IHS TECHNOLOGY

Broadband Coverage in Europe 2015:
Coverage in Switzerland

Mai 2016

technology.ihs.com

FINAL REPORT

Alzbeta Fellenbaum
Senior Analyst, IHS Technology

IHS Technology
133 Houndsditch
London EC3A 7BX, UK
Tel. +44 (0) 20 8544 7812
alzbeta.fellenbaum@ihs.com

Contents

Table of Contents

1.0 Introduction

With the goal of fostering the development of a network-based knowledge economy and stimulate growth, the Digital Agenda for Europe (DAE), adopted in 2010 as a flagship initiative of Europe 2020, includes a set of specific broadband coverage targets:

- Universal broadband coverage by 2013; and
- Universal broadband coverage of speeds at least 30 Mbps by 2020.

In order to monitor the progress of the broadband coverage objectives of the Digital Agenda, DG Connect (the European Commission Directorate General for Communications Networks, Content and Technology) has commissioned the Broadband Coverage in Europe project to measure the household coverage of all 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 & VVA to run the project, with the first report published in 2014 and the second report following in 2015.

It is important to note that the timeline of the data collection for the 2015 edition of the BCE study has been 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 set for early 2016. For this reason, the broadband coverage data collection will be from now on scheduled to reflect the situation at the end of June (i.e. half-year data rather than year-end data points will be collected). The study will continue to run on a once-a-year basis.

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 was to cover 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. This report presents results of this additional research as well as Europe-wide overview of the broadband coverage trends at the end of June 2015.

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 on national and rural level based on the number of homes passed by each individual technology.

The study also aims, as requested by DG Connect, to estimate the overall coverage of “combination” 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

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 in 2013. For the 2013 study IHS & VVA, in agreement with DG Connect, decided to apply similar methodology to the one used by Point Topic, the previous contractor, in the 2010-2012 period and use 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, BCE 2013 and BCE 2014 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 added 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

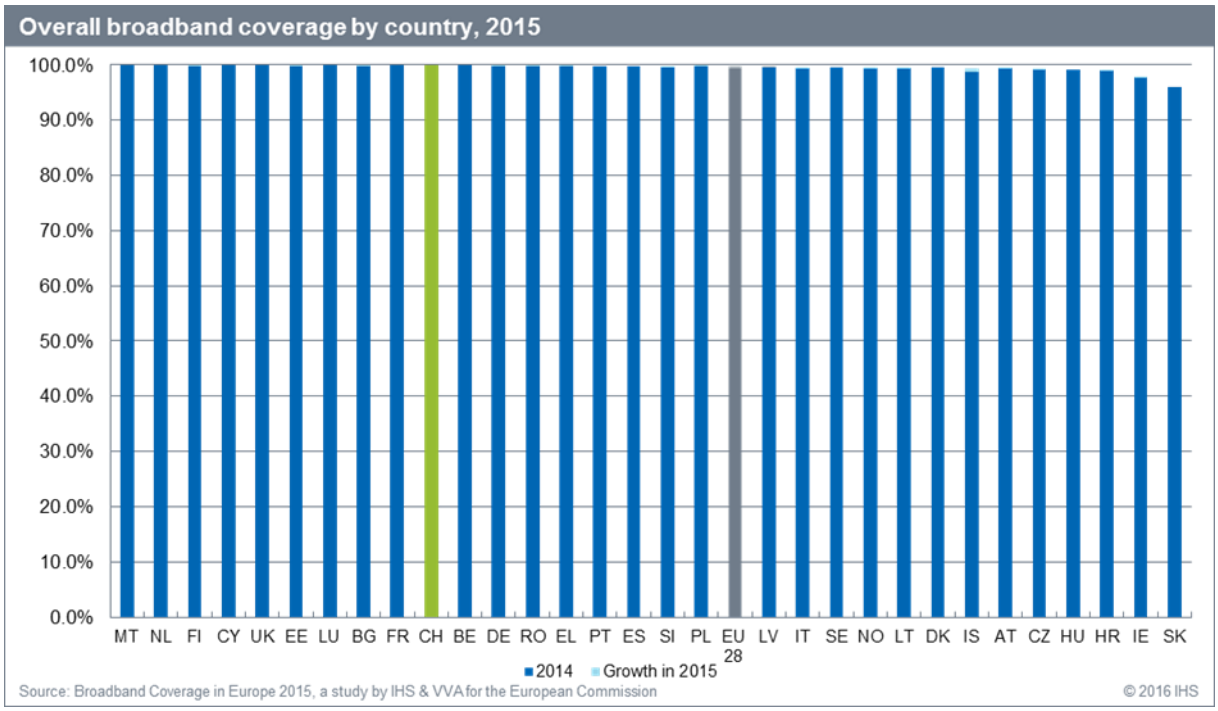
By including the additional metric, it is possible to obtain an additional analytical layer to evaluate the study countries' progress towards the Digital Agenda goals. However, since the main focus of the BCE study remains an analysis of the technology coverage and due to the fact that the level of quality of received data continues to vary quite substantially, the research team decided to include the analysis of coverage by speed categories in the form on an Appendix of this report.

2.0 European Overview

2.1 Country comparison of overall broadband coverage

The overall broadband coverage combination category combines broadband coverage of all fixed broadband access technologies (DSL, cable, FTTP, WiMAX) as well as mobile broadband technologies (HSPA and LTE).

This category provides an indication of the number of households covered by basic broadband provided by at least one of the abovementioned technologies.



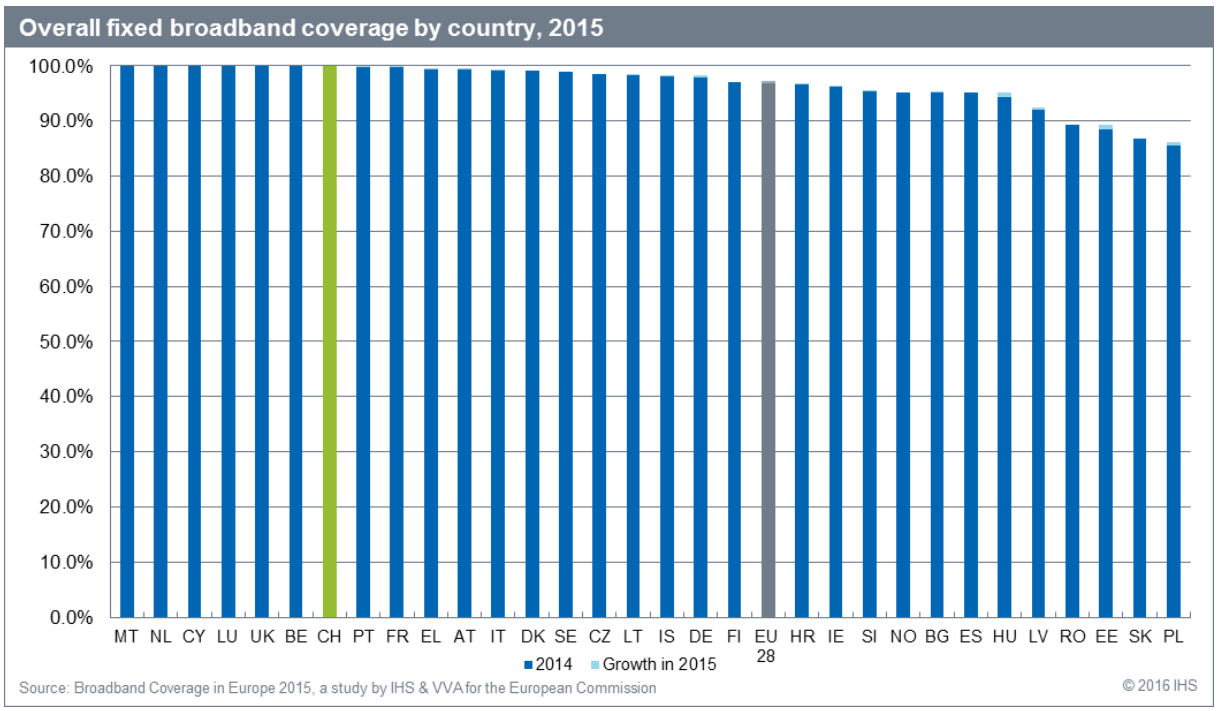
At the end of June 2015, 99.9% of Swiss households had access to at least one fixed or mobile broadband service. In terms of overall broadband coverage, Switzerland ranked above the EU average of 99.8% and was among 14 countries which recorded complete or very nearly complete overall broadband coverage. Slovakia and Ireland were the only two countries, where overall broadband coverage levels did not reach 99% or more households with 95.9% of Slovak households and 97.6% of Irish households being passed by at least one mobile or fixed broadband technology.

No significant increases in overall broadband coverage were reported during the first six months of 2015. This is due to the fact that HSPA rollout, which is generally the biggest driver of this category, has been mostly finished and widespread already in 2014 and availability of DSL (the second most important contributor) is saturated across the majority of European countries.

As was mentioned in previous reports on broadband coverage in Switzerland, while all households in Switzerland are guaranteed by law (Universal Service Obligation) to be able to get connected to at least 2Mbps, our research estimates show that there continues to be a small number of homes (0.06%) that cannot be serviced by either fixed or mobile broadband connections. However, given the fact that 100% satellite coverage was reported for Switzerland, it is possible to assume that satellite broadband services are available to all Swiss households.

2.2 Country comparison of fixed broadband coverage

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 2Mbps download speed. Four technologies make up the overall fixed broadband coverage figures: DSL (including VDSL), cable (including DOCSIS 3.0), FTTP, and WiMAX.



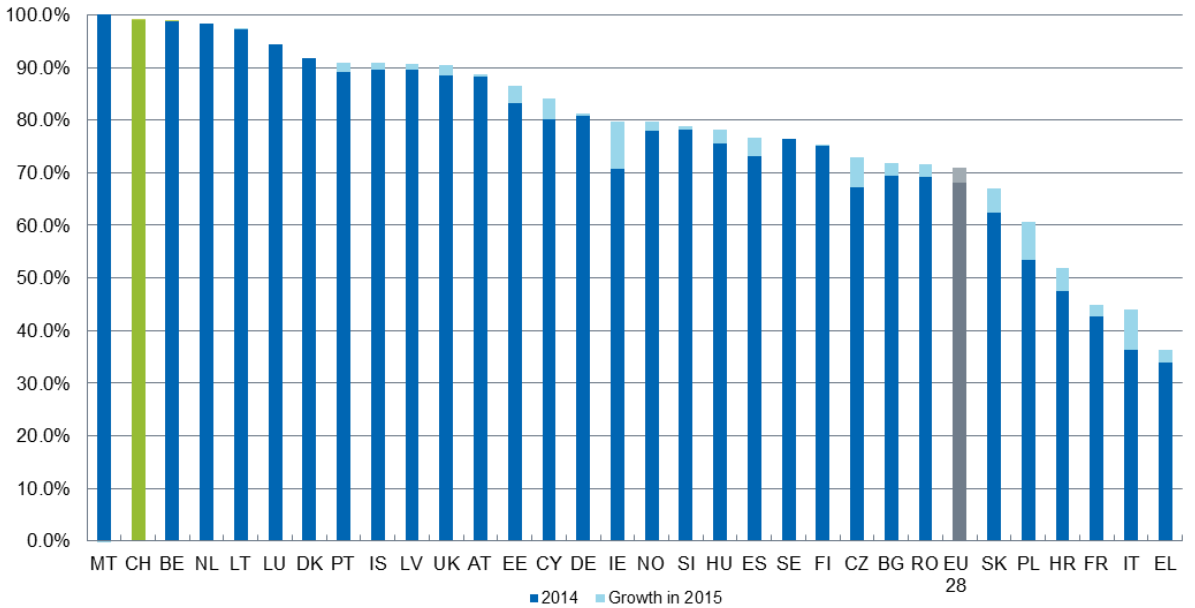
Out of the 31 study countries, 18 countries reported fixed broadband coverage levels at or above the EU average of 97.4% at the end of June 2015. As in previous years, fixed broadband coverage was highest in Cyprus, Luxembourg, Malta, the Netherlands and the United Kingdom where it reached universal or near-universal levels. Only four countries, Estonia, Romania, Slovakia and Poland, reported coverage below 90% of households in mid-2015. These countries face fixed broadband coverage challenges mostly due to lower expansion of DSL networks, and sparsely populated and underserviced rural areas.

In Switzerland, 99.9% of homes had access to at least one fixed broadband service at the end of June 2015, virtually unchanged from the previous year. In terms of coverage by the individual fixed technologies, DSL and cable technologies are available to the vast majority of Swiss households with DSL coverage reaching 99.5% of households and cable broadband networks passing 98.1% of Swiss homes. As in 2014, Switzerland registered second highest coverage of cable broadband networks as only Malta, with universal cable coverage, ranked higher among the study countries.

2.3 Country comparison of NGA coverage

The NGA combination category comprises VDSL, FTTP and DOCSIS 3.0 technologies, all typically capable of delivering a service speed of at least 30Mbps (although VDSL local loop lengths mean that actual speeds do vary). 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 NGA coverage category therefore constitutes an evaluation of the roll-out of the relevant technologies and progress towards this goal.

Overall NGA coverage by country, 2015



Source: Broadband Coverage in Europe 2015, a study by IHS & VVA for the European Commission © 2016 IHS

The chart presented above shows that highly urbanised countries generally record the highest NGA coverage. Malta remained the only country to report complete coverage for NGA technologies, followed by Switzerland, Belgium, the Netherlands and Lithuania all reporting coverage levels exceeding 95%. Unchanged from December 2014, 99.0% of Swiss homes were passed by networks capable to reach at least 30Mbps download speeds in mid- 2015.

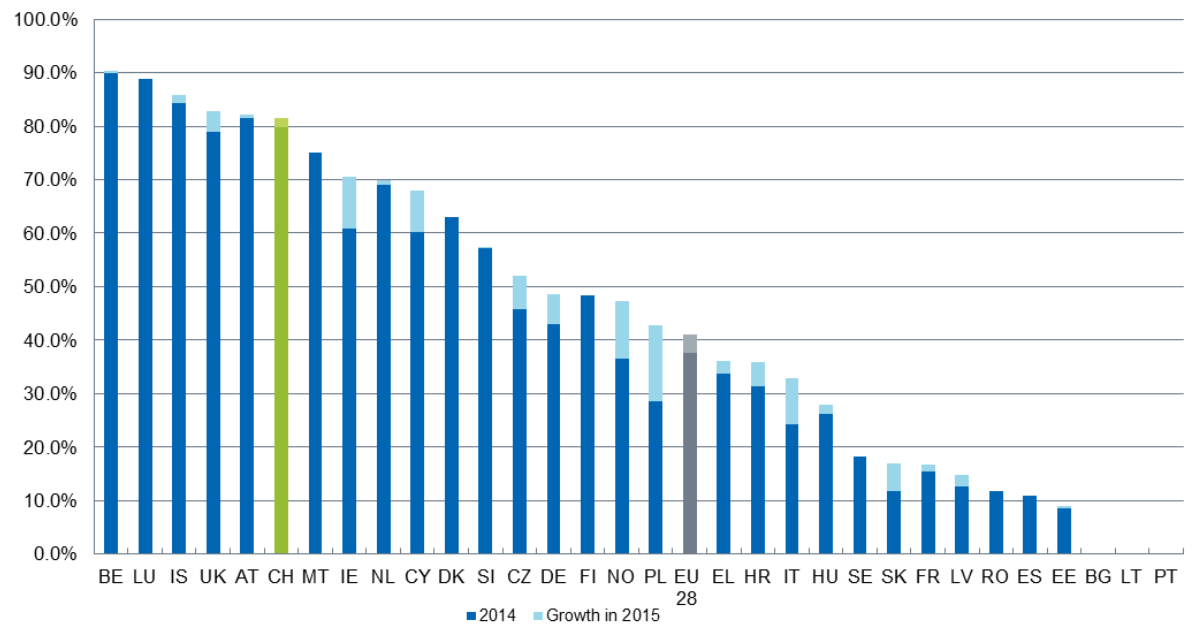
Nevertheless, there are considerable differences in NGA coverage across the study countries, reflecting the various strategies and approaches to high-speed broadband deployment adopted across Europe. Of the 31 study countries, only six countries (Slovakia, Poland, France, Italy, and Greece) reported coverage levels below the European average (70.9%). What is more, coverage levels in these countries remain very low compared to the top performers with NGA services in France and Italy being available to only around 44% of households. In Greece only 36.3% of homes were passed by NGA networks at the end of June 2015.

As in the previous years, VDSL continued to be the fastest growing NGA technology. By mid-2015, VDSL networks passed 41.6% of EU homes compared to 37.6% at the end of 2014. This is a reflection of a trend observed already in 2013, which sees operators focusing their deployment strategies on upgrading existing copper networks instead of investing in the typically more expensive deployments fibre optic networks all the way to customers' properties.

VDSL however remains far from widespread in most markets. Only Belgium reported VDSL coverage exceeding 90%, while five other countries reported coverage levels of over 80% (Luxembourg,

Iceland, UK, Austria and Switzerland). Overall, 17 study countries achieved VDSL coverage exceeding the EU average.

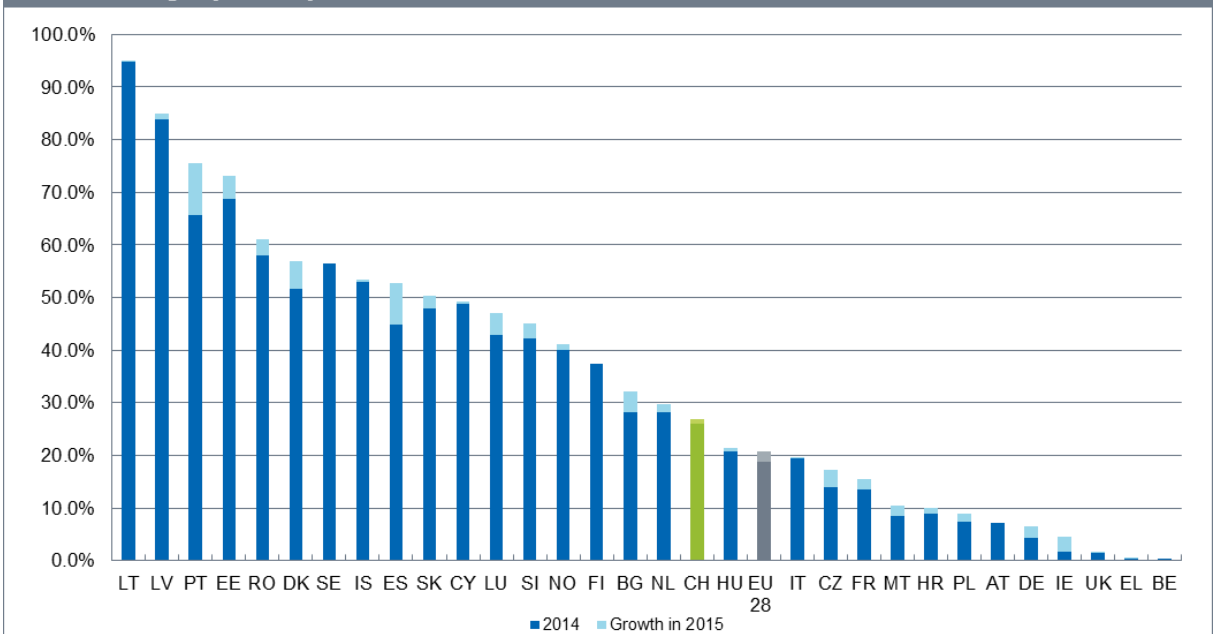
VDSL coverage by country, 2015



Source: Broadband Coverage in Europe 2015, a study by IHS & VVA for the European Commission © 2016 IHS

At the end of June 2015, VDSL was not available in Bulgaria, Lithuania and Portugal, all countries, which traditionally prefer other NGA technologies over VDSL. Some countries, on the other hand, saw substantial coverage increases, such as in Poland and Norway, where VDSL coverage increased by 14.2 and 10.8 percentage points, respectively, during the first six months of 2015.

FTTP coverage by country, 2015



Source: Broadband Coverage in Europe 2015, a study by IHS & VVA for the European Commission © 2016 IHS

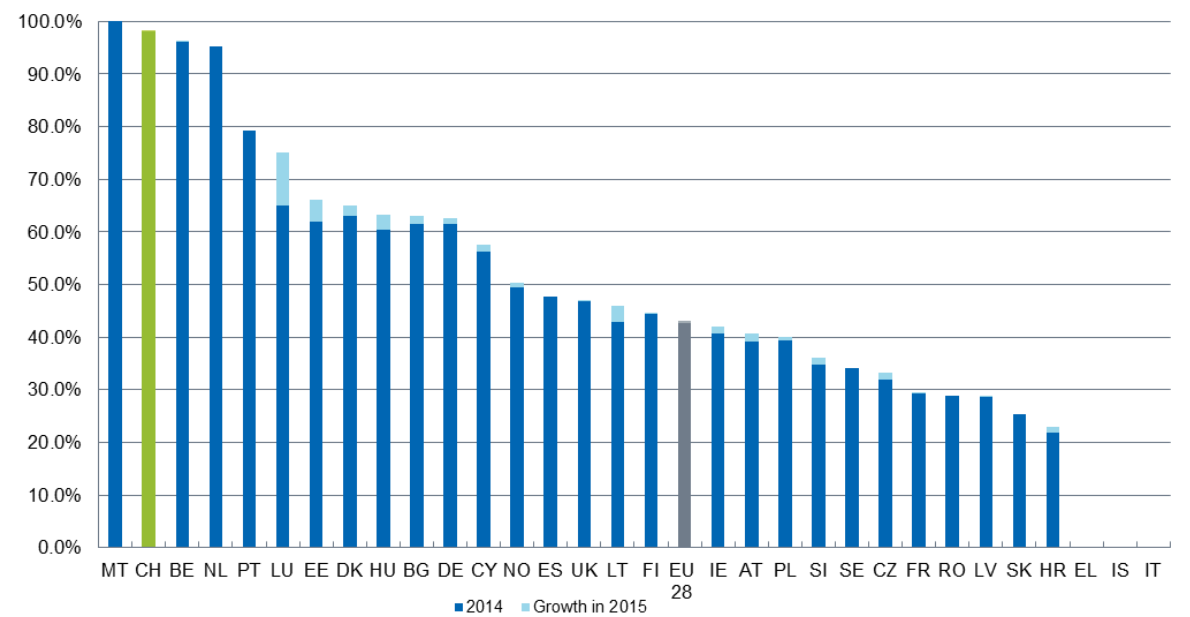
As of mid-2015, the Baltic countries were joined by Portugal at the top of the FTTP coverage ranking. Lithuania and Latvia remained the two countries with the highest FTTP coverage, with 95.1% households passed by FTTP in Lithuania and 85.0% in Latvia. They were followed by Portugal at 75.4% and Estonia at 73.1%. This broadly reflects the national broadband strategies of these countries, which place particular emphasis on fibre roll-out all the way to customers' premises.

As in 2014, the strongest growth in FTTP coverage was recorded in Portugal, where FTTP coverage increased by almost 10 percentage points during the first six months of 2015. One of the major contributors to this rise is the strategic business model of Portuguese network operators, which is based on network sharing and cooperation on joint roll-out of FTTP networks.

Twelve countries reported coverage levels below the EU average. While FTTP access is on offer in all study countries, in some of the countries FTTP is available only on a very limited basis. In Greece and Belgium fibre networks covered only 0.4% of households. In the UK, FTTP coverage was only slightly higher at 1.4%.

During the first half of 2015, European cable network operators continued to upgrade their cable networks to the DOCSIS 3.0 standard, even though most of the work has already been done in the last couple of years. By mid-2015, 98.5% of cable networks across Europe were upgraded to DOCSIS 3.0 technology compared to 98.2% at the end of 2014.

Docsis 3.0 coverage by country, 2015

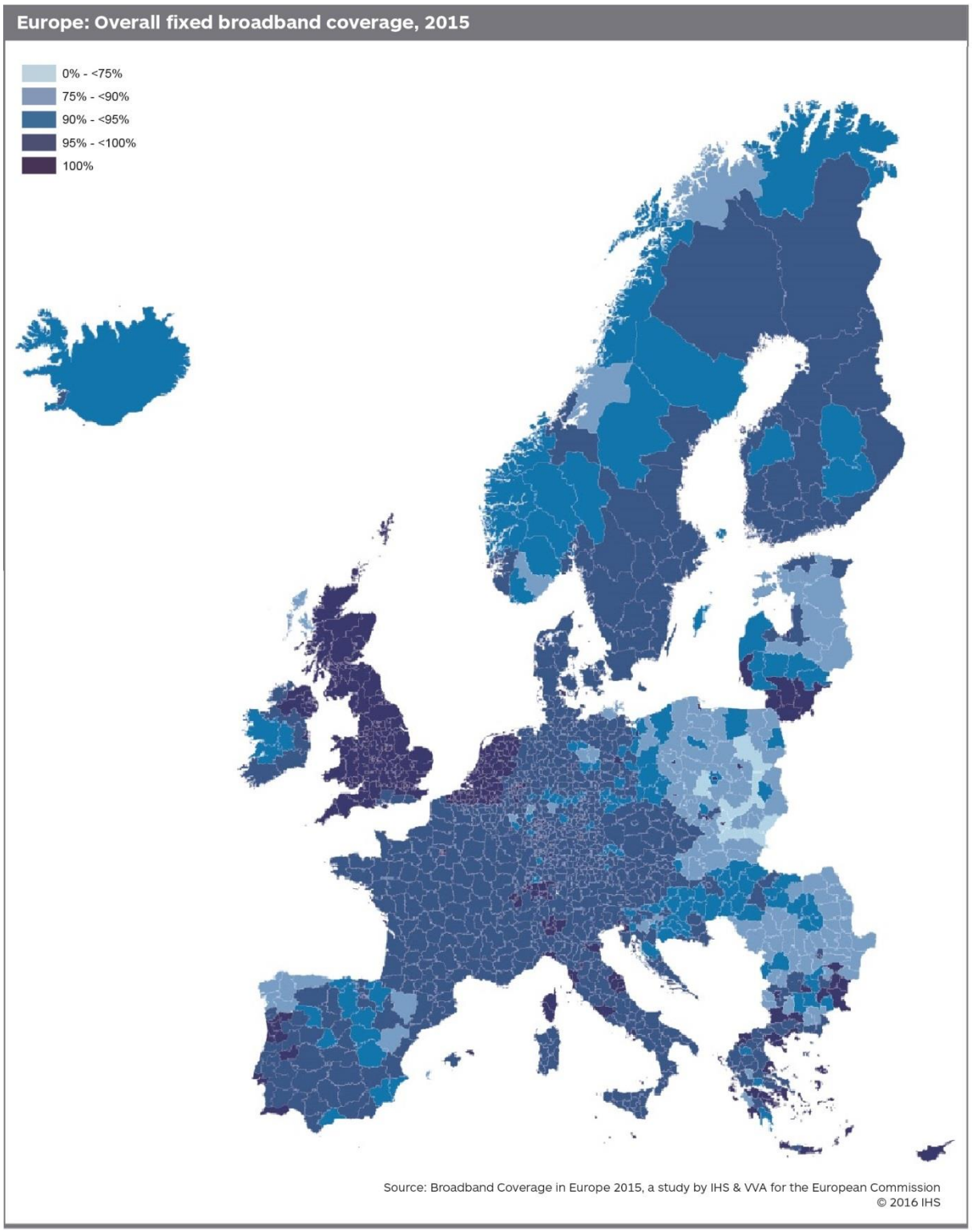


Source: Broadband Coverage in Europe 2015, a study by IHS & VVA for the European Commission

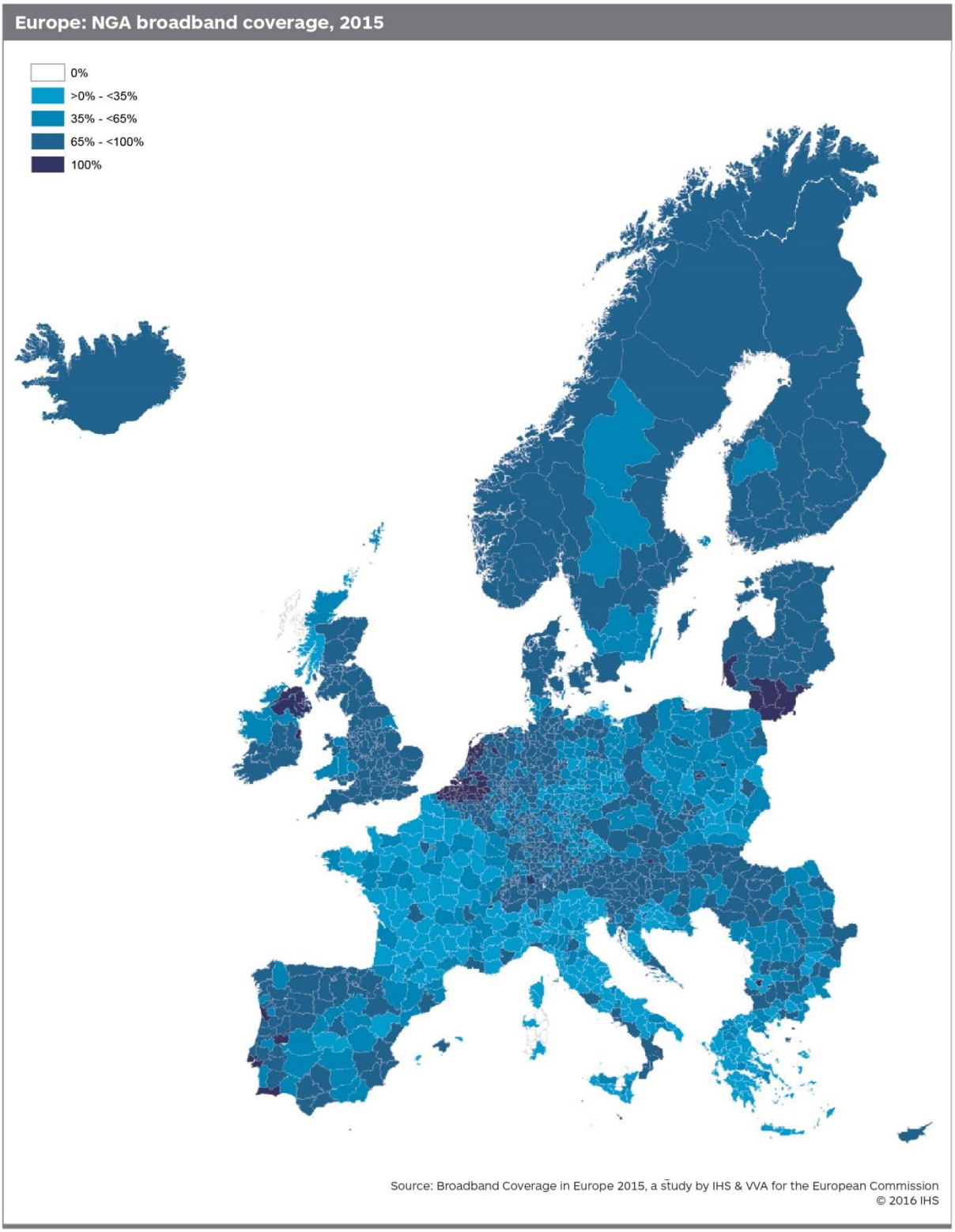
By mid-2015, cable networks in 11 countries were fully upgraded, while DOCSIS 3.0 constituted over 80% of cable networks in almost all countries with cable broadband coverage. The only exception is Croatia, where the upgrade proceeded at a slower pace and by the end of June 2015 only 70.2% of cable connections used DOSCIS 3.0 technology, with a total DOCSIS 3.0 coverage standing at 23% of households.

Malta remained the only country with 100% DOCSIS 3.0 coverage, followed by Switzerland at 98.1%, Belgium at 96.3% and the Netherlands at 95.1%. As in 2014, 17 of the study countries performed better than the EU average (43.1% of households). As Greece, Iceland and Italy lack cable broadband networks, they thus did not report any DOCSIS 3.0 coverage.

2.4 NUTS 3 coverage of overall fixed broadband



2.5 NUTS 3 coverage of NGA broadband



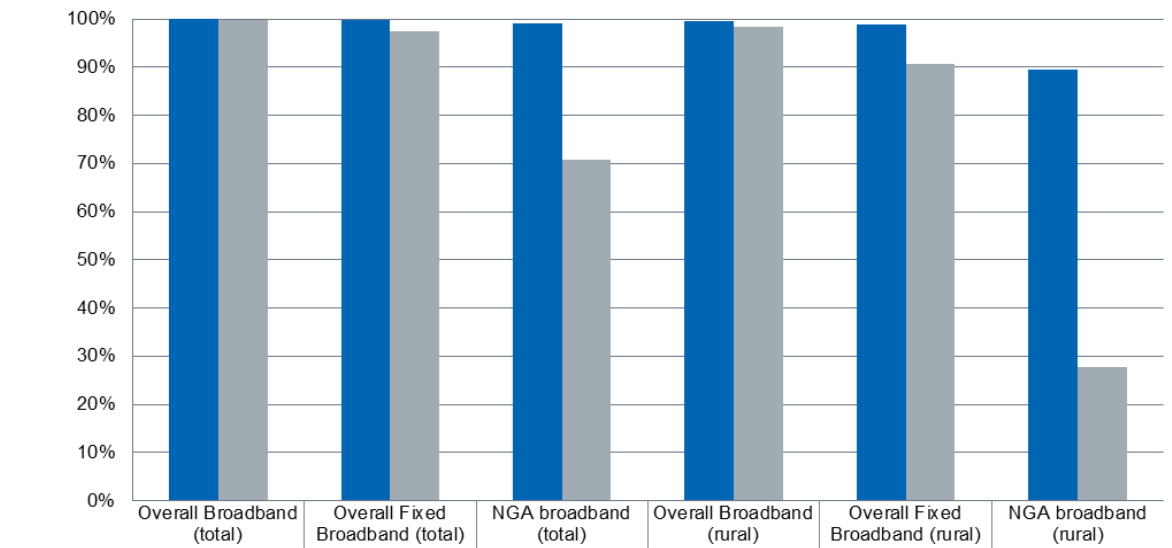
3.0 Switzerland

3.1 National coverage by broadband technology

At the end of June 2015, Switzerland remained one of the top performers with regards to broadband coverage, reporting above-average coverage levels for all coverage combination categories. Given the high broadband coverage levels achieved already in previous years, it is not surprising that no substantial changes were reported in the first half of 2015.

In mid-2015, almost complete coverage has been reported for the overall broadband technology combination on national and rural level (99.9% and 99.4%, respectively), as well as fixed broadband on national level (99.9%). NGA broadband services were available to 99.0% of all households in Switzerland and to nearly 9 in 10 (89.5%) rural households.

Switzerland: Coverage by technology combination, 2015



	Overall Broadband (total)	Overall Fixed Broadband (total)	NGA broadband (total)	Overall Broadband (rural)	Overall Fixed Broadband (rural)	NGA broadband (rural)
Switzerland	99.9%	99.9%	99.0%	99.6%	98.9%	89.5%
EU 28	99.8%	97.4%	70.9%	98.4%	90.6%	27.8%

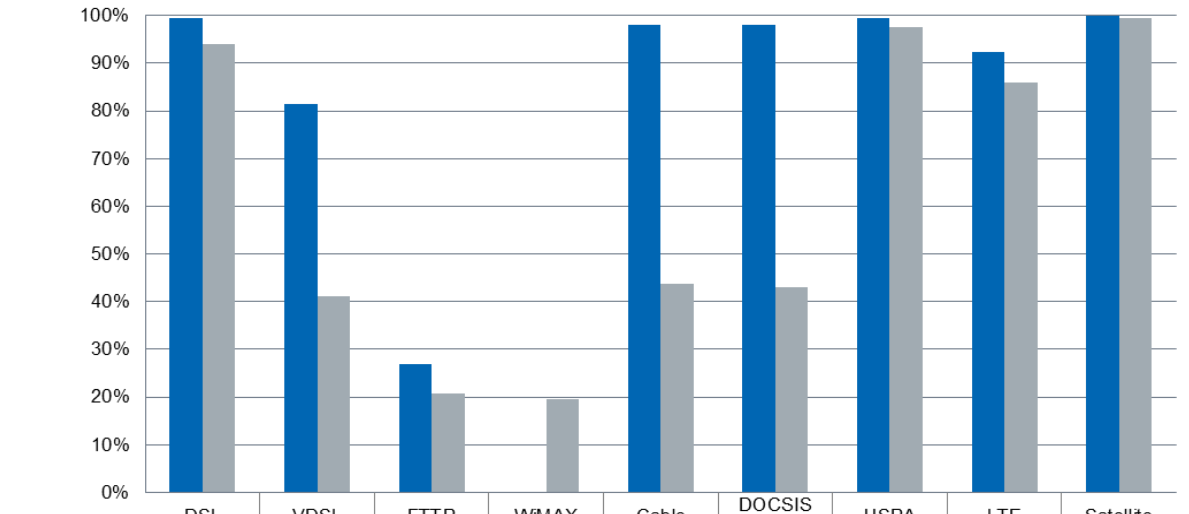
Source: Broadband Coverage in Europe 2015, a study by IHS & VVA for the European Commission

Switzerland continued to rank ahead of the EU average in each category with the exception of WiMAX, which is absent in the Swiss market. Of particular importance is very high reach of cable networks (98.1% household coverage), which have now been completely upgraded to DOCSIS 3.0 meaning that cable networks also serve as the key NGA technology.

VDSL and FTTP coverage levels however continue to grow, with VDSL services being available to 81.5% of households, a 1.8 percentage point growth, and FTTP networks passing 27% of Swiss homes, increasing by 1.1 percentage points in the first six months of 2015. 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 increasing competition from cable providers.

Following a dramatic increase in LTE coverage recorded in 2014, the pace of LTE deployment has slowed down in the first half of 2015. Nevertheless, 92.3% of Swiss households were able to connect to LTE services by mid-2015, compared to 85.9% of average EU households.

Switzerland: Coverage by technology, total, 2015

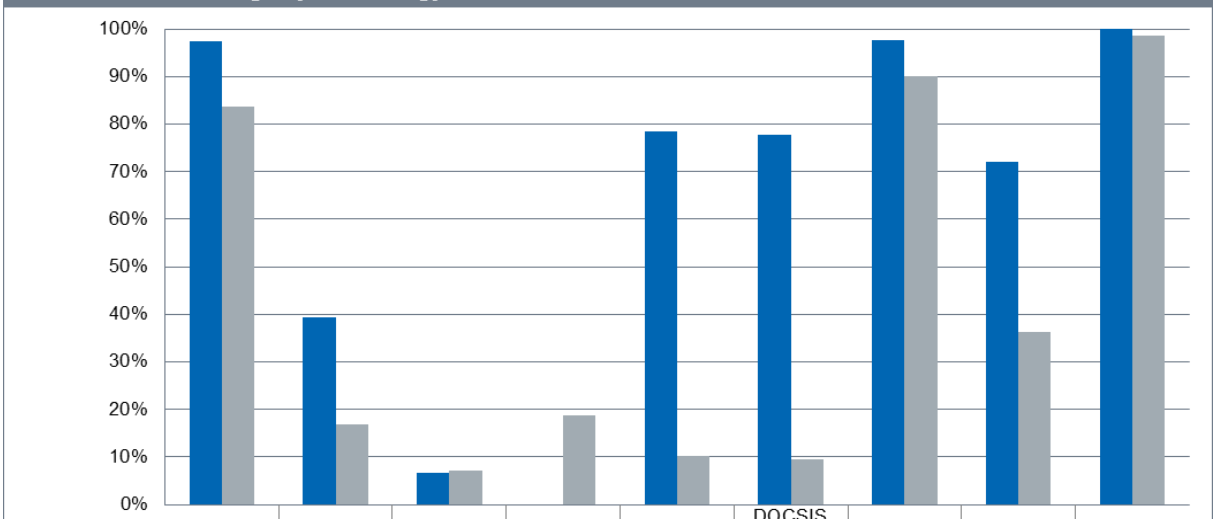


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Switzerland	99.5%	81.5%	27.0%	0.0%	98.1%	98.1%	99.4%	92.3%	100.0%
EU 28	94.0%	41.0%	20.8%	19.7%	43.8%	43.1%	97.6%	85.9%	99.4%

Source: Broadband Coverage in Europe 2015, a study by IHS & VVA for the European Commission © 2016 IHS

Switzerland has been traditionally characterised by very high rural cable coverage compared to the EU average. Cable networks pass 78.4% rural homes, and thanks to network upgrades, 77.8% of rural households are also covered by DOCSIS 3.0 technology, unchanged from 2014. High rural DOCSIS 3.0 coverage also greatly contributes to the high overall levels of rural NGA availability in Switzerland. At the end of June 2015, VDSL services were available to 39.4% of rural households, a slight 0.7 percentage point increase, while 6.6% of rural households had access to FTTP broadband.

Switzerland: Coverage by technology, rural areas, 2015



	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Switzerland	97.4%	39.4%	6.6%	0.0%	78.4%	77.8%	97.6%	72.2%	100.0%
EU 28	83.7%	16.9%	7.2%	18.7%	10.2%	9.4%	90.0%	36.3%	98.7%

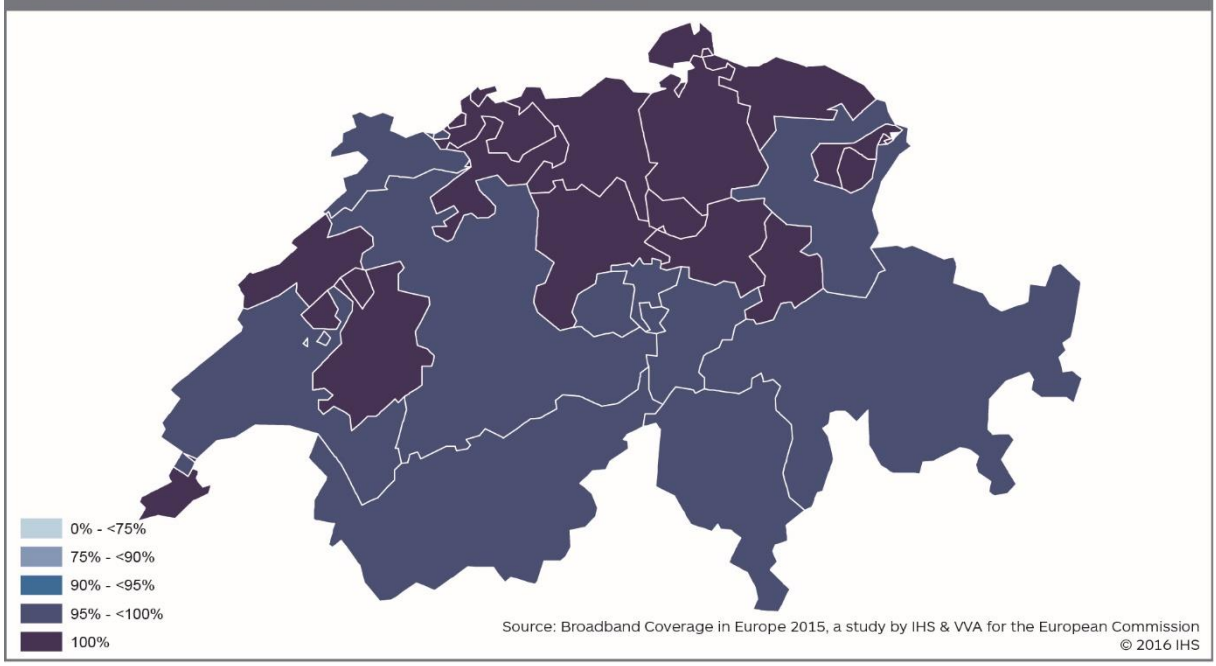
Source: Broadband Coverage in Europe 2015, a study by IHS & VVA for the European Commission © 2016 IHS

Rural LTE coverage increased by 2.3 percentage points and by mid-2015, 72.2% of rural households could connect to the high-speed mobile network, nearly double the EU average.

3.2 Regional coverage by broadband technology

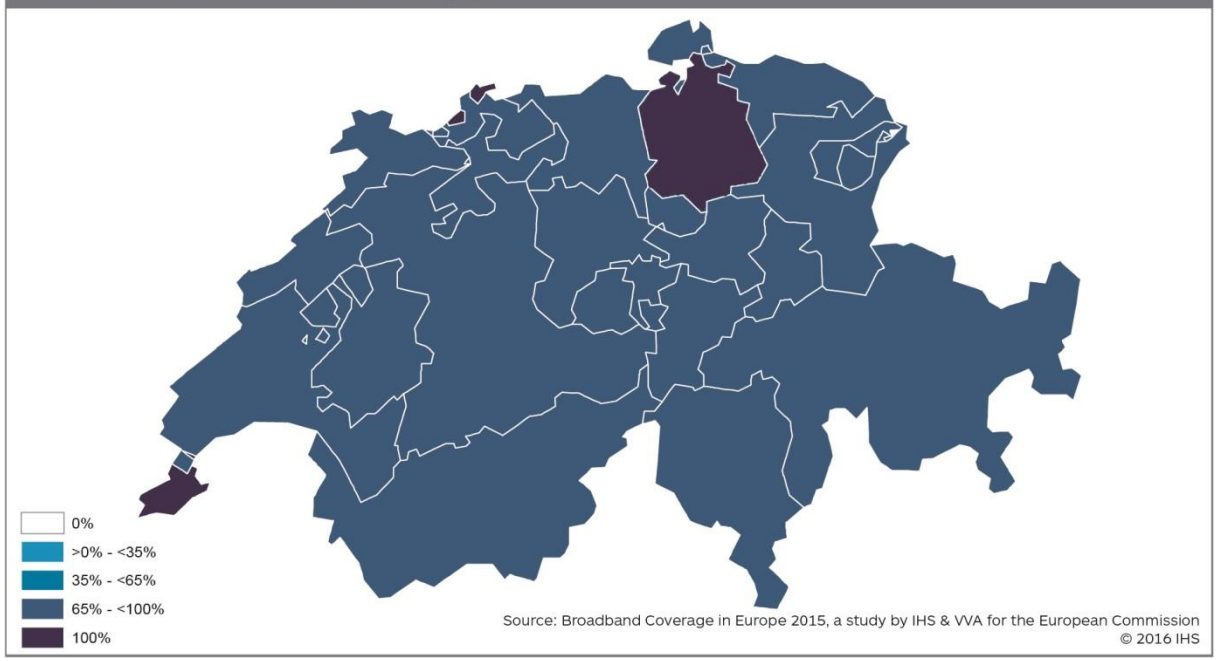
Sixteen out of the 26 Swiss regions recorded virtually complete fixed broadband coverage, with fixed coverage in all of the remaining regions exceeding 95%. Lowest coverage was recorded in the Jura and Uri regions, reaching 97.1% of households.

Switzerland: Overall fixed broadband coverage, 2015



Complete NGA coverage was recorded in Geneva, Basel and Zürich, with over 90% of homes passed by NGA networks in majority of the remaining regions. There were only two regions, where NGA coverage was lower than 90% - Valais and Graubünden.

Switzerland: NGA broadband coverage, 2015



3.3 Regulatory and market overview

The Swiss broadband market is characterised by heavy infrastructure-based competition between cable operators and the incumbent, Swisscom, with a number of smaller FTTP providers active on a regional and local level. Since 2011, Switzerland has been the leading investor in telecommunications infrastructure (on per capita bases) among OECD countries.[1]

Swisscom has been investing extensively in deployment of fibre networks across the country with CAPEX levels highly exceeding its European telco counterparts (3.6 times more on average). The company has adopted a varied approach to its network upgrade, starting with VDSL trials in 2006 and announcing a FTTP network deployment plan in 2008.[2] By mid-2015, Swisscom's FTTP network passed 975 thousand homes across Switzerland capable of up to 1Gbps downstream speeds.[3] In May 2015, the company was the first to trial G.fast technology among its active customers, increasing download speeds to up to 500 Mbps over the copper network and bringing yet another technology into its network infrastructure footprint.[4]

Swiss cable operators, led by Liberty-Global backed Cablecom, have been investing heavily in network upgrades since 2006 and by mid-2015 all cable networks were upgraded to the DOCSIS 3.0 standard, with Cablecom increasing its download speeds to up to 500 Mbps in June 2015[5] with the company looking to roll out 1Gbps speeds in the near future.[6]

At the end of 2012, Swisscom rolled out the first LTE network in Switzerland, followed by Orange and Sunrise in 2013[7]. Both Orange and Swisscom launched LTE-Advanced networks in Switzerland already in 2014.

[1] OECD Digital Economy Outlook 2015.
[2] http://www.swisscom.ch/en/about/medien/press-releases/2008/12/20081209_01_Mit_fibre_suisse_in_die_Glasfaserzukunft.html
[3] https://www.swisscom.ch/content/dam/swisscom/de/about/investoren/documents/2015/2015_Q2_Praesentation_en.pdf
[4] https://www.swisscom.ch/en/about/medien/press-releases/2015/05/20150504-MM-Netzausbau.html
[5] http://www.upc-cablecom.ch/en/internet/products/
[6] https://www.telegeography.com/products/commsupdate/articles/2014/07/25/cablecom-rollout-brings-250mbps-broadband-to-2m-homes/
[7] http://www.zdnet.com/sunrise-joins-switzerlands-4g-crowd-with-lte-launch-in-26-towns-7000017004/

3.4 Data tables for the Switzerland

Statistic	National
Population	8,039,060
Persons per household	2.3
Rural proportion	12.8%

	Switzerland 2015		Switzerland 2014		Switzerland 2013		EU28 2015	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.5%	97.4%	99.4%	96.8%	99.4%	97.3%	94.0%	83.7%
VDSL	81.5%	39.4%	79.7%	38.7%	72.3%	29.1%	41.0%	16.9%
FTTP	27.0%	6.6%	25.9%	6.2%	21.1%	3.7%	20.8%	7.2%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	19.7%	18.7%
Cable	98.1%	78.4%	98.1%	78.4%	97.2%	66.3%	43.8%	10.2%
DOCSIS 3.0	98.1%	77.8%	98.0%	77.8%	97.1%	60.4%	43.1%	9.4%
HSPA	99.4%	97.6%	99.0%	96.1%	98.8%	94.2%	97.6%	90.0%
LTE	92.3%	72.2%	91.8%	69.9%	67.7%	15.5%	85.9%	36.3%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	98.7%
Overall broadband	99.9%	99.6%	99.9%	99.3%	99.9%	99.3%	99.8%	98.4%
Overall fixed broadband	99.8%	98.9%	99.8%	99.0%	99.8%	98.9%	97.4%	90.6%
NGA broadband	99.0%	89.5%	99.0%	89.2%	98.7%	76.4%	70.9%	27.8%

Note: The 2015 figures represent state of broadband coverage as of end of June 2015. The 2014 and 2013 (end of year) figures are drawn from the previous studies conducted by IHS and VVA.

4.0 Methodology

The methodological approach used in the 2015 edition of the Broadband Coverage in Europe study mirrors the approach used in the 2013 and 2014 studies. At the onset of the project, the IHS & VVA research team decided, following an extensive initial discussion with DG Connect, to adopt similar methodology to the one previously applied by Point Topic, in order to ensure 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.

As noted previously, the timeline of the data collection for the 2015 edition of the BCE study has been moved forward by six months. 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). While the same methodology has been applied, it is important to keep in mind that the coverage changes reported in this study are indicative of developments in the first six months of the year rather than the whole year, as was the case in the previous iterations of the broadband coverage research. As such, direct comparisons should not be drawn between the 2015 data and the coverage data reported in previous years without pointing out the changed timeline.

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

4.1 Survey design and data collection

For the sake of consistency, IHS & VVA used similar wording and formatting of the survey questionnaire as in 2013 and 2014, which was based on a questionnaire designed by Point Topic for the 2012 study. Using near-identical question wording enables the research team to deliver findings which can be compared with research undertaken in previous years by both IHS & VVA and Point Topic.

Where possible, the research team contacted survey participants that were approached for the 2012, 2013 and 2014 data collection. DG Connect kindly provided the research team with original contact list including representatives of both national regulatory bodies as well as broadband network operators originally used for the 2012 BCE study. During the data collection for the 2013, 2014 and 2015 studies the 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 generally 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 was focused on one central question, which asked about the absolute number of homes passed by broadband networks, and was 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 - For the 2013 study, a new metric was introduced – that of speed coverage. Thus, the 2013 survey questionnaire was 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 2014 and 2015 studies.

In a number of cases, coverage data was delivered on a more detailed geographical level than the requested NUTS 3 areas. In these cases, IHS & VVA 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.

The IHS & VVA 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 was treated as commercially confidential and was used solely for the purposes of this study.

4.2 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 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, IHS & VVA team (as well as Point Topic) 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 allowed 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 was centred around gaining information on broadband coverage in rural areas. In order for the rural data collected in the period 2013-2015 to be comparable to the 2012 dataset, the IHS & VVA research team adopted a similar approach to determine rural households to the one used by Point Topic.

In 2012, Point Topic developed a new methodology to defining rural areas using the Corine land cover database and creating a database of population and land type in every square kilometre across Europe. Households in square kilometres with population less than one hundred were classified as rural. This granular approach based on population density enabled Point Topic to identify the truly rural areas likely to be unserved or underserved by broadband operators.

In order to be able to analyse rural coverage in a consistent manner, the IHS & VVA team obtained from Point Topic updated estimations of rural population in individual NUTS 3 regions. According to the updated data, in 2015 approx. 14% of households in the study countries were rural. 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.

4.3 Additional research conducted in parallel to the survey

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

The additional research was built on the IHS & VVA 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

4.4 Validation and integration of data

In this phase of the study, data collected through the survey and via additional research were 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 for 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 IHS & VVA team was able to provide estimates for each of the nine broadband technologies in all NUTS 3 areas both on total and rural level.

4.5 Estimating coverage for different technology combinations and speed categories

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)

For the sake of consistency, IHS and VVA applied similar methodology in the 2013, 2014 and 2015 studies to the approach used by Point Topic in the 2012 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 the previous studies, a varied formula was used in cases where some 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 publication of the finalised data in the 2015 update of the Digital Agenda Scoreboard.

In a number of cases, new and more accurate data was provided to the research team reflecting the 2014 data and thus justifying restatement of the figures published in the Broadband Coverage in Europe 2014 study. Restatements are indicated in the data tables sections of individual country chapters.

5.0 Appendix

5.1 Broadband coverage by speed categories

In addition to individual technology coverage and combination technology coverage, DG Connect required coverage by download speed to be included in the study from 2013. The following speed categories were thus added 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

By including the additional metric, it is possible to obtain an additional analytical layer to evaluate the study countries' progress towards the Digital Agenda goals. While some of the technology coverage might be reported as relatively high, it is also important to determine the actual speeds consumers will be able to receive on those particular networks.

Even though, this metric was included already in the 2013 edition of the study, the research team found that it was still a somewhat unfamiliar concept to some operators and NRAs and hence, the quality of received data continued to vary quite substantially across participant responses. For this reason and with approval from DG Connect, the research team decided to include information on speed categories in the form on an Appendix of this report, with the hope that the metric will become a standard component of the report in future iterations.

5.1.1 Methodology for determining 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:

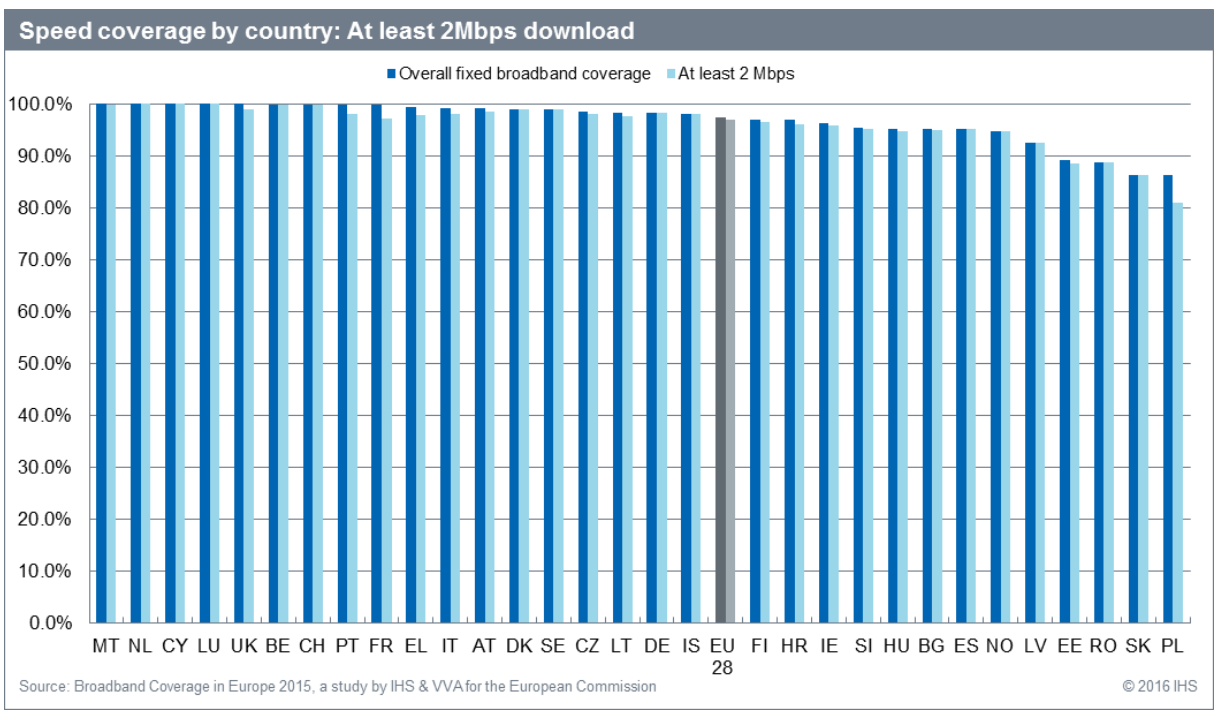
- Coverage by broadband network/s capable of realistically achieving actual download speeds of at least 2 Mbps. This category encompassed DSL (including VDSL), FTTP, WiMAX, standard cable (including DOCSIS 3.0 cable), HSPA and LTE broadband access technologies. However, as not all DSL connections are 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 downstream speed connections if the connection's broadband speed was capable of achieving a minimum of 2, 30, or 100 Mbps downstream speed (respectively) for the majority of the time. 'Majority of time' was understood to mean actual download speeds achieved by a household for at least 75% of the time.

As this was a new metric, and speed information can be generally hard to decode, even for the NRAs and ISPs themselves, the IHS & VVA team also relied in addition to the collected survey data, on sector knowledge regarding deployments to make informed estimates of achievable speeds to gain complete picture of coverage by the speed categories. 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 available such information at future points in time.

5.1.2 Broadband coverage by speed categories results

Comparing data on fixed broadband coverage with information gathered on actual download speed of at least 2 Mbps show that in most countries, the vast majority of homes passed were also able to receive connections with at least 2 Mbps download speeds. On the EU level, 97.4% of households had access to fixed broadband and 96.9% of homes were reached by networks providing them with actual download speeds of at least 2 Mbps.



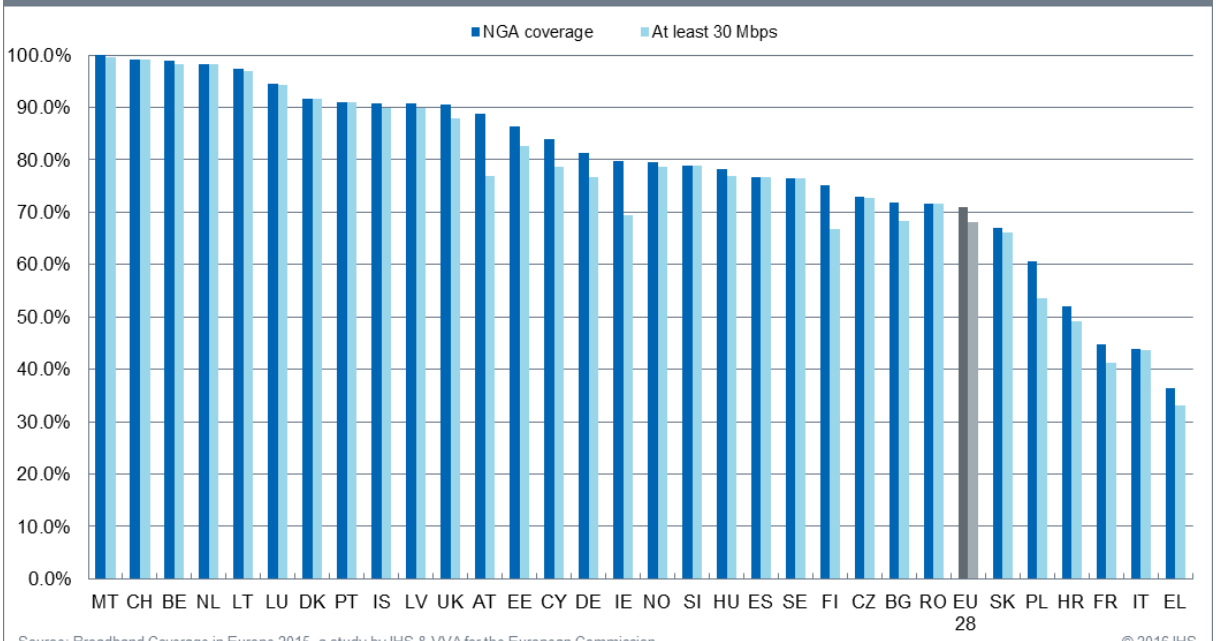
Among the study countries, bigger gaps between fixed broadband coverage and availability of at least 2 Mbps broadband connections could be seen for countries with higher proportion of DSL or WiMAX networks in the make-up of fixed broadband coverage, as traditionally DSL (and WiMAX) networks tend to be less reliable in sustaining actual speeds at peak times compared to cable and FTTP networks.

The biggest difference was registered in the case Poland, which relies mostly on DSL networks to provide fixed broadband coverage. It was estimated that 81.0% of households in Poland had access

to actual 2 Mbps download speed connections, while 86.2% of Polish homes were passed by fixed broadband networks.

More variation can be observed when looking at the NGA coverage figures in comparison with data on at least 30 Mbps actual download speeds. While the study treats NGA coverage to be able to provide technology coverage of at least 30 Mbps, data on actual speeds available to consumers shows gaps between the two categories in some of the countries. In the EU as whole, there was a 2.8% percentage difference between NGA coverage (70.9%) and availability of at least 30 Mbps broadband services, which were accessible to 68.1% of average EU households.

Speed coverage by country: At least 30Mbps download

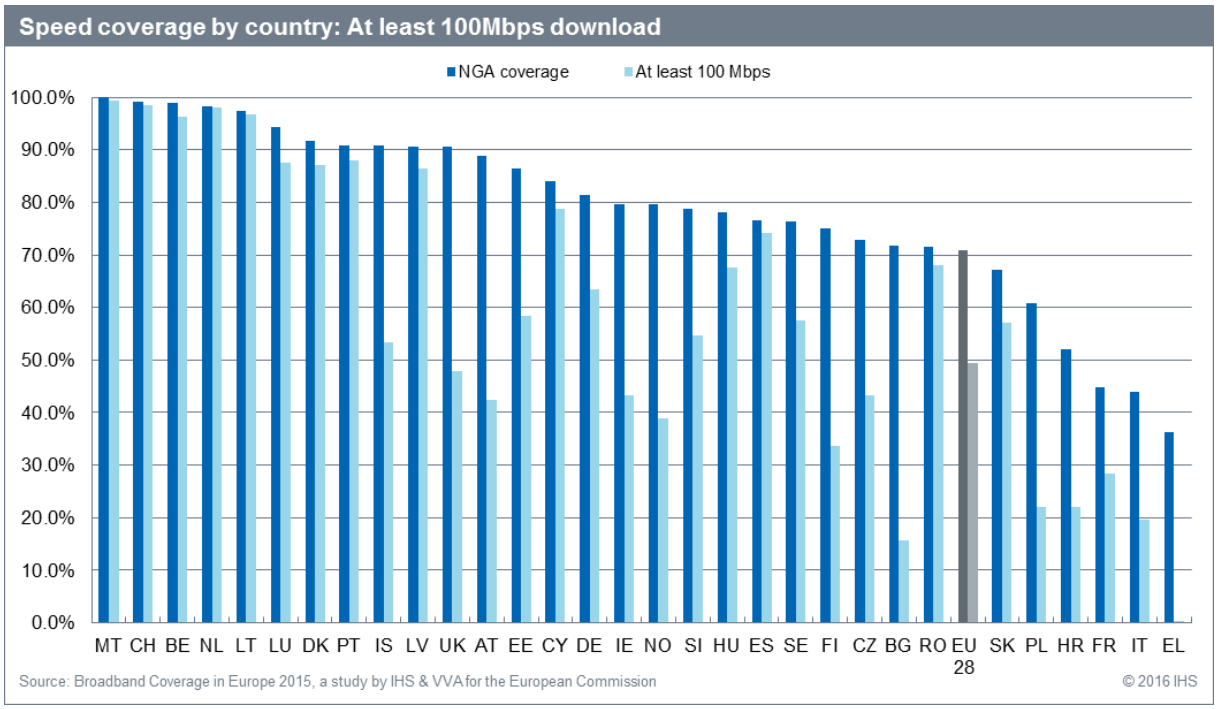


Source: Broadband Coverage in Europe 2015, a study by IHS & VVA for the European Commission © 2016 IHS

Among the individual countries, the biggest inconsistencies appear to be in 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 impacted the most in terms of inconsistencies in actual speeds achieved at peak times.

Countries, with the largest gaps between the two categories include Austria and Ireland, for which differences of more than 10 percentage points between NGA coverage and at least 30 Mbps actual download speed availability were recorded in mid-2015. Poland and Finland also showed significant differences of 7 and 8 percentage points, respectively, between NGA coverage and at least 30 Mbps actual download speed.

Looking at the availability of at least 100 Mbps download speeds, it is possible to see that EU as whole is very close to reaching the Digital Agenda goal of 50% of households having access to 100 Mbps broadband services by 2020 with 49.4% of European households estimated to be able to receive such speed at the end of June 2015. However, big differences remain among individual countries, with levels of 100 Mbps availability ranging from 99.4% in Malta to virtually no connections being able to support at least 100 Mbps speeds in Greece.



The chart above also clearly demonstrates that high NGA coverage does not necessarily mean high levels of availability of at least 100 Mbps speeds. Countries such as the UK, Austria and Poland, where VDSL networks make up significant portion of the overall NGA coverage show some of the biggest differences.

However, also countries with high FTTP contributions in NGA coverage, such as Bulgaria, Norway, or Estonia, reported quite low levels of availability of at least 100 Mbps broadband services. This might be due to the fact that even though FTTP networks have been deployed across those countries, operators are not utilizing their full potential at the moment.

5.1.3 Broadband coverage by speed data table

	Broadband coverage (>2Mbps)	Broadband coverage (>30Mbps)	Broadband coverage (>100Mbps)
AT	98.5%	76.9%	42.3%
BE	99.8%	98.1%	96.4%
BG	94.9%	68.4%	15.7%
HR	96.1%	49.1%	22.0%
CY	100.0%	78.7%	78.7%
CZ	98.0%	72.7%	43.3%
DK	99.0%	92.0%	87.0%
EE	88.4%	82.6%	58.4%
FI	96.5%	66.8%	33.7%
FR	97.1%	41.3%	28.4%
DE	99.9%	76.7%	63.5%
EL	97.7%	33.2%	0.4%
HU	94.8%	76.9%	67.7%
IS	98.0%	89.9%	53.4%
IE	95.9%	69.5%	43.3%
IT	98.1%	43.6%	19.6%
LT	97.5%	97.0%	96.7%
LV	92.5%	89.8%	86.4%
LU	100.0%	94.4%	87.6%
MT	99.8%	99.5%	99.4%
NL	100.0%	98.2%	98.1%
NO	95.3%	78.6%	39.0%
PL	81.0%	53.5%	22.0%
PT	98.1%	90.9%	88.0%
RO	99.9%	73.1%	68.0%
SK	86.3%	66.1%	57.0%
SI	95.3%	87.7%	54.7%
ES	95.1%	76.6%	74.2%
SE	99.0%	76.4%	57.5%
CH	99.9%	99.0%	98.5%
UK	98.9%	87.9%	47.9%
EU 28	96.9%	68.2%	49.4%

Contacts

Alzbeta Fellenbaum
Senior Analyst, Broadband
IHS Technology
+44 (0) 20 8544 7812
alzbeta.fellenbaum@ihs.com

Paul Alexander
Business Development Manager
IHS Technology
+44 (0) 20 8544 7857
paul.alexander@ihs.com

Julian Watson
Director, Operators
IHS Technology
+44 (0) 20 7424 2831
julian.watson@ihs.com

IHS Customer Care:

Americas: +1 800 IHS CARE (+1 800 447 2273); CustomerCare@ihs.com
Europe, Middle East, and Africa: +44 (0) 1344 328 300; Customer.Support@ihs.com
Asia and the Pacific Rim: +604 291 3600; SupportAPAC@ihs.com