100.0%	93.6%	100.0%
SK	74.6%	36.1%	56.4%	49.9%	30.2%	29.7%	92.3%	96.3%	100.0%
SI	95.8%	59.0%	52.2%	2.6%	60.3%	57.4%	98.4%	98.6%	100.0%
ES	90.0%	11.8%	71.4%	57.5%	48.8%	48.8%	99.9%	97.2%	100.0%
SE	93.2%	21.0%	66.4%	0.0%	38.5%	36.8%	99.9%	100.0%	100.0%
CH	99.5%	90.0%	29.5%	0.0%	84.3%	84.3%	99.8%	99.8%	100.0%
UK	100.0%	87.8%	2.3%	0.0%	49.7%	49.7%	99.0%	99.5%	100.0%
EU 28	94.1%	53.4%	26.8%	18.0%	45.1%	44.7%	97.9%	97.9%	99.4%

*** DSL figures include VDSL coverage; Cable figures include DOCSIS 3.0 coverage

6.2.3 Rural coverage by technology for each country

	DSL***	VDSL	FTTP	WiMAX	Cable***	DOCSIS 3.0	HSPA	LTE	Satellite
AT	88.4%	22.1%	5.4%	10.9%	20.5%	20.5%	93.4%	92.7%	100.0%
BE	96.9%	77.7%	0.0%	2.5%	72.8%	72.8%	99.4%	99.8%	100.0%
BG	75.6%	0.0%	0.9%	0.0%	22.8%	22.6%	100.0%	59.3%	100.0%
HR	96.7%	1.3%	0.2%	0.0%	15.1%	15.1%	97.2%	76.5%	100.0%
CY	100.0%	60.0%	0.0%	0.0%	0.0%	0.0%	99.0%	77.8%	100.0%
CZ	83.4%	52.2%	11.1%	71.8%	3.5%	2.4%	84.9%	95.8%	100.0%
DK	93.4%	16.8%	54.8%	7.9%	5.6%	5.6%	100.0%	100.0%	100.0%
EE	32.4%	21.7%	16.8%	8.0%	15.2%	12.7%	97.7%	98.5%	75.4%
FI	81.7%	0.0%	8.3%	0.0%	0.0%	0.0%	99.5%	98.0%	100.0%
FR	100.0%	33.9%	4.3%	0.0%	1.1%	1.1%	99.7%	87.5%	100.0%
DE	87.8%	44.6%	2.4%	13.6%	15.2%	15.0%	60.6%	87.9%	100.0%
EL	96.3%	13.7%	0.0%	0.9%	0.0%	0.0%	96.6%	86.7%	100.0%
HU	74.0%	22.6%	6.7%	0.0%	20.6%	18.4%	95.5%	97.7%	100.0%
IS	98.5%	92.3%	23.2%	0.0%	0.0%	0.0%	99.3%	93.0%	0.0%
IE	89.8%	78.8%	1.2%	17.6%	3.6%	3.4%	99.5%	91.6%	100.0%
IT	90.9%	38.4%	0.8%	45.1%	0.0%	0.0%	95.0%	89.2%	100.0%
LT	15.0%	0.0%	39.4%	73.0%	10.2%	10.2%	98.4%	99.4%	50.0%
LV	26.0%	18.1%	69.3%	16.3%	0.0%	0.0%	100.0%	94.4%	20.3%
LU	99.7%	89.1%	35.1%	0.0%	44.5%	0.0%	99.2%	95.2%	100.0%
MT	100.0%	0.0%	0.0%	0.0%	99.9%	99.9%	99.2%	90.2%	100.0%
NL	99.9%	67.5%	29.4%	0.0%	92.4%	92.4%	99.4%	99.4%	100.0%
NO	65.3%	20.3%	24.2%	0.0%	4.5%	4.5%	98.7%	98.7%	92.7%
PL	77.4%	28.3%	14.9%	1.4%	15.2%	12.4%	98.4%	93.0%	100.0%
PT	94.7%	0.0%	54.6%	0.0%	41.4%	41.4%	92.0%	92.4%	100.0%
RO	66.0%	1.9%	29.1%	33.4%	17.0%	13.8%	100.0%	84.8%	100.0%
SK	69.5%	32.9%	14.1%	50.0%	0.9%	0.3%	77.1%	87.1%	100.0%
SI	86.7%	21.4%	25.8%	4.7%	22.2%	20.6%	94.2%	95.1%	100.0%
ES	84.1%	15.0%	20.9%	56.4%	12.6%	12.6%	99.5%	87.0%	100.0%
SE	78.7%	0.6%	22.2%	0.0%	0.3%	0.3%	99.4%	100.0%	100.0%
CH	96.3%	60.6%	7.6%	0.0%	78.1%	78.1%	99.3%	99.4%	100.0%
UK	99.7%	80.1%	3.2%	0.0%	2.3%	2.3%	88.7%	95.4%	100.0%
EU 28	86.3%	32.5%	11.3%	18.2%	11.4%	10.8%	92.4%	89.9%	99.4%

*** DSL figures include VDSL coverage; Cable figures include DOCSIS 3.0 coverage

6.2.4 Broadband coverage by speed category for each country

	Broadband coverage (>2Mbps)	Broadband coverage (>30Mbps)	Broadband coverage (>100Mbps)
AT	98.6%	81.1%	57.2%
BE	99.9%	98.4%	96.9%
BG	95.0%	74.5%	30.7%
HR	98.7%	60.0%	27.9%
CY	100.0%	85.1%	85.1%
CZ	96.1%	88.6%	55.9%
DK	99.2%	94.6%	91.2%
EE	84.9%	78.6%	61.1%
FI	96.5%	66.0%	43.4%
FR	97.5%	55.5%	39.2%
DE	97.1%	84.1%	65.4%
EL	98.1%	45.9%	0.4%
HU	94.8%	80.0%	70.4%
IS	99.6%	96.6%	76.1%
IE	96.2%	87.5%	52.3%
IT	98.5%	86.2%	21.7%
LT	97.9%	94.0%	81.6%
LV	92.6%	90.7%	86.9%
LU	100.0%	93.2%	86.6%
MT	100.0%	99.9%	99.9%
NL	100.0%	98.2%	98.2%
NO	100.0%	83.8%	79.8%
PL	81.2%	53.4%	37.7%
PT	98.7%	93.5%	90.7%
RO	94.2%	67.9%	64.9%
SK	88.7%	78.4%	67.2%
SI	97.7%	83.2%	74.3%
ES	95.7%	85.0%	83.6%
SE	100.0%	77.9%	73.3%
CH	99.8%	98.9%	98.5%
UK	95.2%	93.9%	50.9%
EU 28	96.0%	79.0%	55.1%

6.2.4 Average operator LTE coverage for each country

	Average operator LTE coverage
AT	97.0%
BE	96.6%
BG	71.6%
HR	73.3%
CY	77.3%
CZ	98.8%
DK	100.0%
EE	95.6%
FI	98.3%
FR	88.6%
DE	87.7%
EL	88.0%
HU	91.5%
IS	94.7%
IE	92.1%
IT	88.7%
LV	97.7%
LT	97.7%
LU	98.3%
MT	99.4%
NL	99.6%
NO	100.0%
PL	91.0%
PT	93.6%
RO	72.0%
SK	81.5%
SI	96.1%
ES	92.3%
SE	100.0%
CH	98.6%
UK	97.5%
EU 28	90.8%

European Commission

Broadband Coverage in Europe 2017
Luxembourg, Publications Office of the European Union

2018 – 206 pages

ISBN 978-92-79-81287-3
doi: 10.2759/358688

KK-01-18-286-EN-N

doi: 10.2759/358688 ISBN 978-92-79-81287-3