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Broadband Coverage in Europe 2014:
Coverage in Switzerland

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FINAL REPORT

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1.0 Introduction

In order to foster 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.

As in previous years, DG Connect requested the study to be 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 EU-28, 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 2014.

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 aimed 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 30Mbps 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 the research team, 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 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 1,362 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 as well as allowing for a year-on-year comparison with the BCE 2012 and BCE 2013 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

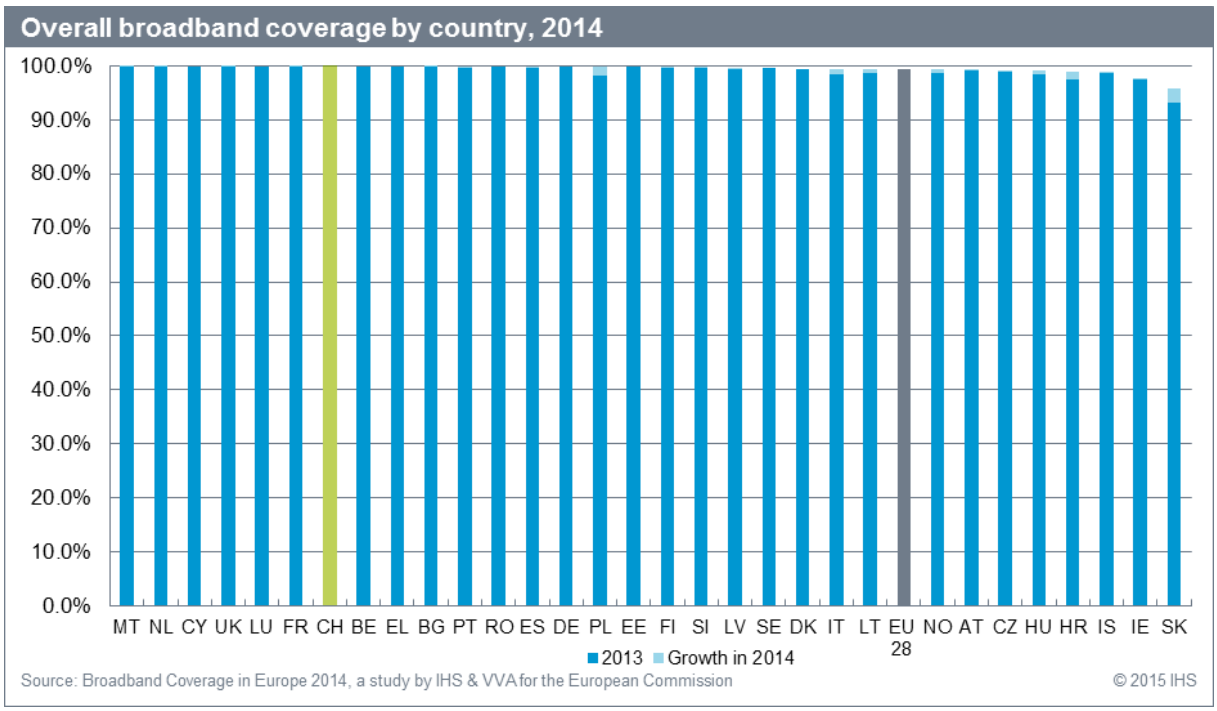
By including the additional metric, it is possible to obtain an additional analytical layer to evaluate the study countries' progress towards the Digital Agenda goals. However, since the main focus of the BCE study remains an analysis of the technology coverage and due to the fact that the level of quality 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.



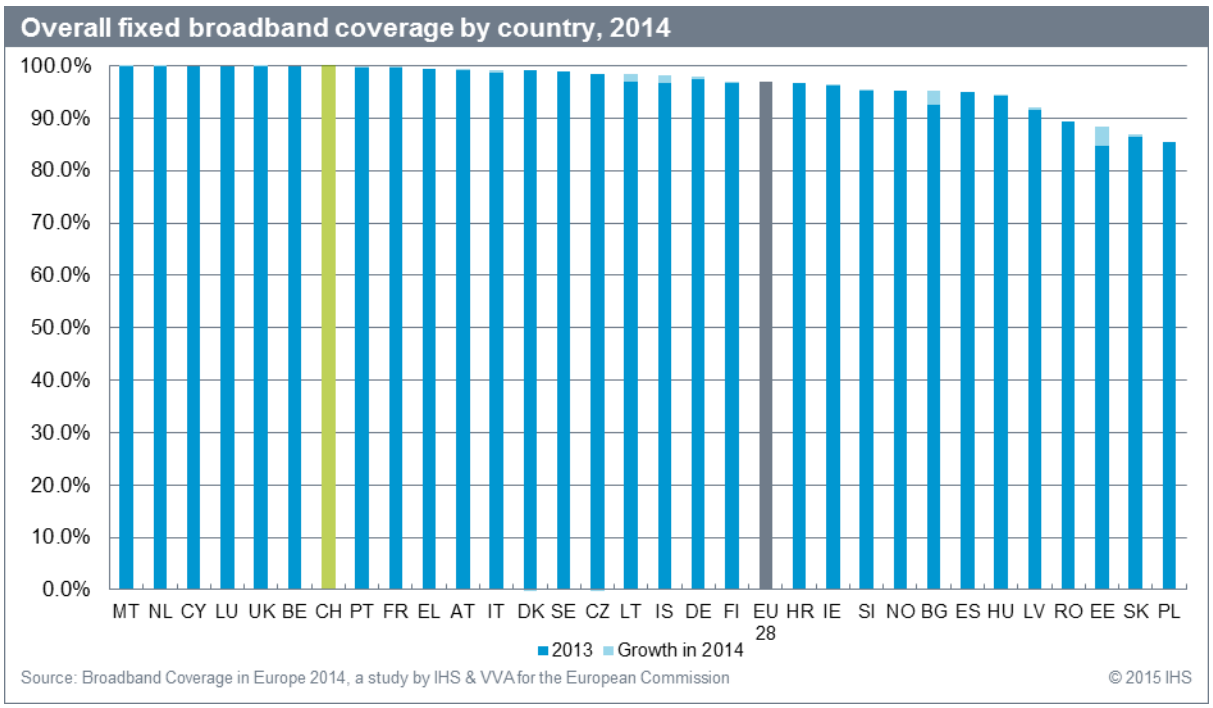
At the end of 2014, 99.9% of Swiss households had access to at least one fixed or mobile broadband service. In terms of overall broadband coverage, Switzerland ranks above the EU average of 99.4% and seventh among all study countries behind Malta, the Netherlands, Cyprus, the UK, Luxembourg and France. All study countries but Slovakia recorded overall broadband coverage reaching more than 96% of households.

Compared to 2013, there were only small increases in overall broadband coverage. Highest increase, 2.6 percentage points was recorded in Slovakia. This is mostly due to the fact HSPA rollout, which is generally the biggest driver of this category, was largely completed in 2013 and DSL (the second most important driver) networks' deployment is saturated across 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.

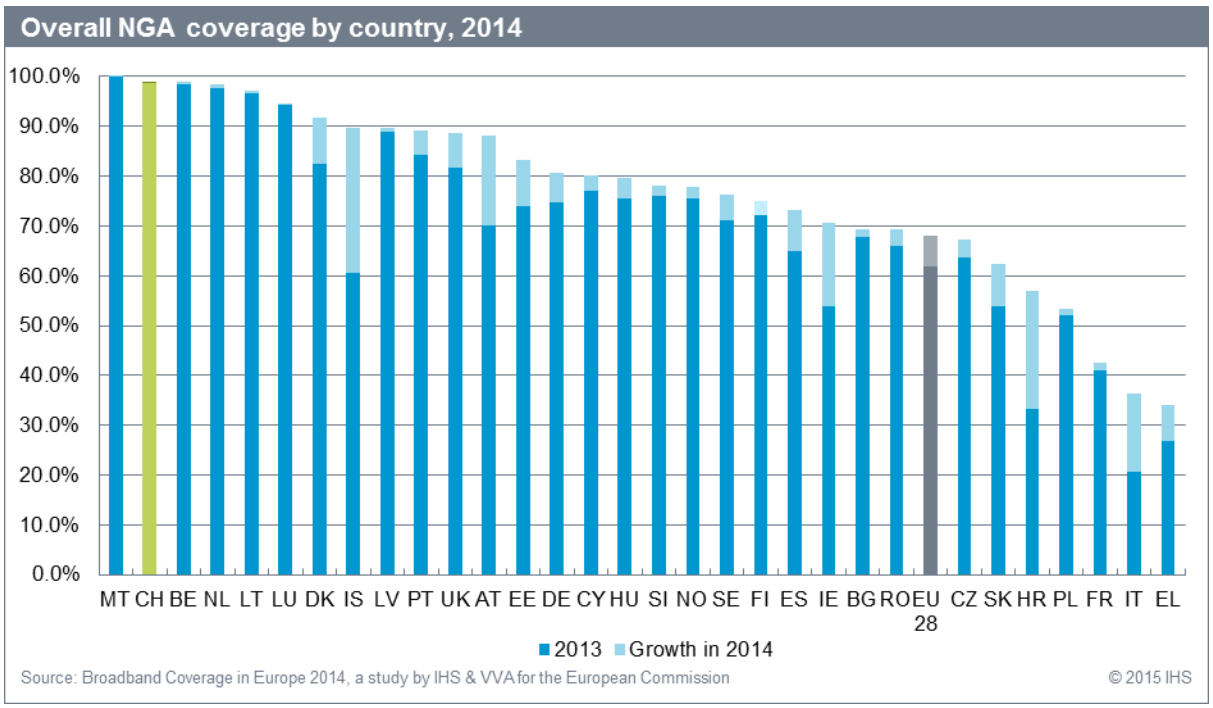


Compared to the previous year, more countries are above the European average for overall fixed broadband coverage. Out of the 31 study countries, nineteen countries had fixed broadband coverage levels at or above the EU28 average of 96.9% at the end of 2014, 27 countries had fixed broadband covering at least 90% of their households. Fixed broadband coverage was highest in Malta, the Netherlands, Cyprus, Luxembourg, and the United Kingdom and lowest in Poland, Slovakia, Estonia and Romania where it reached between 85.4% and 89.4% of households. Apart from being located in Eastern Europe, all of these countries have sparsely populated and underserviced rural areas, which present coverage challenges.

In Switzerland, 99.9% of homes have access to fixed broadband service at the end of 2014, virtually unchanged from the previous year. In terms of coverage by the individual fixed technologies, Switzerland registered second highest coverage of cable broadband networks with 98.1% of homes passed by cable networks. Only Malta, among the study countries, with universal cable coverage ranked higher. DSL coverage in Switzerland is also high, reaching 99.4% of all households.

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.



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, Lithuania, Luxembourg and Denmark, all above 90%. However, the pattern of NGA coverage is very mixed, reflecting the various strategies and approaches to high-speed broadband deployment adopted across Europe.

Switzerland ranked second in terms of NGA coverage with 99.0% homes passed by networks capable to reach at least 30Mbps download speeds. Compared to 2013, NGA coverage in Switzerland recorded a small 0.4 percentage point increase.

Out of the 31 study countries, 24 countries performed above the European average (68.1%) with regards to NGA availability, and only three countries reported NGA coverage below 50% (France, Greece and Italy). Greece had the lowest coverage of NGA technologies, with NGA services available to 34% of households.

In 2014, VDSL continued to be the fastest growing NGA technology, passing over 37% of homes compared to just over 30% in 2013. The fact that VDSL continues to be the fastest growing NGA technology further solidifies the shift observed in 2013, with companies in many study countries refocusing their broadband deployment strategies towards upgrading existing copper networks rather than investing in the typically more costly (although generally longer-lived) deployment of fibre optic all the way to consumers' homes.

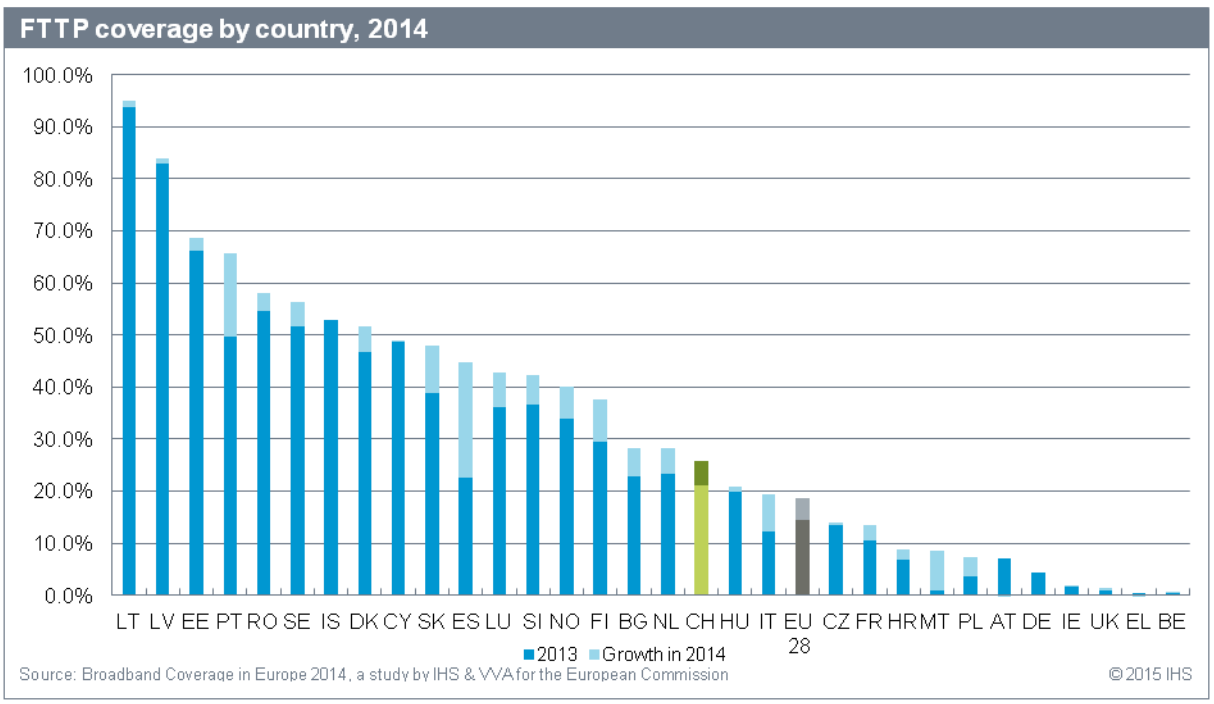
With regards to VDSL roll-out, only four countries reported coverage levels of over 80% of households. Belgium was the best performer, reporting VDSL coverage of 90%, followed by

Luxembourg (88.8%), the Netherlands (84.3%) and Malta (81.6%). Overall, seventeen study countries achieved VDSL coverage exceeding the EU average.

As in 2013, VDSL was not available in Bulgaria, Lithuania and Portugal. While there were no new countries reporting a launch of VDSL services in 2014, VDSL coverage grew significantly in a number of markets. Most significant increases were recorded in Denmark, Austria, and Iceland, all reporting increases in VDSL coverage exceeding 30 percentage points.

Baltic countries continued to lead the FTTP coverage category in 2014. With large complexes of blocks of flats found in almost every major city and with markets exhibiting generally less-developed telephone copper networks, Eastern European countries present strong incentives for FTTP deployment. Lithuania and Latvia remained the two countries with the highest FTTP coverage, with homes passed by FTTP reaching nearly 95% of households in Lithuania and 83.2% of households in Latvia. Estonia was the third highest ranked country for FTTP coverage, with 68.7% of Estonian households being able to access FTTP networks.

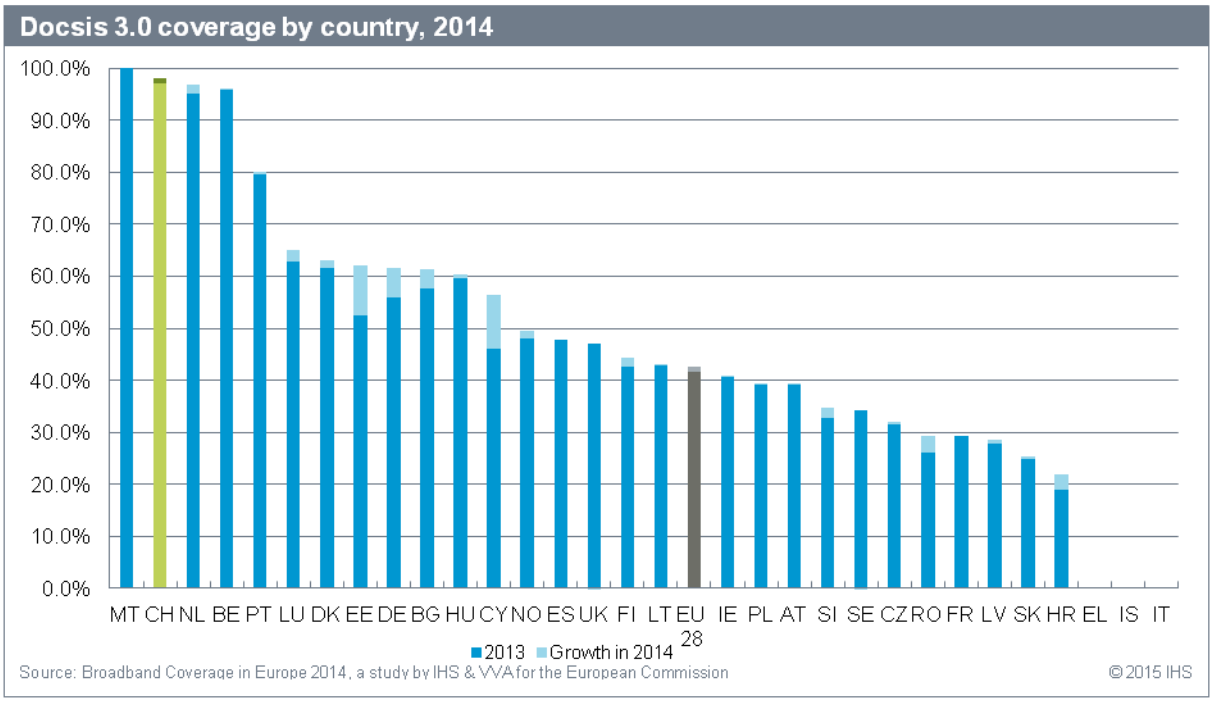
Apart from the three Baltic countries, 20 other countries reported FTTP coverage levels above the EU28 average of 18.7%. The remaining eleven countries reported coverage levels below the European average. As in 2013, Greece and Belgium reported the lowest levels of FTTP coverage, at 0.4% each.



The strongest growth in FTTP coverage compared to 2013 was recorded in Portugal and Spain, where FTTP coverage increased by 16.1 and 22.1 percentage points respectively. It is worth pointing out that in these two countries network operators in recent years introduced a strategic model based on network sharing and cooperation on joint roll-out of FTTP networks.

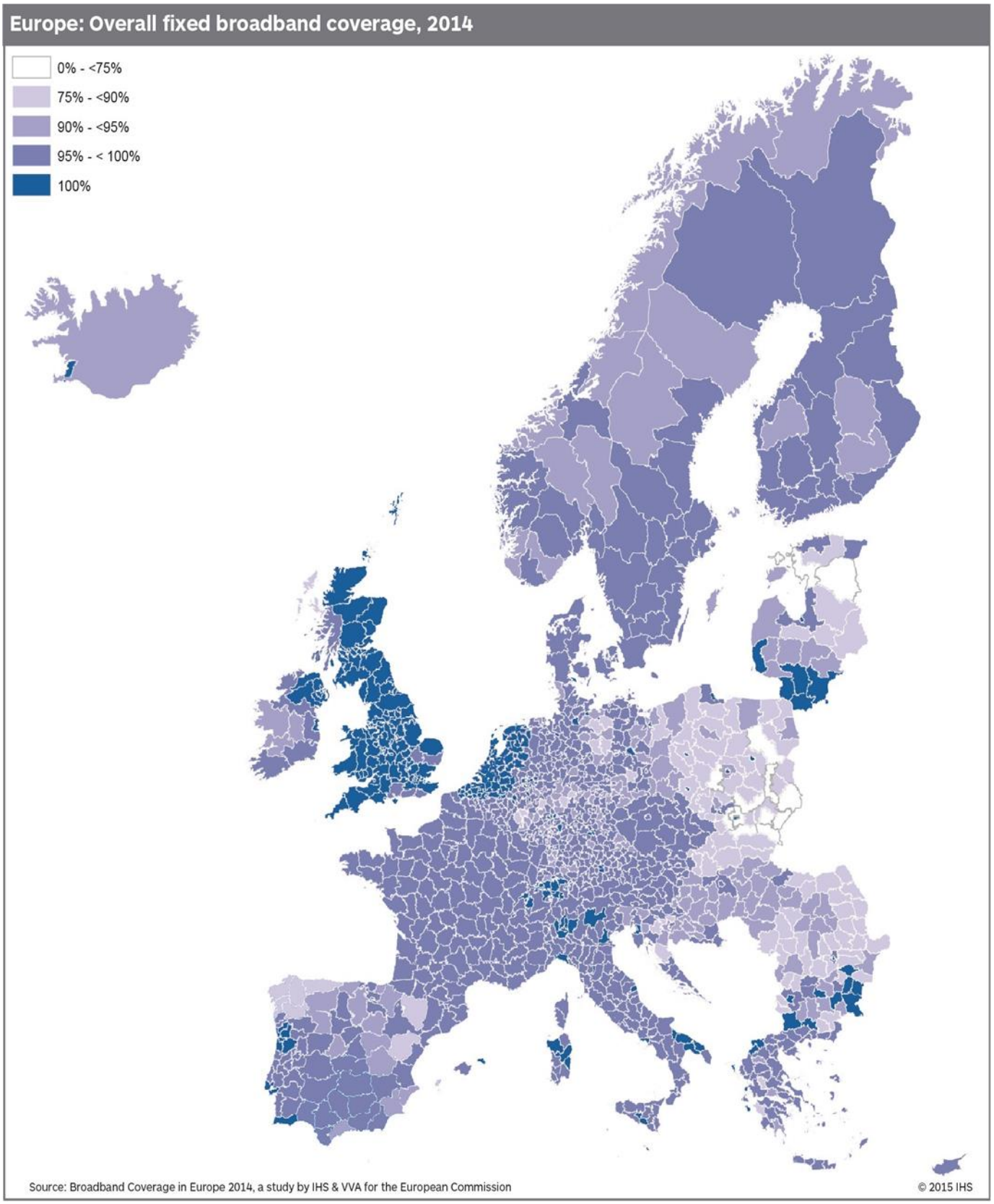
Throughout the year, cable companies across the EU continued the process of upgrading their networks to DOCSIS 3.0. At the end of 2014, 98.2% of homes passed by cable networks were DOCSIS 3.0 capable making the difference between standard cable and DOCSIS 3.0 coverage close to negligible. Malta's DOCSIS 3.0 cable network was the most extensive in Europe in relative terms, covering 100% of Maltese households at the end of 2014. Switzerland, the Netherlands and Belgium

followed closely, with coverage levels above 95%, and Portugal recorded 80% of households covered by DOCSIS 3.0.

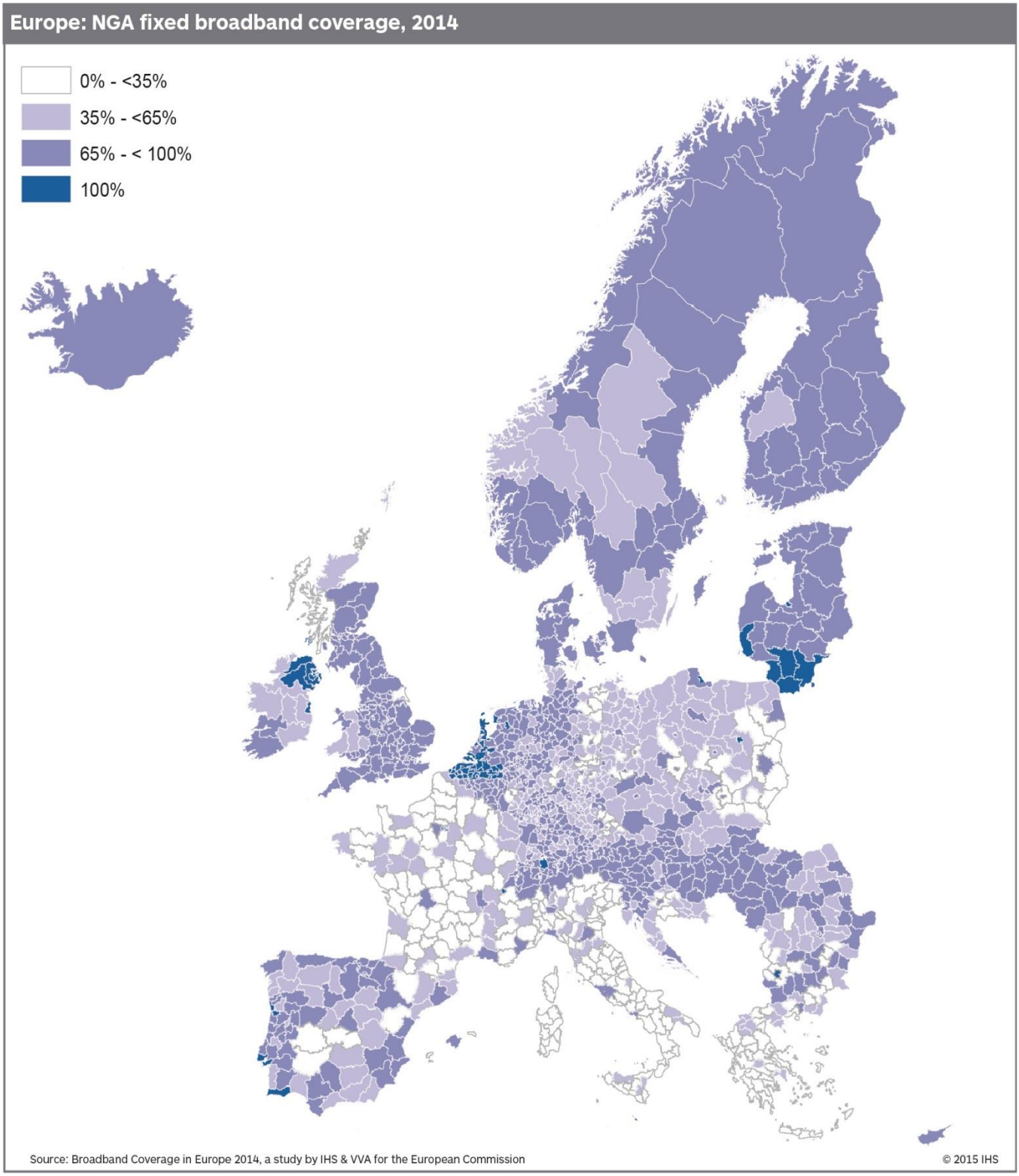


Seventeen of the study countries performed better than the EU average (42.7% of households), but apart from the four top performers mentioned above, all reported DOCSIS 3.0 coverage levels remained below 65% of households.

2.4 NUTS 3 coverage of overall fixed broadband



2.5 NUTS 3 coverage of NGA broadband



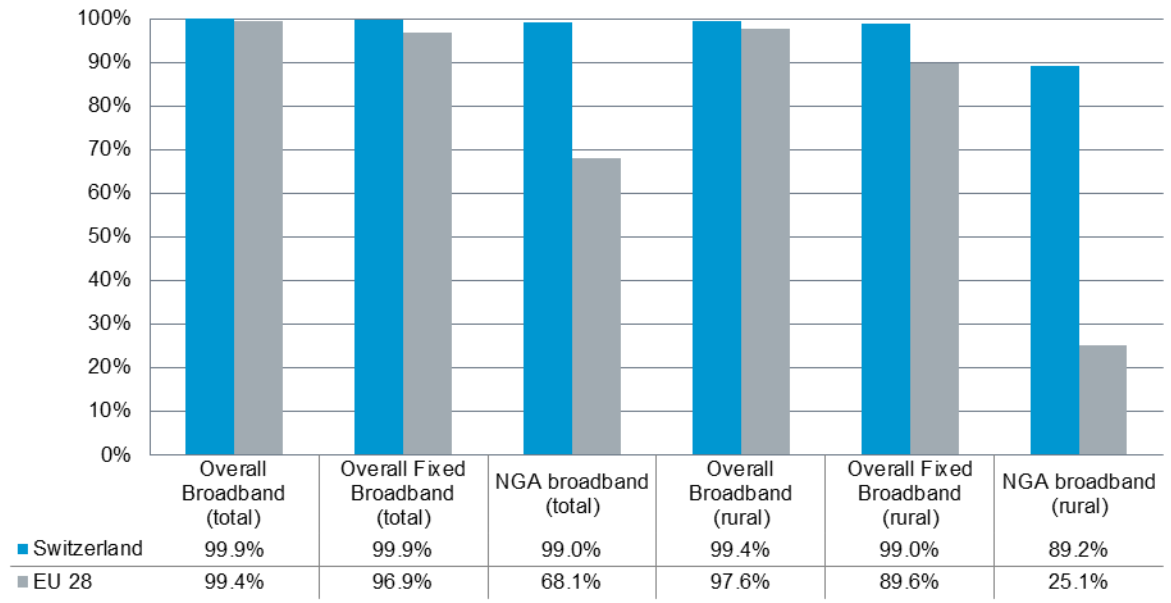
3.0 Switzerland

3.1 National coverage by broadband technology

Switzerland has one of the most advanced broadband network infrastructures among all study countries. In 2014, Switzerland remained one of the top performers with regards to broadband coverage, reporting above-average coverage levels for all technology combinations. Progress has been made with regards to rural NGA coverage, which grew by 14.4 percentage points to 90.9% of households by the end of the year, the fourth highest coverage level among the study countries.

No significant gains were made for other technology combinations, but this can be attributed to the fact that Switzerland recorded very high broadband coverage levels already in previous years. At the end of 2014, nearly complete coverage was 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%).

Switzerland: Coverage by technology combination, 2014



	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%	99.4%	99.0%	89.2%
EU 28	99.4%	96.9%	68.1%	97.6%	89.6%	25.1%

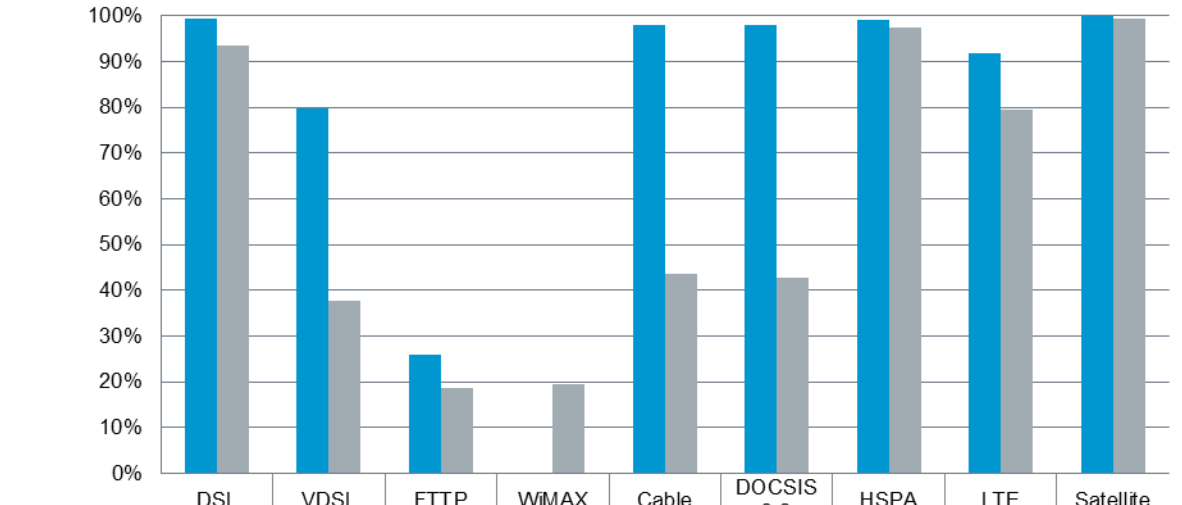
Source: Broadband Coverage in Europe 2014, a study by IHS & VVA for the European Commission

As in 2013, Switzerland was ahead of the EU average in each individual technology category with the exception of WiMAX, which is absent in the Swiss market. Of particular importance is very high cable coverage (98.1%), with cable networks almost completely upgraded to DOCSIS 3.0 (98.0% of households are covered by DOCSIS 3.0 technology) meaning that cable networks also serve as the key NGA technology.

VDSL and FTTP are however growing technologies, with VDSL coverage increasing by 7.5 percentage points to 79.7% and FTTP coverage growing by 4.8 percentage points, passing 25.9% of homes by the end of 2014. These increases can be attributed to a large-scale deployment of both VDSL and FTTP networks by the incumbent operator, Swisscom.

LTE coverage increased by 24 percentage points throughout 2014 and by the end of the year covered 91.8% of households compared to EU average of 79.4%.

Switzerland: Coverage by technology, total, 2014

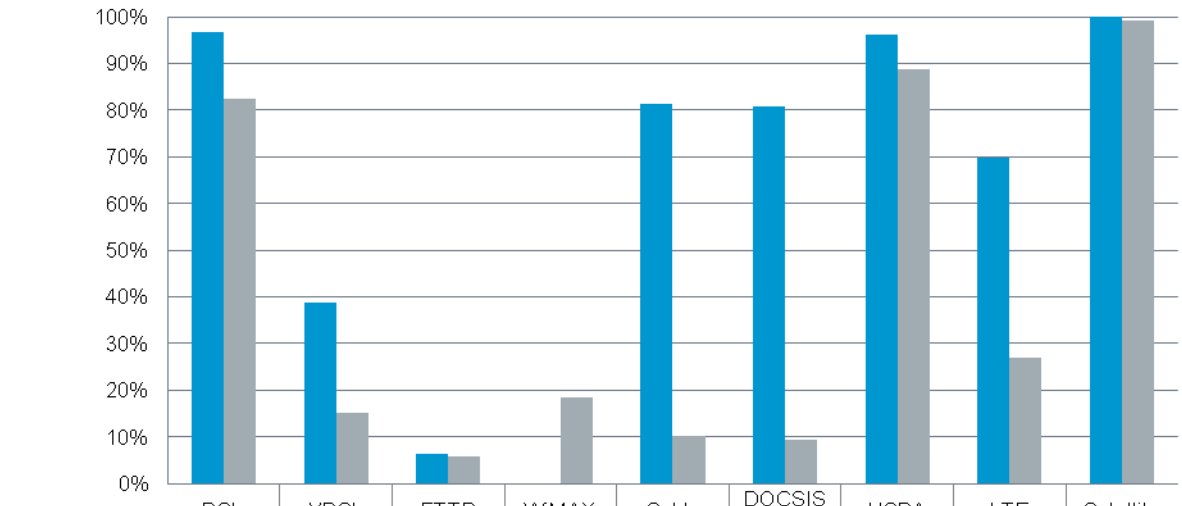


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Switzerland	99.4%	79.7%	25.9%	0.0%	98.1%	98.0%	99.0%	91.8%	100.0%
EU 28	93.5%	37.6%	18.7%	19.6%	43.5%	42.7%	97.3%	79.4%	99.3%

Source: Broadband Coverage in Europe 2014, a study by IHS & VVA for the European Commission

Switzerland is characterised by very high rural cable coverage compared to the EU28 average. Cable networks pass 78.4% rural homes, and due to network upgrades, 77.8% of rural households are also covered by DOCSIS 3.0 technology. DOCSIS 3.0 also accounts largely for high rural NGA coverage, with VDSL available to 38.7% of households and rural FTTP coverage being marginal at 0.4%. While rural VDSL coverage increased by 9.6 percentage points in 2014, the gain in DOSCIS 3.0 coverage was nearly twice as high, at 17.4 percentage points. Significant gains were also made with regards to rural LTE, with coverage increasing by 54.4 percentage points and reaching 69.9%, more than double the EU average.

Switzerland: Coverage by technology, rural areas, 2014

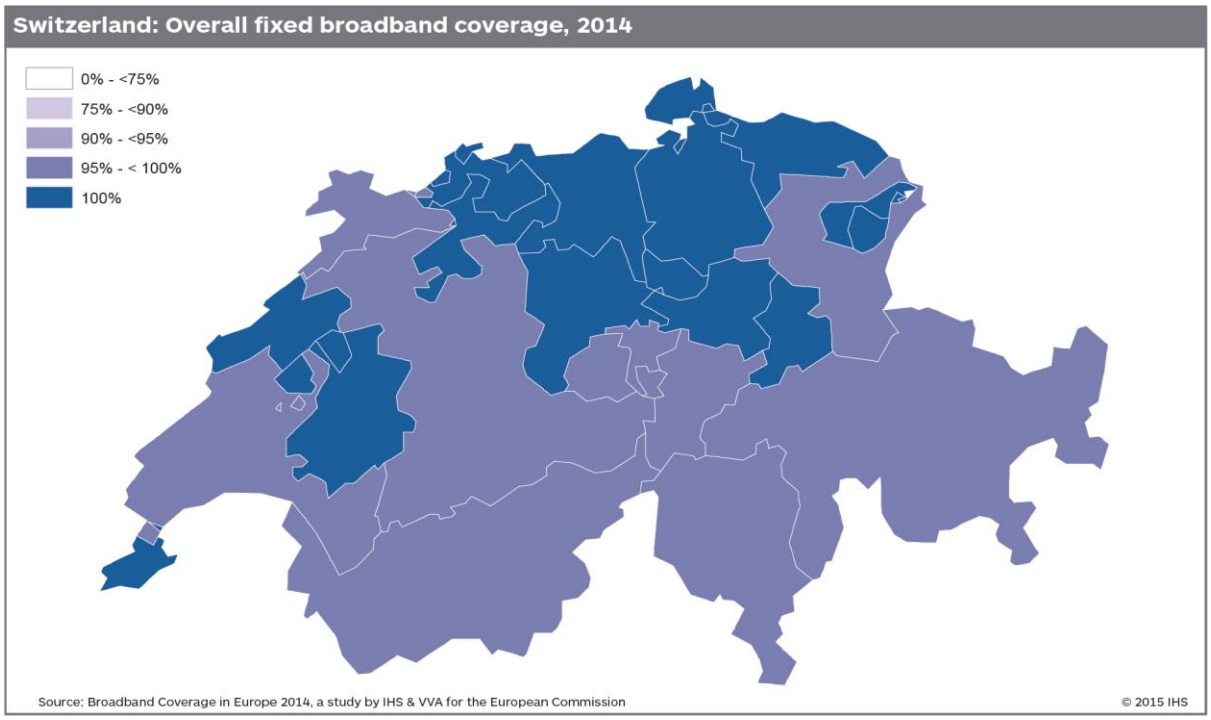


	DSL	VDSL	FTTP	WiMAX	Cable	DOCSIS 3.0	HSPA	LTE	Satellite
Switzerland	96.8%	38.7%	6.2%	0.0%	81.3%	80.8%	96.1%	69.9%	100.0%
EU 28	82.4%	15.1%	5.8%	18.5%	10.0%	9.2%	88.9%	27.0%	99.3%

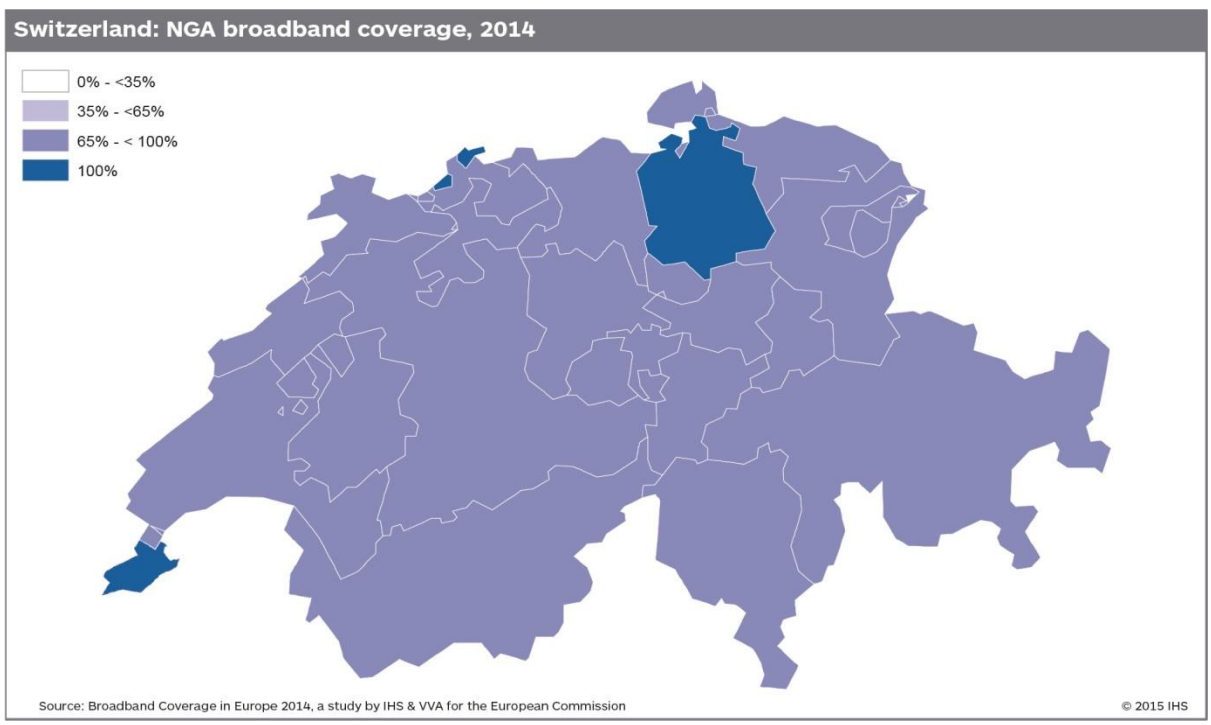
Source: Broadband Coverage in Europe 2014, a study by IHS & VVA for the European Commission

3.2 Regional coverage by broadband technology

Sixteen out of the 26 Swiss cantons registered virtually complete fixed broadband coverage, with coverage in all the remaining regions exceeding 95%. Lowest coverage was recorded in Graubünden, at 95.5%.



Complete NGA coverage was recorded in Geneva, Basel and Zürich, with over 90% of homes covered in the majority of the remaining cantons. There were only three cantons where, at the end of 2014, NGA coverage was lower than 90% - Valais, Jura and Graubünden.



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].

Swiss cable operators, led by Liberty-Global backed Cablecom, have been investing heavily in network upgrades since 2006 and by 2014 nearly all cable networks were upgraded to the DOCSIS 3.0 standard and offering up to 250 Mbps downstream broadband connections[2]. By July 2014, Cablecom reported that 250 Mbps broadband covered 2 million households, with 1 Gbps network roll-out on the way[3].

Swisscom has also 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[4]. In order to boost FTTP network roll-out, Swisscom has entered into cooperation agreements with local utility companies building out FTTP networks in more than 20 locations. By the end of 2014, Swisscom's FTTP network passed approx. 920 thousand homes across Switzerland capable of up to 1Gbps downstream speeds.[5] The company aims to roll out ultra-fast broadband technologies to over 2.3 million homes and businesses by the end of 2015 and to more than 4.6 million by 2020.

Swisscom also rolled out the first LTE network at the end of 2012 followed by Orange and Sunrise in 2013[6]. In 2014, both Orange and Swisscom launched LTE-Advanced networks in 2014. Sunrise aims to cover 97% of the population by 2015, with a potential launch of an LTE-Advanced network also planned[7].

[1] OECD Digital Economy Outlook 2015.

[2] http://www.upc-cablecom.ch/en/internet/products/

[3] https://www.telegeography.com/products/commsupdate/articles/2014/07/25/cablecom-rollout-brings-250mbps-broadband-to-2m-homes/

[4] http://www.swisscom.ch/en/about/medien/press-releases/2008/12/20081209_01_Mit_fibre_suisse_in_die_Glasfaserzukunft.html

[5] http://www.swisscom.ch/content/dam/swisscom/de/about/investoren/documents/2014/2013-annual-results.pdf.res/2013-annual-results.pdf, p. 9

[6] http://www.zdnet.com/sunrise-joins-switzerlands-4g-crowd-with-lte-launch-in-26-towns-7000017004/

[7] IHS Technology 4G launch tracker

3.4 Data tables for Switzerland

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

	Switzerland 2014		Switzerland 2013		Switzerland 2012		EU28 2014	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.4%	97.4%	99.4%	97.3%	99.4%	97.0%	93.5%	82.4%
VDSL	79.7%	38.7%	72.3%	29.1%	53.4%	12.7%	37.6%	15.1%
FTTP	25.9%	6.2%	21.1%	3.7%	16.7%	2.9%	18.7%	5.8%
WiMAX	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	19.6%	18.5%
Cable	98.1%	78.4%	97.2%	66.3%	95.0%	65.7%	43.5%	10.0%
DOCSIS 3.0	98.0%	77.8%	97.1%	60.4%	93.1%	58.8%	42.7%	9.2%
HSPA	99.0%	96.1%	98.8%	94.2%	97.4%	88.9%	97.3%	88.9%
LTE	91.8%	69.9%	67.7%	15.5%	20.2%	0.5%	79.4%	27.0%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.3%	99.3%
Overall broadband	99.9%	99.3%	99.9%	99.3%	99.9%	99.0%	99.4%	97.6%
Overall fixed broadband	99.9%	99.0%	99.8%	98.9%	99.8%	98.8%	96.9%	89.6%
NGA broadband	99.0%	89.2%	98.7%	76.4%	94.4%	64.8%	68.1%	25.1%

4.0 Methodology

The methodological approach used in the 2014 edition of the Broadband Coverage in Europe study mirrors the approach used in the 2013 study. 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.

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, the research team used similar wording and formatting of the survey questionnaire as in 2013, which was based on a questionnaire designed by Point Topic for the 2012 study. Using near-identical question wording enabled 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 and 2013 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 2013 and the 2014 data collection 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 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, 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 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 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 asked 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, the reseach 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 on a yearly basis 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 2013 and 2014 to be comparable to the 2012 dataset, the research team adopted a similar approach to determine rural areas to the one used by Point Topic.

In 2012, Point Topic developed a new methodology to defining rural areas using the Corrine 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 research team obtained from Point Topic an updated estimations of rural population in individual NUTS 3 regions. The updated data estimated that in 2014 approx. 14% of households in the study countries were rural. Combining this information with updated 2014 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 research 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 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
- Operators' (ISPs) financial reports and press releases
- Industry organisations white papers, special reports and analysis
- Industry news

IHS & VVA also contacted other relevant organisations, such as the FTTH Council Europe and Cable Europe to gain additional insight on individual access technologies deployment and coverage trends. The research team is particularly grateful to the FTTH Council Europe and IDATE, FTTH Council Europe's data provider, for kindly sharing information from their research of FTTx coverage and subscribers across Europe. While in most cases the team relied on data collected though the survey, IDATE's data proved to be an important source for cross-checking the gathered figures and estimating the final coverage results.

IHS has also utilised its close relationship with cable industry association Cable Europe. IHS has been Cable Europe's preferred research partner for the past decade and has access to data from Cable Europe members – used in the publication of the annual 'Cable Yearbook' study. Cable Europe was very helpful in establishing initial contacts with a number of European cable providers for the purposes of this study.

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 to the one used by Point Topic in previous 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 study, 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 at the national level were made by summing the estimates for the NUTS 3 areas rather than applying this formula at 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 2014 update of the Digital Agenda Scoreboard.

In a number of cases, new and more accurate data was provided to the research team reflecting the 2013 data and thus justifying restatement of the figures published in the Broadband Coverage in Europe 2013 study.

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

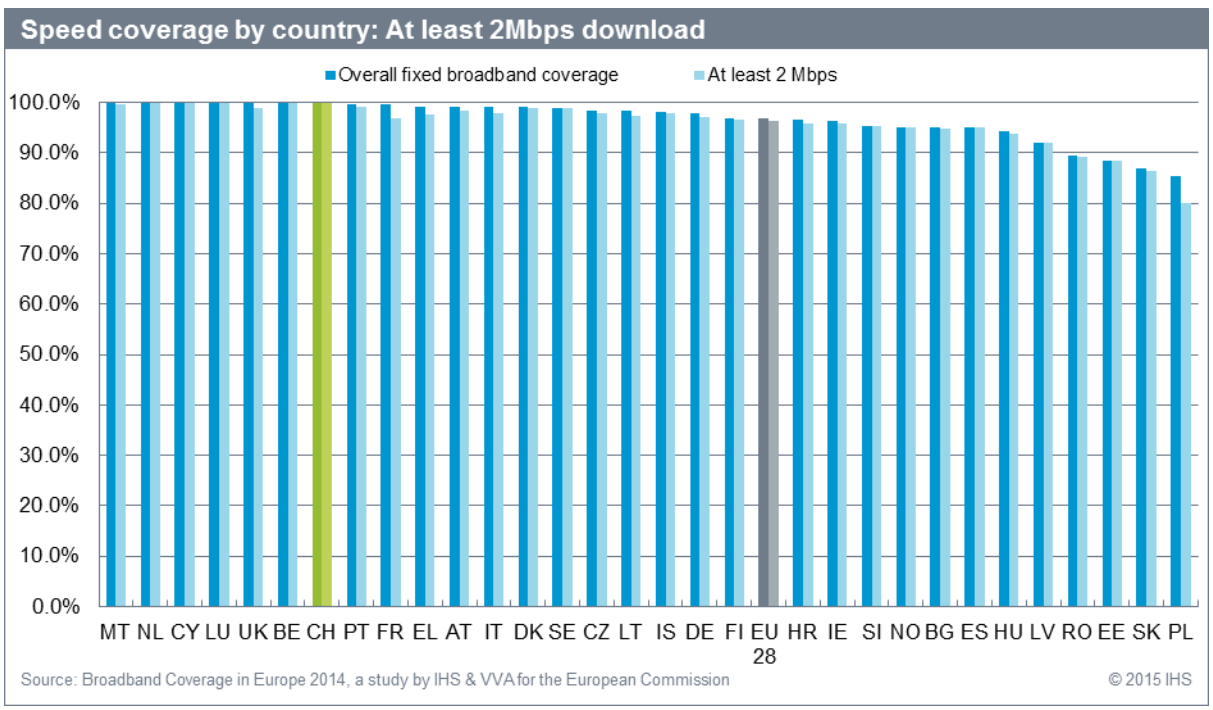
on achievable end-user broadband speeds), respondents were asked to exclude those connections from their answers.

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

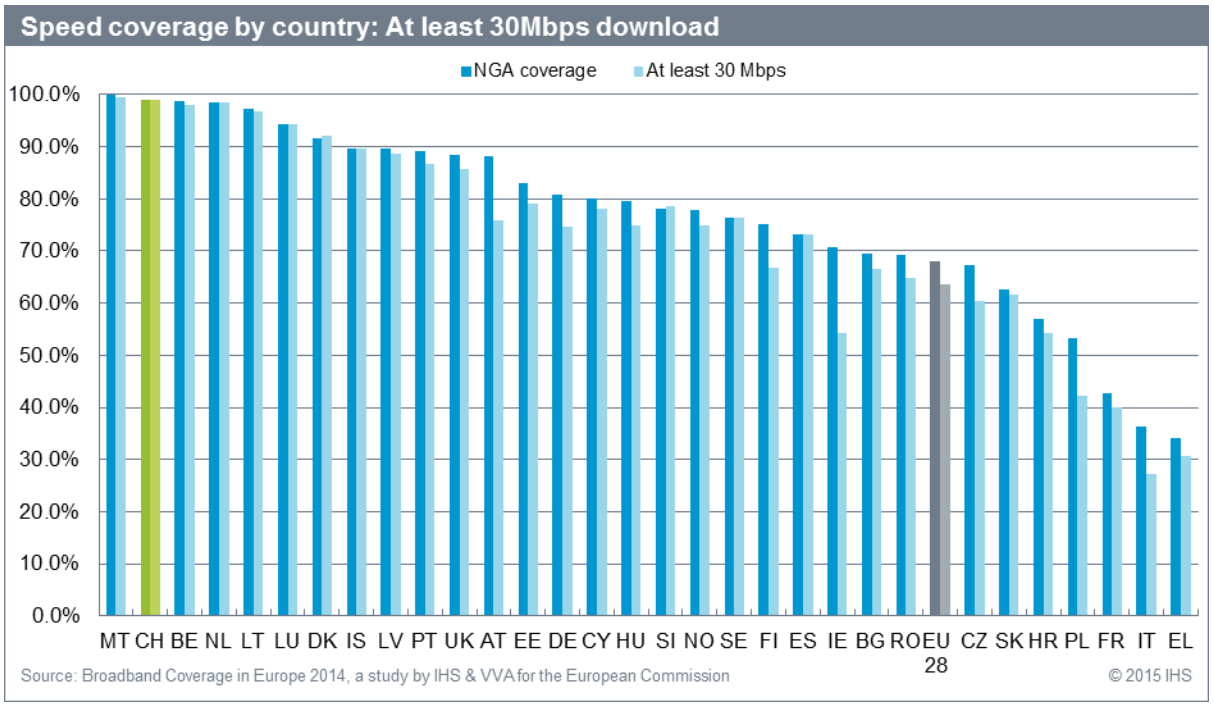
Comparing data on fixed broadband coverage with information gathered on actual download speed of at least 2 Mbps show that in most countries, the vast majority of homes passed were also able to receive connections with at least 2 Mbps download speeds. On the EU level, 96.9% of households had access to fixed broadband and 96.4% 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 reliant 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 around 80% of households in Poland had access to actual 2 Mbps download speed connections, while 85.4% 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 4.4% percentage difference between NGA coverage (68.1%) and availability of at least 30 Mbps broadband services, which were accessible to 63.7% of average EU households.



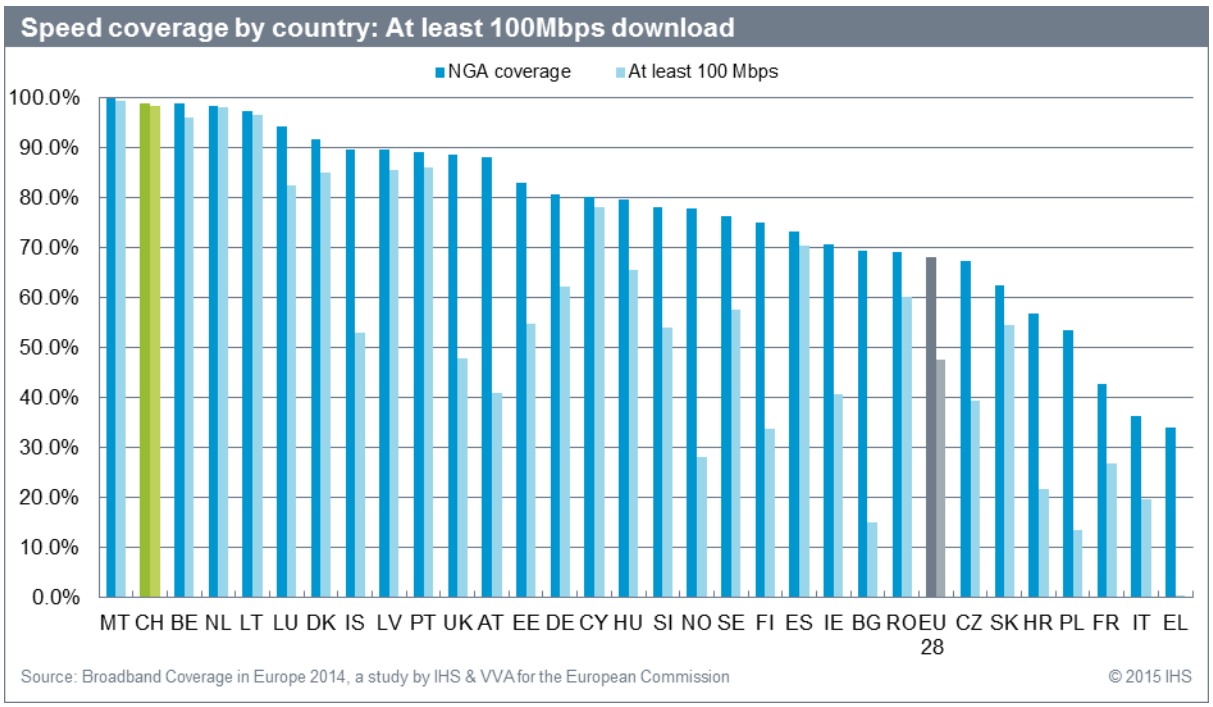
Among the individual countries, the biggest inconsistencies appear to be in countries, which have seen large increases in VDSL coverage in recent years, resulting in high levels of VDSL coverage compared to other NGA technologies. As the quality of VDSL connection speeds relies on a number of factors, 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, Ireland and Poland, for which differences of more than 10 percentage points between NGA coverage and at least 30 Mbps actual download speed availability were recorded in 2014.

Interestingly, while Greece ranked the last among the study countries in terms of NGA coverage with 34.0% of homes passed, when looking at availability of at least 30 Mbps broadband services, Greek households seem to be better off than their Italian counterparts. As 31.0% of Greek households have access to at least 30 Mbps broadband connections, in Italy, on 27% of households have the option, despite NGA networks passing 36.3% of homes across the country.

Looking at the availability of at least 100 Mbps download speeds, it is possible to see that EU as whole is nearing the Digital Agenda goal of 50% of households having access to 100 Mbps broadband services by 2020 with 47.6% of European households being able to receive such speed in 2014. 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.

Nevertheless, this is clearly not the case of Switzerland, where 98.5% of households had access to broadband services capable over 100 Mbps download speeds at the end of 2014, a marginal difference compared to the 99.0% NGA coverage.

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