European Commission

Broadband Coverage in Europe 2019

Mapping progress towards the coverage objectives of the Digital Agenda

FINAL REPORT

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

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POINT topic

Digital Single Market

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Contents

Abstract

The Broadband Coverage in Europe study is designed to monitor the progress of EU Member States toward their specific broadband coverage objectives – namely: 'Universal Broadband Coverage with speeds at least 30 Mbps by 2020' and '50% of households should have broadband subscriptions of 100Mbps or more by 2020'. This report covers thirty-one countries across Europe – the EU 28, plus Norway, Iceland and Switzerland, and analyses the availability of nine broadband technologies (DSL, VDSL, VDSL2 Vectoring, cable modem DOCSIS 3.0, DOCSIS 3.1, FTTP, FWA, LTE and satellite) across each market, at national and rural levels. In addition, various combination categories indicating the availability of one or more forms of broadband connection are also published. These cover overall fixed broadband availability, next-generation access (NGA) availability and overall Very High Capacity Networks, namely FTTP and DOCSIS 3.1 availability. Europe-wide overview, country comparisons and year-on-year trends are provided in this report. Additionally, broadband coverage developments in study countries are discussed in individual country chapters.

Résumé

L'étude sur la Couverture Haut-Débit en Europe a été conçue pour suivre la progression des Etats membres de l'UE vers leurs objectifs spécifiques en matière de couverture haut-débit – à savoir « La couverture universelle en haut débit avec une transmission d'au moins 30 Mb/s d'ici 2020 » ainsi que « 50% des ménages ayant une connexion en haut débit avec une transmission d'au moins 100 Mb/s d'ici 2020 ». Ce rapport étudie trente-et-un pays en Europe (l'UE-28 ainsi que la Norvège, l'Islande et la Suisse), et analyse la disponibilité de neuf technologies haut débit (DSL, VDSL, VDSL2 Vectoring, modem câble DOCSIS 3.0, DOCSIS 3.1, FTTP, FWA, LTE et satellite) sur chacun des marchés, à la fois au niveau national et rural. De plus, diverses combinaisons indiquant la disponibilité d'une ou plusieurs formes de connexion haut débit sont également publiées. Celles-ci comprennent la disponibilité globale du haut débit fixe, la disponibilité de l'accès de nouvelle génération (ANG) et la disponibilité globale des réseaux à très haute capacité (FTTP et DOCSIS 3.1). Ce rapport donne un aperçu de la situation à l'échelle européenne et fournit des comparaisons entre pays ainsi que des courbes d'évolution année par année. De plus, le développement de la couverture haut débit dans les différents pays d'étude est abordé de façon individuelle dans les chapitres consacrés aux pays considérés.

Executive Summary

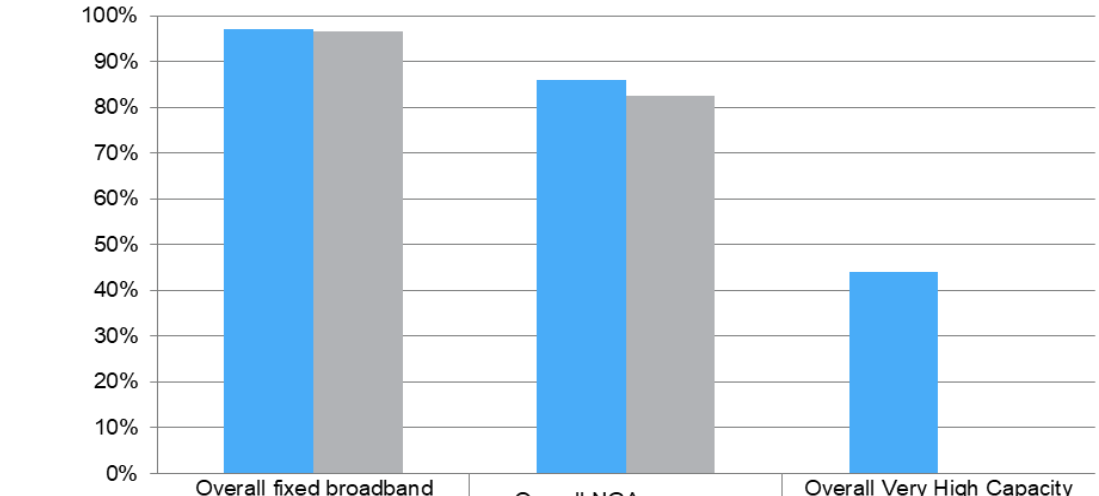
- The Broadband Coverage in Europe study is designed to monitor the progress of EU Member States towards the specific broadband coverage objectives set out in the Digital Agenda for Europe – namely: 'Universal Broadband Coverage with speeds at least 30 Mbps by 2020' and '50% of households should have broadband subscriptions of 100Mbps or more by 2020'. The Digital Agenda objectives were further expanded in the 2016 Connectivity for a European Gigabit Society measures, which include broadband connectivity target of 'Universal connectivity offering a downlink of at least 100 Mbps, upgradable to Gigabit speed by 2025'[1].

- In 2019, DG CONNECT selected IHS Markit Technology, which has since rebranded as Omdia, in partnership with Point Topic to run the three-year project. The research team surveyed NRAs and telecommunications groups across each participating state to compile the requisite information. The current research team has conducted the broadband coverage study since 2016. In addition, Point Topic was the incumbent provider introducing the original research methodology in the period 2010-2012. The Omdia team, under the IHS Markit brand (in cooperation with VVA), delivered the study from 2013-2015 and adopted similar data collection and analysis methods to those implemented by Point Topic in order to ensure comparability of datasets for the purposes of time-series assessment.

- The collected data reflects the situation at the end of June 2019 compared to the situation at the end of June 2018. For the 2019 edition, the research team reviewed the technologies and combination coverage categories included in the study and made several changes, agreed by the DG CONNECT team. The previously tracked metrics of standard cable modem broadband, WiMAX, and HSPA were excluded and three new technologies were introduced: VDSL2 Vectoring, cable modem DOCSIS 3.1, and FWA.

- This report covers 31 countries across Europe – the EU28, plus Norway, Iceland and Switzerland, and analyses the availability of nine broadband access technologies (DSL, VDSL, VDSL2 Vectoring, cable modem DOCSIS 3.0, cable modem DOCSIS 3.1, FTTP, FWA, LTE and satellite) across each market, at national and rural levels. In addition, three combination categories indicating the availability of one or more forms of broadband coverage are also published. These cover overall fixed broadband availability, next generation access (NGA) availability and a new combination category looking at availability of very high capacity networks (VHCN), which include DOCSIS 3.1 and FTTP.

EU28: Coverage by technology combination, 2019



	Overall fixed broadband coverage	Overall NGA coverage	Overall Very High Capacity Networks (VHCN) coverage
EU28 2019	97.1%	85.8%	44.0%
EU28 2018	96.7%	82.6%	-

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

[1] https://ec.europa.eu/digital-single-market/en/policies/improving-connectivity-and-access

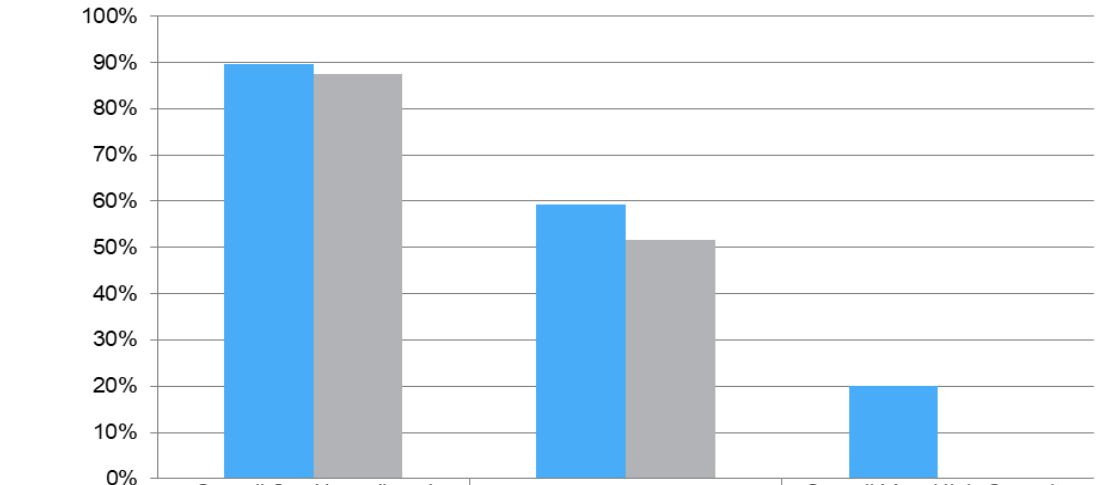
- The collected data show that more than 216 million EU households (97.1%) had access to at least one of the main fixed broadband access technologies at the end of June 2019 and nearly 1 million additional households gained access to fixed broadband services compared to the end of June 2018.

- By mid-2019, the availability of next generation access services (VDSL, VDSL2 Vectoring, DOCSIS 3.0, DOCSIS 3.1 and FTTP) services in the EU reached 85.5% households. This equates to a 3.3 percentage point increase, or 7.3 million additional households, compared to the end of June 2018. In total, 191 million households had access to next generation broadband in mid-2019.

- At the end of June 2019, 44.0% of EU homes were passed by very high capacity networks (VHCN). These include combined coverage of DOCSIS 3.1 and FTTP, i.e. those technologies currently capable of supporting gigabit speeds. This metric has been introduced in 2019 for the first time and it is therefore not possible to provide year-on-year comparison.

- Rural broadband coverage continued to be lower than national coverage across EU Member States. In mid-2019, 89.7% of rural EU homes were passed by at least one fixed broadband technology and nearly two thirds (59.3%) had access to high-speed next generation services. Rural NGA coverage has been increasing at a consistent pace year-on-year, growing by 7.6 percentage points, equalling to nearly 2.8 million additional rural households having access to NGA broadband services compared to the end of June 2018.

EU28: Coverage by technology combination in rural areas, 2019



	Overall fixed broadband coverage	Overall NGA coverage	Overall Very High Capacity Networks (VHCN) coverage
EU28 2019	89.7%	59.3%	20.1%
EU28 2018	87.5%	51.7%	-

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

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

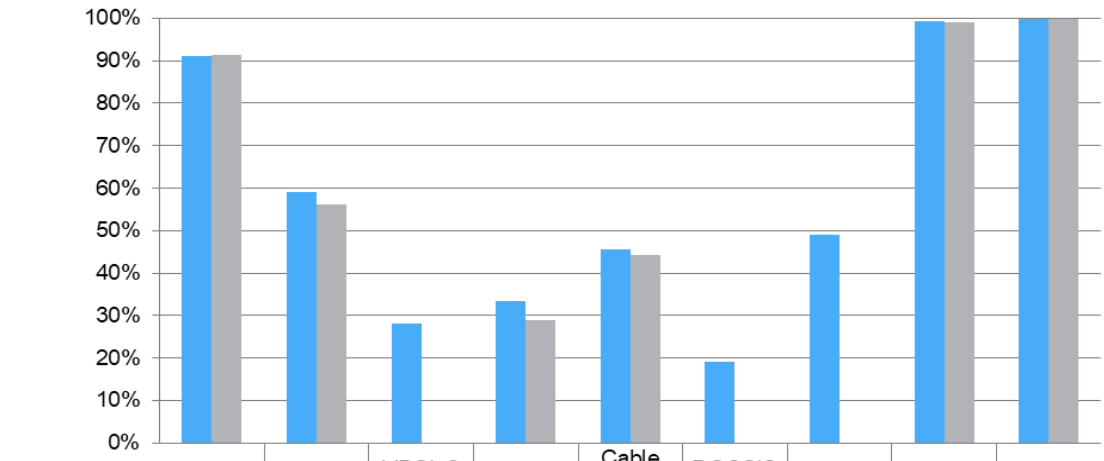
- In mid-2019, DSL remained the dominant fixed access technology in the EU28, passing 91.2% of homes. This equates to a decline of 0.1 percentage points compared to mid-2018, as new DSL deployments are limited and exceeded by total household growth.

- At the end of June 2019, VDSL services were available to 59.2% of EU households, an increase of 3.0 percentage points during the twelve-month period, and VDSL remained the most pervasive NGA technology in the EU28. In addition, availability of VDSL2 Vectoring technology was tracked for the first time to indicate coverage of higher-capacity bandwidth services offered

via legacy copper networks and typically providing download speeds higher than 100Mbps. By mid-2019, 28.2% of EU homes were passed by VDSL 2 Vectoring.

- FTTP service availability continued to increase at a similar rate as in the previous year, rising by 4.5 percentage points to pass a third (33.5%) of EU homes at the end of June 2019. FTTP has been the fastest growing broadband technology for a second year in a row.

EU28: Coverage by technology, total



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
EU28 2019	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%
EU28 2018	91.3%	56.2%	-	29.0%	44.4%	-	-	98.9%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

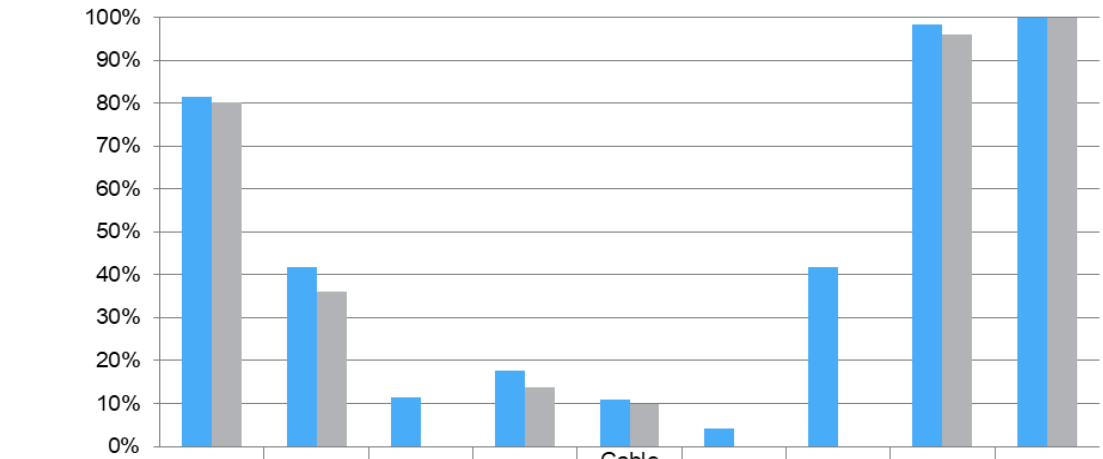
- With vast majority of cable modem networks upgraded to the DOCSIS 3.0 standard, the research team, in agreement with DG CONNECT, decided to track only Cable modem DOCSIS 3.0 and DOCSIS 3.1 network coverage in the 2019 iteration of the Broadband Coverage in Europe study. By mid-2019, 45.5% of EU households had access to high-speed cable broadband services and nearly a fifth (19.2%) of EU homes were passed by cable networks upgraded to the DOCSIS 3.1 standard, which is capable of delivering gigabit broadband connections.

- By the end of June 2019, nearly all EU households (99.4%) were covered by LTE mobile networks. Coverage of HSPA networks was excluded from the study as the technology has reached consistent and near-universal coverage levels and has become less relevant in light of LTE coverage improvements.

- Examining rural broadband coverage, there was a difference of 7.4 percentage points between the availability of fixed broadband services at a total level (97.1%) and at a rural level (89.7%). The gap was much wider in terms of NGA technologies, as NGA networks passed 59.3% of rural EU homes, 26.6 percentage points less than total NGA coverage. Nevertheless, the gap between rural and national coverage, for both fixed and NGA technologies, continues to narrow compared to previous editions of the study, supported by increasing investment in rural broadband.

- VDSL coverage continued to expand more quickly than other fixed broadband technologies in rural areas. Rural VDSL availability increased by 5.6 percentage points in the twelve months to mid-2019, reaching 41.8% of rural EU households. Growth in rural VDSL services highlights the focus of operators, in particular incumbent operators, on upgrading existing DSL networks in rural areas.

EU28: Coverage by technology, rural areas



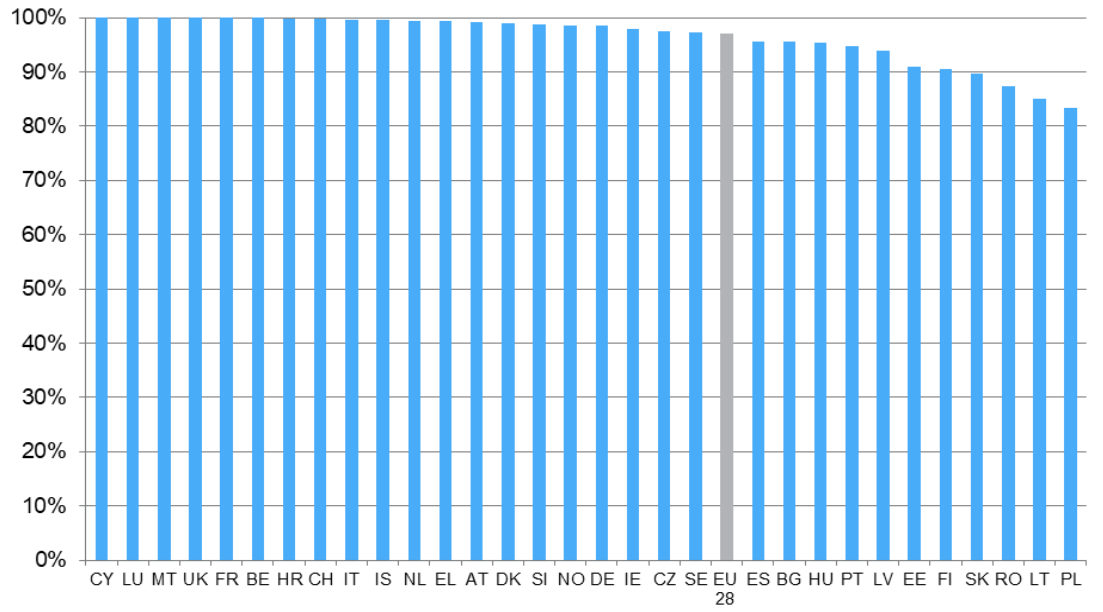
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
EU28 2019	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%
EU28 2018	80.2%	36.2%	-	13.6%	9.8%	-	-	96.1%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

- Examining mobile broadband technologies, the growth in availability of LTE networks decelerated, with rural LTE coverage improving by 2.1 percentage points compared to 5.3 percentage points last year and 9.4 percentage points the year prior to that. However, this deceleration is due to LTE networks gaining near universal coverage in rural areas reaching 98.2% of rural EU households by mid-2019

- Out of the 31 study countries, 24 countries registered fixed broadband coverage levels above 95.0%, while 20 countries had fixed broadband coverage above the EU28 average (97.1%). Several countries registered complete fixed broadband coverage including Belgium, Cyprus, France, Luxembourg, Malta, the Netherlands, and the United Kingdom. In four countries (Poland, Lithuania, Romania and Slovakia), fixed broadband availability was below 90% of households.

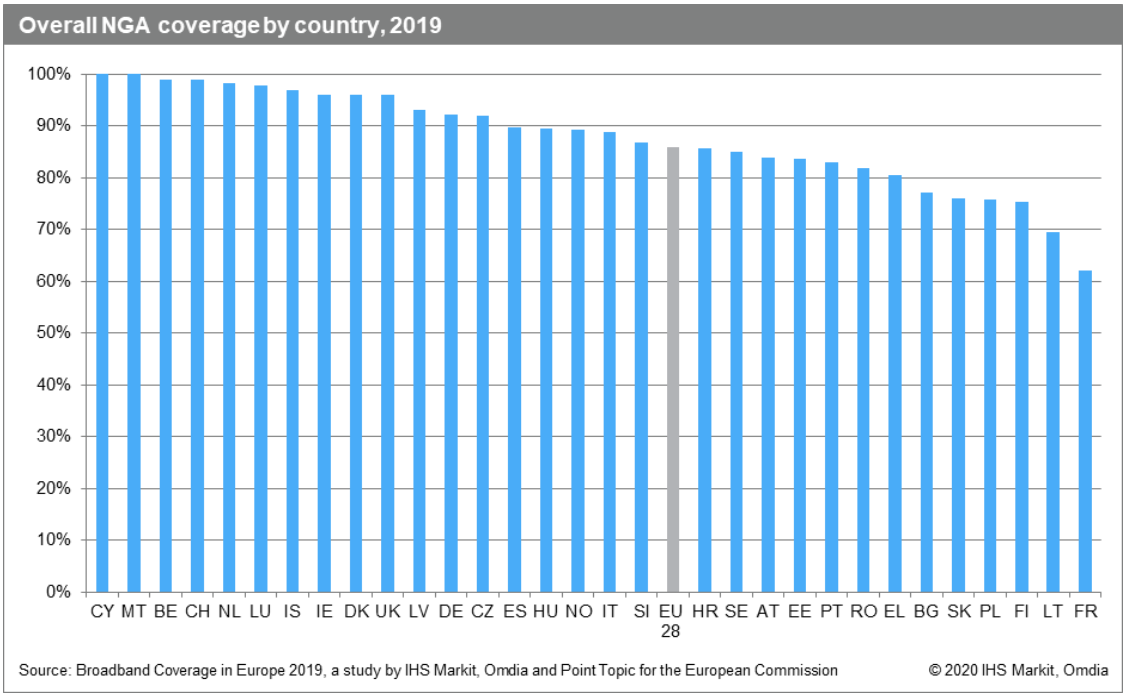
Overall fixed broadband coverage by country, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

- Cyprus and Malta were the only two countries to report complete coverage for NGA technologies, while Belgium and Switzerland, recorded NGA coverage levels equal to or above 99%.

- Out of the 31 study countries, 18 countries reported NGA coverage above the EU average (85.8%). At 62.1% and despite a significant increase in availability of NGA services, France remained the lowest ranked country in this study in terms of the proportion of homes passed by NGA networks.



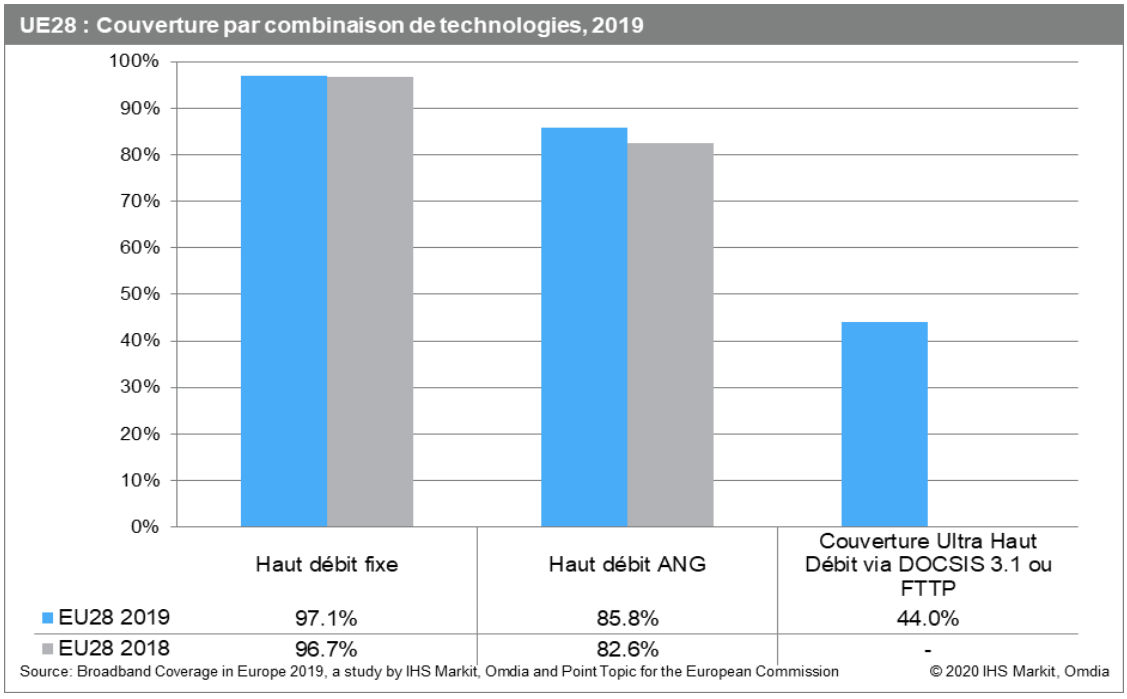
- Looking at mobile broadband technologies, LTE coverage reached at least 99.0% of households in 29 study countries, with no country recording coverage levels lower than 98.0%.

Résumé

- L'étude sur la Couverture Haut Débit en Europe a été conçue pour suivre la progression des Etats membres de l'Union européenne (UE) vers les objectifs fixés dans l'Agenda numérique, à savoir : « une couverture universelle en haut débit avec une transmission d'au moins 30 Mb/s d'ici 2020 » et « 50% des ménages ayant une connexion en haut débit avec une transmission d'au moins 100 Mb/s d'ici 2020 ». Les objectifs de l'Agenda numérique ont été étendus en 2016 dans le cadre des mesures pour la Connectivité d'une société européenne du gigabit, qui incluent l'objectif « d'une couverture universelle en haut débit avec une transmission d'au moins 100 Mb/s, pouvant être améliorée pour attendre le gigabit d'ici 2025[2]. »

- En 2019, la DG CONNECT a choisi IHS Markit Technology, qui a depuis été renommé Omdia, en partenariat avec Point Topic afin de mener ce projet d'une durée de 3 ans. Dans chaque pays participant, IHS Markit et Point Topic ont consulté les autorités nationales de régulation ainsi que des entreprises de télécommunications pour récolter les informations nécessaires à l'étude. L'équipe de recherche conduit l'étude sur la couverture en haut débit depuis 2016. De plus, Point Topic est à l'origine de la première étude sur la période 2010-2012. L'équipe Omdia, à l'époque sous le nom IHS Markit (en collaboration avec VVA), a réalisé l'étude pour la période 2013-2015 et avait adopté des méthodes similaires à celles de Point Topic pour la collecte et l'analyse de données afin de garantir la comparabilité des jeux de données pour l'évaluation en séries temporelles.

- Les données recueillies reflètent la situation à la fin du mois de juin 2019, à comparer avec la situation fin juin 2018. Pour l'édition 2019, l'équipe de recherche a réévalué les technologies et les combinaisons de technologies inclues dans l'étude, et ont apporté plusieurs changements, en accord avec l'équipe DG CONNECT. Les technologies câble modem, WiMAX et HSPA précédemment étudiées ont été enlevées, et trois nouvelles technologies ont été ajoutées : VDSL2 Vectoring, câble modem DOCSIS 3.1 et FWA.



- Ce rapport couvre trente-et-un pays à travers l'Europe, à savoir l'UE-28 ainsi que la Norvège, l'Islande et la Suisse, et analyse la disponibilité de neuf technologies haut débit (DSL, VDSL, VDSL2 Vectoring, modem câble DOCSIS 3.0, modem câble DOCSIS 3.1, FTTP, FWA, LTE et satellite) sur chacun des marchés, au niveau national et rural. De plus, trois combinaisons

[2] https://ec.europa.eu/digital-single-market/en/policies/improving-connectivity-and-access

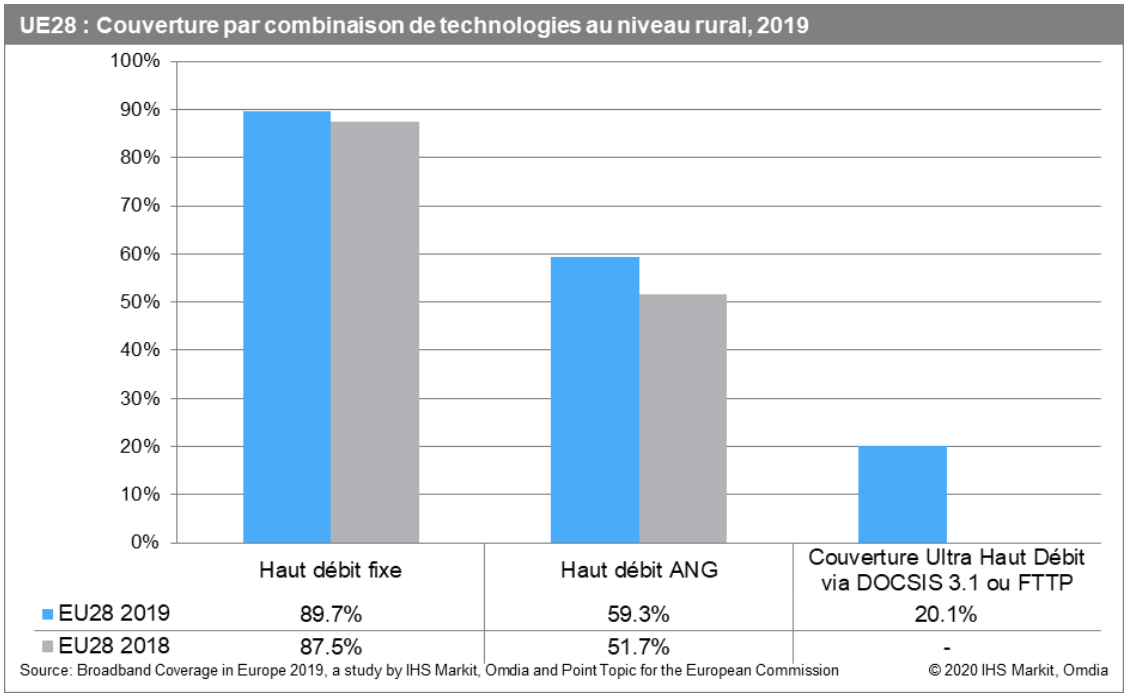
indiquant la disponibilité d'une ou plusieurs formes de connexion haut débit sont également publiées. Celles-ci couvrent la disponibilité globale du haut débit, la disponibilité de l'Accès de nouvelle génération (ANG), et une nouvelle combinaison indiquant la disponibilité des réseaux à très haute capacité (RTHC), qui incluent le FTTP et le câble modem DOCSIS 3.1.

- Les résultats de l'enquête montrent qu'approximativement 216 millions de ménages de l'UE (97,1%) avaient accès à au moins une des principales technologies d'accès haut débit fixe en juin 2019, soit environ 1 million de ménages supplémentaires y ayant gagné accès par rapport à la fin juin 2018.

- A la mi-2019, la couverture en services d'accès nouvelle génération (VDSL, VDSL2 Vectoring, DOCSIS 3.0, DOCSIS 3.1 et FTTP) atteignait 85,5% des ménages européens. Cela représente une augmentation de 3,3 points de pourcentage, ou 7,3 millions de ménages supplémentaires par rapport à la fin juin 2018. Au total, 191 millions de ménages avaient accès au haut débit de nouvelle génération à la mi-2019.

- A la fin juin 2019, 44,0% des foyers de l'UE avaient accès aux réseaux à très haute capacité (RTHC). Ces réseaux incluent le DOCSIS 3.1 et du FTTP, c'est-à-dire les technologies capables d'offrir des débits atteignant le gigabit. Cette mesure ayant été introduite en 2019, il n'y a donc pas de comparaison possible avec les résultats d'études antérieures.

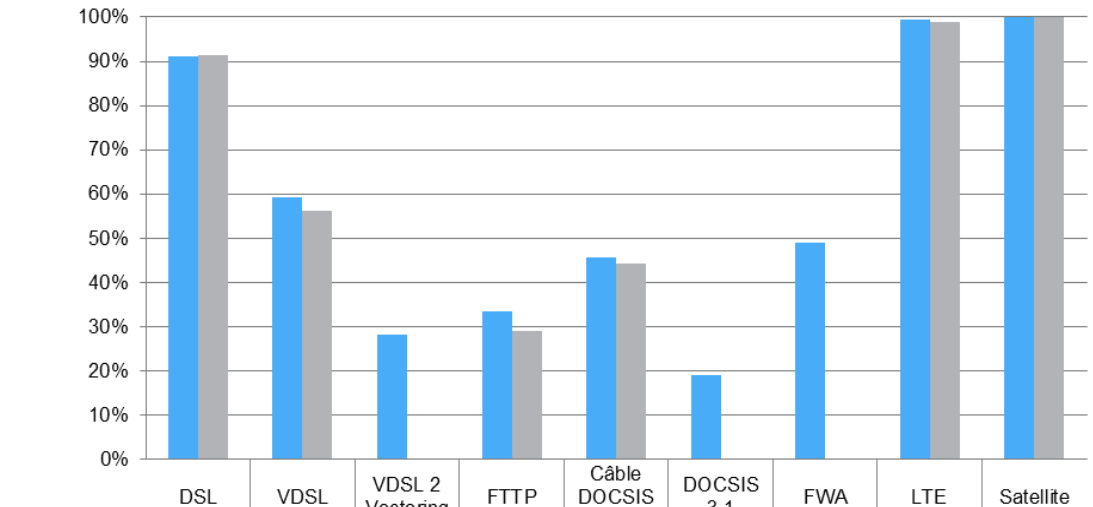
- La couverture en haut débit des zones rurales reste inférieure à la couverture au niveau national dans l'ensemble des Etats membres. A la mi-2019, 89.7% des foyers ruraux avaient accès à au moins une technologie de haut débit fixe, et près des deux tiers (59,3%) avaient accès au très haut débit de nouvelle génération. La couverture des zones rurales par les ANG a continué de croitre, et a augmenté de 7,6 points, soit 2,8 millions de foyers supplémentaires comparé à la fin juin 2018.



- Le satellite reste la technologie la plus étendue en Europe en termes de couverture globale. La couverture satellite est toutefois toujours limitée en Estonie, et absente en Islande.
- A la mi-2019, la connexion par modem DSL continue d'être la technologie de haut débit fixe la plus répandue dans l'UE28, couvrant 91,2% des ménages européens. Cela représente un déclin de 0,1 point de pourcentage comparé à la mi-2018, qui s'explique par une croissance du nombre de ménages plus rapide que le déploiement de nouveaux réseaux DSL.
- A la fin juin 2019, la technologie VDSL couvrait 59,2% des ménages européens, soit une augmentation de 3,0 points de pourcentage au cours des 12 mois de la période. Le VDSL reste la technologie ANG la plus répandue au sein de l'UE28. De plus, la disponibilité de la

technologie du VDSL2 Vectoring a été calculée pour la première fois dans cette étude, afin d'observer la couverture de services offrant des débits plus élevés, via les réseaux cuivre traditionnels, et pouvant dépasser 100 Mb/s. A la mi-2019, 28,2% des foyers européens étaient couverts par le VDSL2 Vectoring.

UE28 : Couverture par technologie au niveau national, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Câble DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
EU28 2019	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%
EU28 2018	91.3%	56.2%	-	29.0%	44.4%	-	-	98.9%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

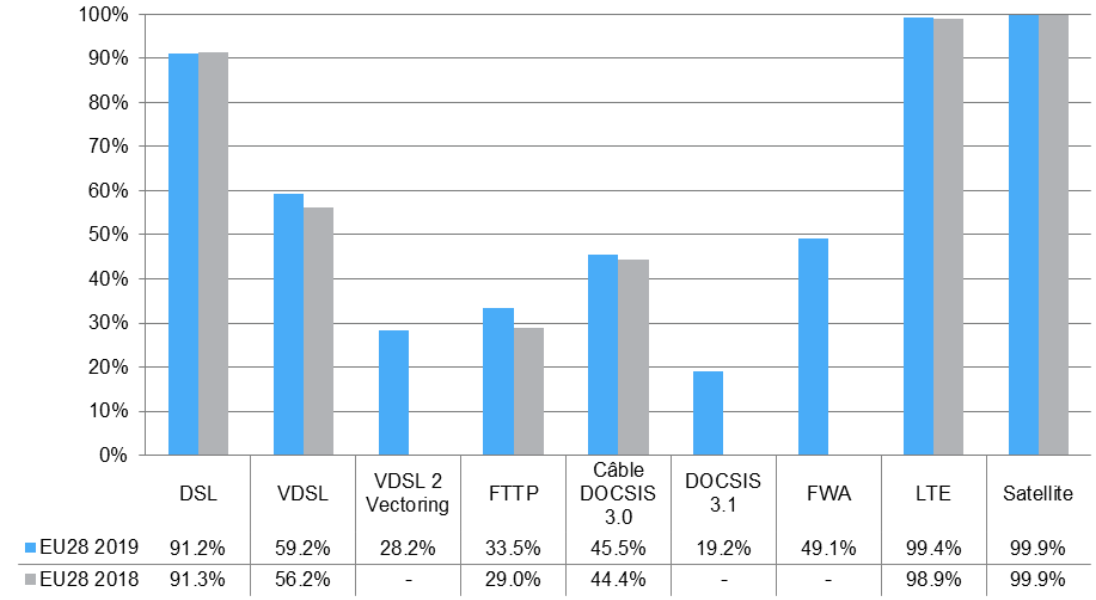
- La disponibilité des réseaux FTTP a continué de croître à un rythme similaire à celui de l'année dernière, ayant cru de 4,5 points de pourcentage, pour atteindre un tiers (33,5%) des ménages européens à la fin juin 2019. La vitesse de déploiement de la fibre FTTP reste cette année la plus élevée de l'étude.

- La quasi-totalité des réseaux de câble ayant été mis à jour au standard DOCSIS 3.0, l'équipe de recherche, en accord avec DG CONNECT, a décidé d'étudier uniquement le câble modem DOCSIS 3.0, et DOCSIS 3.1 dans l'étude 2019. A la mi-2019, 45,5% des foyers de l'Union européenne avaient accès à une connexion rapide via câble modem, et presqu'un cinquième (19,2%) des foyers de l'EU étaient couverts par des réseaux de câble ayant été mis à jour au standard DOCSIS 3.1, qui sont par ailleurs capables d'offrir des vitesses atteignant le gigabit.
- A la fin juin 2019, presque tous les foyers de l'UE (99,4%) étaient couverts par les réseaux mobiles LTE. La couverture par les réseaux HSPA a été exclue de l'étude, ayant atteint des niveaux de couverture a la fois stables et quasi-universels, et étant devenus moins pertinents vus les progrès faits en termes de couverture LTE.

- En ce qui concerne le haut débit dans les zones rurales, une différence de 7,4 points de pourcentage peut être notée entre la couverture en haut débit fixe au niveau global (97,1%) et au niveau rural (89,7%). Cette différence était davantage marquée en termes de technologies NGA : ces réseaux étaient accessibles à 59,3% des ménages ruraux, soit 26,6 points de pourcentage de moins que la couverture totale en ANG. La différence entre couverture globale et rurale continue cependant de se réduire pour le haut débit fixe et les technologies NGA, ce qui s'explique en partie par des investissements plus importants dans les zones rurales.

- La couverture des réseaux VDSL des zones rurales a continué de croître plus rapidement que les autres technologies de haut débit fixe. L'accessibilité des réseaux VDSL a augmenté de 5,6 points de pourcentage, reliant 41,8% des ménages ruraux de l'Union européenne. Cette croissance rapide des réseaux VDSL en zones rurales souligne la focalisation des opérateurs, en particulier des opérateurs historiques, sur la modernisation des réseaux DSL existants.

UE28 : Couverture par technologie au niveau rural, 2019

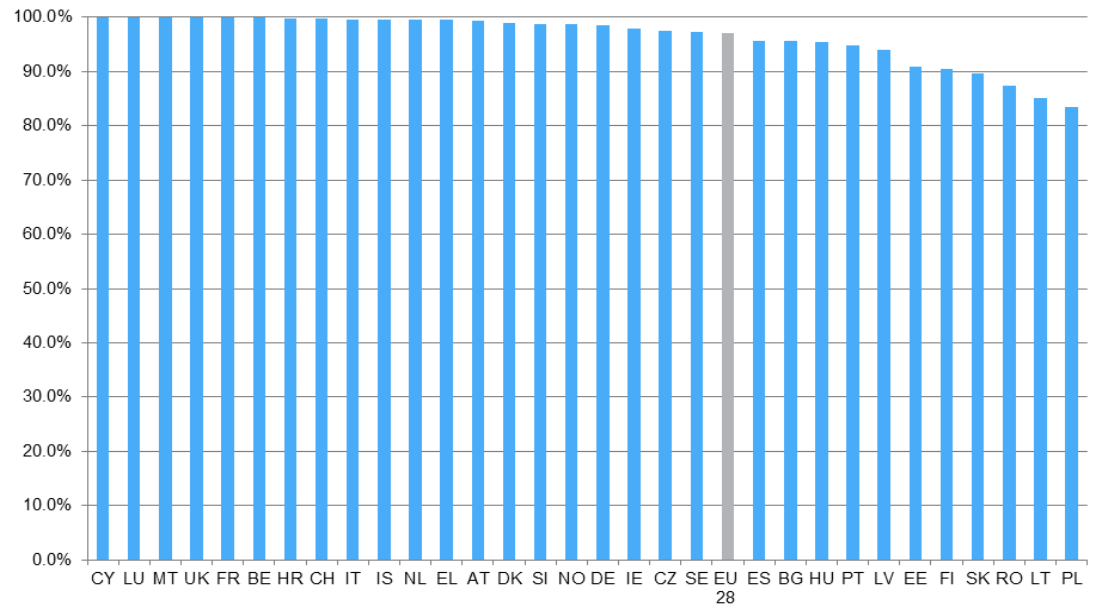


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Câble DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
EU28 2019	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%
EU28 2018	91.3%	56.2%	-	29.0%	44.4%	-	-	98.9%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

- S'agissant de réseaux mobiles, la croissance de la couverture des réseaux LTE a continué de ralentir, la couverture ayant augmenté de 2,1 points, comparé à 5,3 points lors de la dernière étude. Ce ralentissement est dû à la couverture quasi universelle en LTE des régions rurales a la mi-2019, atteignant 98,2% des foyers ruraux de l'Union européenne.

UE28 : Couverture en haut débit fixe par pays, 2019

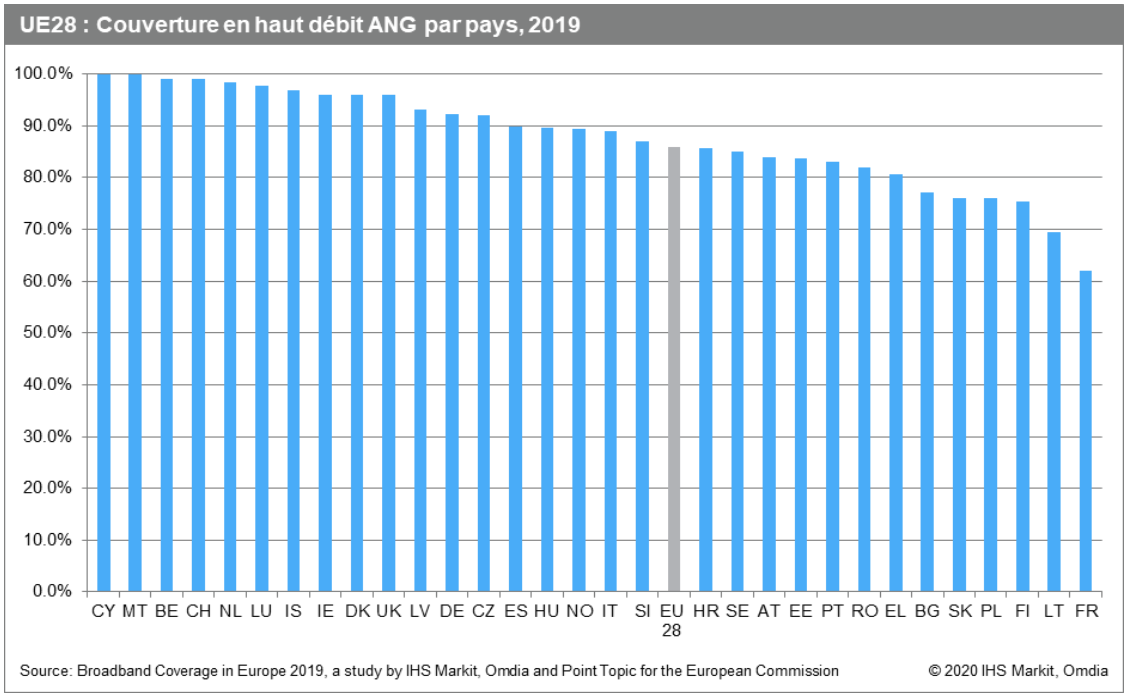


Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

- Parmi les 31 pays étudiés, 24 atteignaient une couverture en haut débit fixe supérieure à 95.0%, et 20 pays offraient une couverture en haut débit fixe supérieure à la moyenne des UE28 (97,1%). Un certain nombre de pays offraient une couverture en haut débit fixe complète de leur territoire, dont la Belgique, Chypre, la France, le Luxembourg, Malte, les Pays-Bas et le Royaume-Uni. Dans quatre des pays de l'étude (Pologne, Lituanie, Roumanie et Slovaquie), la connexion en haut débit fixe était accessible a moins de 90,0% des ménages.

- Chypre et Malte étaient les deux seuls pays à offrir une couverture complète en réseaux ANG, tandis que la Belgique et la Suisse offraient une couverture supérieure ou égale à 99,0%.

- Des 31 pays de l'étude, 18 pays démontraient des niveaux de couverture en ANG supérieurs à la moyenne de l'UE (85,8%). Avec 62,1% et malgré une augmentation considérable du nombre de foyers couverts en ANG, la France reste le pays le moins bien classe de l'étude en termes de couverture par les réseaux ANG.



- S'agissant du haut débit mobile, les réseaux LTE couvraient au moins 99,0% des ménages dans 29 des pays de l'étude, et tous les pays offraient des couvertures au-dessus de 98,0%.

1.0 Introduction

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

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

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

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

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

- Universal broadband coverage of speeds at least of 30 Mbps by 2020.
- 50% of households should have broadband subscriptions of 100Mbps or more by 2020[3].

Additionally, in September 2016, the European Commission introduced a new set of competitive Gigabit Society connectivity targets to be achieved by 2025. These targets include:

- Gigabit connectivity for all main socio-economic drivers such as schools, transport hubs and main providers of public services as well as digitally intensive enterprises.
- All urban areas and all major terrestrial transport paths to have uninterrupted 5G coverage.
- All European households, rural or urban, will have access to Internet connectivity offering a downlink of at least 100 Mbps, upgradable to Gigabit speed.

Moreover, the Connectivity for a Competitive Digital Single Market communication identified and confirmed the importance of investment-friendly regulatory and policy framework, which would facilitate high-capacity broadband deployments as well as a need for forward-looking European regulatory policy, especially with regards to 5G spectrum allocation and access.

The European Commission has been monitoring broadband deployments since 2008 with the Digital Scoreboard serving as a tool for assessing progress towards these targets. Broadband availability metrics are also a component of the Digital Economy and Society Index (DESI) that summarises indicators on Europe's digital performance and Member States' digital competitiveness. One of DESI's five-dimension measures focuses on connectivity and evaluates the deployment and quality of broadband infrastructure.

In order to monitor the progress of broadband networks' deployment across the Member States, DG CONNECT (the European Commission Directorate General for Communications Networks, Content and Technology) has commissioned the Broadband Coverage in Europe (BCE) project to examine household coverage of all of the main fixed and wireless broadband technologies with a specific focus on Next Generation Access (NGA) technologies. In 2013, DG CONNECT selected the consortium of IHS Markit & VVA to run the three-year project. In 2016, IHS Markit partnered with the previous research provider of the BCE study, Point Topic, and was subsequently chosen to continue to deliver the broadband coverage research for the period 2016-2018. In 2019, the IHS Markit and Point Topic research team was awarded the research contract until 2021. In August 2019, IHS Markit Technology, which the Broadband Coverage in Europe research team is part of, was acquired by Informa Group and

[3] https://ec.europa.eu/digital-single-market/en/broadband-strategy-policy

the new research organisation has been since rebranded as Omdia. Whilst IHS Markit remains as the lead contractor of this study, the original research team now belongs under Omdia and continues to be supported by Point Topic.

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

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

The nine broadband technologies analysed in this study are:

- DSL (including VDSL)
- VDSL (including VDSL2 Vectoring)
- VDSL2 Vectoring
- Cable modem DOCSIS 3.0 (including DOCSIS 3.1)
- DOCSIS 3.1
- FTTP (Fibre-to-the-Premises)
- FWA (Fixed Wireless Access)
- LTE
- Satellite

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

Compared to the previous iterations of the Broadband Coverage in Europe study, the research team in agreement with DG CONNECT, reviewed the categories included in the study and made several changes to reflect the technological developments and requirements of broadband connectivity. The previously tracked metrics of standard cable modem broadband, WiMAX, and HSPA were excluded and three new technologies were introduced: VDSL2 Vectoring, cable modem DOCSIS 3.1, and FWA. VDSL2 Vectoring was included to indicate availability of higher-capacity bandwidth services (typically providing download speeds higher than 100Mbps) offered via legacy copper networks. Tracking of cable network upgrades to DOCSIS 3.1 provides insight into coverage of networks capable of delivering gigabit speeds. Fixed Wireless Access (FWA) technologies, including Wi-Fi, WiMAX and in particular 4G LTE-TDD standards have been gaining popularity in the last number of years and the research team anticipates FWA to become even more relevant access technology once 5G FWA becomes available.

The study also aims, as requested by DG CONNECT, to estimate the overall “combination” coverage of technologies, accounting for the overlap of the different technologies capable of delivering a comparable level of performance. The combination categories included in this study are:

- Overall fixed broadband coverage
    - Includes all the main fixed-line broadband access technologies, but excludes satellite
    - Combination of DSL (including VDSL and VDSL2 Vectoring), cable modem DOCSIS 3.0 (including DOCSIS 3.1), FTTP, and FWA

- 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 (including VDSL2 Vectoring), DOCSIS 3.0 (including DOCSIS 3.1), and FTTP

- Very High Capacity Networks (VHCN) coverage
    - Includes fixed-line broadband access technologies primarily capable of achieving gigabit download speeds
    - Combination of DOCSIS 3.1 and FTTP
    - This category has been introduced for the first time as per the Tender Specifications for SMART 2019/2020.

The previously tracked Overall broadband coverage category, which included both fixed and mobile technologies, was excluded from the study in 2019 as overall broadband coverage levels reached universal coverage in vast majority of study countries and the relevance of findings relating to this category has become limited.

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 coverage of the individual technologies as well as combination categories.

The methodology used in this report mirrors the approach developed by Point Topic in 2012, adopting a regional approach to measuring overlapping and complementary coverage. Coverage data was collected on a regional level using NUTS 3 statistical units as a research basis. The NUTS (Nomenclature of Units for Territorial Statistics) areas are geographical subdivisions generally based on existing national regional divisions of EU countries and associated countries (such as Norway, Iceland and Switzerland). More specifically, NUTS 3 level areas are smaller regional units of 150,000 to 800,000 inhabitants. There are 1,386 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 2012-2018 data (with the exemption of the new categories introduced in the 2019 study).

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

- Coverage by broadband network/s capable of at least 2 Mbps download speed
- Coverage by broadband network/s capable of at least 30 Mbps download speed
- Coverage by broadband network/s capable of at least 100 Mbps download speed
- Coverage by broadband network/s capable of at least 1Gbps download speed

Coverage by speed categories was first estimated by the research team in the 2013 edition of the BCE study. By including this additional metric, it is possible to obtain an additional analytical layer to evaluate the study countries' progress towards the Digital Agenda goals and determine the actual speeds consumers will be able to receive on the networks available to them. Coverage of at least 1Gbps download speed is a newly introduced category added in the study for the first time in 2019.

In the Tender Specifications for SMART 2019/0020, DG CONNECT also requested additional mobile coverage data to be collected in order to better reflect availability of mobile broadband services for European consumers. Therefore, in addition to the standard coverage metrics, the research team provided DG CONNECT with data on average LTE coverage in each study country. This measurement takes into account coverage of all LTE network operators, calculating the average household/population coverage level in order to better represent an actual user experience, as a typical user will only be able to use one mobile network at a time. This indicator is included as one of the components of the DESI Connectivity dimension.[4]

[4] DESI Indicator 1b2: 4G coverage (DESI 2017), DESI Indicator 1b1: 4G coverage (DESI 2018 & 2019), DESI Indicator 1c1: 4G coverage (DESI 2020).

The following table details the scope of the Broadband Coverage in Europe 2019 study.

Scope	Description of Broadband Coverage Metrics
Geographical coverage	• EU28 + Iceland, Norway and Switzerland • Rural and national coverage
Technologies	The following technologies are included: • DSL (including VDSL and VDSL2 Vectoring) • VDSL • VDSL2 Vectoring • Cable modem DOCSIS 3.0 (including DOCSIS 3.1) • DOCSIS 3.1 • FTTP (Fibre-to-the-Premises, i.e. Fibre-to-the-Home and Fibre-to-the-Building) • Fixed Wireless Access (FWA) • LTE • Satellite The study also covers the following technology combinations: • Overall fixed broadband coverage (including DSL, VDSL, VDSL2 Vectoring, FTTP, cable modem DOCSIS 3.0, DOCSIS 3.1 and FWA) • NGA coverage (including VDSL, VDSL2 Vectoring, FTTP, cable modem DOCSIS 3.0 and DOCSIS 3.1) • Overall Very High Capacity Networks (VHCN) coverage (including FTTP and cable modem DOCSIS 3.1)
Speeds	The study covers the following speed categories: • At least 2 Mbps download • At least 30 Mbps download • At least 100 Mbps download • At least 1Gbps download
Mobile coverage	An additional mobile metric is included in the 2019 edition of the study: • Average LTE coverage (average of operators in each study country)

Acknowledgements

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

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

2.0 Project Objectives

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

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

3.0 Methodological approach in detail

The methodological approach used in the 2019 edition of the Broadband Coverage in Europe study mirrors the approach used in the 2013-2018 studies, which was in turn based on a methodology first implemented by Point Topic in 2012. Applying the same methodological approach allows the research team to ensure both consistency and year-on-year comparability of the data.

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

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

3.1 Survey design and data collection

For the sake of consistency, the research team used similar wording and formatting of the survey questionnaire as in 2012-2018. Using near-identical question wording enables the research team to deliver findings which can be compared with research undertaken in previous years.

Where possible, the research team contacted survey participants that were approached for the 2012-2018 data collection. During the previous data collection runs 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 means that most respondents are familiar with the study as well as the survey questionnaire, making it easier for them to fill in the by-now familiar information.

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

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

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

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

- Speed coverage - the survey questionnaire also includes 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. An additional speed category of at least 1Gbps download speed was included in the 2019 survey questionnaire as requested by DG CONNECT.

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

In addition to the coverage questions, the survey questionnaire also provided space for additional comments and explanations of the various technologies and speed specifications in cases in which respondents' definitions differed from those outlined in the survey (detailed definitions of the individual broadband technologies are included in the Appendices of this report). These comments provided further insight and were reflected in the final analysis of the data.

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

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.

3.2 Defining households and rural areas

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

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

One of the key dimensions of the study is centred around gaining information on broadband coverage in rural areas. In order for the rural data collected in the period 2013-2019 to be comparable to the 2012 dataset, the research team uses a methodology first developed by Point Topic in 2012, which defines rural areas using the Corine land cover database, and creates a database of population and land type in every square kilometre across Europe. Households in square kilometres with a population of less than one hundred are classified as rural. This granular approach based on population density identifies the truly rural areas likely to be unserved or underserved by broadband operators.

According to an updated estimation of rural population in individual NUTS 3 regions, approximately 15% of households in the study countries were rural in 2019. Combining this information with updated population and household data from Eurostat, the EU statistical office, allowed the research team to create new estimates for the numbers of rural households across each market and NUTS 3 area.

3.3 Additional research conducted in parallel to the survey

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

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

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

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

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

3.4 Validation and integration of data

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

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

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

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

3.5 Estimating coverage for different technology combinations

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

- Overall fixed broadband coverage (including DSL, VDSL, VDSL2 Vectoring, FTTP, Cable modem DOCSIS 3.0, DOCSIS 3.1 and FWA)

- Overall NGA coverage (including VDSL, VDSL2 Vectoring, FTTP, cable modem DOCSIS 3.0, and DOCSIS 3.1)

- Overall Very High Capacity Networks (VHCN) coverage (including FTTP and cable modem DOCSIS 3.1)

For the sake of consistency, the research applied a similar methodology in the 2019 study to the approach used in the 2012-2018 editions of the study. Unless information provided by NRAs or telecoms groups suggested otherwise, a standardised default formula was used, taking the average of:

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

2. The maximum possible coverage; equal to the sum of the coverage of all the technologies or operators being considered, or if the sum is higher than 100%, coverage is capped at 100%.

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

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

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

In a number of cases, new and more accurate data was provided to the research team impacting previous years' data and thus justifying restatements of the figures published in the Broadband Coverage in Europe 2018 study.

3.6 Estimating coverage for speed categories

The speed categories were first included as broadband coverage metrics in 2013 in order to provide additional analytical layer to evaluate the study countries' progress towards the Digital Agenda goals and to estimate the download speeds available to households across the EU Member States. This additional component of the broadband coverage research was retained in the 2019 edition of the study with the following speed categories included among the metrics:

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

In addition, a new speed category was included in the 2019 study:

- Coverage by broadband network/s capable of at least 1Gbps download speed

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

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

- Coverage by broadband network/s capable of realistically achieving actual download speeds of at least 2 Mbps. This category encompassed DSL (including VDSL and VDSL2 Vectoring), FTTP, FWA, cable modem DOCSIS 3.0 and DOCSIS 3.1 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 (including VDSL2 Vectoring), FTTP, FWA (4G TD LTE standard) and DOCSIS 3.0 (including DOCSIS 3.1) 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 VDSL2 Vectoring, 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.

- Coverage by broadband network/s capable of realistically achieving actual download speeds of at least 1Gbps. This category encompassed FTTP and DOCSIS 3.1 cable broadband access technologies. However, as with the other speed categories, not all connections utilizing these technologies can achieve 1Gbps actual download speeds and 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, 100 Mbps or 1Gbps download speed connections if the connection's broadband speed was capable of achieving a minimum of 2, 30, 100 Mbps or 1Gbps download speed (respectively) for the majority of the time. 'Majority of time' is understood to mean actual download speeds achieved by a household for at least 75% of the time.

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

Following discussions with DG CONNECT, the research team has made a few changes in terms of technologies considered when estimating the coverage by speed categories. These changes reflect the technological advancements and improving capabilities of individual broadband access technologies that have been observed over the last couple of years. For this reason, availability of FWA provided over 4G LTE-TDD was considered in the at least 30 Mbps speed category and VDSL2 Vectoring was included in the analysis of availability of services providing at least 100 Mbps download speeds.

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

3.7 Estimating additional mobile coverage metric

As required in the Tender Specifications for SMART 2019/0020 and following the discussions with DG CONNECT at the inception meeting, the research team has introduced one new mobile metric as part of the Broadband Coverage in Europe 2019 study, which is aimed to better reflect availability of mobile broadband services for European consumers:

- Average LTE coverage

This additional metric has been included in the study since 2017 and takes into account LTE household/population coverage provided by individual operators in each study country. This data was provided either by the operators themselves, by the NRAs or collected from publicly available sources, such as information accessible from operators' websites, quarterly reports, press releases, etc. The research team then provided DG CONNECT with an overall average LTE coverage value, calculated as a simple average of operators' LTE networks coverage in each study country.

This indicator was requested by DG CONNECT to serve as a better measurement of actual user experience (as a typical user will only be able to use one network at a time) and is included as one of the components of the DESI's Connectivity dimension (1c1 – 4G Coverage).

In parallel, the research team collected information from additional sources such as NRA reports and other operator reported and publicly available information to complement the survey data.

4.0 European Overview

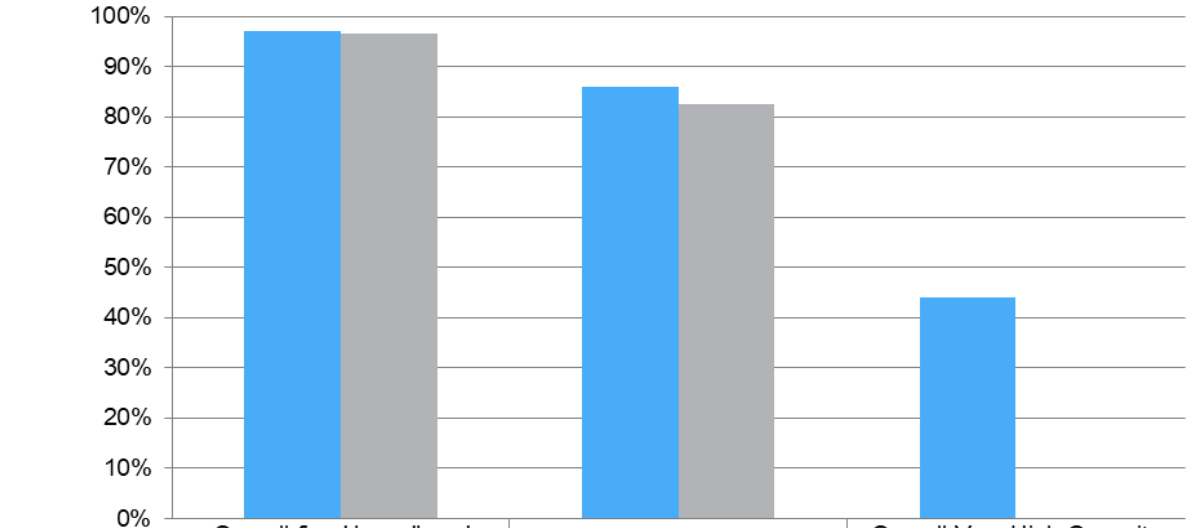
4.1 Europe-wide coverage by technology combinations

The main objective of the Broadband Coverage in Europe 2019 study was to assess the availability of broadband services across the EU, with additional information provided for Norway, Iceland and Switzerland.

For the 2019 edition, the research team reviewed the technologies and combination coverage categories included in the study and made several changes, agreed by the DG CONNECT team. The previously tracked metrics of standard cable modem broadband, WiMAX, and HSPA were excluded and three new technologies were introduced: VDSL2 Vectoring, cable modem DOCSIS 3.1, and FWA. The nine broadband technologies examined in the 2019 edition of the BCE study are: DSL, VDSL, VDSL 2 Vectoring, FTTP, cable modem DOCSIS 3.0, DOCSIS 3.1, FWA (fixed wireless access), LTE, and satellite. Most technologies (DSL, VDSL, FTTP, cable modem DOCSIS 3.0, LTE, satellite) were included in previous editions of the study, and thus ensure comparability and possibility to evaluate progress in broadband rollout across Europe.

The collected data shows that more than 216 million EU households (97.1%) had access to at least one of the main fixed broadband access technologies in mid-2019 (excluding satellite). The proportion of homes passed by at least one fixed broadband network (DSL, cable DOCSIS 3.0, FTTP or FWA) increased slightly during the twelve months to mid-2019, growing by 0.4 percentage point.

EU28: Coverage by technology combination, 2019



	Overall fixed broadband coverage	Overall NGA coverage	Overall Very High Capacity Networks (VHCN) coverage
EU28 2019	97.1%	85.8%	44.0%
EU28 2018	96.7%	82.6%	-

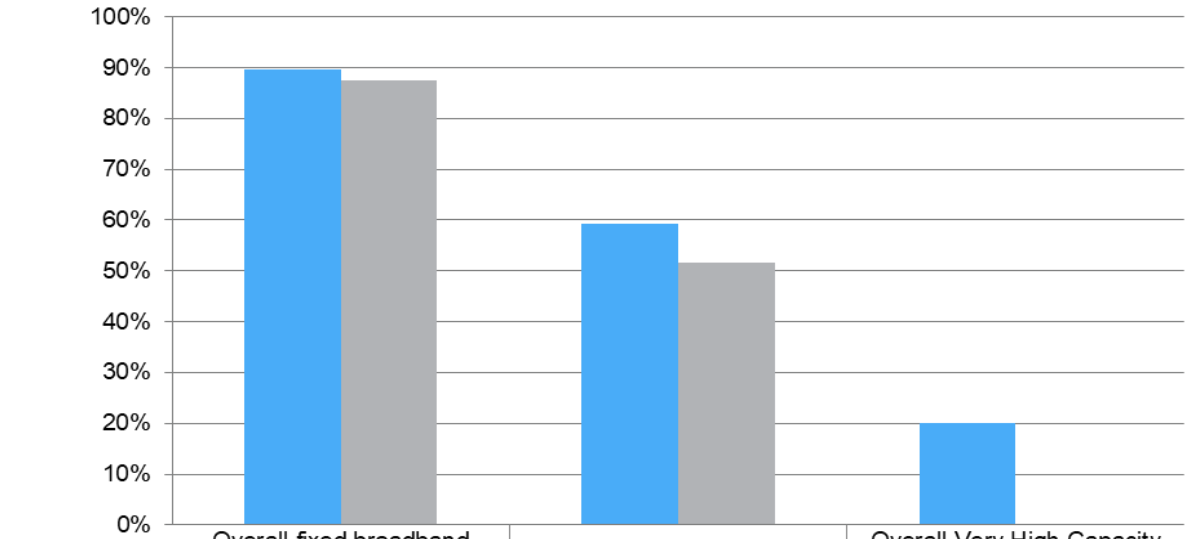
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

As in previous years, the largest growth among the combination categories was witnessed in coverage of Next Generation Access (NGA) networks. During the twelve-month period to mid-2019, NGA coverage increased by 3.2 percentage points. This marked a slight reduction compared to NGA growth in the twelve months to mid-2018 (3.6 percentage points) but still meant that more than 7 million additional EU households gained access to at least one of the NGA technologies (VDSL incl. VDSL 2 Vectoring, FTTP, and cable modem DOCSIS 3.0 incl. DOCSIS 3.1) and in total 85.8% of EU homes were passed by at least one NGA network. In the future, it can be expected that growth in NGA coverage will continue to slow down as NGA networks approach universal coverage levels.

The research team, in agreement with DG CONNECT, decided to remove the overall broadband coverage category, which included both fixed and mobile technologies, as overall broadband coverage has reached universal coverage levels in all study countries and findings from this combination coverage

calculation were limited. DG CONNECT also requested for the previously tracked Overall FTTP & DOCSIS 3.0 coverage category to be replaced by the Very High Capacity Networks (VHCN) coverage, which is estimated on a national and rural level indicating overall coverage by FTTP & DOCSIS 3.1 networks. These two technologies are those primarily capable of achieving at least 1Gbps, a stretch target of the Connectivity for a European Gigabit Society policy initiative[5]. This metric thus provides an indication of the technological availability of these very high-speed networks. In-mid 2019, 44.0% of EU households had access to either FTTP or DOCSIS 3.1 broadband services. If we analyse it in absolute terms, that is over 98 million EU homes being passed by very high capacity networks.

EU28: Coverage by technology combination in rural areas, 2019



	Overall fixed broadband coverage	Overall NGA coverage	Overall Very High Capacity Networks (VHCN) coverage
EU28 2019	89.7%	59.3%	20.1%
EU28 2018	87.5%	51.7%	-

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Access to fast broadband services in rural areas remains a key priority for the EU. At the end of June 2019, 89.7% of rural households across the EU28 had access to at least one fixed broadband technology, up from 87.5% in mid-2018. By contrast, only 59.3% of rural households could benefit from NGA broadband in mid-2019, in absolute terms this translated to just under 20 million (19.7 million) rural households. Rural NGA broadband coverage grew by 7.6 percentage points since mid-2018, slightly over the 7.4 percentage points of growth recorded in the last iteration of this study. The gap between rural fixed broadband coverage and rural NGA coverage continued to narrow, however there was still a 30.4 percentage point difference between rural fixed broadband and NGA broadband coverage levels.

[5] https://ec.europa.eu/digital-single-market/en/policies/improving-connectivity-and-access

4.2 Europe-wide coverage by individual technologies

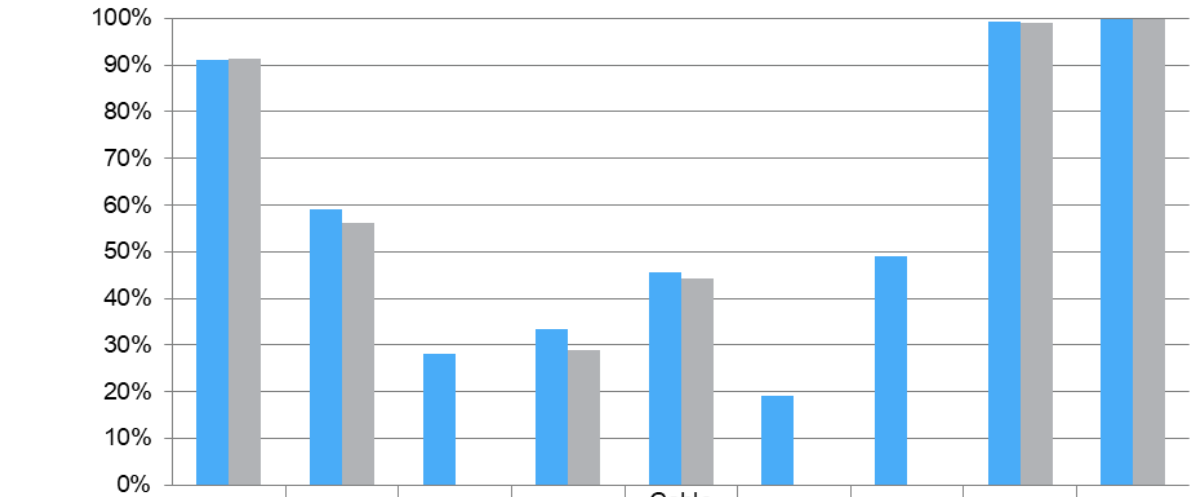
4.2.1 Coverage by technology in total

At the end of June 2019, satellite broadband was available to 99.9% of EU households, remaining the most pervasive technology in Europe in terms of overall coverage. Our research indicates there has been no change in satellite broadband availability in Europe compared to 2018. There continued to be limited coverage from KA-band satellites in Estonia, with satellite broadband reaching only certain parts of the country. Iceland remained the only study country where there were no satellite broadband services available.

Examining the availability of fixed broadband technologies, DSL remained the most pervasive broadband technology, reaching 91.2% of EU households in mid-2019. This represents a marginal 0.1 percentage point decline compared to mid-2018, underpinned by the growing number of operators opting for disconnection of copper lines and upgrade to fibre. In absolute terms, DSL coverage decreased by 281 thousand households during the twelve-month period.

Fixed Wireless Access, which includes Wi-Fi, WiMAX and 4G LTE-TDD, was available to just under half of EU households (49.1%) at the end of June 2019. In the previous iterations of the BCE study, only WiMAX coverage was tracked. However, with the increasing importance of 4G FWA access and the anticipated ascent of 5G FWA, the research team decided to expand the WiMAX category to include other FWA standards.

EU28: Coverage by technology, total



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
EU28 2019	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%
EU28 2018	91.3%	56.2%	-	29.0%	44.4%	-	-	98.9%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Over the study period, VDSL coverage continued to expand, and gained 3.0 percentage points in coverage since mid-2018. As observed in previous iterations of this study, VDSL coverage growth has been decreasing and was overtaken by FTTP in 2018 as the fastest growing broadband technology across the EU. At the end of June 2019, VDSL was available to nearly two-thirds of EU households (59.2%). In addition, availability of VDSL2 Vectoring technology was tracked for the first time in 2019 to indicate coverage of higher-capacity bandwidth services offered via legacy copper networks, i.e. those typically providing download speeds higher than 100Mbps. By mid-2019, 28.2% of EU homes were passed by VDSL 2 Vectoring.

While FTTP was the fastest growing broadband technology in 2019, its coverage remained lower than VDSL and cable modem DOCSIS 3.0. It was, however, more widely available than VDSL 2 Vectoring and DOCSIS 3.1. Over the study period, FTTP coverage grew by 4.5 percentage points, to reach a third (33.5%) of EU households, or over 74 million households in absolute terms.

As nearly all cable networks in the EU had already been upgraded to DOCSIS 3.0 already in mid-2017, the research team decided to exclude standard cable modem technology and track DOCSIS 3.0 and DOCSIS 3.1 coverage going forward. While the research team has been monitoring DOCSIS 3.1 launches in the past, the technology was officially included in 2019 for the first time. By mid-2019, 45.5% of EU households had access to high-speed cable broadband provided by DOCSIS 3.0. Cable services provided over DOCSIS 3.1 were available to 19.2% of EU households, which means that 42.1% of DOCSIS 3.0 networks had already been upgraded to the DOCSIS 3.1 standard at the end of June 2019.

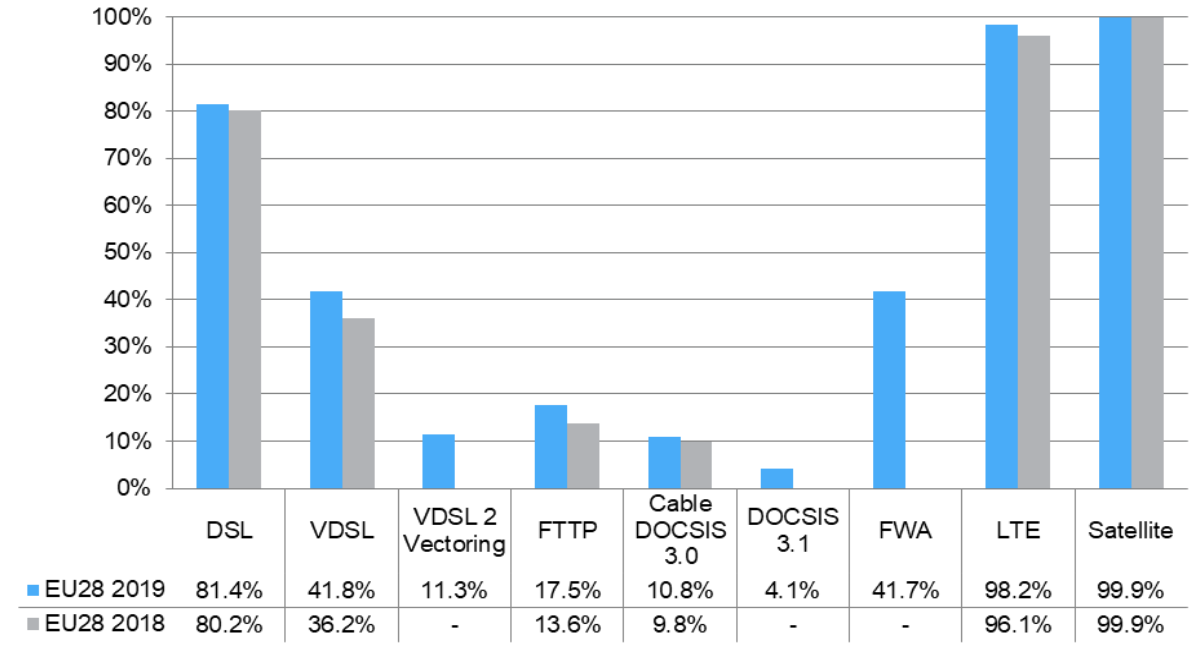
Examining mobile network coverage, LTE growth continued to slow down over the study period, and coverage increased by 0.5 percentage points, reaching 99.4% availability. As LTE coverage is now almost universal in the EU, the research team expects the focus to shift to 5G rollouts in the next years.

4.2.2 Coverage by technology in rural areas

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

Broadband coverage levels in rural regions remain notably lower than total national coverage, with fixed broadband networks passing 89.7% of rural EU households compared to 97.1% of total households. The gap between total NGA coverage and rural NGA coverage remained much larger, but at 26.6 percentage points, it continued to narrow during the twelve months to mid-2019. For comparison, the difference in total and rural NGA coverage was 30.8 percentage points in mid-2018, and 33.2 percentage points in mid-2017, highlighting the shift in NGA network deployments towards rural areas.

EU28: Coverage by technology, rural areas



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
EU28 2019	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%
EU28 2018	80.2%	36.2%	-	13.6%	9.8%	-	-	96.1%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

The most widespread fixed broadband technology in rural areas continued to be DSL, reaching 81.4% of rural EU households by mid-2019, an increase of 1.2 percentage point since mid-2018. During the twelve months to mid-2019, rural VDSL coverage expanded by 5.6 percentage points, reaching 41.8% of rural households. As was the case in previous years, the additional VDSL coverage relates mainly to areas already covered by DSL networks, which are being gradually upgraded to VDSL. Consequently, this increase would not account for newly deployed networks to previously unserved areas. VDSL 2 Vectoring was available to 11.3% of rural households, that is almost 17 percentage points less than on a national level.

Fixed Wireless Access was available to 41.7% of rural households. The recent years have seen the emergence of fixed wireless solutions as substitutes to traditional fixed broadband technologies in remote areas, mostly in rural regions.

Cable coverage in rural areas remained limited due to the high costs associated with deploying cable networks. As a result, operators traditionally prioritised new cable network deployment in urban areas to take advantage of the higher population densities, which helped them maximise the return on investment. At the end of June 2019, cable modem DOCSIS 3.0 networks passed only 10.8% of rural EU homes, up one percentage point since mid-2018. As most DOCSIS 3.1 upgrades have so far been focused primarily on urban areas, DOCSIS 3.1 was available to just 4.1% of rural households at the end of June 2019. DOCSIS 3.1 was thus the technology with the lowest rural coverage level.

FTTP coverage of rural regions continued to increase this year, growing by 3.9 percentage points and reaching 17.5% of rural households by the end of June 2019.

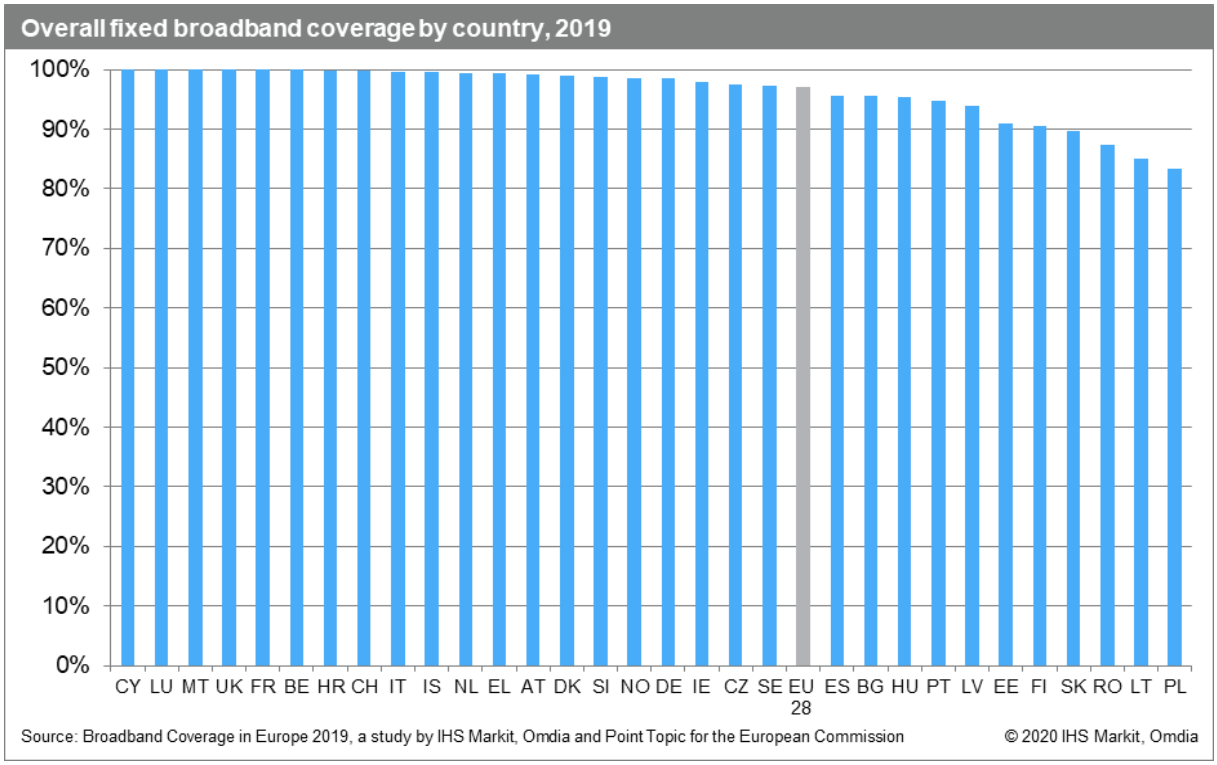
By mid-2019, rural LTE coverage approached near universal levels, with 98.2% of rural EU homes passed by at least one LTE network. As most areas become covered by LTE networks, the pace of roll outs has slowed down considerably. Over the study period, LTE coverage of rural regions increased by 2.1 percentage points. For reference, rural LTE coverage had increased by 5.3 percentage points in 2018, and by 9.5 percentage points in 2017.

The nature of satellite technology means that satellite broadband services reach a similar level of coverage in rural areas as across the EU as a whole. As such, satellite broadband coverage remained relatively unchanged, reaching 99.9% of rural areas. Satellite remains the only option for receiving broadband access in the most sparsely populated and hard-to-reach regions.

4.3 Country comparison by total technology coverage

4.3.1 Total overall fixed broadband by country

The overall fixed broadband coverage category has been designed to provide a measure of progress in deployment of fixed broadband access technologies, which are capable of providing households with broadband services of at least 2 Mbps download speed. Four technologies make up the overall fixed broadband coverage figure: DSL (including VDSL and VDSL 2 Vectoring), cable DOCSIS 3.0 and DOCSIS 3.1), FTTP, and FWA. FTTP coverage trends are discussed in more detail in the following chapter on NGA coverage by country.

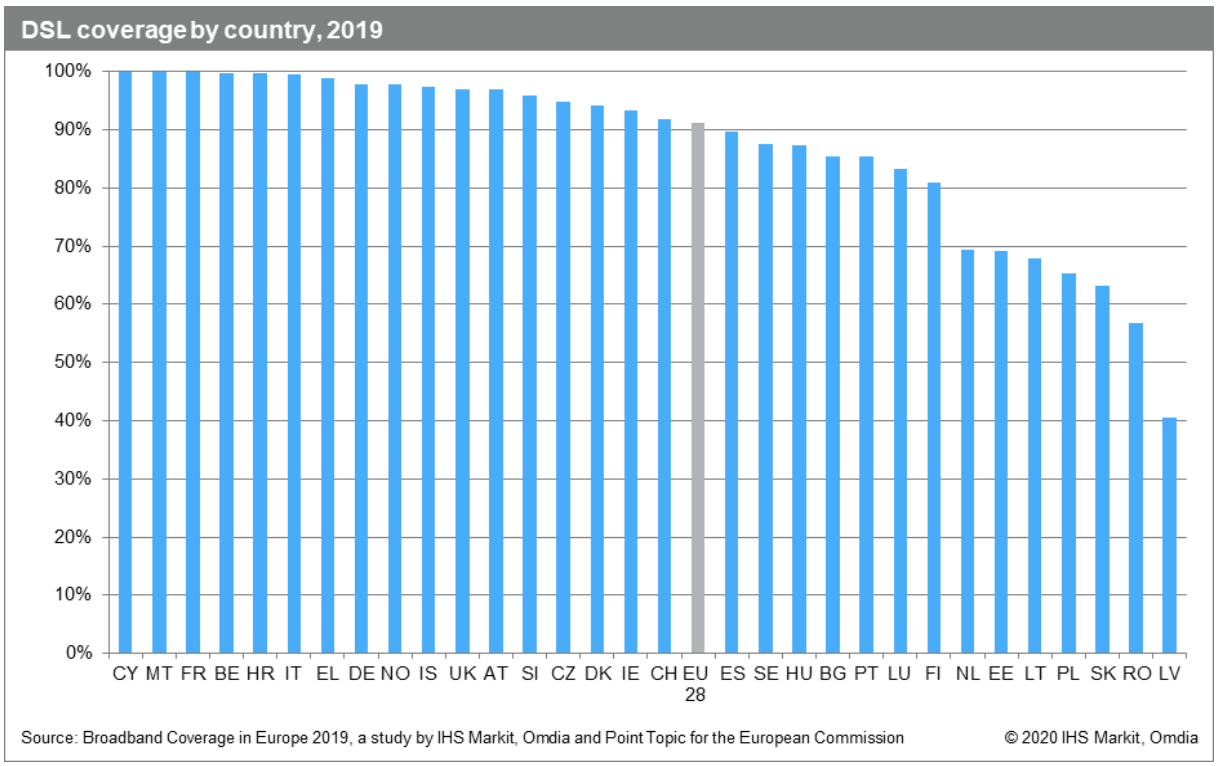


In total, 23 out of the 31 study countries registered fixed broadband coverage of above 95.0%, highlighting the breadth of fixed broadband coverage in most countries. As of mid-2019, six countries recorded complete fixed broadband coverage, namely: Cyprus, Luxembourg, Malta, the UK, France, and Belgium. On the other hand, Poland, Lithuania, Romania and Slovakia remained the only countries with fixed broadband coverage levels below 90.0%.

4.3.1.1 Total DSL coverage by country

As was the case in previous iterations of this study, DSL continued to be the most pervasive fixed broadband technology in terms of coverage in most study countries. In total, 18 out of the 31 study countries recorded DSL coverage above 90.0%, with the EU average for DSL availability having marginally decreased by 0.1 percentage point since mid-2018. At the end of June 2019, Cyprus, Malta, and France, reported complete coverage by DSL networks. However, it is important to note that while universal DSL coverage was registered for these countries, this is generally considered accurate to one decimal place to account for the possibility of a negligible number of remote homes failing to receive DSL coverage.

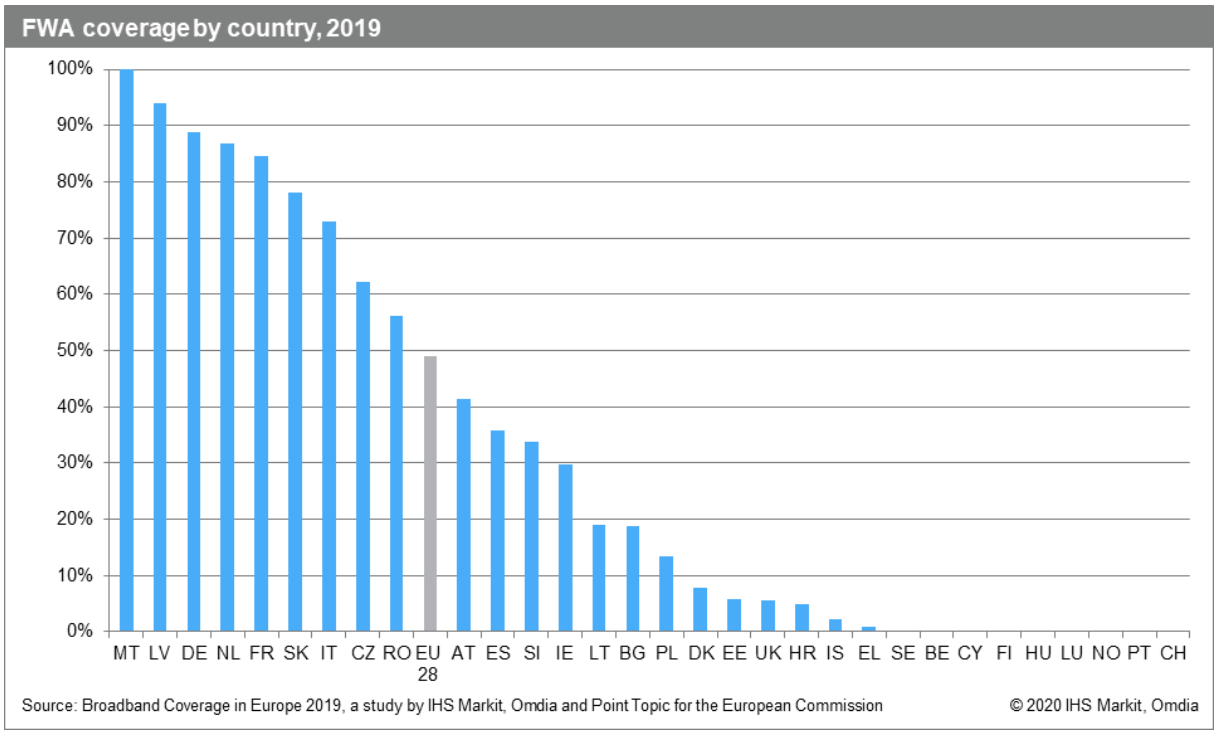
Universal or near-universal DSL coverage (i.e. very close to 100.0% of households) was observed in countries with the most developed traditional telephone networks as DSL technology utilizes legacy fixed line twisted-pair copper network infrastructure.



Latvia, Romania, Slovakia, Poland, Lithuania, Estonia and the Netherlands all recorded DSL coverage levels below 80.0%. In a number of these countries, DSL coverage has begun to give way to NGA technologies such as FTTP, which is discussed in more detail in the individual country chapters.

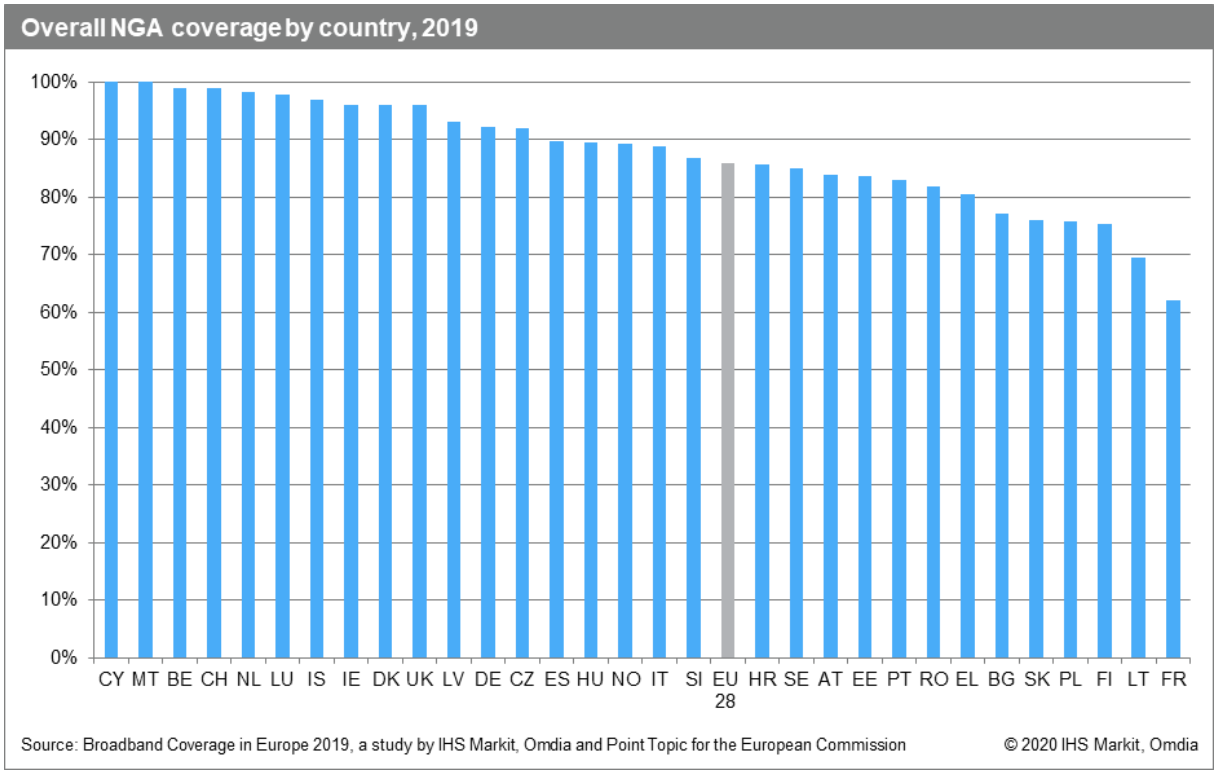
4.3.1.2 Total Fixed Wireless Access (FWA) coverage by country

As mentioned earlier, Fixed Wireless Access includes Wi-Fi, WiMAX and 4G TD LTE. Those technologies generally provide a viable broadband solution for less-densely populated and harder-to-reach areas. The EU average for FWA coverage stood at 49.1% at the end of June, with coverage ranging between 0.0% and 100.0%. Eight countries recorded total absence of FWA coverage, while only Malta recorded complete FWA coverage.



4.3.2 Total overall NGA coverage by country

The NGA combination category is comprised of VDSL (including VDSL 2 Vectoring), FTTP, and cable modem DOCSIS 3.0 (including DOCSIS 3.1) technologies, all typically capable of delivering a service speed of at least 30 Mbps (although VDSL local loop lengths mean that actual speeds do vary[6]). The main objective of the Digital Agenda for Europe is to have complete coverage of European households at this speed by 2020. The analysis of the combination category therefore constitutes an evaluation of the rollout of the relevant technologies and progress towards this goal.



By the end of June 2019, there continued to be considerable differences in NGA coverage across the study countries, reflecting the various strategies adopted by network operators across Europe to deploy high-speed broadband. Cyprus and Malta were the two countries that recorded complete NGA coverage, whilst Belgium and Switzerland continued to reach near universal NGA coverage levels.

On the other hand, thirteen countries reported coverage levels below the European average of 85.8%, with France remaining the country with the lowest coverage of the study, with 62.1% of homes passed by NGA networks.

4.3.2.1 Total VDSL coverage by country

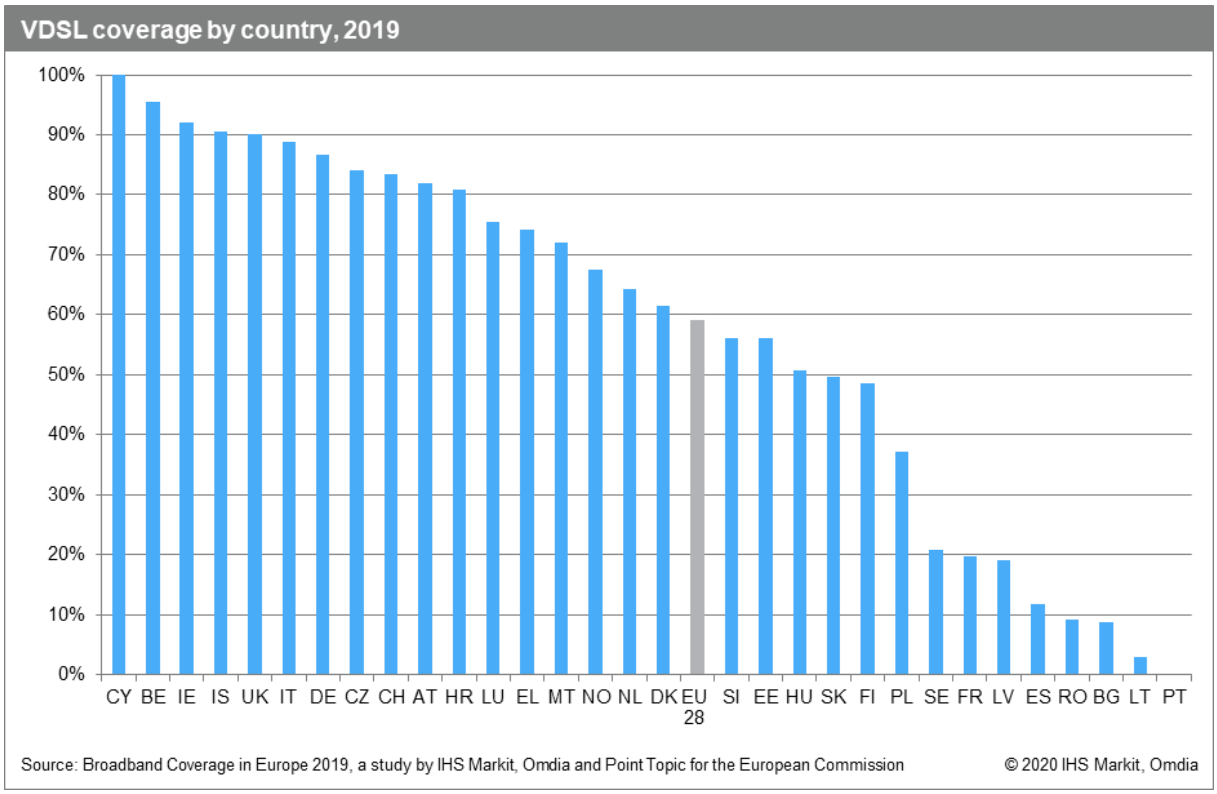
VDSL broadband services were available to 59.2% EU households by mid-2019. Despite VDSL coverage having grown at a slower pace than FTTP coverage, many operators continued to focus their deployment strategies on upgrading existing copper infrastructure, rather than investing in the typically more expensive deployments of fibre optic networks all the way to customers' property.

It is important to note that broadband performance on VDSL lines varies depending on the length of the copper loop from the VDSL enabled cabinet connected to the optical fibre backhaul. Formerly, households with a VDSL connection at a distance of about 500 metres from a VDSL enabled street cabinet or exchange, typically, reached download connection speeds of around 25 Mbps. However, with the newest VDSL technology, these speeds can be achieved up to a distance of 1 000 metres.[7]

[6] Please see Chapter 4.5 for more information on actual download speed coverage.

[7] For further analysis of actual download speed coverage please see Chapter 4.5.

By mid-2019, Cyprus, Belgium, Ireland, Iceland, and the UK all recorded VDSL coverage levels that exceeded 90.0%, whilst VDSL networks passed more than 80.0% of homes in six other countries (Italy, Germany, Czechia, Switzerland, Austria, and Croatia). Overall, 17 study countries recorded VDSL coverage levels that were higher than the EU average of 59.2%. Over the study period, Cyprus saw a double-digit percentage point increase (20 p.p.) in VDSL coverage with VDSL services available to all households in the country.



However, VDSL services remained far from widespread in a number of countries. Latvia, Spain, Romania, Bulgaria, and Lithuania all recorded VDSL coverage below 20.0%, while Portugal remained the only country with no VDSL availability. Yet, it is important to note that in many of these countries, operators traditionally focus on deploying other NGA technologies, such as FTTP.

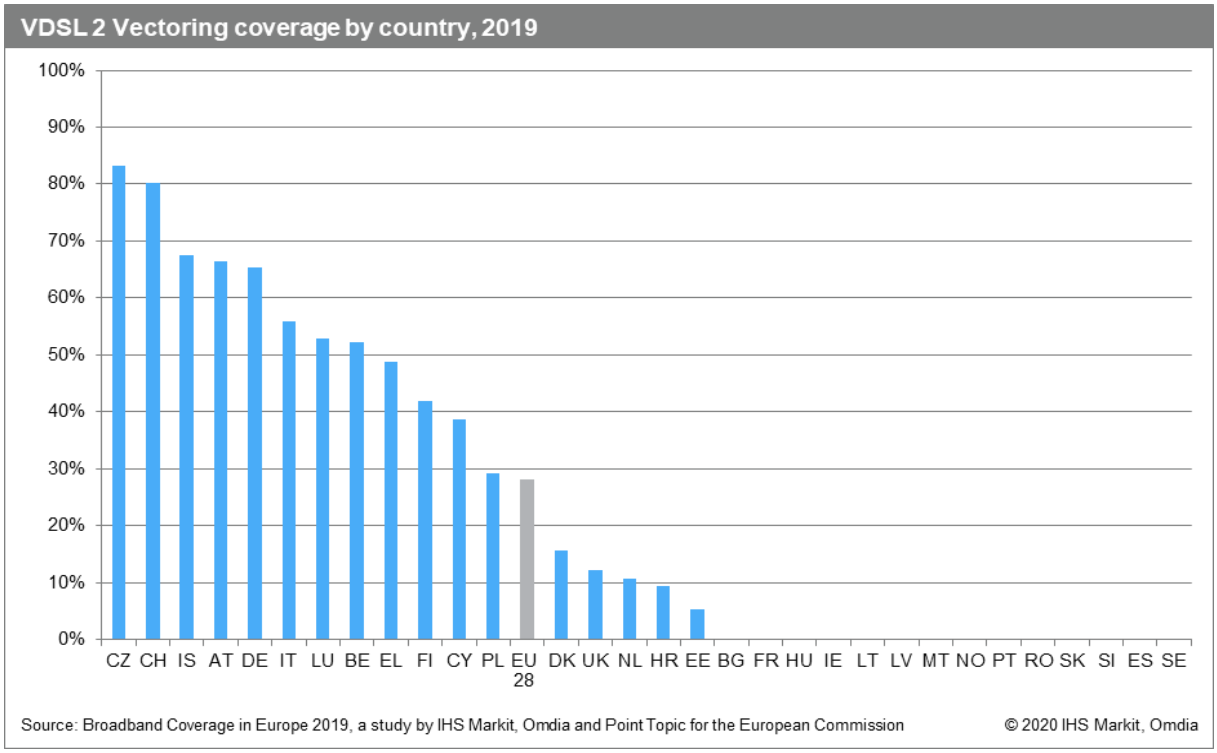
4.3.2.2 Total VDSL2 Vectoring coverage by country

Availability of VDSL2 Vectoring technology was tracked for the first time in 2019 to indicate coverage of higher-capacity bandwidth services offered via legacy copper networks, i.e. those typically providing download speeds higher than 100Mbps.

On average, VDSL2 Vectoring coverage reached 28.2% of EU households at the end of June 2019. However, availability of VDSL2 Vectoring services varied widely across the EU, between 0.0% and 80.0%. The technology was absent in fourteen study countries, and its coverage surpassed 50.0% of households in eight countries. It is worth noting though that two countries, Switzerland and Iceland, which recorded two of the three highest VDSL2 Vectoring coverage levels are not EU Member States and therefore are not included in the average EU28 VDSL2 Vectoring coverage calculation.

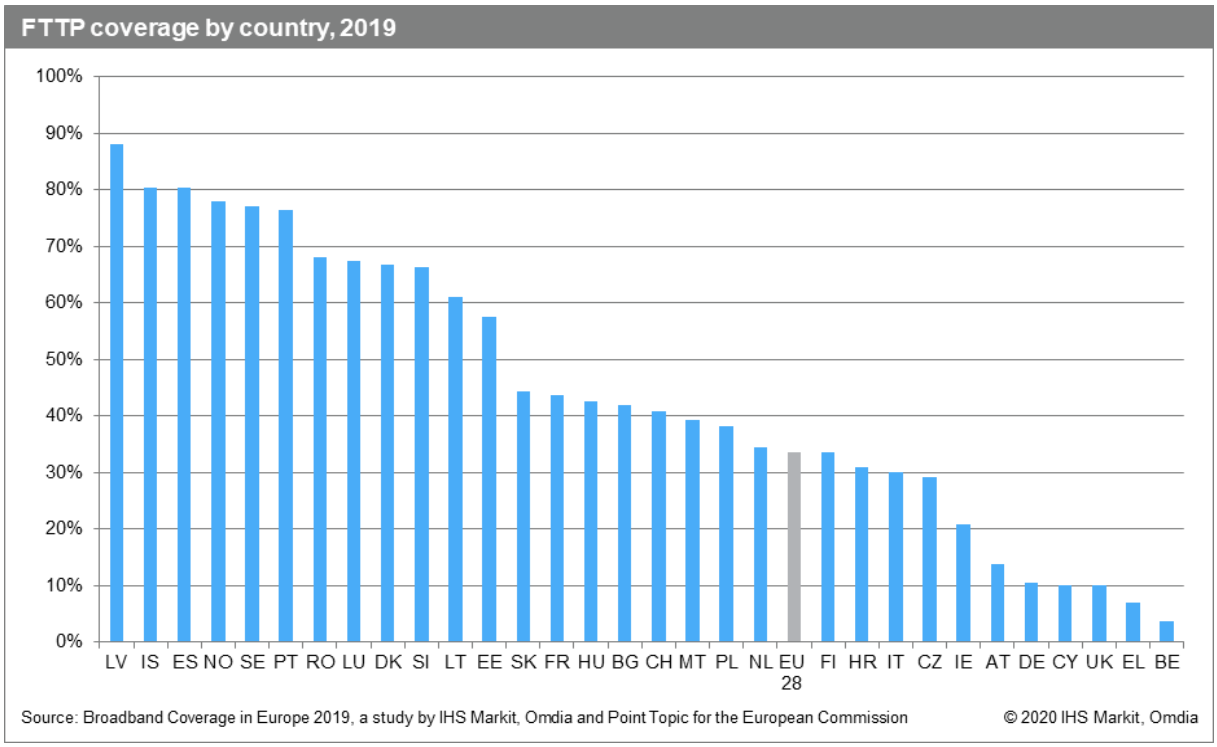
Czechia recorded the highest VDSL2 Vectoring coverage of this study, with 83.3% of homes passed by VDSL2 Vectoring. Moreover, due to the focus of the Czech incumbent's infrastructure arm on deploying VDSL2 Vectoring solutions over the last year, the whole VDSL network footprint has been upgraded to offer services with download speeds higher than 100 Mbps.

In the case of Italy, VDSL2 Vectoring is not deployed, but due to the nature of the legacy copper network grid, with large number of cabinets positioned close to customer premises, the VDSL network is capable of reaching speeds higher than 100Mbps. In order to not skew the results unfavourably, the research team worked with the Italian NRA to precisely identify those households close enough to the cabinet to receive at least 100Mbps coverage and only those were classified as VDSL2 Vectoring passed for the purposes of the study and included in this category.



4.3.2.3 Total FTTP coverage by country

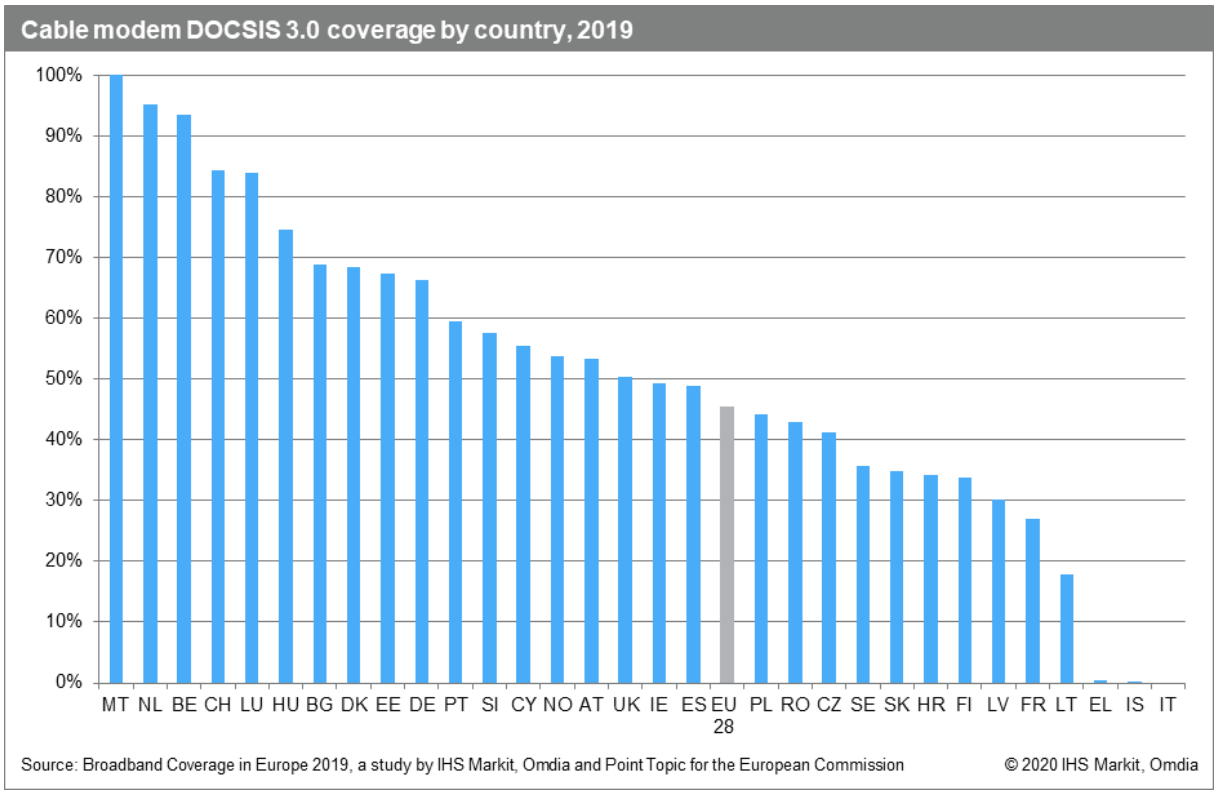
As was the case last year, FTTP was the fastest growing NGA technology, increasing by 4.5 percentage points in the twelve months to mid-2019. Latvia remained the country with the highest FTTP coverage level, with 88.1% of households passed. Last year, Latvia was the only study country with FTTP availability over 80.0%, but by mid-2019, two new countries had achieved this level: Iceland and Spain (both reaching 80.4%). Norway recorded the largest FTTP increase over the study period, with FTTP coverage growing by 19.4 percentage points and reaching 78.1% Norwegian households by the end of June 2019.



On average, a third (33.5%) of EU homes were passed by FTTP networks with only ten countries recording FTTP coverage below the EU average. Whilst FTTP networks were available in all study countries, availability remained limited in some. However, this year, only one country recorded FTTP coverage below 5.0%: Belgium, with 3.6% of households passed, and only one other country (Greece) recorded FTTP coverage below 10.0%. In both countries, operators have prioritised VDSL upgrades to existing DSL networks as opposed to investing in the typically more expensive FTTP technology. Similar strategy was adopted by operators in other countries such as Austria, Germany, Cyprus, and the UK, which all recorded FTTP coverage levels below 20% in mid-2019. Such operators tend to view the speeds associated with VDSL technologies as sufficient to satisfy current demand. In addition, some of these operators have also been trailing out solutions such as G.fast to increase achievable speeds using existing copper infrastructure.

4.3.2.4 Total cable modem DOCSIS 3.0 coverage by country

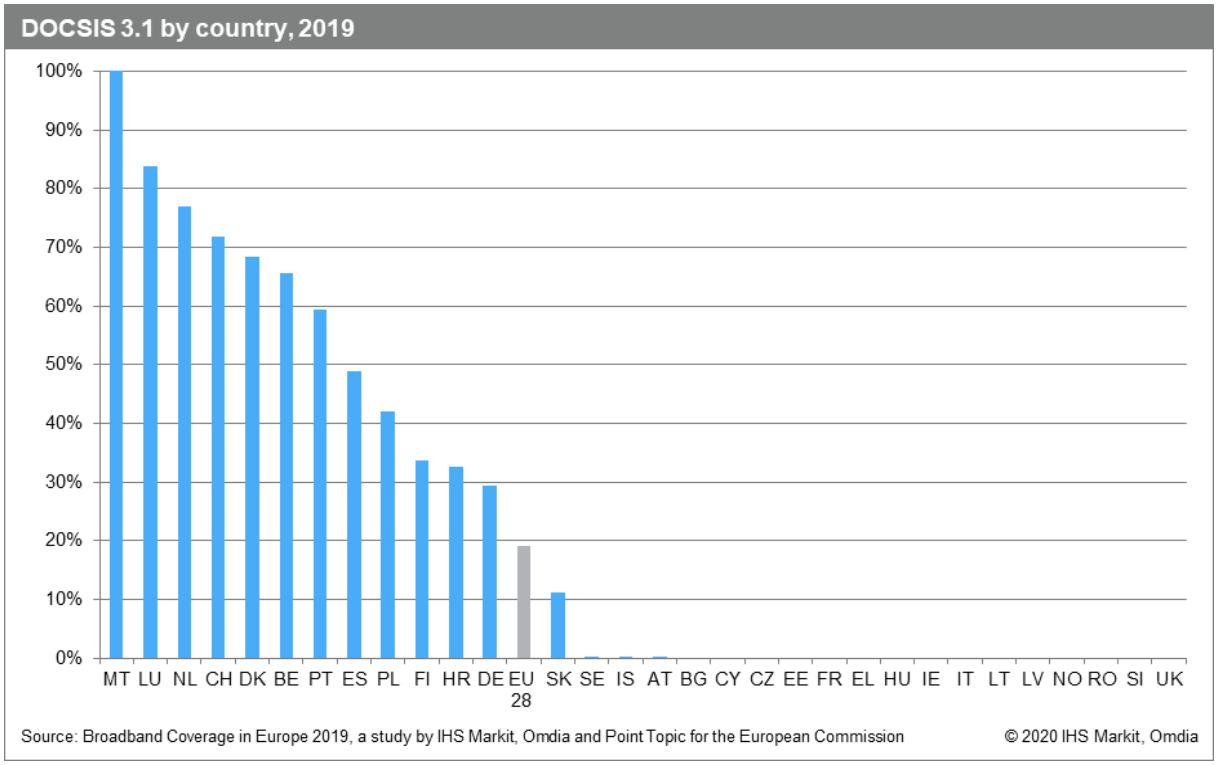
At the end of June 2019, cable modem DOCSIS 3.0 was available to 45.5% of EU households, up from 44.4% in mid-2018. As was the case in previous iterations of this study, cable availability varied widely across study countries, with complete absence of coverage in Italy to universal coverage in Malta. The Netherlands and Belgium were the only other two countries where coverage exceeded 90.0%, and Switzerland and Luxembourg the only other two countries where coverage exceeded 80.0%.



Overall, cable modem DOCSIS 3.0 coverage has remained relatively stable over the last few years, owing to cable networks having largely been upgraded to DOCSIS 3.0 already, and the lack of further deployment of cable networks. By mid-2019, Romania recorded the largest cable modem DOCSIS 3.0 coverage increase, with an extra 5.1 percentage points of households covered since mid-2018. However, decommission of cable networks and their upgrade to FTTH has already started in a number of study countries, with Slovenia witnessing the largest decrease, with 2.2 percentage points since mid-2018, owing to adjustments made to data by Slovenia's largest cable operator.

4.3.2.5 Total DOCSIS 3.1 coverage by country

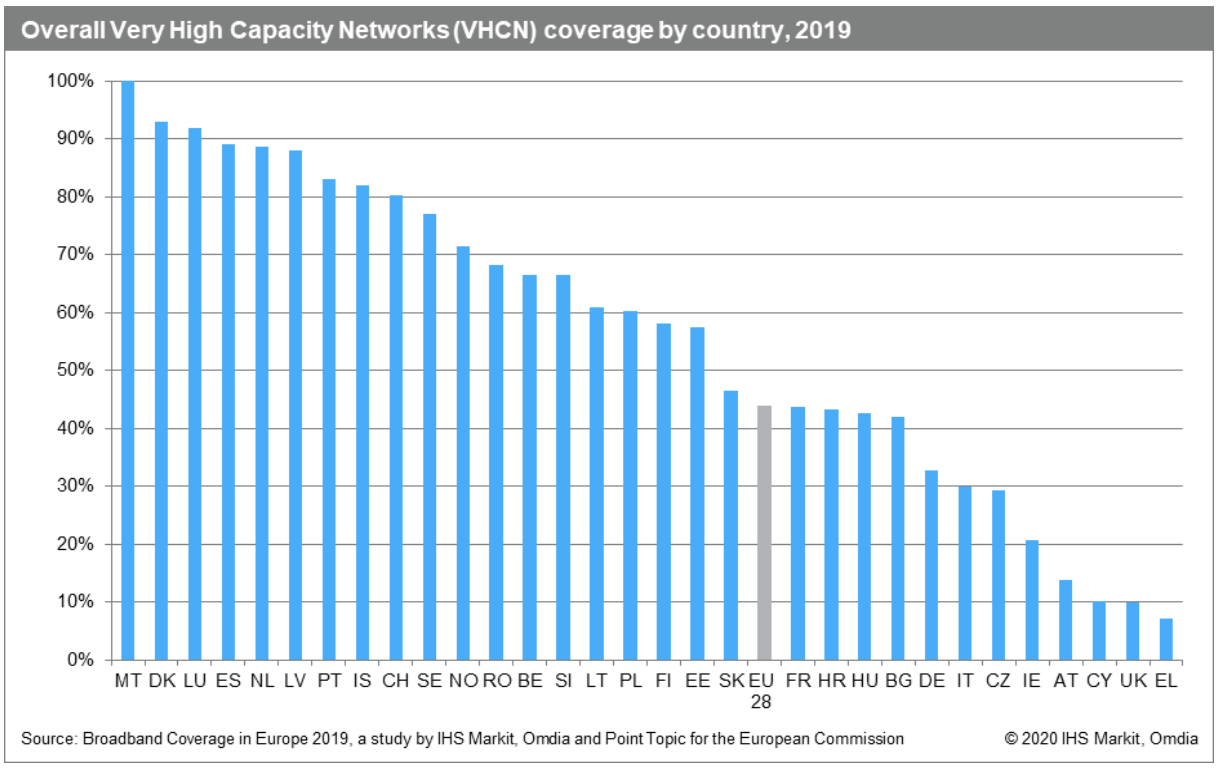
The launch of the DOCSIS 3.1 standard has allowed cable operators to compete with fibre operators on the ultrafast broadband market. At the end of June 2019, the EU average for DOCSIS 3.1 coverage stood at 19.2%, well below the DOCSIS 3.0 average of 45.5%, meaning that less than half (42.1%) of DOCSIS 3.0 networks has been upgraded to the DOCSIS 3.1 standard by the end of June 2019.



DOCSIS 3.1 coverage varied widely across study countries, between 100.0% in Malta, and 0.0% in sixteen study countries. It is to be noted that in Croatia, Denmark, Finland, Luxembourg, Malta, Poland, Portugal and Spain, cable networks have been upgraded almost entirely or entirely to the DOCSIS 3.1 standard.

4.3.3 Overall Very High Capacity Networks (VHCN) coverage by country

In 2019, DG CONNECT requested that a new combination coverage category to be estimated on a national and rural level, indicating overall Very High Capacity Networks (VHCN) coverage. This category includes fixed-line broadband access technologies primarily capable of achieving gigabit download speeds, namely FTTP and DOCSIS 3.1.



At the end of June 2019, 44.0% of EU households were passed by at least one FTTP or DOCSIS 3.1 network. Coverage ranged between 7.1% in Greece and 100.0% in Malta. Among the countries registering the highest overall VHCN coverage were those with most widespread DOCSIS 3.1 coverage, such as Malta, Luxembourg, and Denmark, all reaching coverage levels over 90.0%.

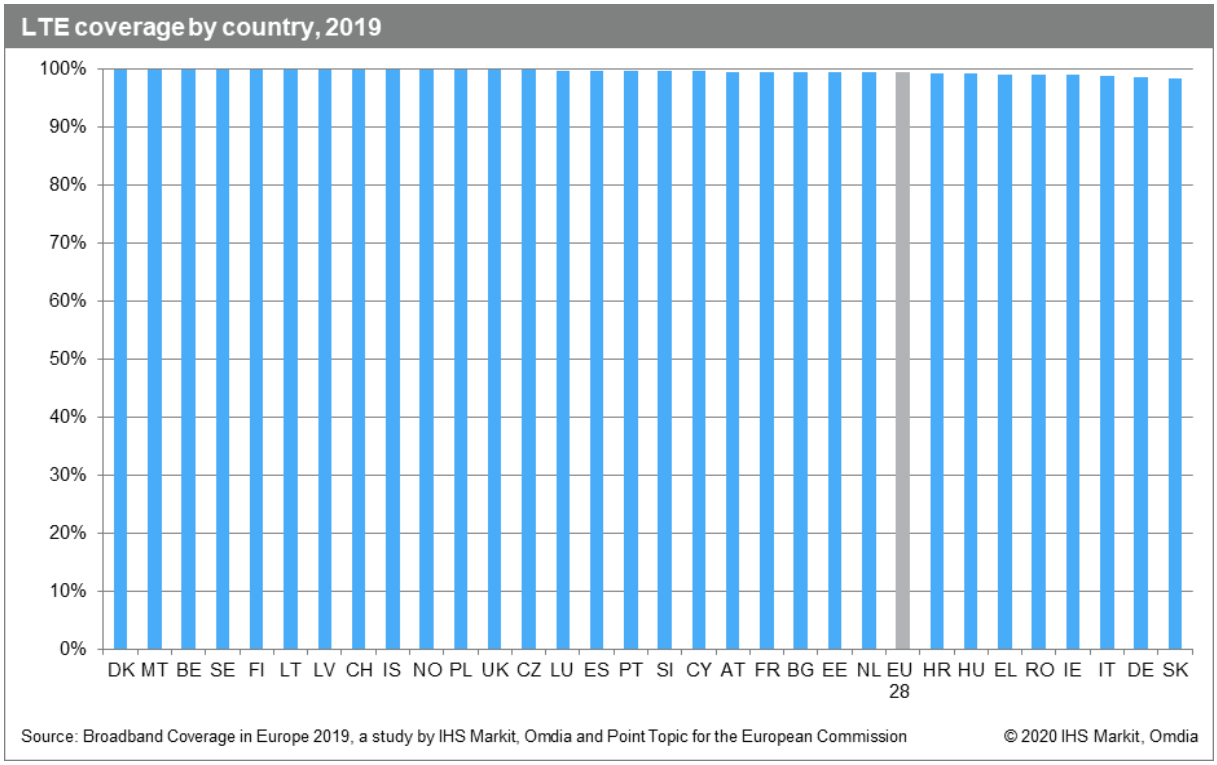
On the other hand, countries such as Greece, the UK, and Cyprus recorded the lowest levels, due to operators' preference for VDSL upgrades over FTTP deployments, and cable operators not yet having started on DOCSIS 3.1 upgrades.

4.3.4 Mobile broadband technologies coverage by country

4.3.4.1 Total LTE coverage by country

LTE coverage in the EU increased by 0.5 percentage point in the twelve-month period to mid-2019, reaching 99.5% of households. This minimal increase in coverage comes as a result from high levels of coverage already achieved in mid-2018 (98.9%). At the end of June 2019, 23 study countries reported LTE coverage levels above the EU average of 99.5%. Moreover, seven study countries registered complete LTE coverage, that is two more countries than in mid-2018.

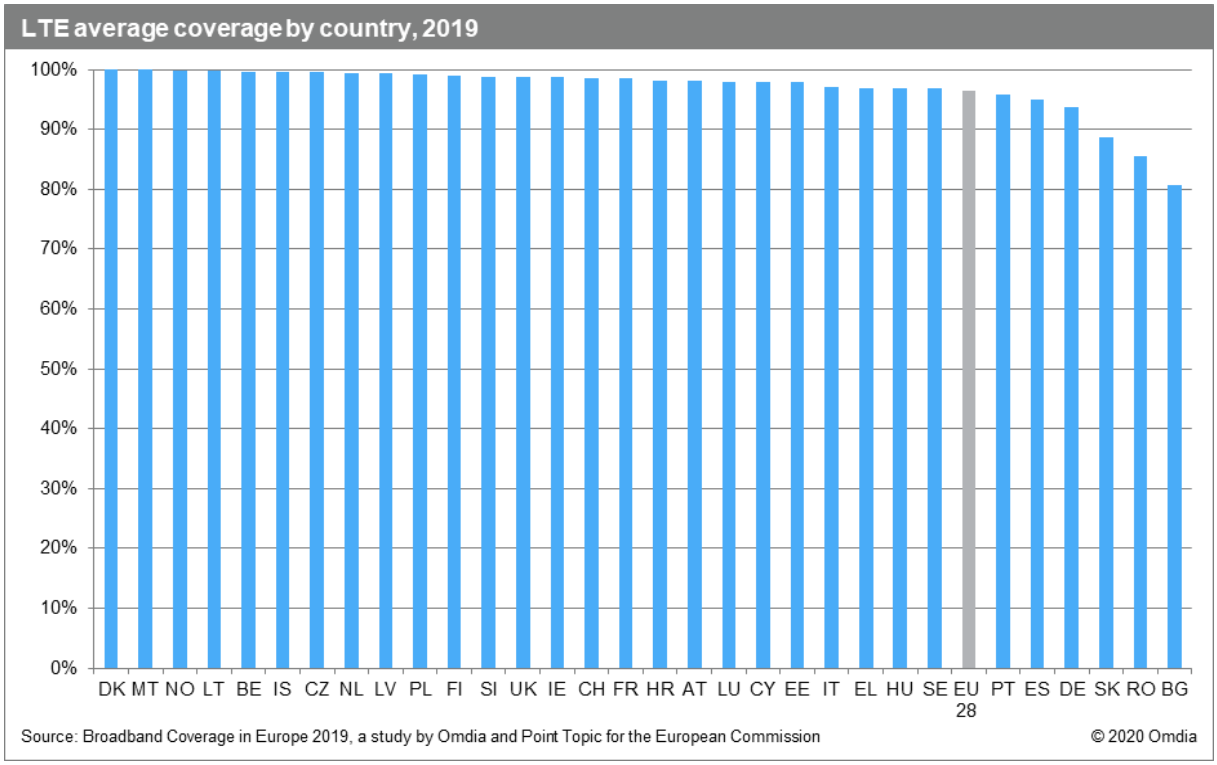
Ireland recorded the largest increase in LTE coverage in the twelve months to June 2019, growing by additional 3.2 percentage points compared to mid-2018. Aside from Ireland, only Cyprus and Romania recorded LTE coverage increases higher than 2.0 percentage points. Slovakia was the country with the lowest LTE availability, at 98.4% of households covered, and together with Slovakia, only Italy and Germany recorded LTE coverage below 99.0%.



4.3.4.2 Average LTE coverage by country

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

By the end of June 2019, operators in Denmark and Malta provided universal average LTE coverage. As a result, no matter which particular operator a consumer decides to use, there will be near-ubiquitous coverage. Meanwhile, the average LTE coverage was lower than 90.0% in only three countries: Bulgaria, Romania, and Slovakia.



4.3.5 Total satellite coverage by country

At the end of June 2019, all study countries, with the exception of Iceland, were covered by KA-band satellite, which is able to deliver a 2Mbps broadband service. However, in certain countries (Estonia and Norway) there was only partial satellite coverage. As in 2018, satellite beams are still capable of reaching 75.4% of Estonian households and 97.2% of Norwegian households and are now reaching 100.0% of Lithuanian and Latvian households. In addition, satellite dishes with 1.2m diameter are required to receive satellite broadband services in these areas, making the widespread use of satellite broadband in these countries more challenging.

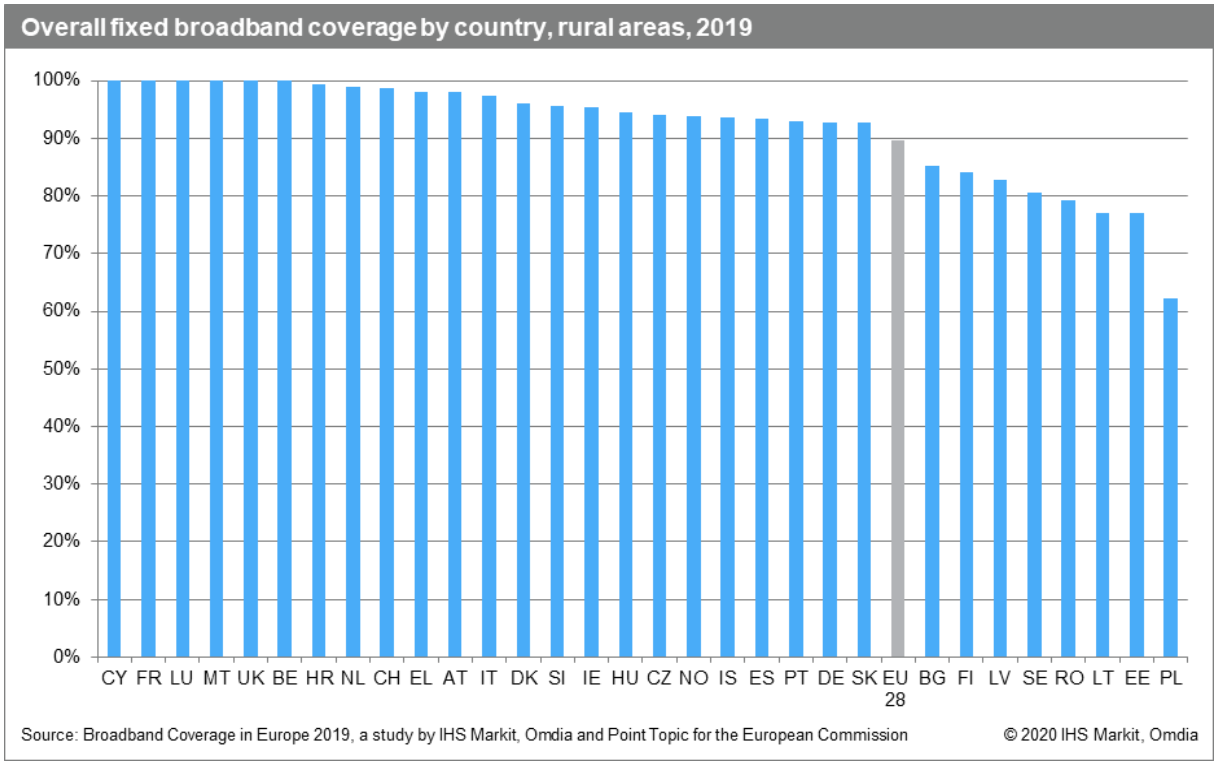
Moreover, it is important to note that while satellites are technically able to cover all households in the reach of a particular beam, the actual number of users that can be serviced by a single beam is limited by the peak average bandwidth usage, thus restricting number of serviceable homes in a particular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

As in the previous year, the research team estimated the total EU coverage of satellite broadband as reaching over 99.0% of EU households. Satellite coverage in rural areas was assumed to be identical to the total satellite coverage and satellite coverage for overseas administrative areas was assumed to be the same as coverage of the respective countries to which they belong (France, Portugal and Spain).

4.4 Country comparison by rural technology coverage

4.4.1 Rural overall fixed broadband coverage by country

Rural fixed coverage continued to be lower than national fixed coverage, except in instances where universal coverage levels were recorded. By mid-2019, rural fixed broadband coverage reached 89.7% of rural households compared to national coverage of 97.1%. However, the gap between total fixed coverage and rural fixed coverage continues to reduce. In mid-2019, the gap closed to 7.4 percentage points, compared with 9.3 percentage points in mid-2018.



Eight countries reported rural fixed broadband coverage below the EU average (89.7%), with only four countries (Poland, Estonia, Lithuania, and Romania) recording levels below 90.0%. Poland recorded the lowest rural fixed broadband coverage of the study, with 62.2% of rural homes passed. Rural fixed broadband coverage was universal in Cyprus, France, Luxembourg, Malta and the UK.

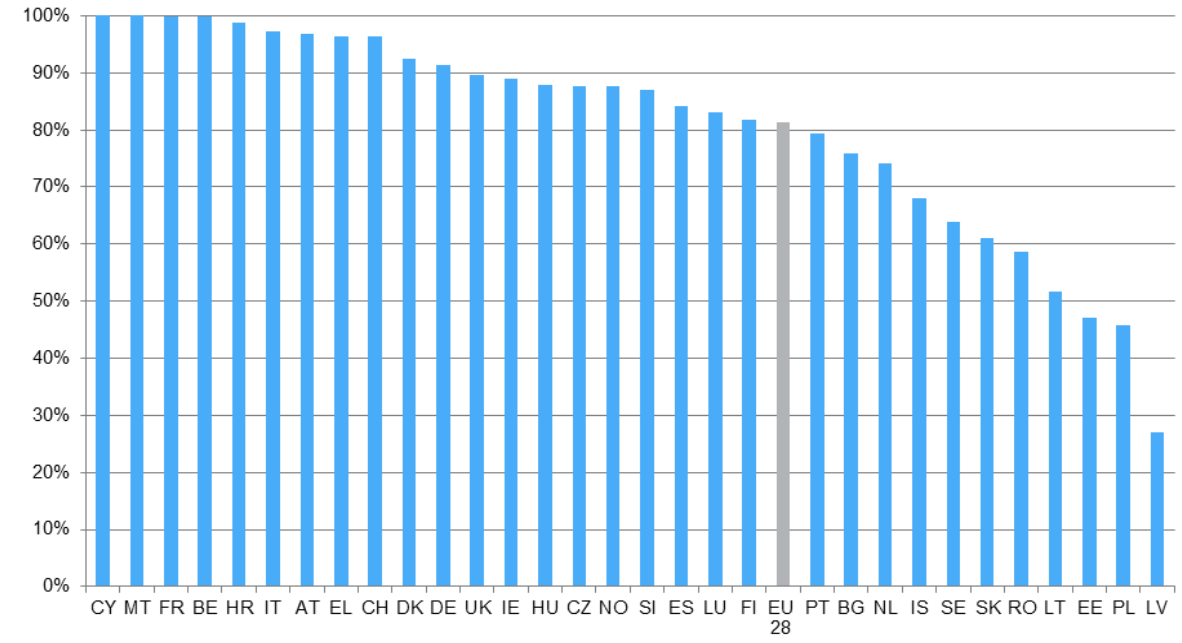
It should be noted that data on rural coverage collected from NRAs and individual operators was not always as comprehensive as total market-level data. In cases when information on rural coverage was incomplete, the research team estimated rural coverage. These estimations assume that a technology will typically cover a particular rural area only when urban or non-rural areas within the same region reach universal coverage.

4.4.1.1 Rural DSL and FWA coverage by country

DSL continued to be by far the most pervasive fixed broadband technology in terms of the number of rural homes passed, reaching 81.4% of rural EU households. This equalled to a 1.2 percentage increase during the twelve months to the end of June 2019. When compared to the total EU average DSL coverage, rural DSL coverage was 9.8 percentage points lower and the difference between total and rural DSL coverage remained considerable in some countries, such as Iceland (29.3 percentage points) and Sweden (23.7 percentage points).

In mid-2019, only eleven countries recorded rural DSL coverage levels below the EU average (81.4%). As was the case last year, Poland, Estonia, and Latvia reported the lowest rural DSL coverage levels, at 27.0%, 45.7% and 47.0% respectively. Norway reported the highest increase in DSL rural coverage, at 14.2 percentage points. Within the EU, Hungary recorded the largest increase, at 5.1 percentage points.

DSL coverage by country, rural areas, 2019

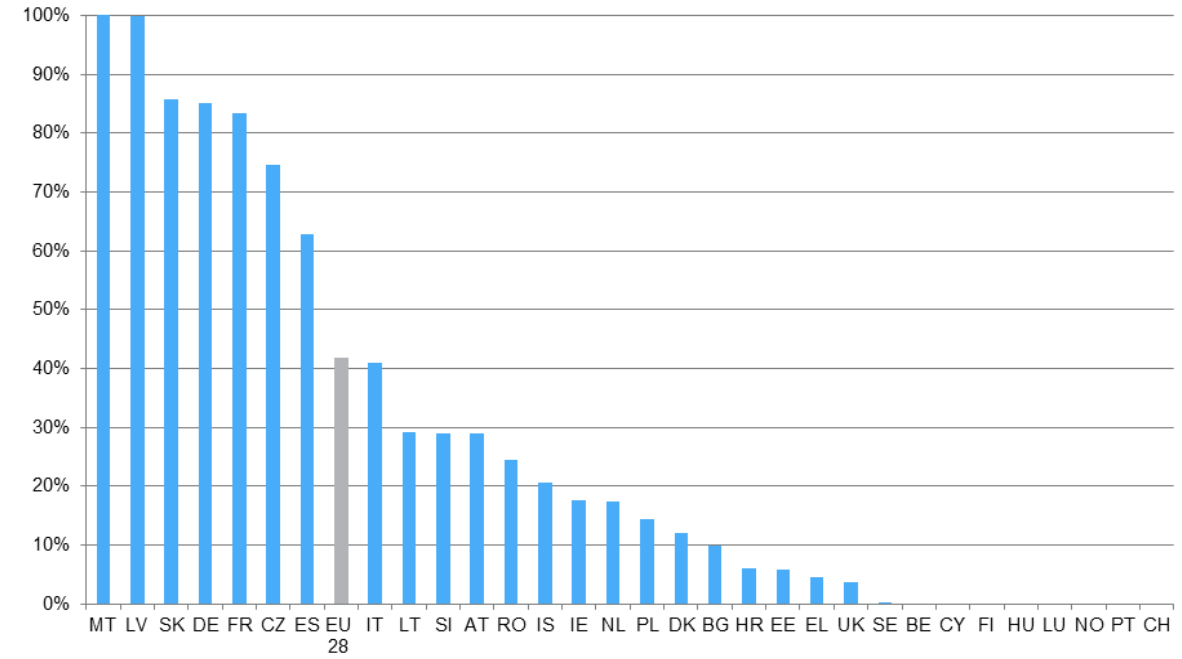


Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

However, other technologies can serve as a partial substitute for DSL in rural areas meaning that countries with low-DSL coverage in rural areas are often among the leaders in terms of coverage by other technologies. For instance, Latvia recorded the lowest rural DSL coverage and the highest FTTP coverage of rural areas of all study countries, at 73.2% of households passed.

In some countries, Fixed Wireless Access (FWA) services provide a significant boost to rural connectivity, especially in areas where deployment of other fixed technologies is challenging from both technical and economic point.

FWA coverage by country, rural areas, 2019

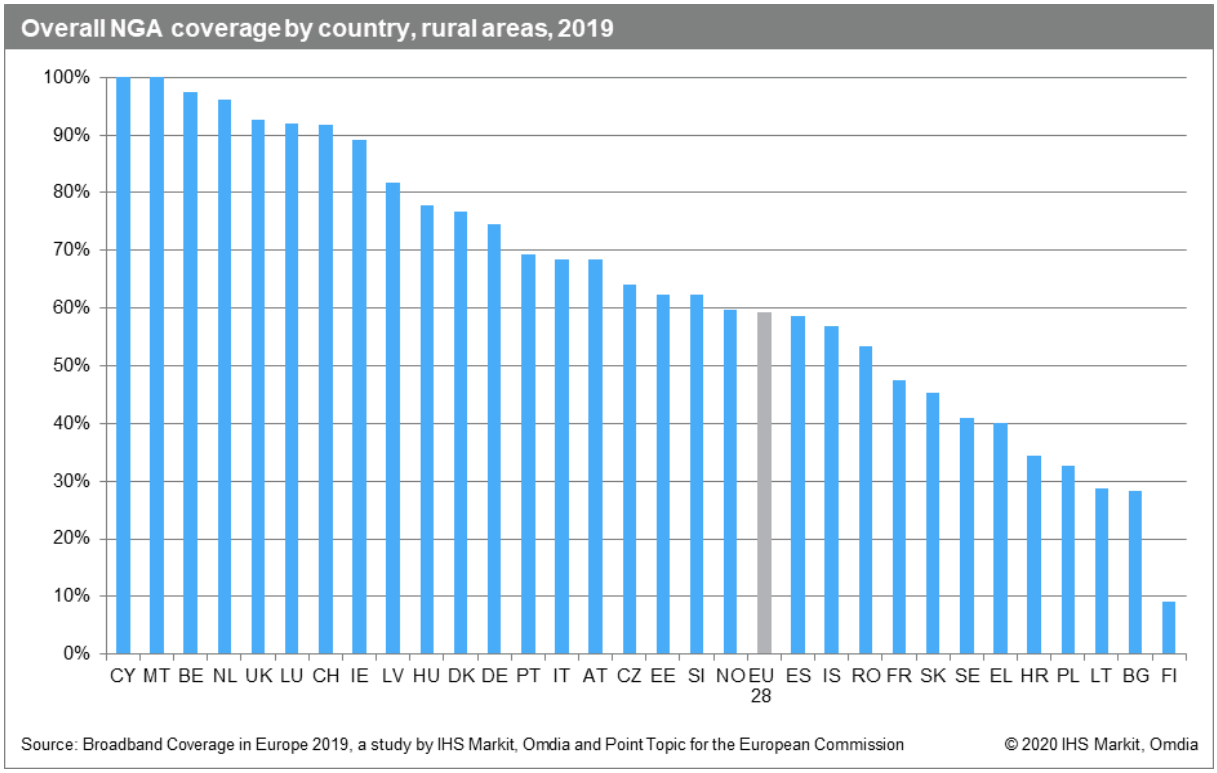


Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

4.4.2 Rural NGA coverage by country

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

At the end of June 2019, the rural EU average for NGA coverage was 59.3%, an increase of 7.6 percentage points compared to mid-2018. Although rural NGA coverage was 26.5 percentage points below total NGA coverage (85.8%), the gap between the two categories continued to close during the study period. For comparison, the coverage difference between national and rural NGA coverage was 30.9 percentage points in mid-2018, and 34.7 percentage points in mid-2017. This indicates that network deployment is shifting towards rural areas, as urban areas start to reach saturation for NGA coverage.



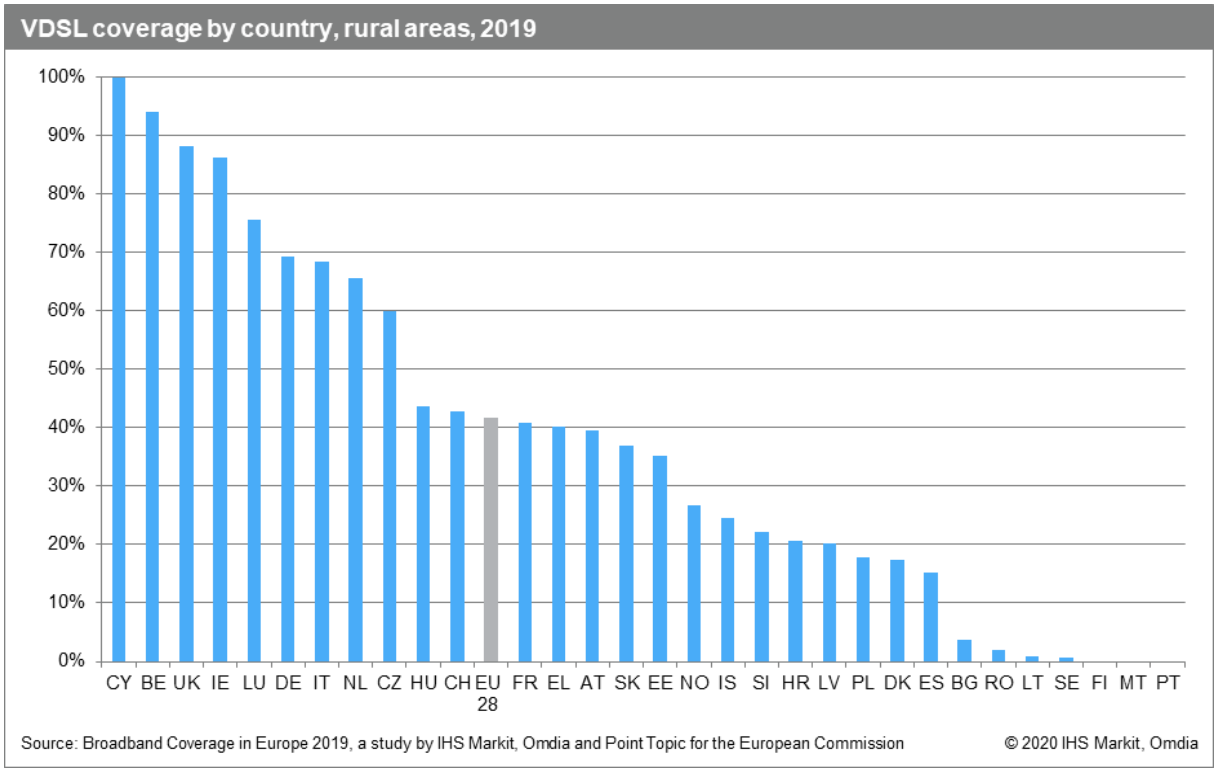
This year, both Cyprus and Malta recorded universal rural NGA coverage. Five other countries recorded rural NGA coverage exceeding 90.0%: Belgium, the Netherlands, the UK, Luxembourg, and Switzerland. Six countries reported double-digit increases in rural NGA availability, with Cyprus recording the largest increase, at 35.0 percentage points since mid-2018.

In total, twelve countries recorded NGA availability below the EU average of 59.3%. Finland remained the only country with rural NGA availability levels below 10.0% (9.1%), as mobile technologies are key to providing broadband coverage in rural Finland.

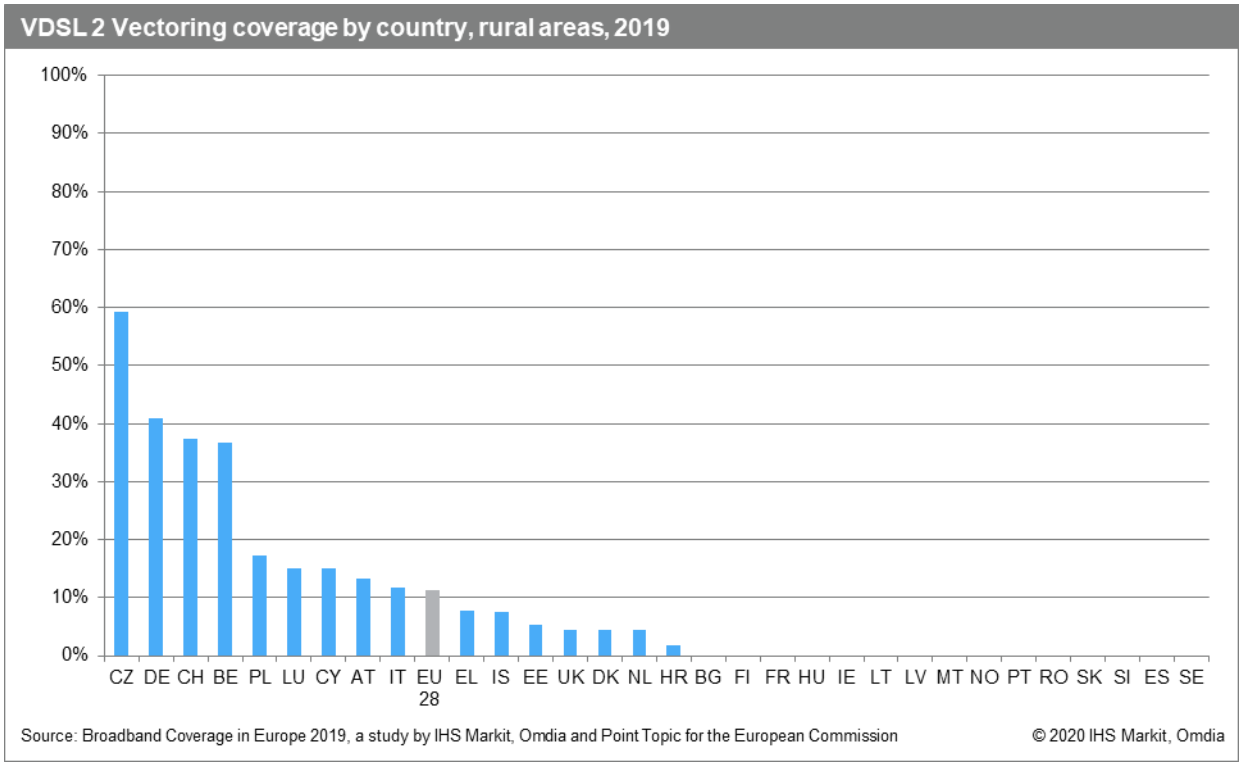
4.4.2.1 Rural VDSL, VDSL 2 Vectoring, FTTP, DOCSIS 3.0 and DOCSIS 3.1 coverage by country

As in previous years, VDSL was by far the most widespread rural NGA technology. Rural VDSL networks passed 41.8% of rural homes in the EU, a 5.6 percentage point increase during the twelve months to mid-2019.

Cyprus was the only country to record universal rural VDSL coverage, whilst in four other countries (Belgium, the UK, Ireland, and Luxembourg) VDSL services were available to more than three-quarters of rural households. On the other hand, VDSL remained absent from rural regions of Finland, Malta, and Portugal.

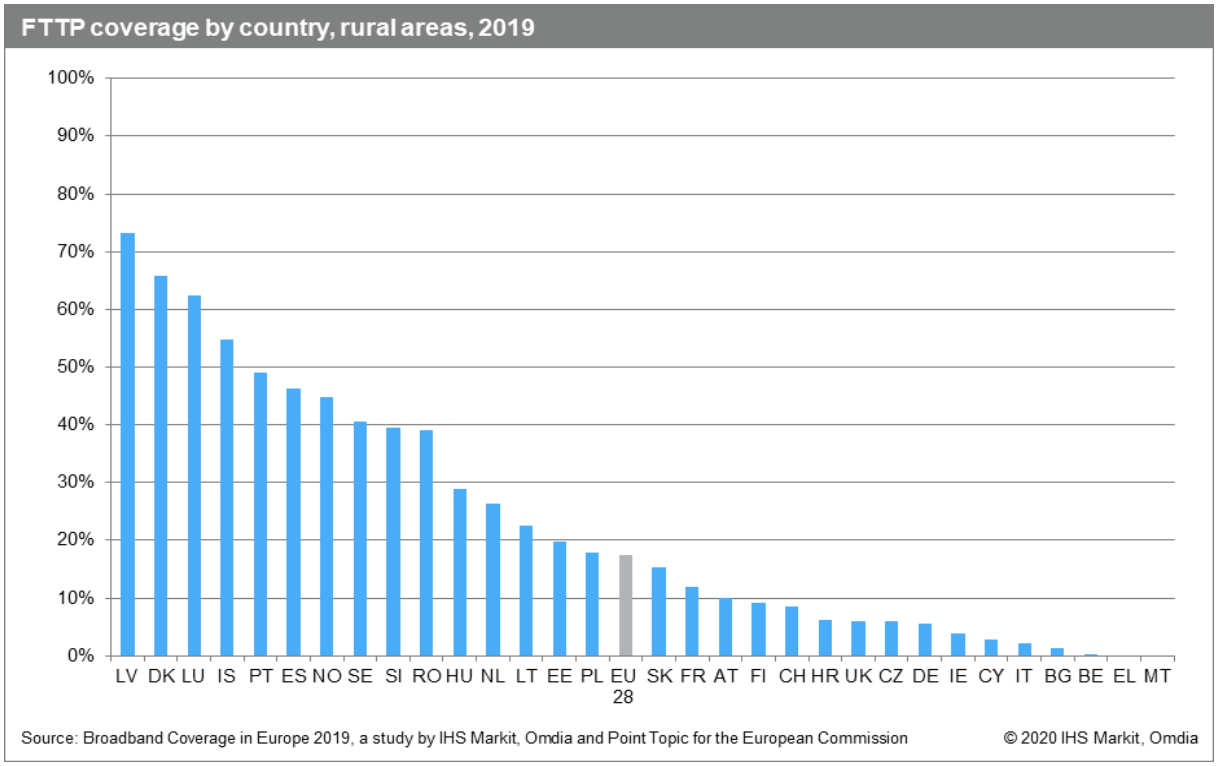


At the end of June 2019, VDSL2 Vectoring was absent from rural regions of 15 study countries. The EU average stood at 11.3%, with Czechia recording the highest coverage level, at 59.3%. By the end of June 2019, 99.0% of rural VDSL networks were based on VDSL 2 Vectoring in Czech rural areas.

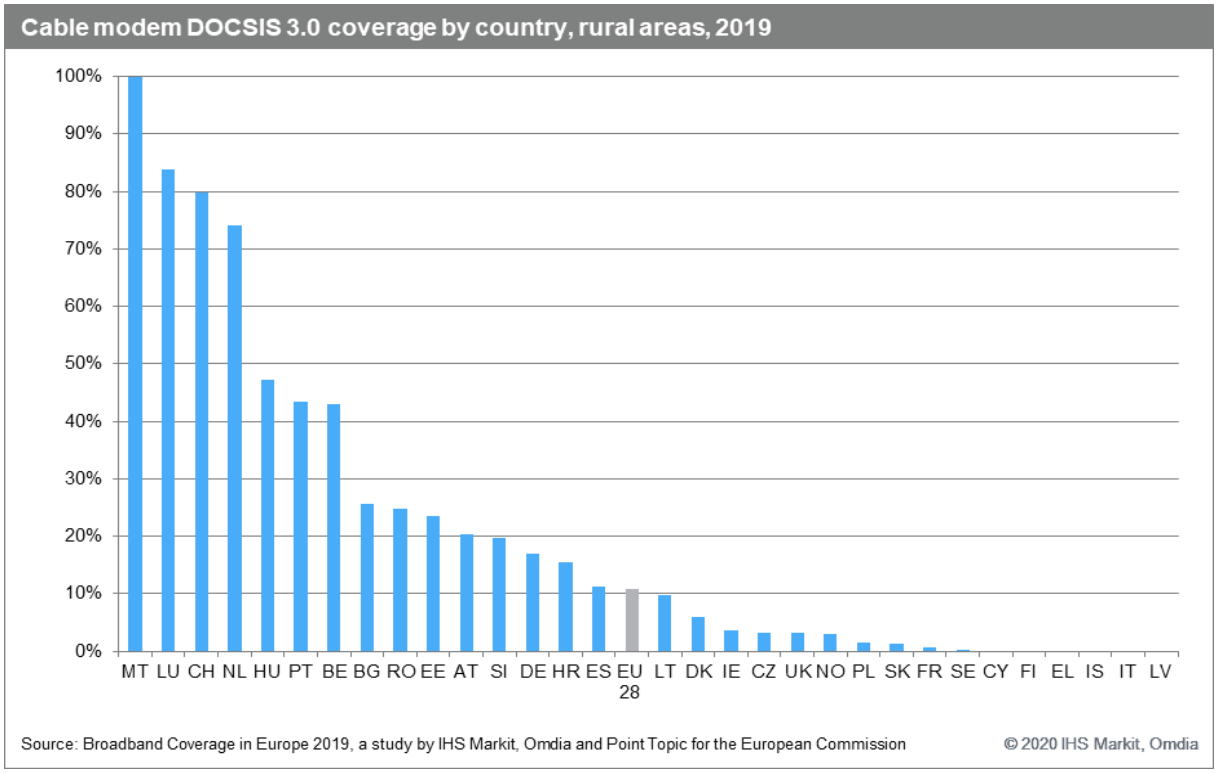


By mid-2019, Latvia remained the leader in terms of rural FTTP coverage (73.2%). In addition, FTTP networks passed nearly two-thirds of rural homes in Denmark and Luxembourg, and more than half of rural Iceland households had access to FTTP services. Luxembourg also recorded the largest year-on-year increase, with rural FTTP coverage growing by 25.4 percentage points.

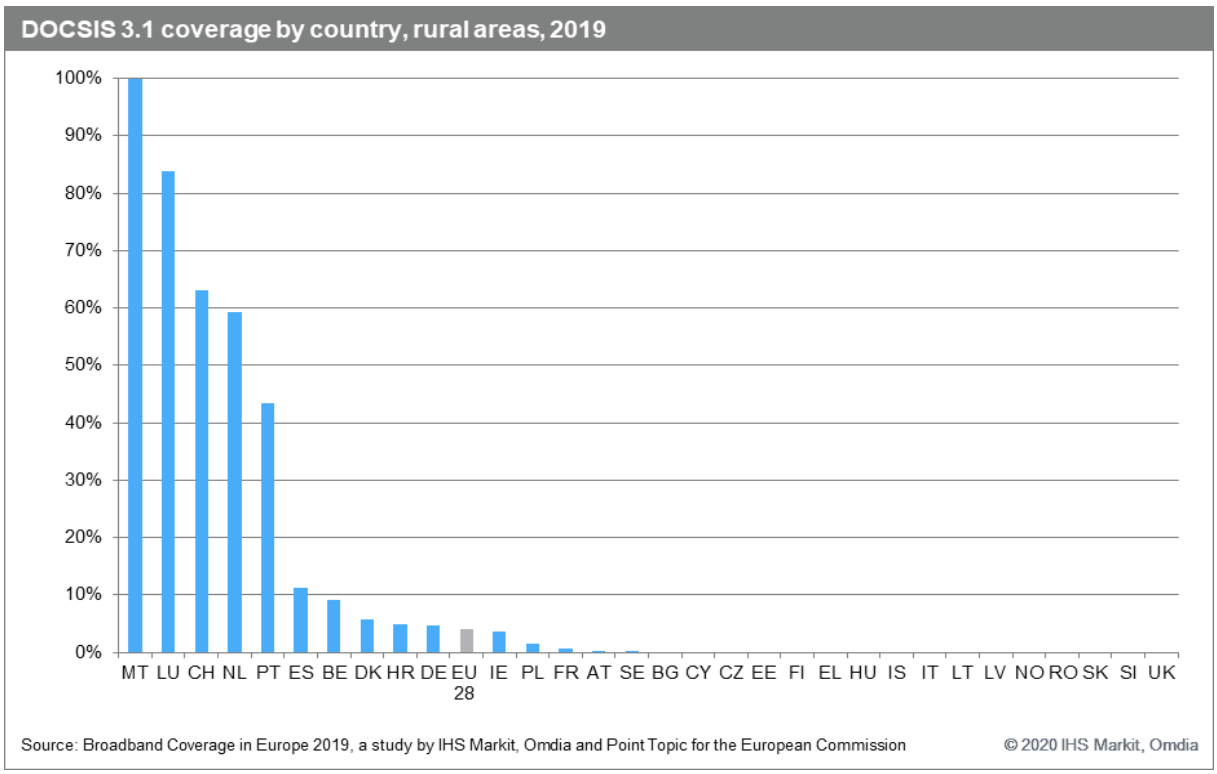
Conversely, sixteen countries recorded rural FTTP coverage below the EU average of 17.5% and FTTP remained absent from rural regions of Malta and Greece.



Malta remained the leader in terms of rural DOCSIS 3.0 coverage (100.0%). Apart from Malta, only Luxembourg, Switzerland and the Netherlands recorded rural DOCSIS 3.0 availability higher than 50.0%. Over the study period, Hungary recorded the largest rural cable modem DOCSIS 3.0 increase in coverage, at 9.3 percentage points.

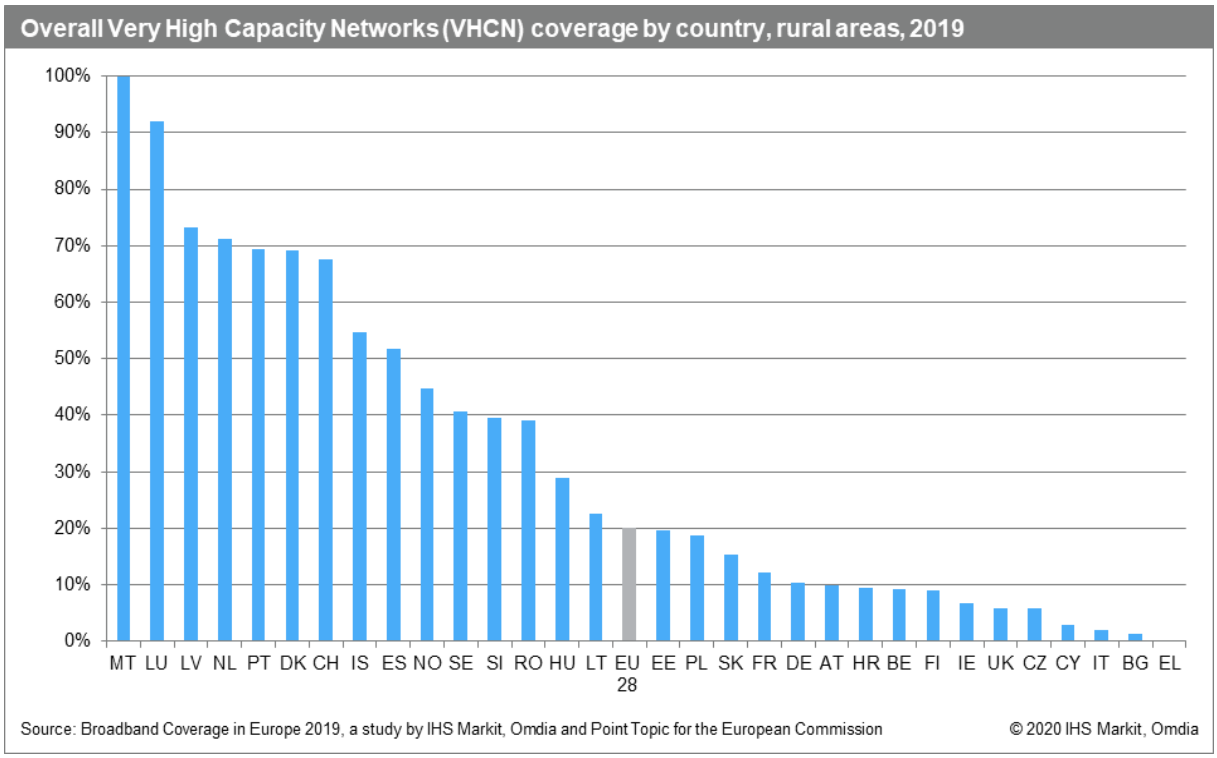


At the end of June 2019, DOCSIS 3.1 was absent from rural regions of 19 study countries. DOCSIS 3.1 was also the technology with the lowest rural EU average, at 4.1% of rural households. Malta was the only country to record complete rural DOCSIS 3.1 coverage, and only three other countries (Luxembourg, Switzerland, and the Netherlands) recorded coverage over 50.0%.



4.4.3 Rural Very High Capacity Networks (VHCN) coverage by country

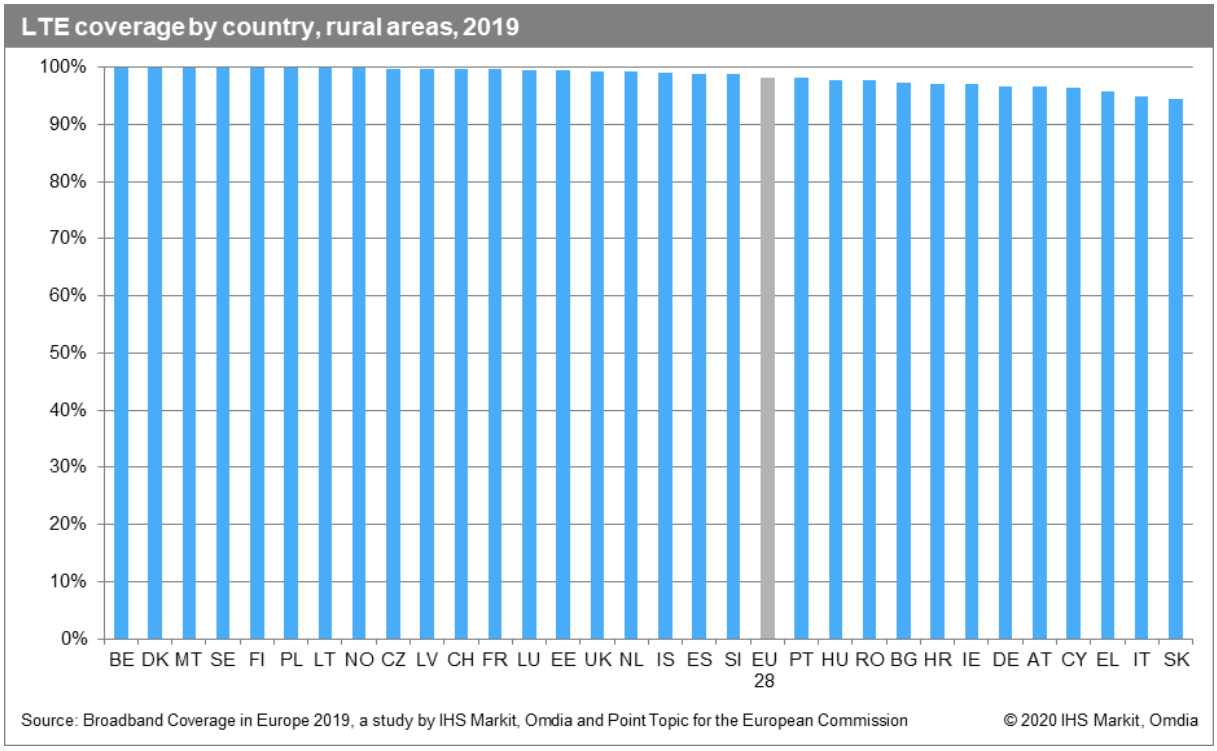
By mid-2019, 20.1% of rural EU homes were passed by either FTTP or DOCSIS 3.1 networks. On average, VHCN coverage of rural regions across the EU was 23.8 percentage points lower than on a national level.



Greece was the only country to record complete absence of VHCN coverage, with rural regions being covered by DSL-based technologies only. Sixteen countries recorded rural VHCN coverage levels below the EU average, with Malta being the only country with complete VHCN rural coverage.

4.4.4 Rural LTE coverage by country

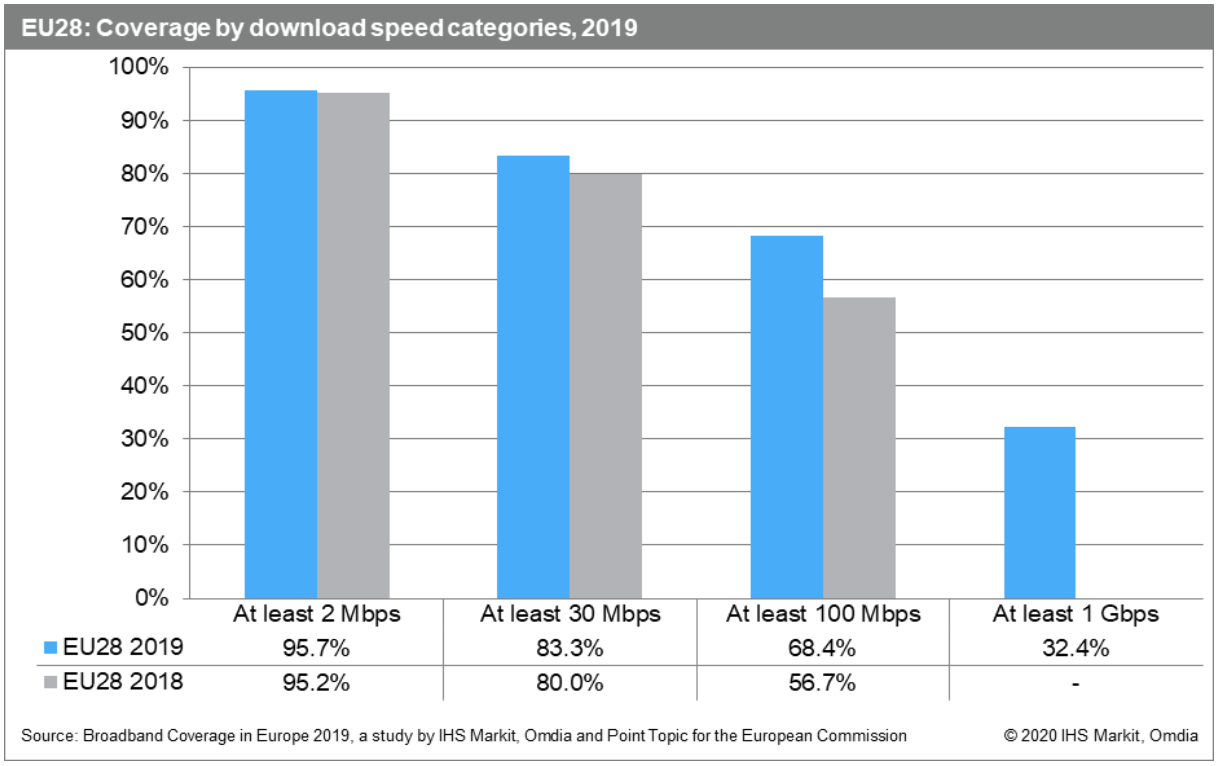
By mid-2019, the EU average for rural LTE coverage was 98.2%, an increase of 2.1 percentage points in the twelve-month period. Belgium, Denmark, Malta and Sweden recorded universal LTE coverage in rural areas, with thirteen other study countries reporting rural LTE coverage above 99.0%. This year, all study countries recorded rural LTE coverage levels over 90.0%. Cyprus recorded the largest rural LTE coverage increase since mid-2018, at 16.8 percentage points.



4.5 Coverage by speed categories

4.5.1 Europe-wide coverage by speed categories

Examining coverage levels by the individual speed categories, at the end of June 2019, 95.7% of EU homes were passed by fixed broadband networks capable of providing them with actual download speeds of at least 2 Mbps.



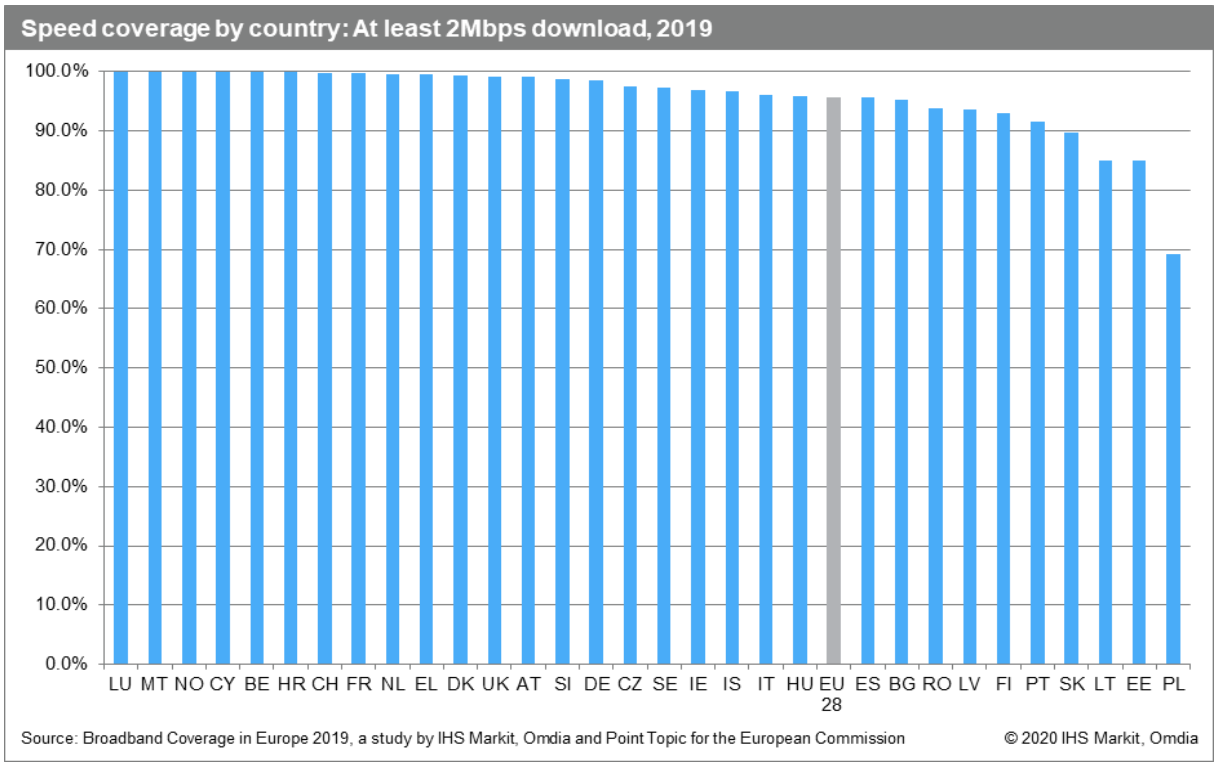
By mid-2019, 83.3% of EU households had access to at least one fixed broadband service that provided actual download speeds of at least 30 Mbps, a 3.3 percentage point increase since mid-2018. This increase was driven by the overall growth in NGA coverage as well as the technological advancements that resulted in a higher number of VDSL networks being capable of supporting 30 Mbps download speeds.

The At least 100 Mbps speed coverage category recorded the largest coverage increase since mid-2018, growing by 11.7 percentage points year-on-year. This is a result of inclusion of VDSL2 Vectoring in this category as well as increases in FTTP coverage. At the end of June 2019, 68.4% of EU households had access to broadband services capable of providing at least 100 Mbps actual download speeds.

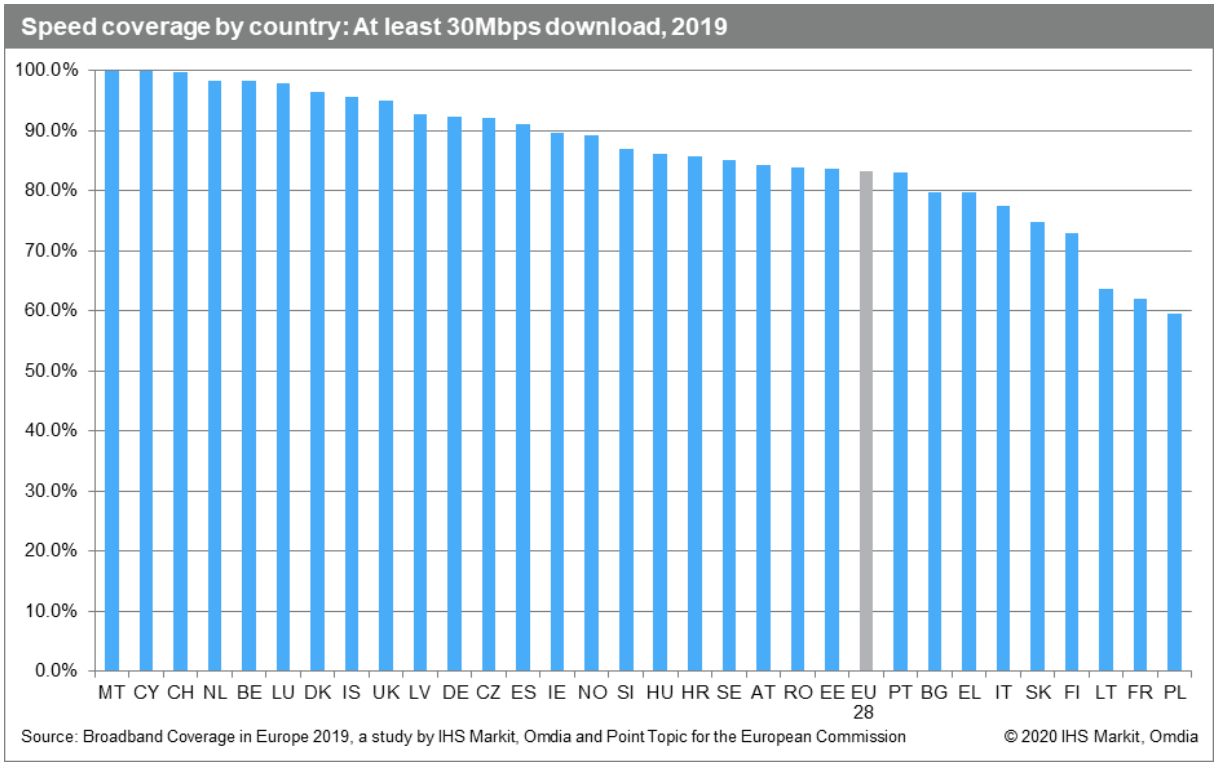
At the end of June 2019, almost a third (32.4%) of EU households had access to broadband services capable of providing at least 1 Gbps actual download speeds. This category has been included in the BCE study for the first time in 2019, to provide an indication of progress in achieving the Connectivity for a European Gigabit Society targets.

4.5.2 Country comparison of coverage by speed categories

By mid-2019, in most study countries availability of fixed broadband services capable of at least 2 Mbps actual download speeds reached over 90.0%, with only Poland, Estonia, and Lithuania standing below 90.0%.



At the end of June 2019, fixed broadband services capable of at least 30 Mbps download speeds passed more than 60% of households in all study countries with the exception of Poland, which stood just below at 59.6%.

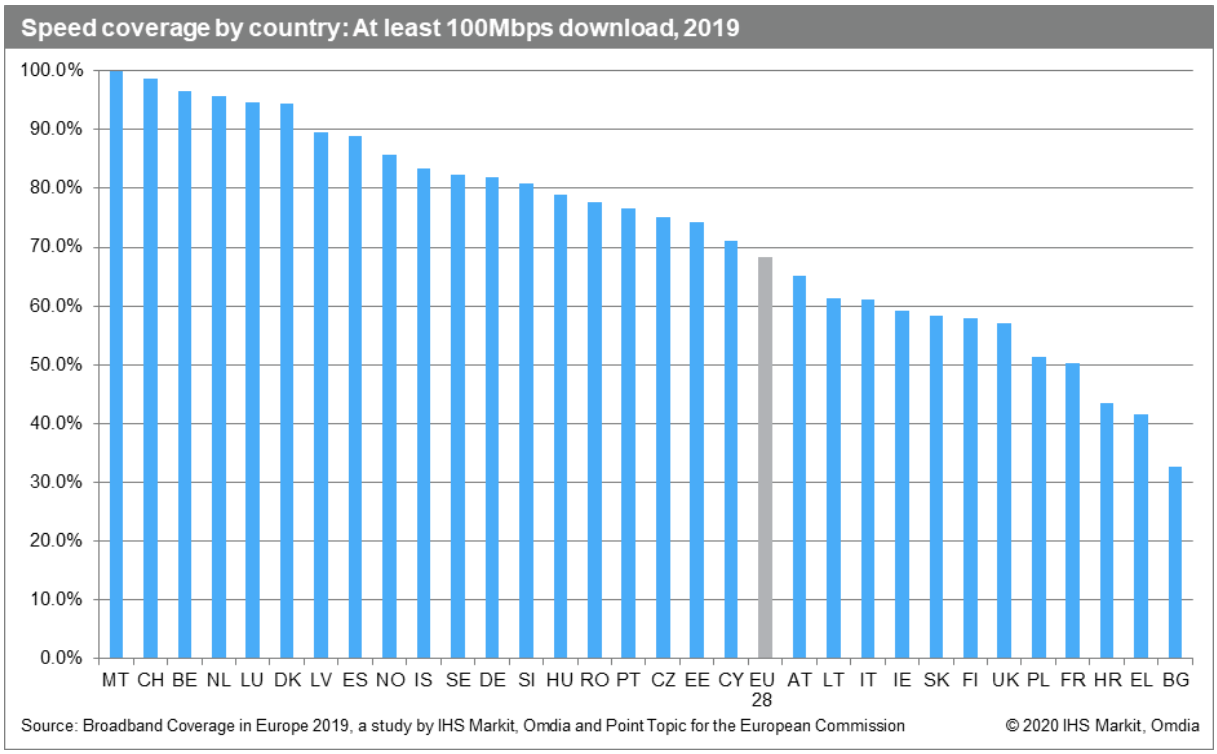


Malta and Cyprus recorded near universal at least 30 Mbps coverage and in eleven other countries (Switzerland, the Netherlands, Belgium, Luxembourg, Denmark, Iceland, the UK, Latvia, Germany,

Czechia, and Spain), high-speed broadband service capable of delivering at least 30 Mbps download speeds were available to more than 90% of households. Greece registered the highest growth with at least 30 Mbps coverage expanding by 18.7 percentage points in the twelve-month period to the end of June 2019.

Whilst significant improvements have been made in high-speed broadband connectivity in recent years, examining availability of at least 100 Mbps speeds shows that achieving universal coverage by 2025 will be challenging. At the end of June 2019, 68.4% of EU households had access to broadband services capable of providing at least 100 Mbps actual download speeds. Some considerable differences remain among individual countries. By mid-2019, over 90.0% of homes in six study countries (Malta, Switzerland, Belgium, the Netherlands, Luxembourg, Denmark) were passed with a fixed broadband service capable of reaching at least 100 Mbps actual download speeds, compared to only 32.6% of homes in Bulgaria.

Greece, which was the only country with no availability of at least 100 Mbps speed coverage in 2018, recorded the highest coverage increase growing by 41.2 percentage points by mid-2019. This growth can be primarily attributed to VDSL2 Vectoring being included in the at least 100 Mbps speed category as VDSL is the dominant NGA technology deployed in in the country.



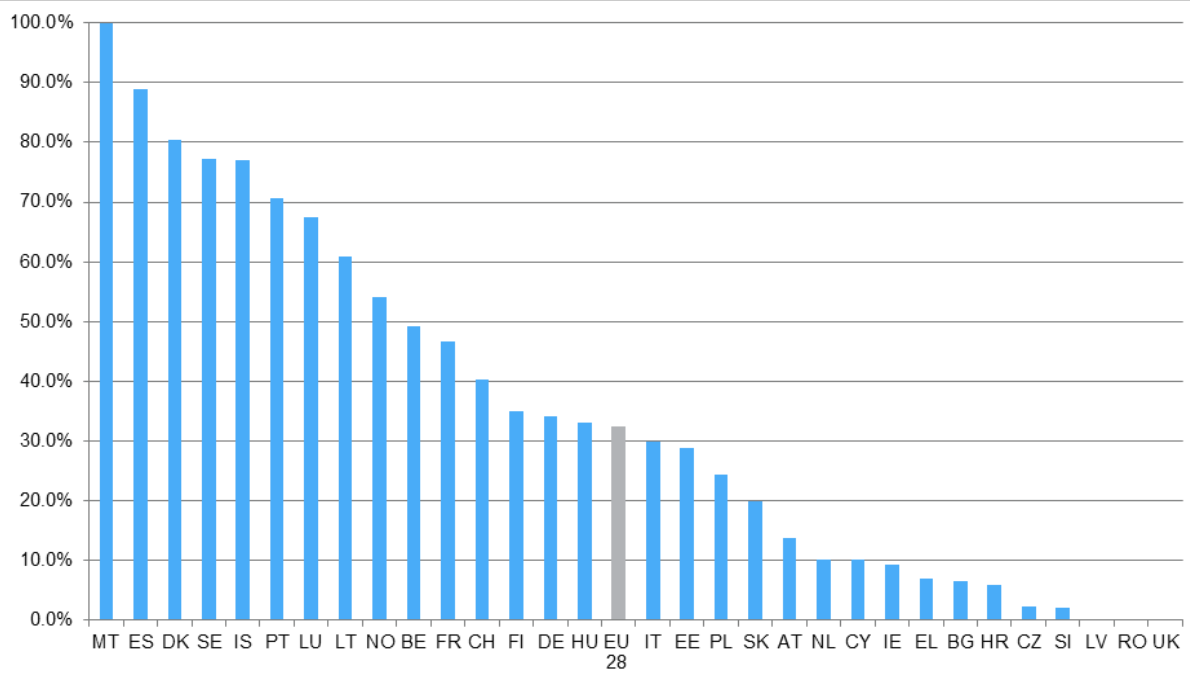
Great disparities can also be observed when analysing availability of services providing gigabit connectivity. At the end of June 2019, Malta was the only study country to record universal coverage by broadband services capable of providing at least 1 Gbps. In Spain, at least 1Gbps services were available to nearly 9 in 10 (89.0%) of households and 80.3% of Danish households had access to very high capacity broadband services.

Interestingly, despite Latvia being the leader in FTTP coverage, there were no services providing at least 1Gbps download speeds available to Latvian households at the end of June 2019. However, given that FTTP infrastructure is widely deployed across the country, the Latvian operators have flexibility in terms of launching gigabit speed offering when the market conditions become ready.

In addition to Latvia, the UK was the only other country, where services providing at least 1Gbps download speeds were not available at the end of June 2019. In six countries (Slovenia, Czechia, Croatia, Bulgaria, Greece, Ireland) less than 1 in 10 households had access to at least 1Gbps broadband services.[8]

[8] It is worth noting that in several countries (e.g. Romania), internet offers with maximum/advertised "best-effort" speed of 1 Gbps are considered as a 940 Mbps offers and, thus, below the Gigabit reporting threshold.

Speed coverage by country: At least 1Gbps download, 2019

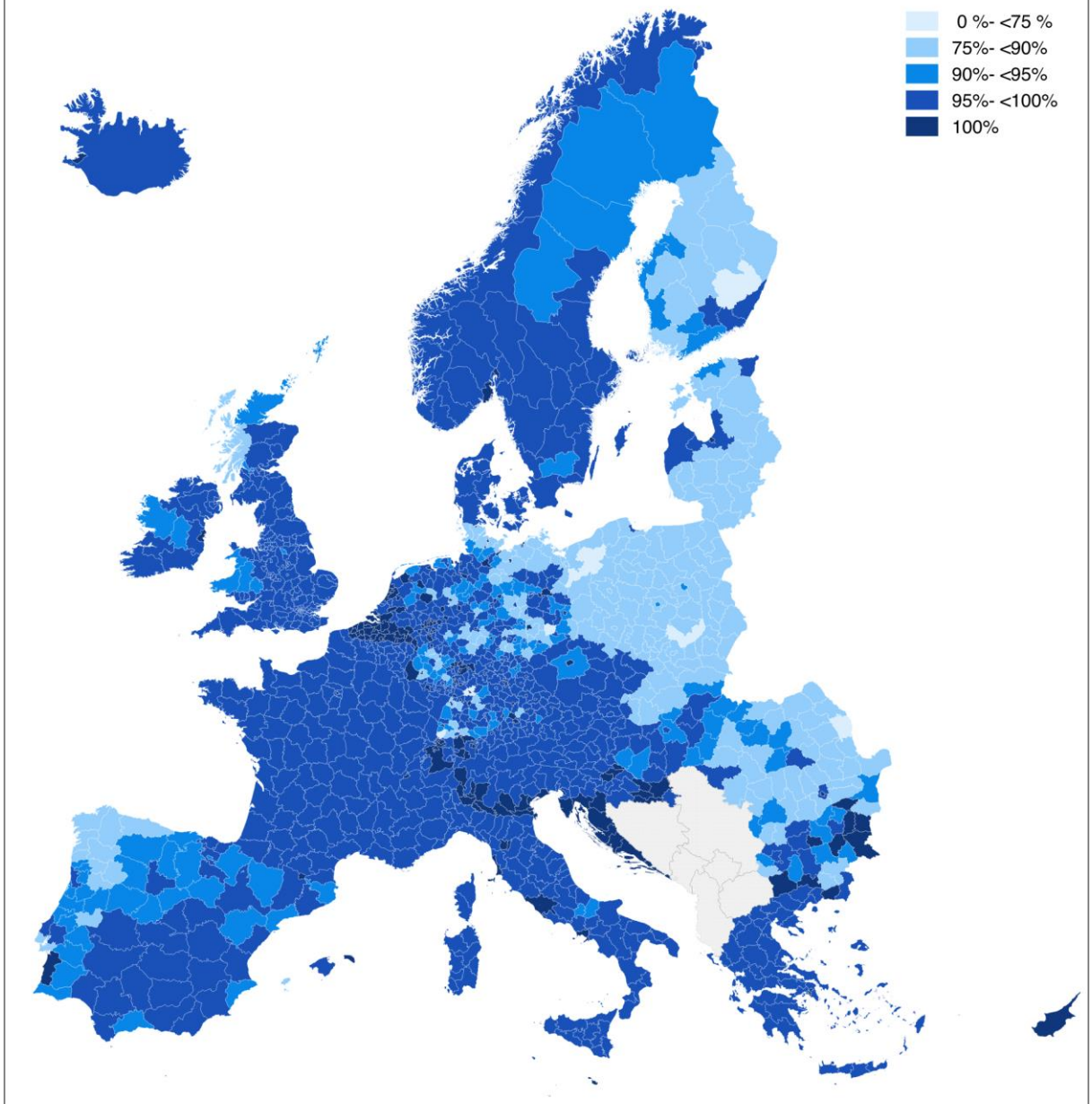


Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

4.6 NUTS 3 level coverage

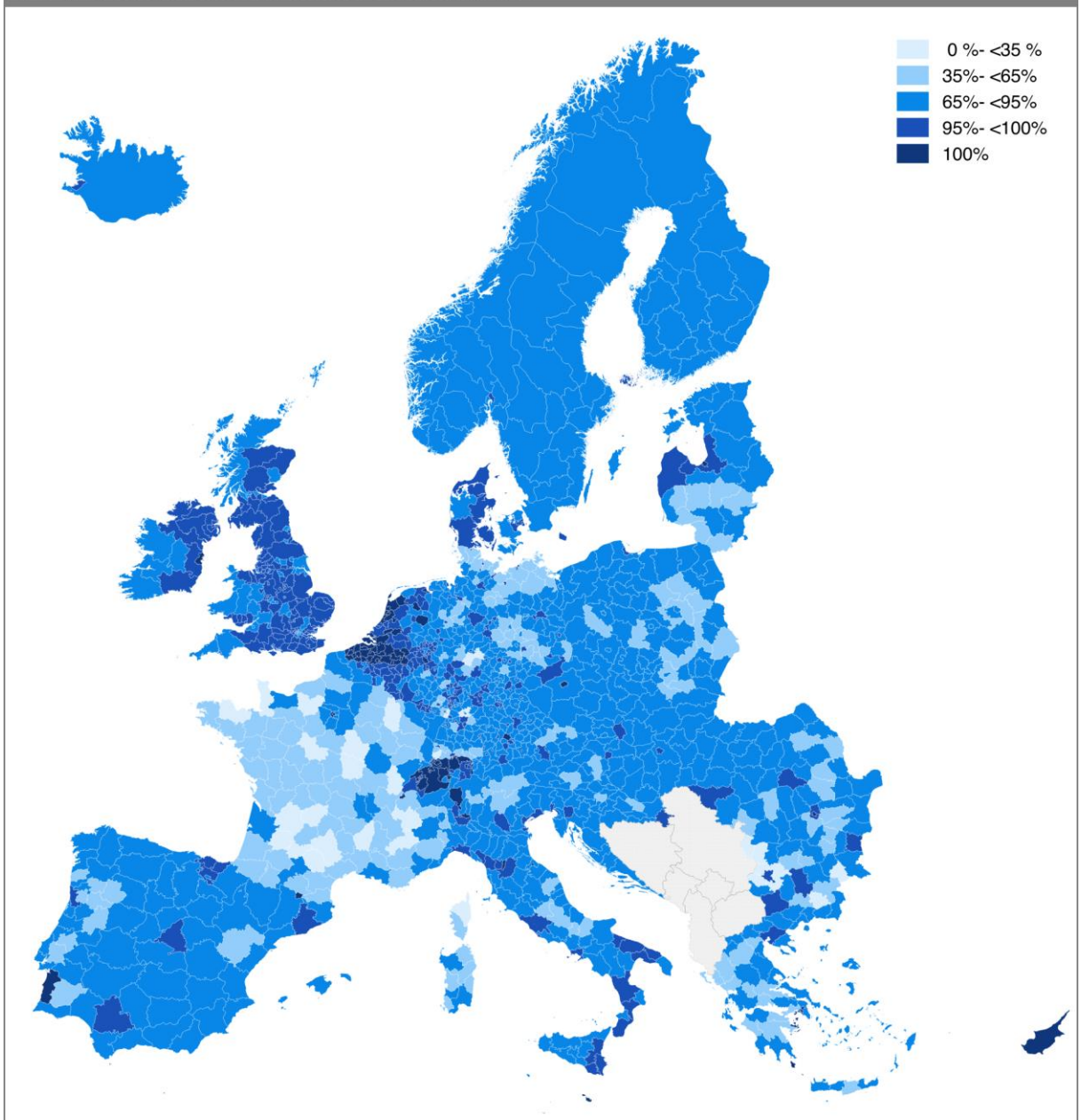
The maps included in this chapter indicate the distribution of fixed and NGA broadband coverage across Europe's regions and demonstrate the study results discussed in the previous chapters of this report.

Europe: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

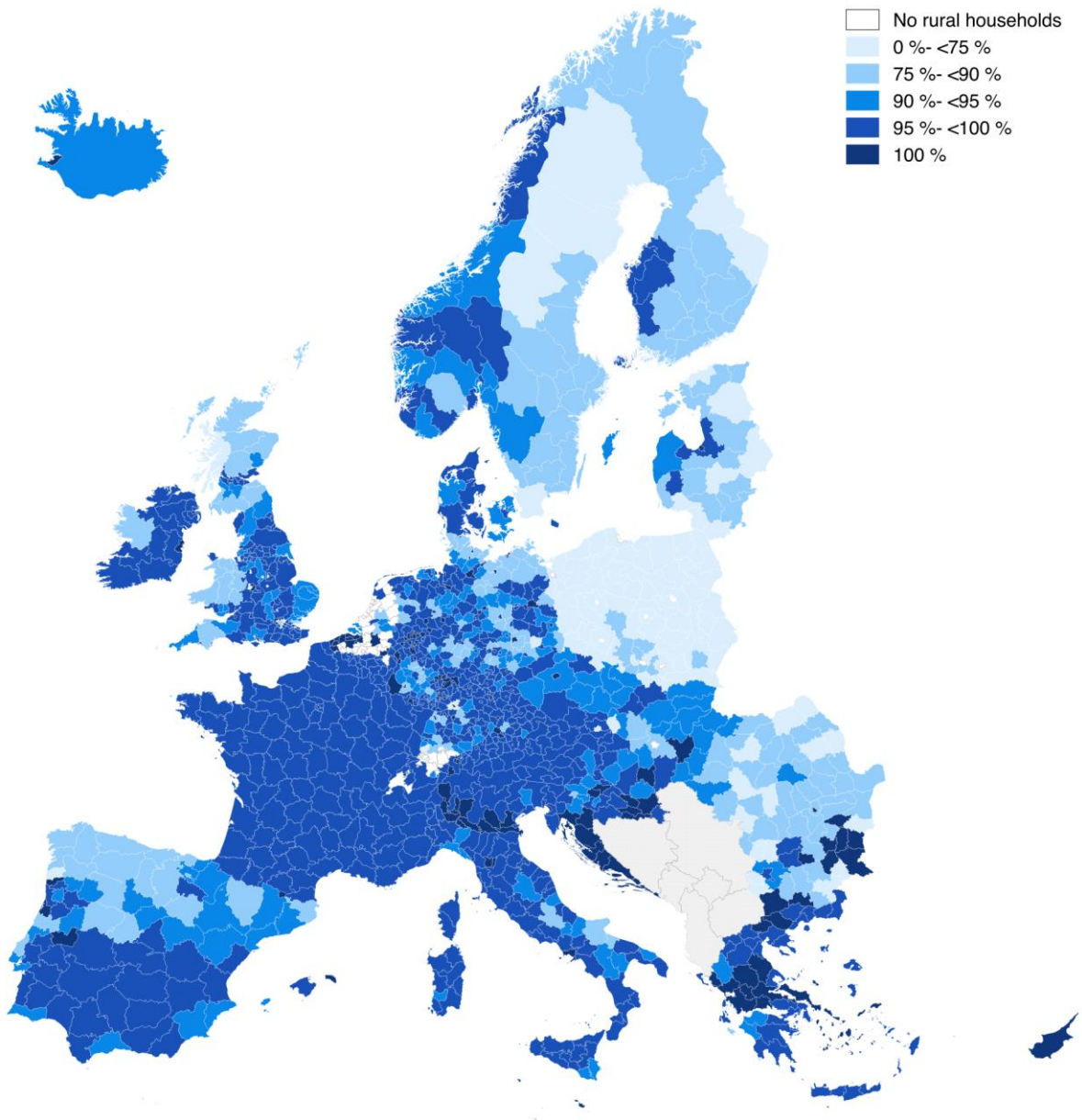
Europe: Overall NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

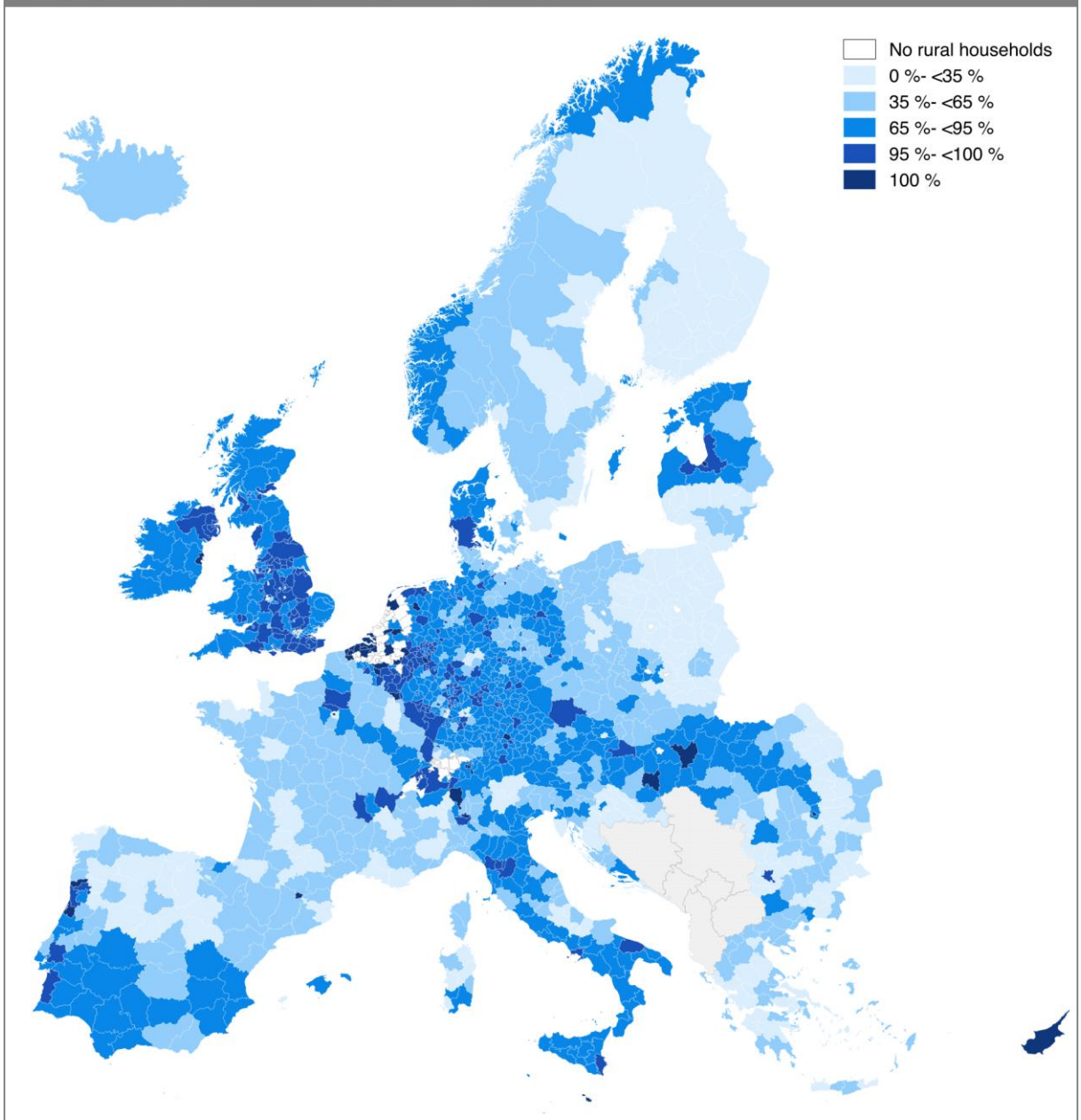
It is important to note that Belgium, France, Hungary, Switzerland, Spain and the United Kingdom all have some NUTS3 regions which do not have any rural households. These NUTS3 regions are represented by the white areas on the rural coverage maps.

Europe: Overall fixed rural broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Europe: Overall rural NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.0 Coverage by Country

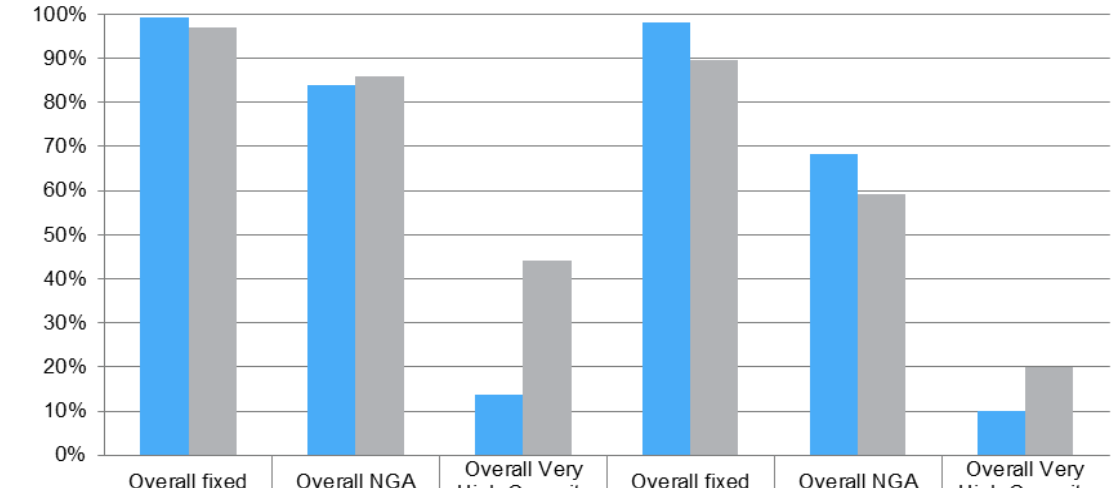
5.1 Austria

5.1.1 National coverage by broadband technology

As in previous years, Austrian fixed broadband coverage remained higher than the European average both nationally and in rural areas. A 1.0 percentage point increase in the fixed networks' coverage set Austria close to universal fixed broadband availability. Whilst there was no considerable increase in total NGA coverage during the study period, availability of NGA broadband services in rural areas increased by 6.9 percentage points with nearly 7 in 10 (68.4%) rural Austrian households having access to high-speed broadband at the end of June 2019, above the EU average of 59.3%.

On the other hand, overall coverage by very high capacity networks (DOCSIS 3.1 and FTTP) was significantly lower than the EU average on both total and rural level. This is mainly due to the fact that operators have not yet launched DOCSIS 3.1 in Austria and FTTP coverage remains limited.

Austria: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Austria	99.3%	84.0%	13.8%	98.0%	68.4%	10.0%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

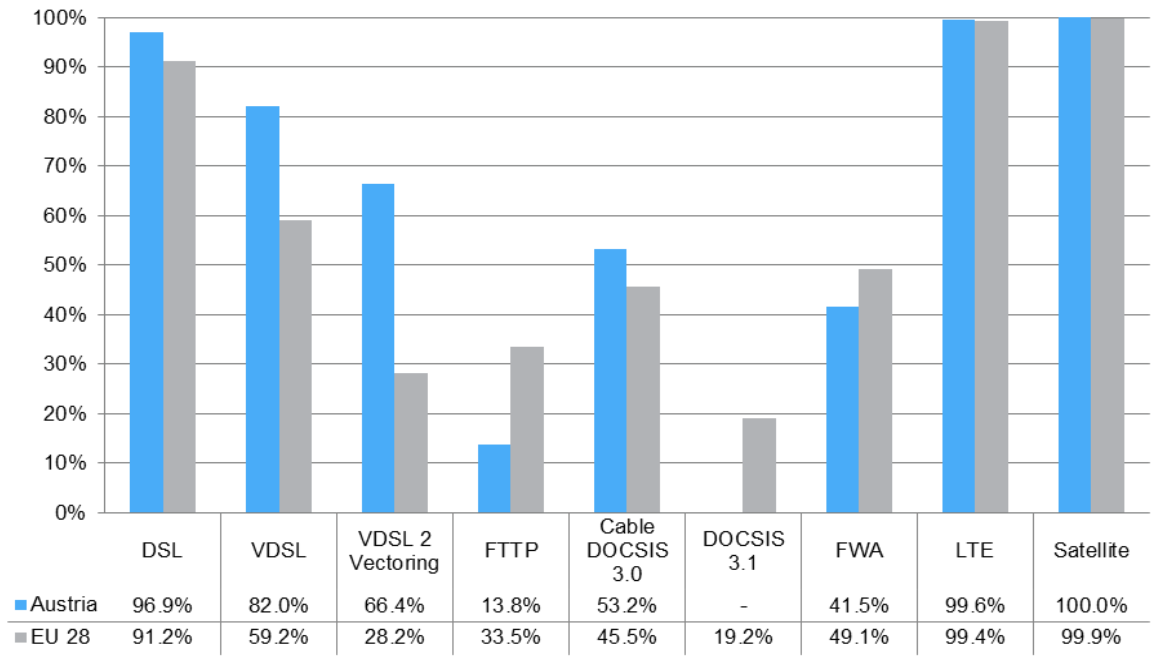
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at coverage of individual technologies, at the end of June 2019, DSL networks continued to be the most widespread with 96.9% of Austrian households having access to DSL-based broadband services. Moreover, the proportion of DSL networks upgraded to VDSL and VDSL 2 Vectoring is significantly higher in Austria than the EU average. By mid-2019, more than 8 in 10 (82.0%) of Austrian homes were passed by VDSL networks and 66.4% of households had access to VDSL2 Vectoring services providing download speeds higher than 100Mbps.

High-speed cable modem DOCSIS 3.0 networks passed more than half (53.2%) of Austrian homes at the end of June 2019, 7.7 percentage points higher than the EU average. As mentioned above, no coverage for DOCSIS 3.1 networks was reported in Austria in mid-2019. Availability of FTTP networks improved only slightly over the study period, growing by 0.8 percentage point to 13.8% and remaining well below the EU average (33.5%).

In relation to mobile broadband technologies, nearly all Austrian homes (99.6%) were passed by at least one LTE network by the end of June 2019. On average, when considering coverage of all mobile network operators, LTE services were available to 98.2% of Austrians.

Austria: Coverage by technology, total, 2019

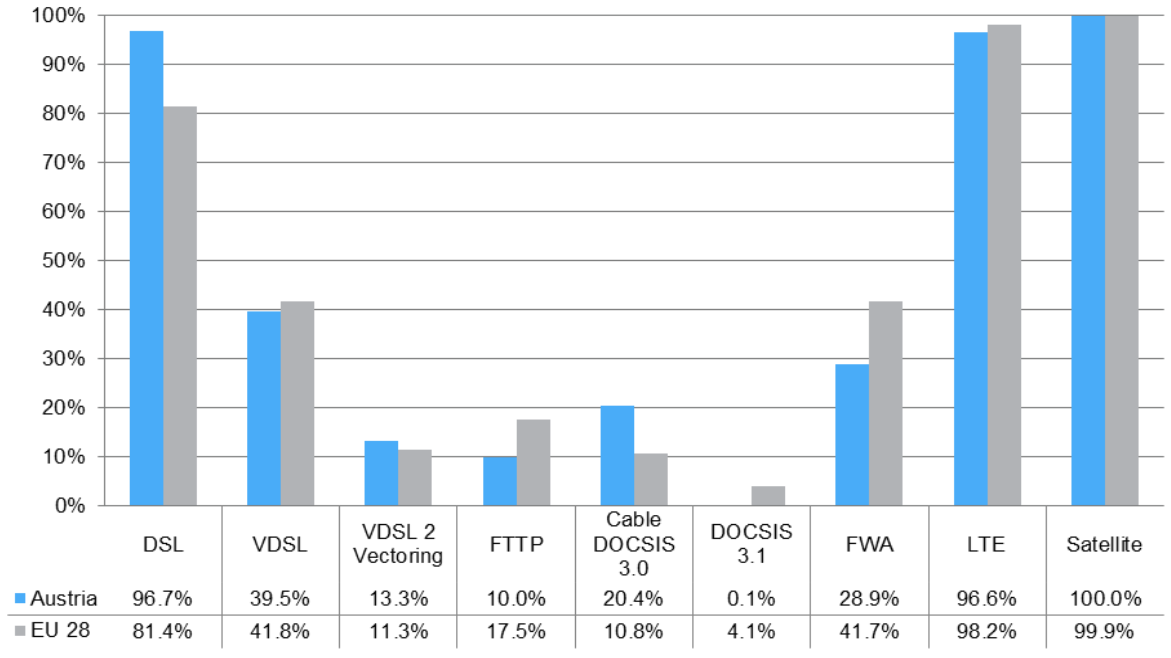


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Austria	96.9%	82.0%	66.4%	13.8%	53.2%	-	41.5%	99.6%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Examining rural broadband coverage, DSL continued to be the primary broadband technology in rural areas, passing 96.7% of rural homes. The proportion of rural homes passed by cable DOCSIS 3.0 networks was 20.4%. This remains stable from 2018 but it is still higher than the European average (10.8%). Fixed Wireless Access (FWA) networks passed 28.9% of the rural Austrian households.

Austria: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Austria	96.7%	39.5%	13.3%	10.0%	20.4%	0.1%	28.9%	96.6%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

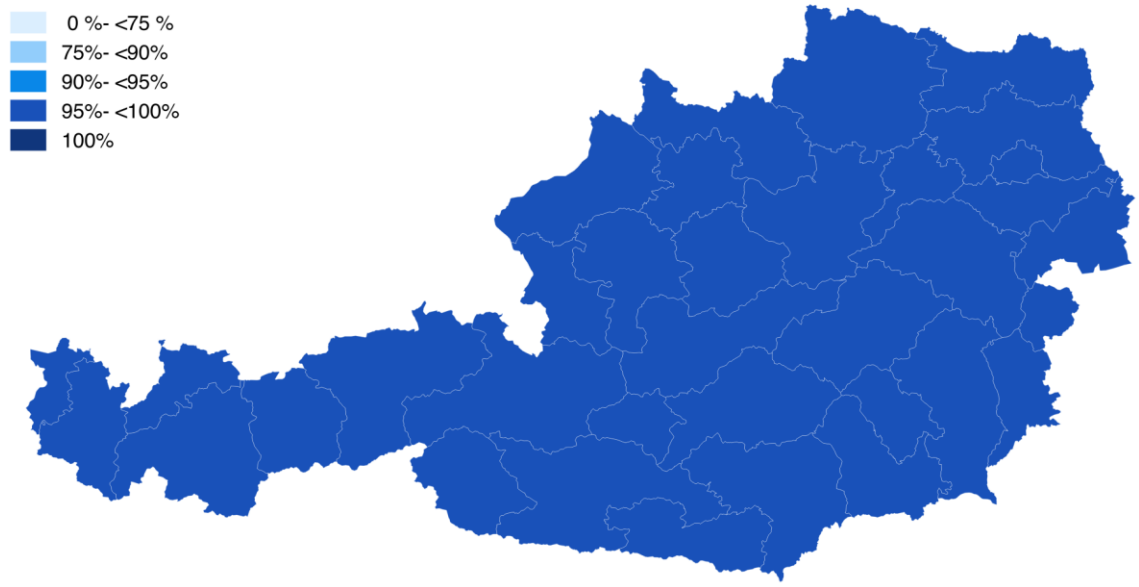
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural coverage of NGA technologies, rural FTTP deployments expanded with coverage rising by 4.1 percentage points during the twelve-month period and FTTP networks passing 10.0% of rural homes in Austria at the end of June 2019. However, VDSL remained the dominant NGA technology in rural areas reaching 39.5% rural households.

5.1.2 Regional coverage by broadband technology

Examining coverage levels in individual regions, fixed broadband coverage did not vary significantly across regions, with all regions reporting coverage between 95.0% and 100.0%. Austria recorded universal fixed broadband coverage in two regions, Rheintal and Wien.

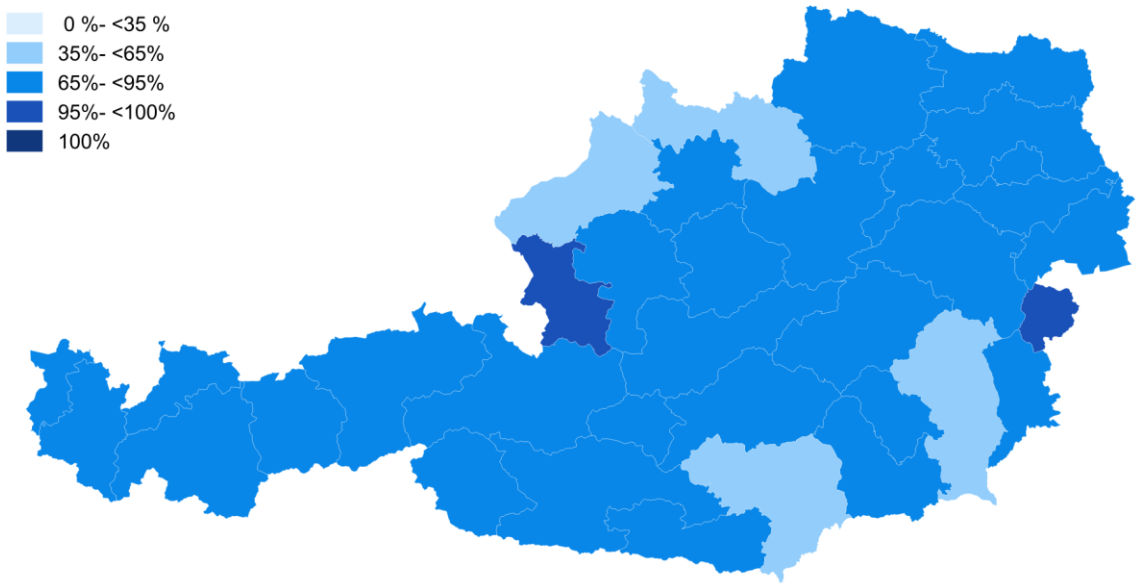
Austria: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

NGA availability remained varied in Austria, with coverage levels ranging from slightly below 46% (Oststeiermark) to almost 100.0% (Salzburg und Umgebung).

Austria: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.1.3 Data tables for Austria

Statistic	National
Population	8,772,865
Persons per household	2.3
Rural proportion	12.9%

	Austria 2019		Austria 2018		Austria 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	96.9%	96.7%	96.6%	*96.4%*	96.9%	88.4%	91.2%	81.4%
VDSL	82.0%	39.5%	*82.2%*	39.1%	82.2%	22.1%	59.2%	41.8%
VDSL 2 Vectoring	66.4%	13.3%	-	-	-	-	28.2%	11.3%
FTTP	13.8%	10.0%	13.0%	5.9%	12.4%	5.4%	33.5%	17.5%
Cable modem DOCSIS 3.0	53.2%	20.4%	53.0%	20.4%	51.8%	19.9%	45.5%	10.8%
DOCSIS 3.1	0.03%	0.0%	-	-	-	-	19.2%	4.1%
FWA	41.5%	28.9%	-	-	-	-	49.1%	41.7%
LTE	99.6%	96.6%	99.5%	96.4%	99.0%	92.7%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	98.2%	-	98.5%	-	97.0%	-	96.5%	-
Satellite	100%	100.0%	100%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.3%	98.0%	98.2%	*98.0%*	98.4%	94.0%	97.1%	89.7%
NGA broadband	84.0%	68.4%	*83.9%*	*61.5%*	*83.7%*	44.6%	85.8%	59.3%
Very High Capacity Networks	13.8%	10.0%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	99.2%	-	98.1%	-	97.9%	-	95.7%	-
At least 30 Mbps	84.2%	-	*81.3%*	-	80.9%	-	83.3%	-
At least 100 Mbps	65.2%	-	57.5%	-	56.2%	-	68.4%	-
At least 1 Gbps	13.8%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

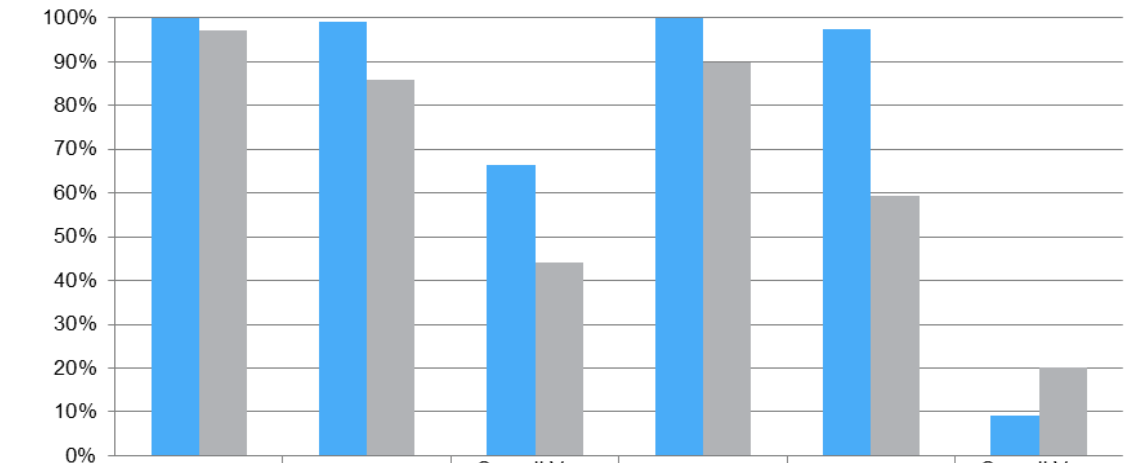
All restatements are highlighted in italics.

5.2 Belgium

5.2.1 National coverage by broadband technology

In mid-2019, all Belgian households had access to at least one fixed broadband service. NGA coverage on a national level continued to increase, and reached 99.1% of households, well-above the EU average of 85.8%. NGA coverage improved especially in rural regions, with a 5.7 percentage point annual increase, reaching 97.5% of rural households. In addition, 66.5% of Belgian homes were passed by very high capacity networks (VHCN) a significant proportion in comparison with the EU average (44.0%). However, only 9.3% of the rural homes were passed by these networks.

Belgium: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Belgium	100.0%	99.1%	66.5%	99.9%	97.5%	9.3%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

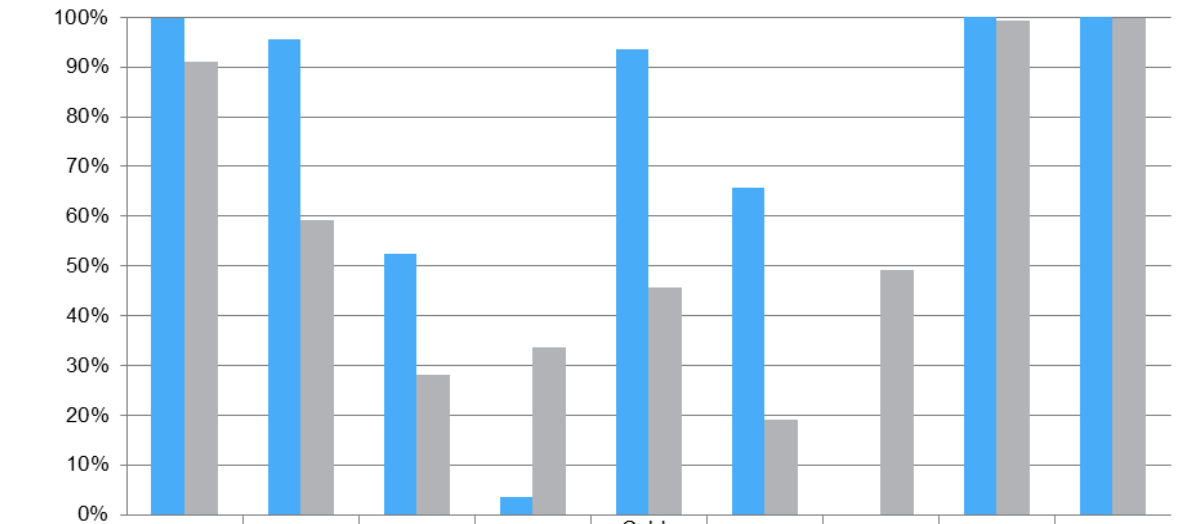
Looking at coverage of individual technologies at a national level, DSL availability remained stable with 99.9% of homes passed by DSL networks. In addition, over the last several years Belgian incumbent operator has upgraded a considerable share of its legacy copper networks to new technology standards offering higher speeds. By mid-2019, VDSL and VDSL 2 Vectoring enabled networks passed 95.5% and 52.3% of Belgian homes, respectively. These are much higher coverage levels than those observed in the EU, where VDSL services were available to 59.2% of EU households and just 28.2% of EU households had access to VDSL2 Vectoring high-speed broadband services.

Cable Modem DOCSIS 3.0 services were available to 93.5% of households and Belgium was one of the study countries where operators have launched and made considerable progress in DOCSIS 3.1 network upgrades. By mid-2019 nearly two thirds (65.5%) of Belgian homes were passed by DOCSIS 3.1 networks, well above the EU average of 19.2%.

Because Belgian operators have traditionally focused on upgrading their legacy copper and cable networks, Belgium's FTTP coverage is the lowest among all study countries, reaching only 3.6% of households at the end of June 2019. Compared to mid-2018, FTTP coverage increased by 2.2 percentage points, however, availability of FTTP services remained very limited.

Looking at mobile broadband coverage, Belgium had already achieved universal LTE coverage in 2017. However, the average coverage of all LTE network operators grew by 0.1 percentage points to 99.7%.

Belgium: Coverage by technology, total, 2019

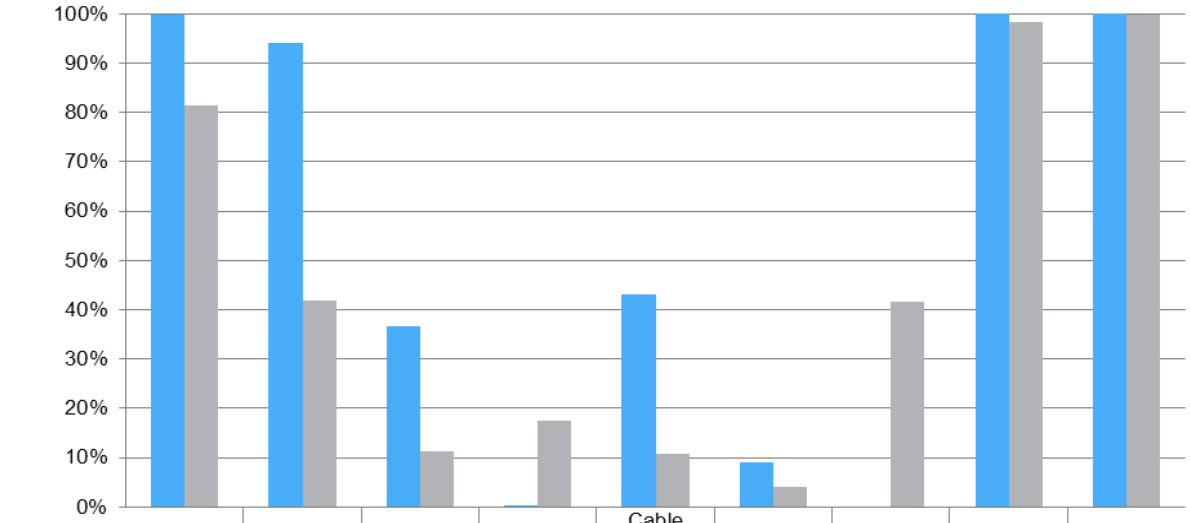


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Belgium	99.9%	95.5%	52.3%	3.6%	93.5%	65.6%	-	100.0%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural regions of Belgium, DSL remained the most prevalent fixed technology in rural areas with 99.8% of homes passed and standing at over 18 percentage points above the EU average of 81.4%. Similarly, VDSL (94.0%) and VDSL 2 Vectoring (36.6%) far exceeded the EU average levels (41.8% and 11.3%, respectively). Cable modem DOCSIS 3.0 was available to 43.0% of rural households which was four times higher than the EU average (10.8%). Meanwhile, DOCSIS 3.1 networks passed 9.1% of Belgian rural homes.

Belgium: Coverage by technology, rural areas, 2019



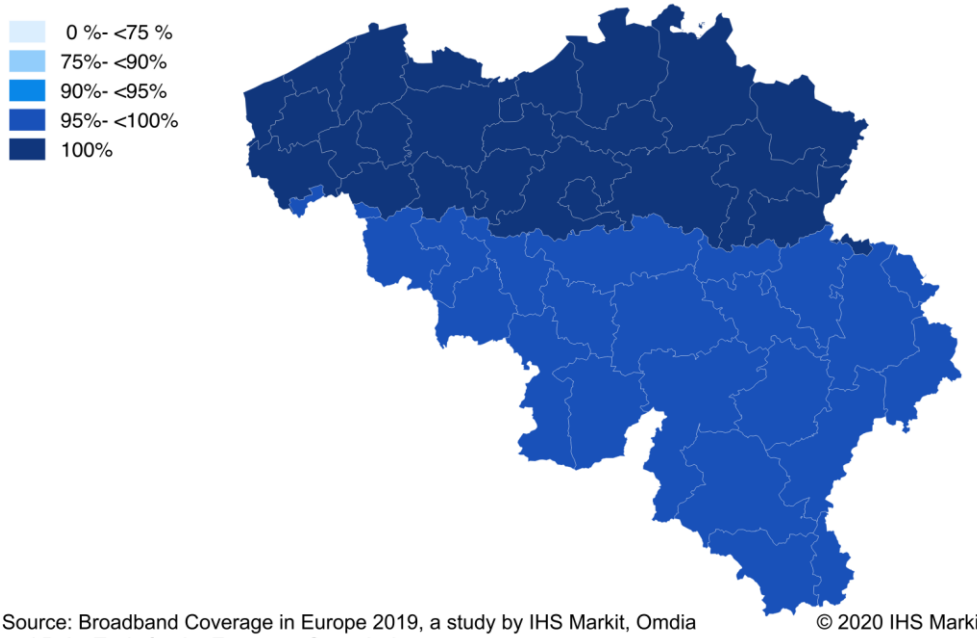
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Belgium	99.8%	94.0%	36.6%	0.1%	43.0%	9.1%	-	100.0%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.2.2 Regional coverage by broadband technology

In the line with previous years, in mid-2019, fixed broadband coverage exceeded 99.9% in all Belgian regions. Fixed broadband was available to all households in half of the regions, with coverage being near-universal (99.9%) in the Walloon regions of Nivelles, Charleroi, Mons, Liège, and Namur, among others southern regions.

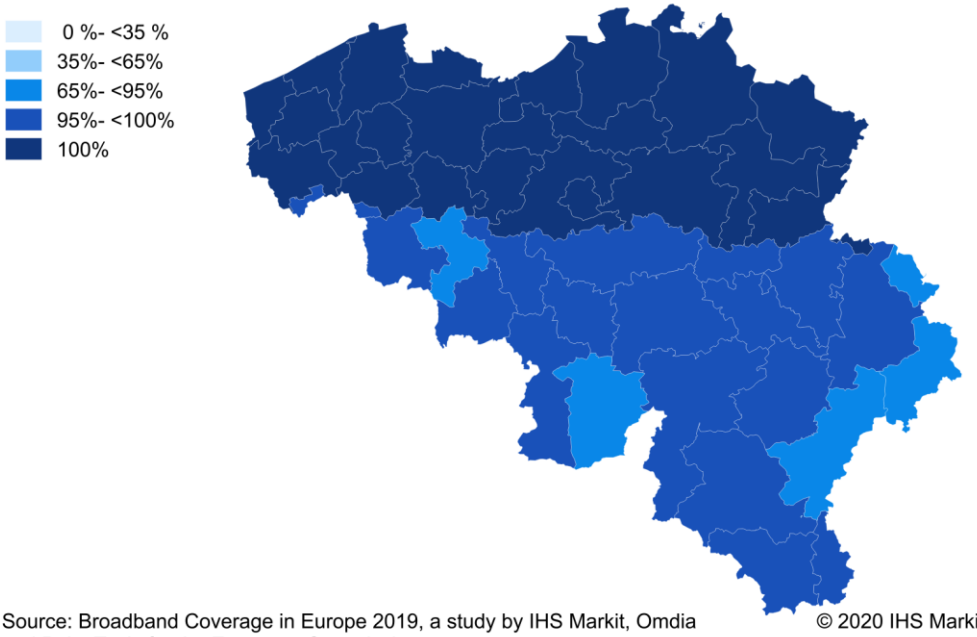
Belgium: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

As in previous years, all Flemish regions of Belgium registered compete NGA coverage. NGA availability in the Walloon regions ranged from 93.7% to 98.4% of coverage.

Belgium: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.2.3 Data tables for Belgium

Statistic	National
Population	11,398,589
Persons per household	2.3
Rural proportion	4.1%

	Belgium 2019		Belgium 2018		Belgium 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.9%	99.8%	99.9%	97.2%	99.9%	97.3%	91.2%	81.4%
VDSL	95.5%	94.0%	94.4%	82.3%	94.0%	77.7%	59.2%	41.8%
VDSL 2 Vectoring	52.3%	36.6%	-	-	-	-	28.2%	11.3%
FTTP	3.6%	0.1%	1.4%	0.0%	0.8%	0.0%	33.5%	17.5%
Cable modem DOCSIS 3.0	93.5%	43.0%	*93.9%*	*44.2%*	91.3%	45.2%	45.5%	10.8%
DOCSIS 3.1	65.6%	9.1%	-	-	-	-	19.2%	4.1%
FWA	0.0%	0.0%	-	-	-	-	49.1%	41.7%
LTE	100.0%	100.0%	100.0%	99.7%	100.0%	99.7%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	99.7%	-	99.6%	-	96.57%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	100.0%	99.9%	99.9%	98.6%	99.9%	98.7%	97.1%	89.7%
NGA broadband	99.1%	97.5%	*98.7%*	*91.8%*	98.3%	90.4%	85.8%	59.3%
Very High Capacity Networks	66.5%	9.3%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	99.9%	-	99.9%	-	99.9%	-	95.7%	-
At least 30 Mbps	98.3%	-	98.8%	-	96.1%	-	83.3%	-
At least 100 Mbps	96.5%	-	*95.5%*	-	91.6%	-	68.4%	-
At least 1 Gbps	49.2%	-	-	-	-	-	32.4%	-

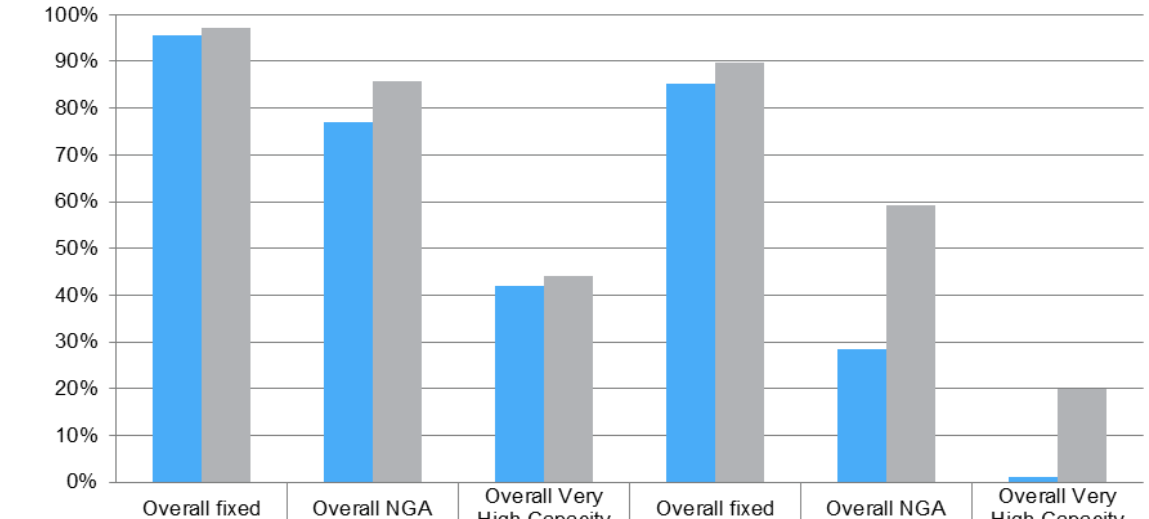
Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by HIS Markit and Point Topic.
All restatements are highlighted in italics.

5.3 Bulgaria

5.3.1 National coverage by broadband technology

Overall fixed broadband national coverage in Bulgaria remained relatively unchanged throughout the twelve months to mid-2019 with fixed broadband services being available to 95.6% of all households and 85.2% rural households. In total, NGA coverage in Bulgaria increased by 1.9 percentage points, reaching 77.1% at the end of June 2019. In rural areas, NGA technologies became available to 28.4% of rural households, recording an annual increase of 1.7 percentage points. Despite these improvements, Bulgarian fixed and NGA coverage remained below the EU average. As there were no DOCSIS 3.1 launches by mid-2019, coverage of very high capacity networks (VHCN), i.e. combined DOCSIS 3.1 and FTTP coverage, was identical to FTTP coverage and as such also ranked below the average EU coverage levels.

Bulgaria: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Bulgaria	95.6%	77.1%	42.0%	85.2%	28.4%	1.3%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

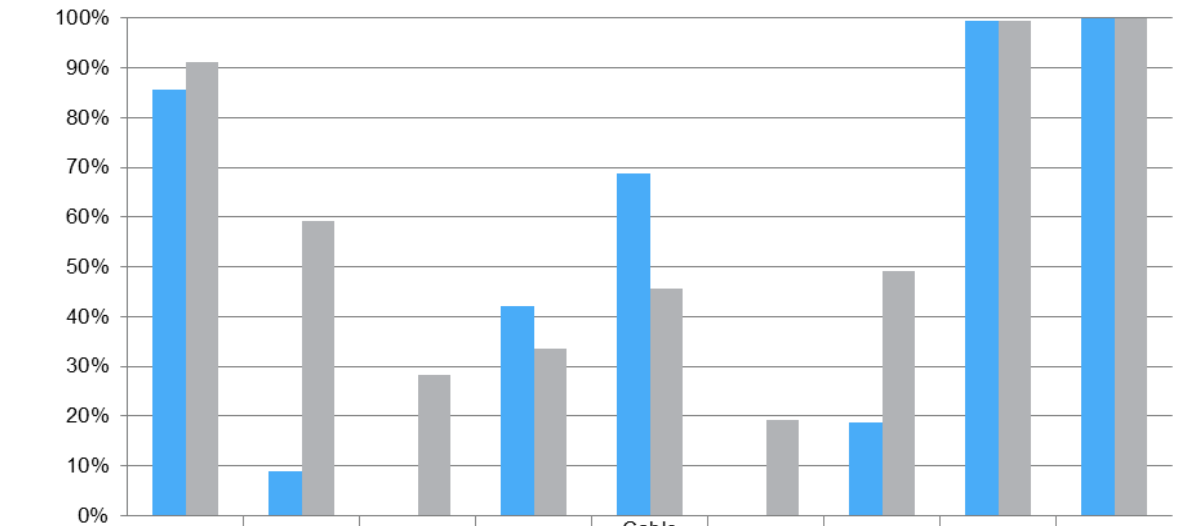
As was the case in the previous iteration of this study, DSL remained the most prevalent fixed broadband technology, with 85.5% of households covered in Bulgaria. This represents a 0.4 p.p. increase in coverage compared to 2018. Fixed Wireless Access (FWA) broadband services were available to 18.8% of households in Bulgaria.

Looking at NGA technologies, VDSL continued to be gradually deployed, and recorded a significant 7.3 percentage point increase since mid-2018, the largest year-on-year growth out of all technologies in Bulgaria. Yet, despite this increase stimulated by the incumbent Vivacom's 2017 network upgrade partnership with Huawei, VDSL services were available to only 8.8% of Bulgarian households and no VDSL2 Vectoring were launched in the country by the end of June 2019.

Cable modem DOCSIS 3.0 coverage continued to increase, growing by 4.3 percentage points and reaching 68.7% Bulgarian households. As was the case in 2018, cable modem DOCSIS 3.0 remained the most prevalent NGA technology in Bulgaria but so far, no advancements have been made in terms of upgrades to DOCSIS 3.1. Coverage of FTTP networks improved by 4.0 percentage points in the twelve months to mid-2019 with 42.0% of Bulgarian households having access to FTTP broadband services, above the EU average of 33.5%.

Regarding mobile broadband in Bulgaria, LTE coverage continued to improve this year, with at least one LTE network passing 99.5% of Bulgarian homes. Yet, when considering average LTE coverage of all mobile network operators, 80.7% of Bulgarians had access to LTE services.

Bulgaria: Coverage by technology, total, 2019



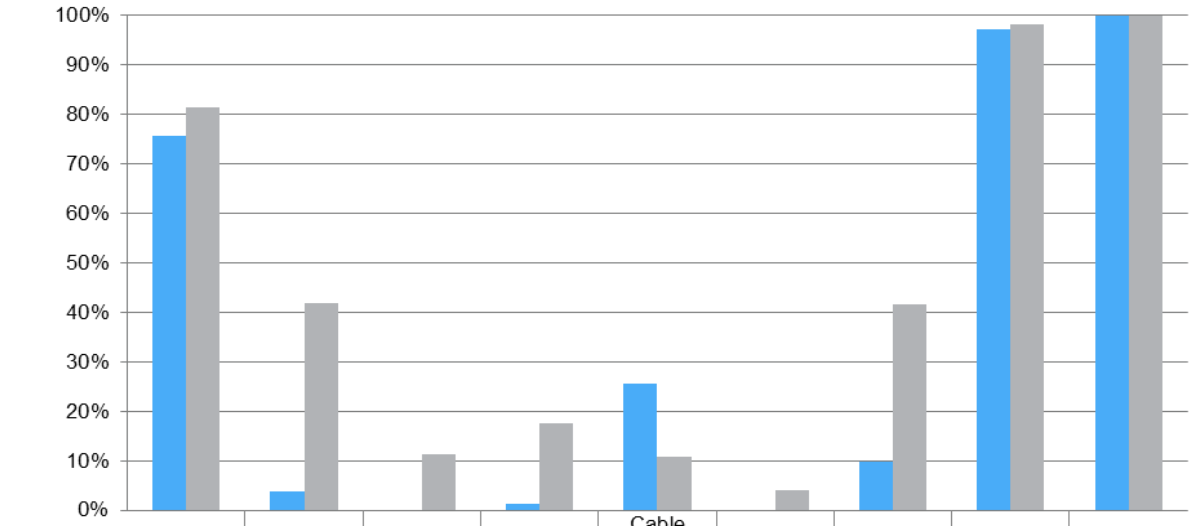
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Bulgaria	85.5%	8.8%	-	42.0%	68.7%	-	18.8%	99.5%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural areas, DSL remained the leading technology in rural Bulgaria reaching 75.8% of rural households. Cable modem DOCSIS 3.0 recorded a slight increase, to pass 25.5% of rural homes. For comparison, the EU average stood at less than half of this, at 10.8%.

At the end of June 2019, NGA coverage of rural areas in Bulgaria stood at 28.4%, having recorded a slight increase of 1.7 percentage point since mid-2018. As mentioned earlier, VDSL continued to be deployed in Bulgaria, and reached 3.7% of rural Bulgarian homes at the end of June, having recorded a 2.6 percentage point increase since mid-2018. FTTP coverage also progressed, to reach 1.3% of rural Bulgarian homes.

Bulgaria: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Bulgaria	75.8%	3.7%	-	1.3%	25.5%	-	9.8%	97.3%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

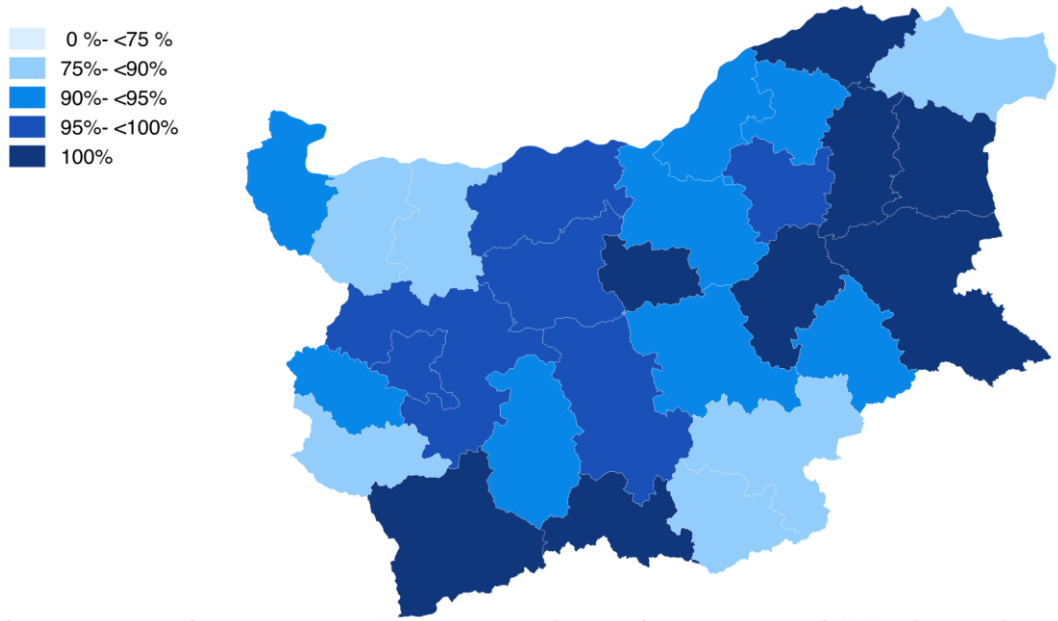
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at mobile broadband in rural regions of Bulgaria, LTE coverage increased by 3.9 percentage points, to reach 97.3% of rural Bulgarian households. Despite this increase, LTE coverage of rural homes remained below the EU average, which stood at 98.2%.

5.3.2 Regional coverage by broadband technology

In this iteration of the study, there was complete fixed broadband coverage in eight regions of Bulgaria: Gabrovo, Silistra, Varna, Shumen, Burgas, Sliven, Blagoevgrad and Smolyan. That is one extra region compared to mid-2018. The region with the lowest coverage remained Haskovo, with 82.1% of houses passed.

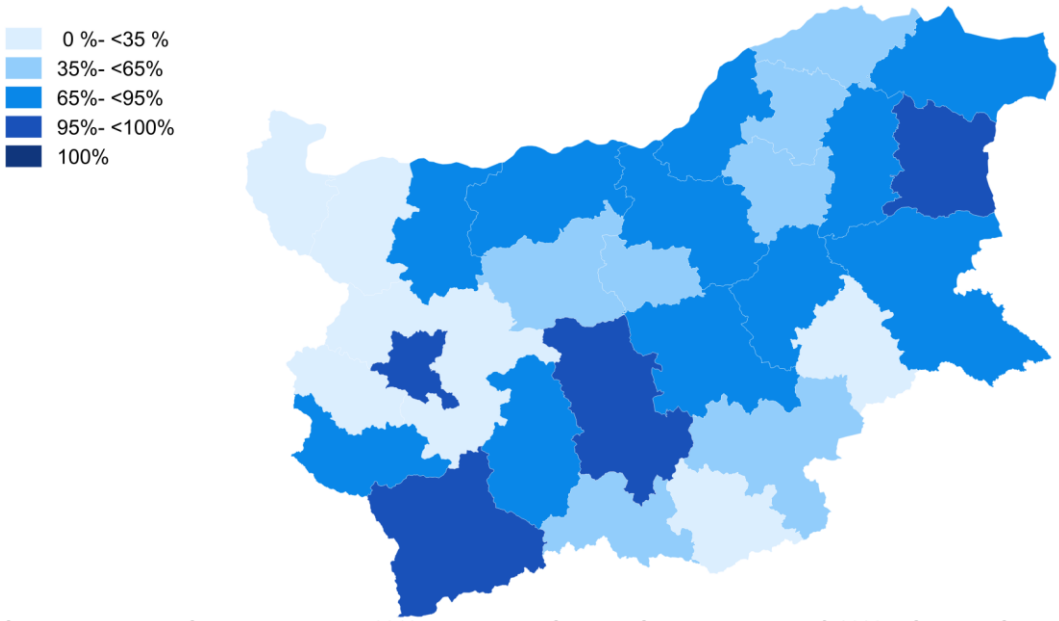
Bulgaria: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

At the end of June 2019, variance of NGA broadband coverage between regions of Bulgaria remained significant. NGA technologies reached almost all households in the capital city of Sofia, with 98.4% of households covered, whilst only 10.1% of houses in Pernik had access to NGA broadband.

Bulgaria: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.3.3 Data tables for Bulgaria

Statistic	National
Population	7,050,034
Persons per household	2.5
Rural proportion	19.2%

	Bulgaria 2019		Bulgaria 2018		Bulgaria 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	85.5%	75.8%	85.1%	75.8%	85.2%	75.6%	91.2%	81.4%
VDSL	8.8%	3.7%	1.5%	1.1%	0.0%	0.0%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	42.0%	1.3%	38.0%	1.1%	37.8%	0.9%	33.5%	17.5%
Cable modem DOCSIS 3.0	68.7%	25.5%	64.4%	25.3%	64.2%	22.6%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	18.8%	9.8%	-	-	-	-	49.1%	41.7%
LTE	99.5%	97.3%	98.7%	93.4%	91.9%	59.3%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	80.7%	-	79.7%	-	71.6%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	95.6%	85.2%	95.5%	84.0%	95.2%	82.5%	97.1%	89.7%
NGA broadband	77.1%	28.4%	75.2%	26.7%	74.6%	25.0%	85.8%	59.3%
Very High Capacity Networks	42.0%	1.3%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	95.3%	-	95.1%	-	95.0%	-	95.7%	-
At least 30 Mbps	79.8%	-	75.0%	-	74.5%	-	83.3%	-
At least 100 Mbps	32.6%	-	30.9%	-	30.7%	-	68.4%	-
At least 1 Gbps	6.5%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

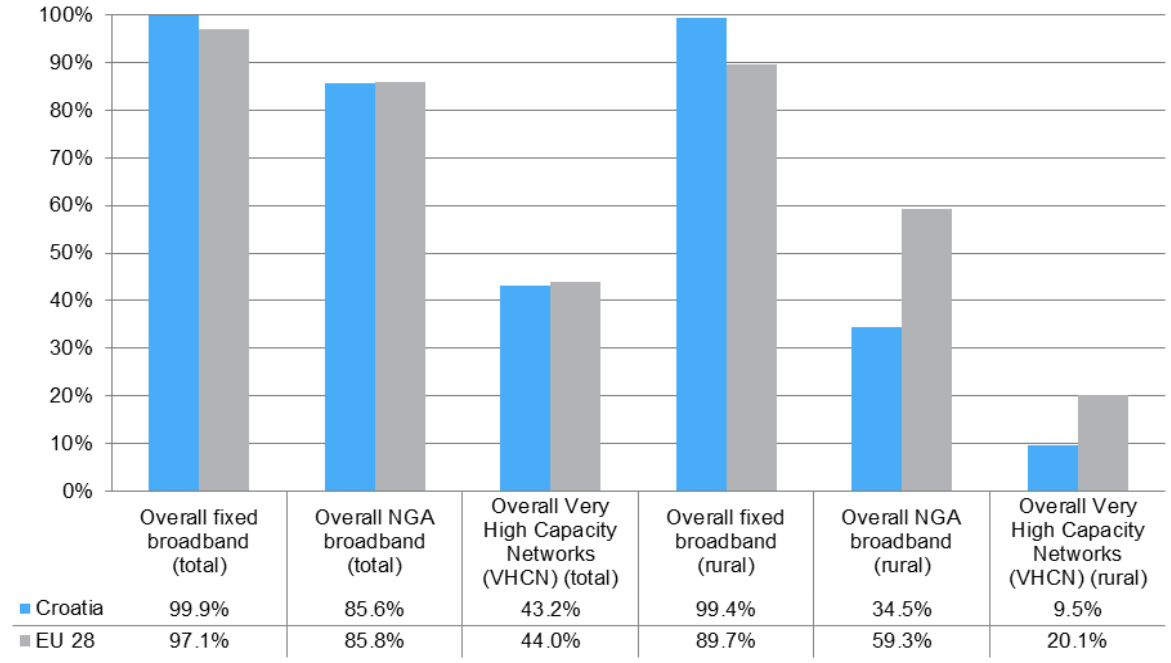
All restatements are highlighted in italics.

5.4 Croatia

5.4.1 National coverage by broadband technology

Over the twelve months to the end of June 2019, overall fixed broadband coverage in Croatia remained stable reaching 99.9% of households. NGA coverage continued to grow, albeit at a slower rate than in 2018, to reach 85.6% of households, just below the EU average, which stood at 85.8%. At the rural level, after recording a significant increase in 2018, NGA coverage progressed by just 0.1 percentage point, to reach a third (34.5%) of Croatian households. Very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, passed 43.2% of Croatian homes at the end of June 2019.

Croatia: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Croatia	99.9%	85.6%	43.2%	99.4%	34.5%	9.5%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at the individual fixed broadband technologies, DSL remained the most prevalent technology in Croatia, with 99.8% of households covered. At the end of June 2019, Fixed Wireless Access (FWA) networks reached 4.9% of Croatian households.

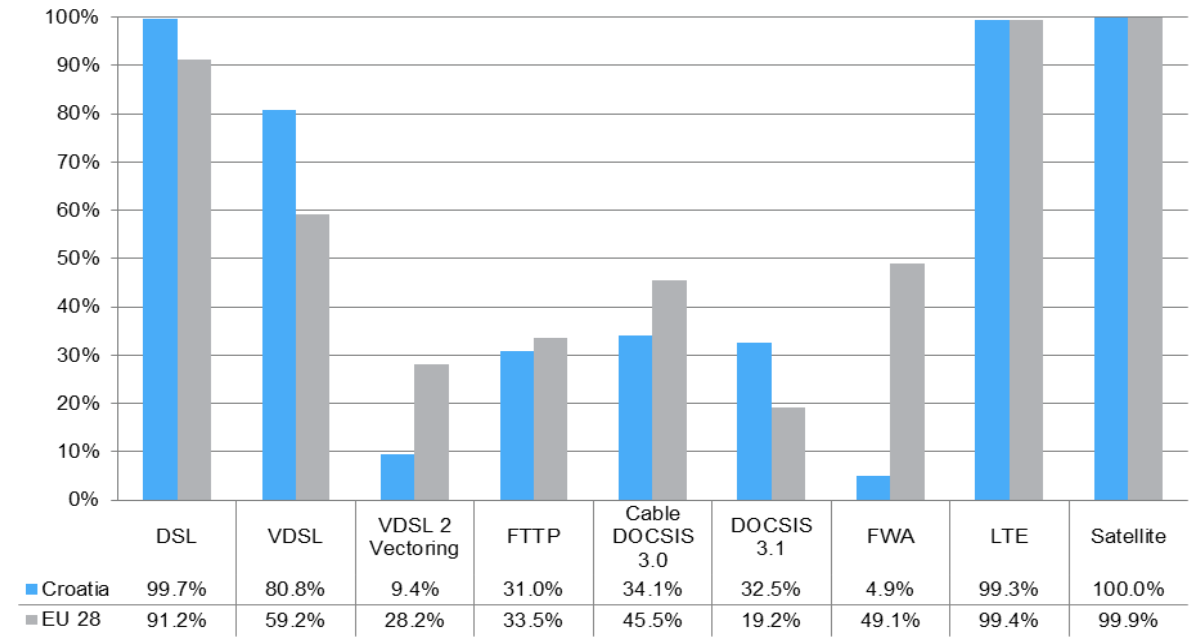
Regarding NGA technologies, VDSL remained the most prevalent NGA access technology in Croatia, with 80.8% of households having access to VDSL services, up from 76.9% in mid-2018 and over 20 percentage points higher than the EU average (59.2%). Croatian operators have also been deploying VDSL2 Vectoring, which was available to 9.4% of households at the end of June 2019.

FTTP recorded the largest coverage increase in Croatia in this iteration of the study, having grown by 7.6 percentage points, to reach 31.0% of Croatian households. Despite this increase, however, Croatia remained below the EU average which stood at 33.5%.

Looking at cable coverage, cable modem DOCSIS 3.0 increased slightly since the end of June 2018, from 32.3% to 34.1% of homes covered. DOCSIS 3.1 has also been deployed in Croatia, with 32.5% of homes covered by the end of June 2019, well above the EU average of 19.2%. In fact, Croatia is one of the leaders in terms of proportion of cable networks upgraded to DOCSIS 3.1 as 95.3% of DOCSIS 3.0 networks were upgraded to the ultrafast standard.

Mobile broadband coverage continued to grow in 2019, albeit at a slower rate, with LTE reaching 99.3% of Croatian households, up from 97.6% in mid-2018. When considering coverage of all mobile operators, on average 98.2% of Croatians had access to LTE services.

Croatia: Coverage by technology, total, 2019

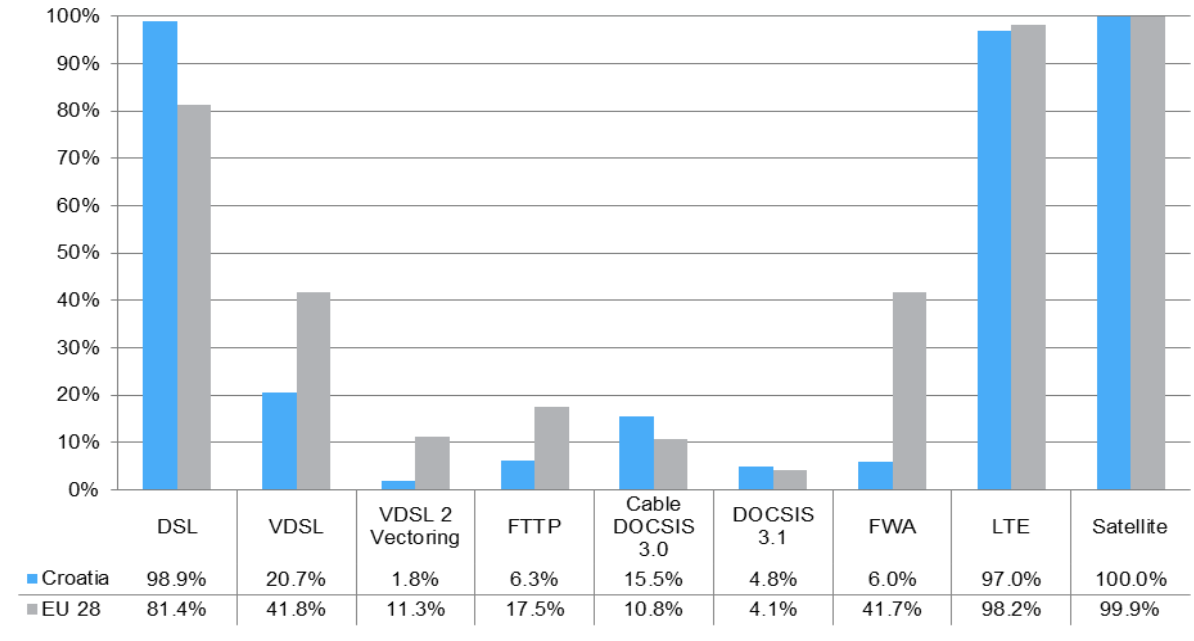


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Croatia	99.7%	80.8%	9.4%	31.0%	34.1%	32.5%	4.9%	99.3%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural regions of Croatia, DSL coverage was widespread, reaching 98.9% of rural households at the end of June 2019. The other non-NGA category of this study, FWA, was accessible to 6.0% of Croatian rural households.

Croatia: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Croatia	98.9%	20.7%	1.8%	6.3%	15.5%	4.8%	6.0%	97.0%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

NGA coverage had more than doubled between 2017 and 2018, due to substantial upgrades of DSL to VDSL. In this iteration of the study, VDSL coverage of rural regions increased by 2.1 percentage points, to reach 20.7% of households. FTTP coverage progressed to reach 6.3% of rural homes and remained below the EU average of 17.5%. Cable modem DOCSIS 3.0 and DOCSIS 3.1 both stood above the EU average, reaching 15.5% and 4.8% of Croatian rural households, respectively.

Rural LTE coverage continued to improve, and recorded an 8.1 percentage point increase, to cover 97.0% of rural homes. Despite this increase, however, LTE coverage of rural Croatia remained slightly below the EU average of 98.2%.

5.4.2 Regional coverage by broadband technology

As was the case in mid-2018, overall fixed broadband coverage in all regions of Croatia exceeded 98.5% at the end of June 2019. The region of Sisačko-Moslavačka remained the lowest covered region with 98.5% of homes passed by at least one fixed broadband technology.

Croatia: Overall fixed broadband coverage, 2019

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at regional NGA coverage patterns, three Croatian regions recorded NGA coverage increases of more than 10 percentage points: Koprivničko-Križevačka, Brodsko-posavska and Sisačko-Moslavačka. At the end of June 2019, NGA coverage ranged between 96.1% in the Vukovarsko-srijemska region and 48.5% in Krapinsko-zagorska region.

Croatia: NGA broadband coverage, 2019

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.4.3 Data tables for Croatia

Statistic	National
Population	4,105,493
Persons per household	2.8
Rural proportion	21.8%

	Croatia 2019		Croatia 2018		Croatia 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.7%	98.9%	99.7%	98.8%	98.8%	96.7%	91.2%	81.4%
VDSL	80.8%	20.7%	76.9%	18.6%	58.2%	1.3%	59.2%	41.8%
VDSL 2 Vectoring	9.4%	1.8%	-	-	-	-	28.2%	11.3%
FTTP	31.0%	6.3%	23.4%	3.7%	17.8%	0.2%	33.5%	17.5%
Cable modem DOCSIS 3.0	34.1%	15.5%	32.3%	15.2%	28.3%	15.1%	45.5%	10.8%
DOCSIS 3.1	32.5%	4.8%	-	-	-	-	19.2%	4.1%
FWA	4.9%	6.0%	-	-	-	-	49.1%	41.7%
LTE	99.3%	97.0%	97.6%	88.9%	94.8%	76.5%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	98.2%	-	94.4%	-	73.3%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.9%	99.4%	99.9%	99.4%	99.3%	97.4%	97.1%	89.7%
NGA broadband	85.6%	34.5%	82.7%	34.4%	67.6%	16.2%	85.8%	59.3%
Very High Capacity Networks	43.2%	9.5%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	99.9%	-	99.8%	-	98.7%	-	95.7%	-
At least 30 Mbps	85.6%	-	84.5%	-	60.3%	-	83.3%	-
At least 100 Mbps	43.6%	-	37.7%	-	28.5%	-	68.4%	-
At least 1 Gbps	5.9%	-	-	-	-	-	32.4%	-

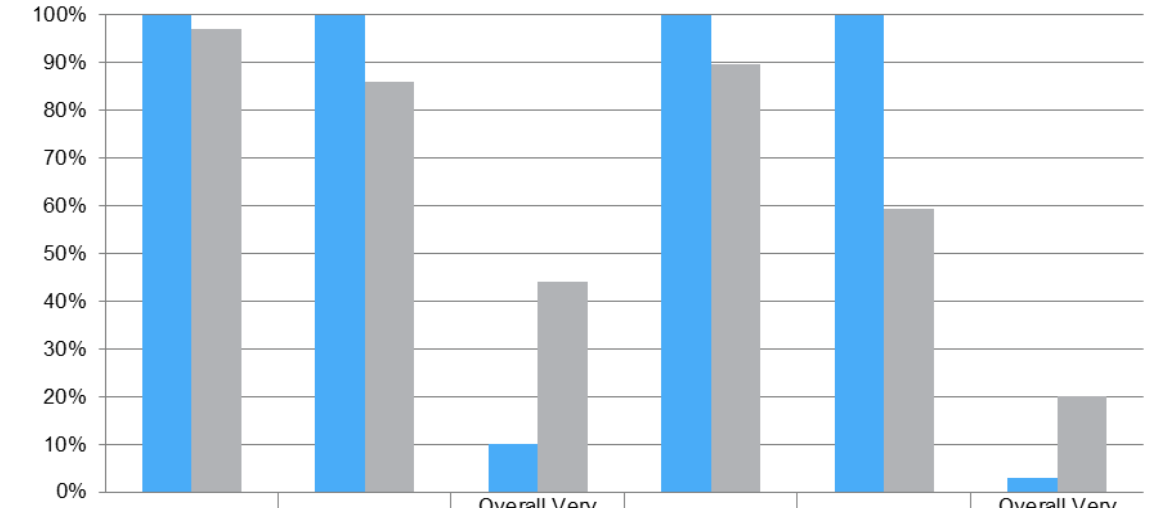
Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.
All restatements are highlighted in italics.

5.5 Cyprus

5.5.1 National coverage by broadband technology

Cyprus achieved complete fixed broadband coverage at a national and rural level already in 2012. By mid-2019, Cyprus became the second country in the study to achieve universal NGA broadband coverage due to increase in VDSL coverage. On the other hand, very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, only passed 10.1% of homes across the island at the end of June 2019.

Cyprus: Coverage by technology combination, 2019

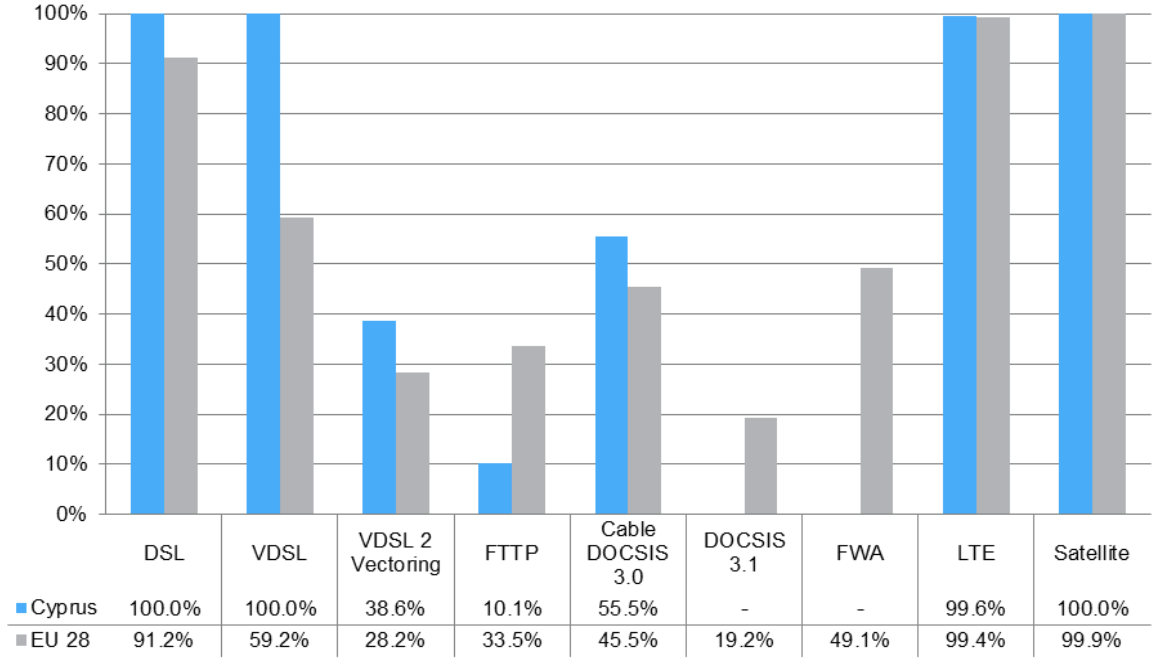


	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Cyprus	100.0%	100.0%	10.1%	100.0%	100.0%	2.8%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Considering the individual broadband technologies, DSL and VDSL services were available to all households in Cyprus. VDSL coverage recorded the highest annual increase across all study countries growing by 20 percentage points. High-speed VDSL2 Vectoring services were available to a third (38.6%) of Cypriot households.

Cyprus: Coverage by technology, total, 2019



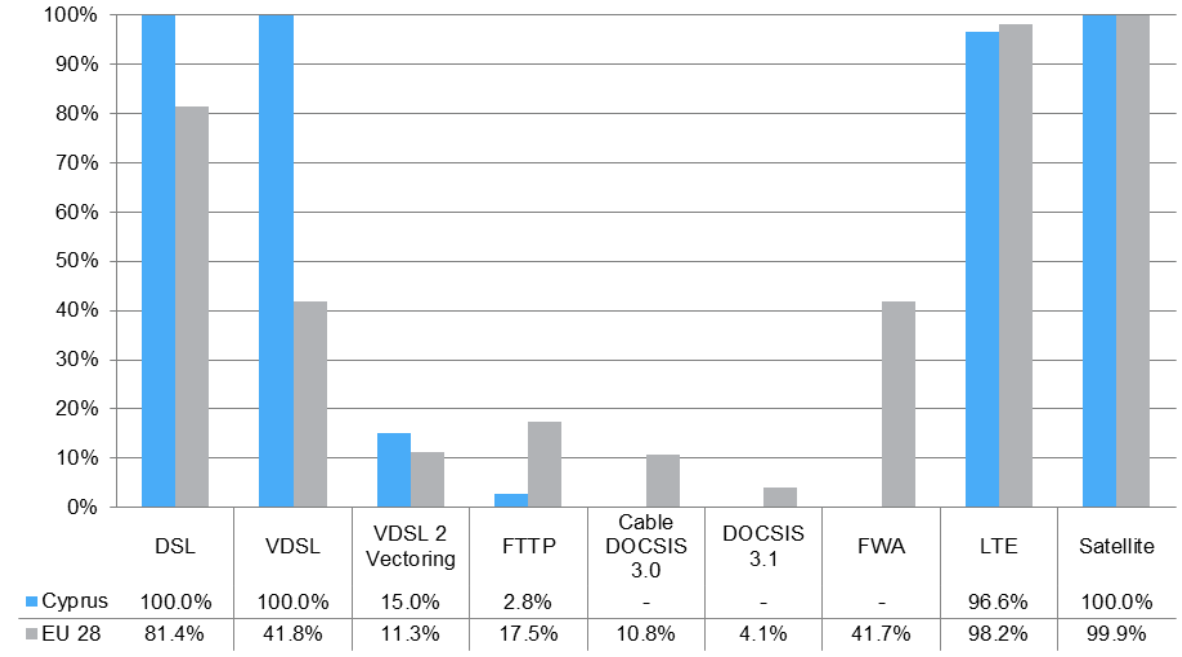
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Cyprus	100.0%	100.0%	38.6%	10.1%	55.5%	-	-	99.6%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Cable modem DOCSIS 3.0 passed 55.5% of homes, an annual increase of 2.8 percentage points. By mid-2019, cable operators in Cyprus have not yet launched DOCSIS 3.1 upgrades. FTTP is thus the only technology currently capable of supporting gigabit speed services. At the end of June 2019, FTTP networks passed 10.1% of homes, following a 9.6 percentage point increase in coverage. Yet, despite this significant growth, FTTP coverage in Cyprus remained below the European average (33.5%).

Examining mobile broadband technologies, LTE coverage recorded a 2.4 percentage point growth, with the technology covering 99.6% of households in mid-2019. Consequently, the average coverage of all LTE network operators increased by 4.0 percentage points, from 94.0% by mid-2018 to 98.0% at the end of June 2019.

Cyprus: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Cyprus	100.0%	100.0%	15.0%	2.8%	-	-	-	96.6%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

In terms of rural coverage, by mid-2019, DSL and VDSL broadband provided universal rural coverage in Cyprus. Given that DOCSIS 3.0 networks were not present in rural areas and FTTP was only limited to 2.8% of the Cypriot rural households, VDSL 2 Vectoring was the third most prevalent fixed technology, available to 15.0% of rural households.

Looking at the availability of mobile broadband, rural LTE coverage grew significantly, from 79.8% recorded in mid-2018 to 96.6% at the end of June 2019.

5.5.2 Regional coverage by broadband technology[9]

Cyprus: Overall fixed broadband coverage, 2019

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Cyprus: NGA broadband coverage, 2019

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

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

5.5.3 Data tables for Cyprus

Statistic	National
Population	864,236
Persons per household	2.8
Rural proportion	11.6%

	Cyprus 2019		Cyprus 2018		Cyprus 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	91.2%	81.4%
VDSL	100.0%	100.0%	80.0%	65.0%	75.0%	60.0%	59.2%	41.8%
VDSL 2 Vectoring	38.6%	15.0%	-	-	-	-	28.2%	11.3%
FTTP	10.1%	2.8%	0.5%	0.0%	0.0%	0.0%	33.5%	17.5%
Cable modem DOCSIS 3.0	55.5%	0.0%	52.7%	0.0%	45.0%	0.0%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	0.0%	0.0%	-	-	-	-	49.1%	41.7%
LTE	99.6%	96.6%	97.2%	79.8%	88.0%	77.8%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	98.0%	-	94.0%	-	77.3%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	97.1%	89.7%
NGA broadband	100.0%	100.0%	90.0%	65.0%	87.5%	60.0%	85.8%	59.3%
Very High Capacity Networks	10.1%	2.8%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	100.0%	-	100.0%	-	100.0%	-	95.7%	-
At least 30 Mbps	100.0%	-	84.0%	-	78.1%	-	83.3%	-
At least 100 Mbps	71.0%	-	62.9%	-	45.0%	-	68.4%	-
At least 1 Gbps	10.1%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

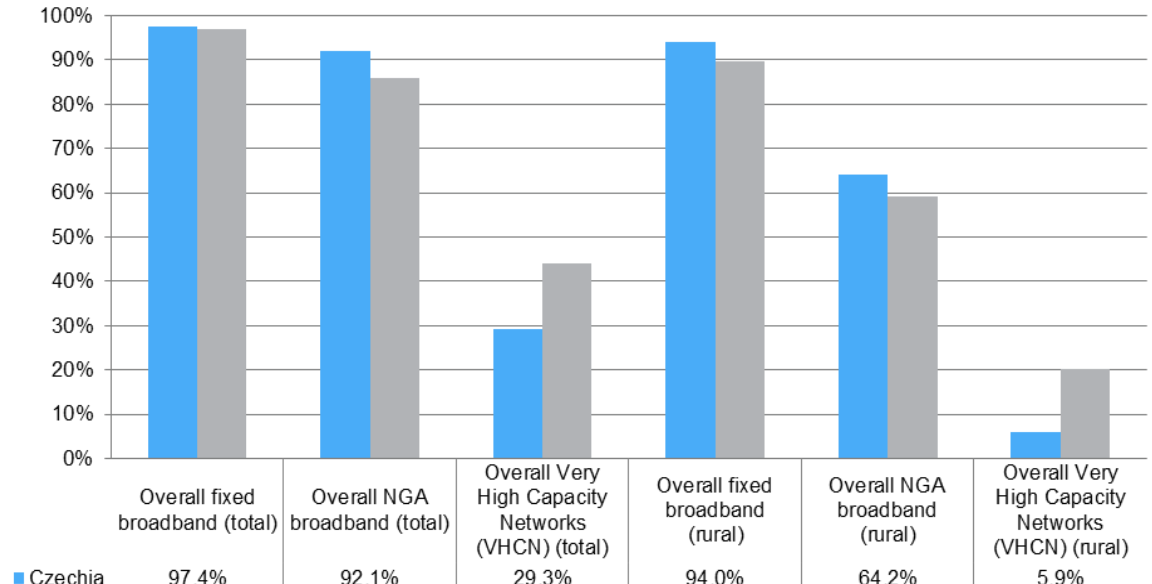
All restatements are highlighted in italics.

5.6 Czechia

5.6.1 National coverage by broadband technology

At the end of June 2019, 97.4% of Czech homes were passed by at least one fixed broadband network, slightly above the EU average of 97.1%. In rural regions of Czechia, 94.0% of households had access to fixed broadband networks. NGA broadband services were available to 92.1% of all Czech households and to 64.2% of rural households. Rural NGA coverage remained 5 percentage points above the EU average. Coverage of very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, reached 29.3% of Czech households but was limited to just FTTP as there were no DOCSIS 3.1 deployments by mid-2019.

Czechia: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Czechia	97.4%	92.1%	29.3%	94.0%	64.2%	5.9%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

In terms of individual technologies, DSL remained the most widespread technology available to 94.9% of Czech households. The infrastructure arm of the Czech incumbent operator, CETIN, continued to expand its VDSL network, which grew by 4.5 percentage points and reached 84.1% of households by the end of June 2019. Moreover, the operator has also rolled out VDSL2 Vectoring across most of its footprint by mid-June 2019 resulting in Czechia being the leader in VDSL2 Vectoring coverage with 83.3% homes passed.

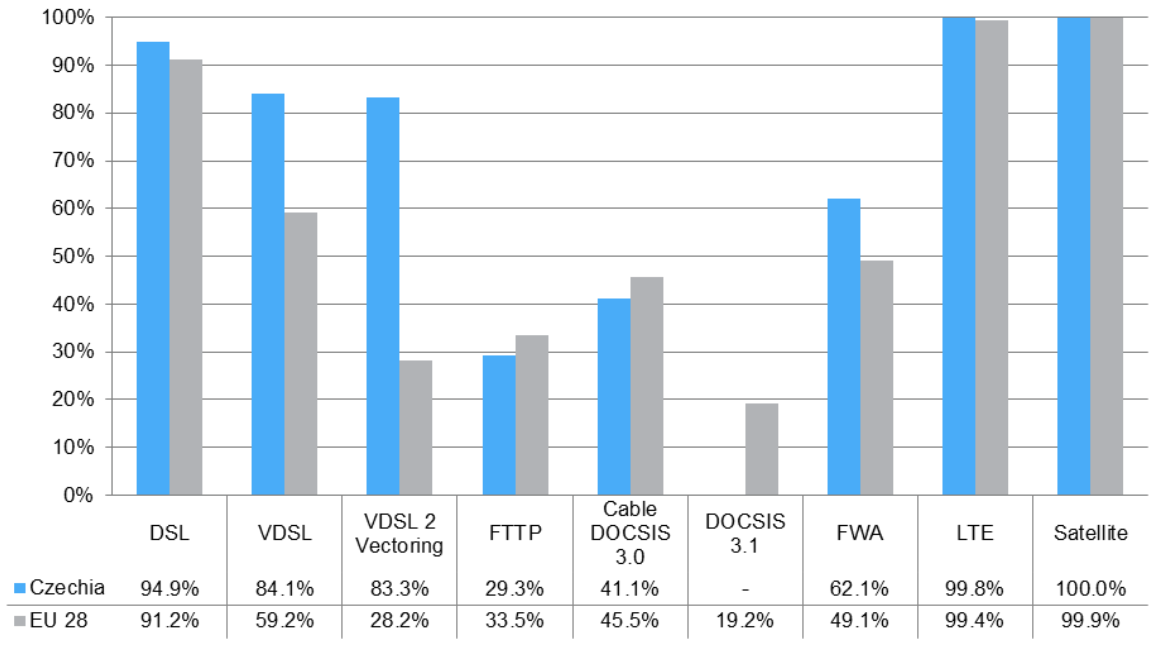
The Czech broadband market is also characterised by a large number of small local fixed wireless providers, which is reflected in the relatively high total FWA coverage. At the end of June 2019, 62.1% of Czech households had access to FWA services provided by these local operators.

Cable modem DOCSIS 3.0 coverage reached 41.1% of Czech households at the end of June 2019. As cable companies have traditionally limited their presence to big cities across Czechia, the vast majority of households covered by cable networks were located in urban areas. Additionally, DOCSIS 3.1 deployments have not been rolled out in the country by mid-2019.

At the end of June 2019, FTTP networks were estimated to pass 29.3% of Czech home with most of the FTTP rollouts attributed to smaller and local operators deploying these networks.

At the end of June 2018, LTE availability grew 0.4 percentage points reaching near-universal coverage with 99.8% of the homes passed by these networks. Meanwhile, LTE operator average coverage grew to 99.6% compared to mid-2018 meaning that mobile network operators in the Czechia offer nearly equal coverage of their respective networks.

Czechia: Coverage by technology, total, 2019

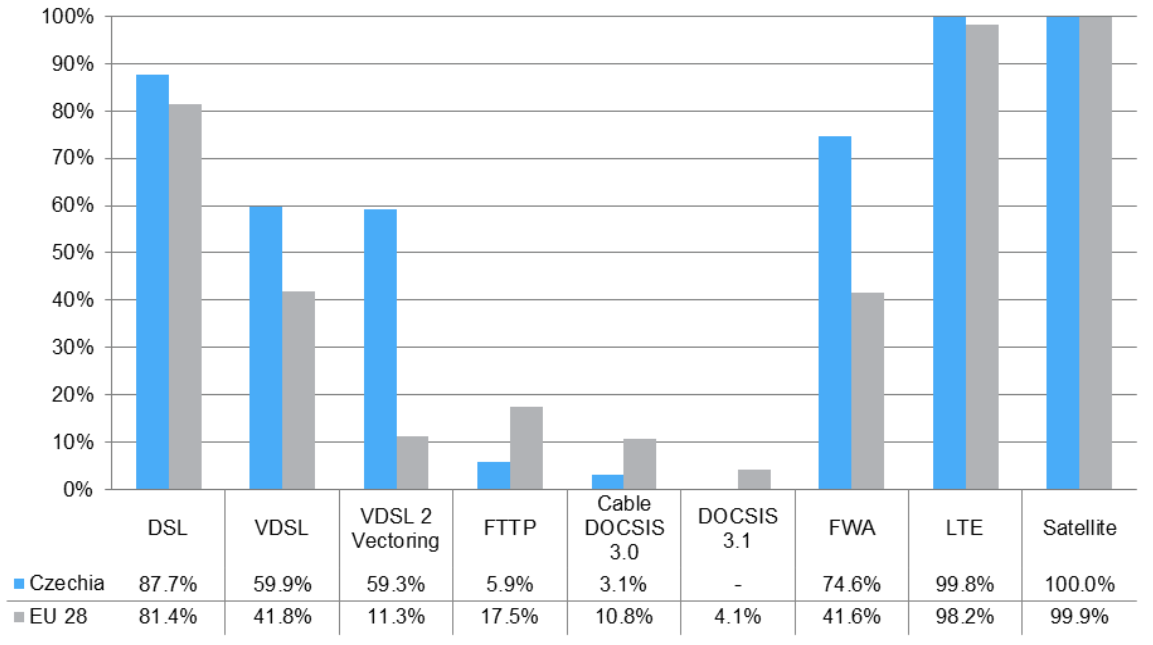


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Czechia	94.9%	84.1%	83.3%	29.3%	41.1%	-	62.1%	99.8%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural areas, rural DSL and VDSL coverage reached 87.7% and 59.9% of rural Czech households, respectively and remained above the EU average levels. In the same way, VDSL 2 Vectoring passed 59.3% of the Czech rural households, a proportion five times higher than the EU average (11.3%). The number of rural homes passed by DOCSIS 3.0 and FTTP networks remained stable, only 3.1% of rural Czech households had access to high-speed cable broadband services and FTTP are available to 5.9%. Fixed Wireless Access (FWA) networks passed three-quarters (74.6%) rural Czech homes, a significant share in comparison with the EU average (41.7%). Finally, LTE coverage also recorded a considerable growth, reaching 99.8% of rural households and surpassing the EU average (98.2%).

Czechia: Coverage by technology, rural areas, 2019



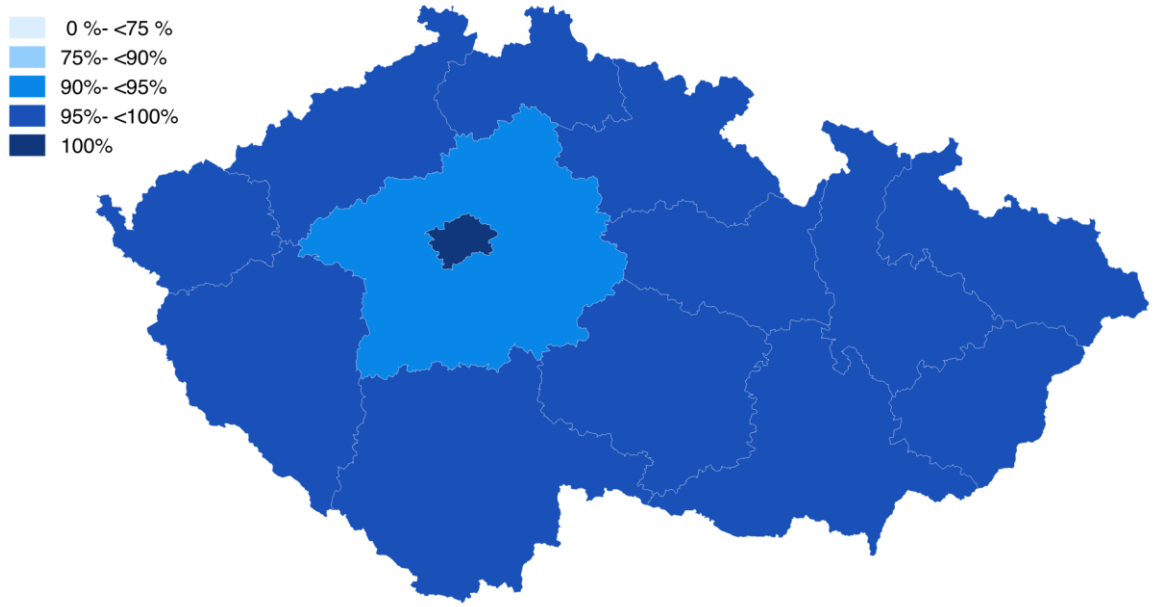
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Czechia	87.7%	59.9%	59.3%	5.9%	3.1%	-	74.6%	99.8%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.6%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.6.2 Regional coverage by broadband technology

Overall fixed broadband coverage in all regions of the Czechia exceeded 91.3%, with only three regions reporting coverages below 97%.

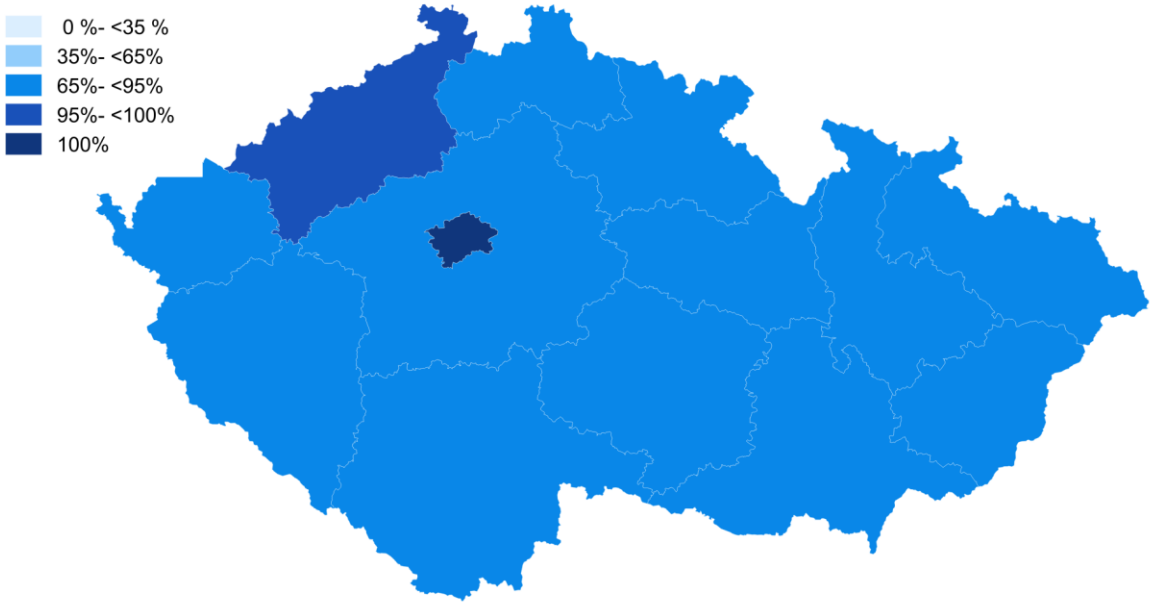
Czechia: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Regional NGA coverage continued to record more varied levels, ranging from 85.6% in the Středočeský region, to universal coverage in the capital, Prague. Over the study period, all of the Czech regions have improved their NGA broadband availability.

Czechia: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.6.3 Data tables for Czechia

Statistic	National
Population	10,610,055
Persons per household	2.4
Rural proportion	14.0%

	Czechia 2019		Czechia 2018		Czechia 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	94.9%	87.7%	92.9%	85.3%	93.1%	83.4%	91.2%	81.4%
VDSL	84.1%	59.9%	79.6%	57.3%	77.4%	52.2%	59.2%	41.8%
VDSL 2 Vectoring	83.3%	59.3%	-	-	-	-	28.2%	11.3%
FTTP	29.3%	5.9%	*28.3%*	*5.6%*	*25.9%*	*5.3%*	33.5%	17.5%
Cable modem DOCSIS 3.0	41.1%	3.1%	41.5%	3.2%	38.8%	2.4%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	62.1%	74.6%	-	-	-	-	49.1%	41.7%
LTE	99.8%	99.8%	99.4%	95.8%	99.4%	95.8%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	99.6%	-	99.1%	-	98.8%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.4%	94.0%	97.7%	95.8%	98.4%	94.8%	97.1%	89.7%
NGA broadband	92.1%	64.2%	89.8%	62.4%	88.6%	57.5%	85.8%	59.3%
Very High Capacity Networks	29.3%	5.9%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	97.4%	-	96.0%	-	96.1%	-	95.7%	-
At least 30 Mbps	92.1%	-	89.8%	-	88.6%	-	83.3%	-
At least 100 Mbps	75.0%	-	58.2%	-	55.9%	-	68.4%	-
At least 1 Gbps	2.4%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

Data on DSL and VDSL coverage is from the incumbent infrastructure company, CETIN.

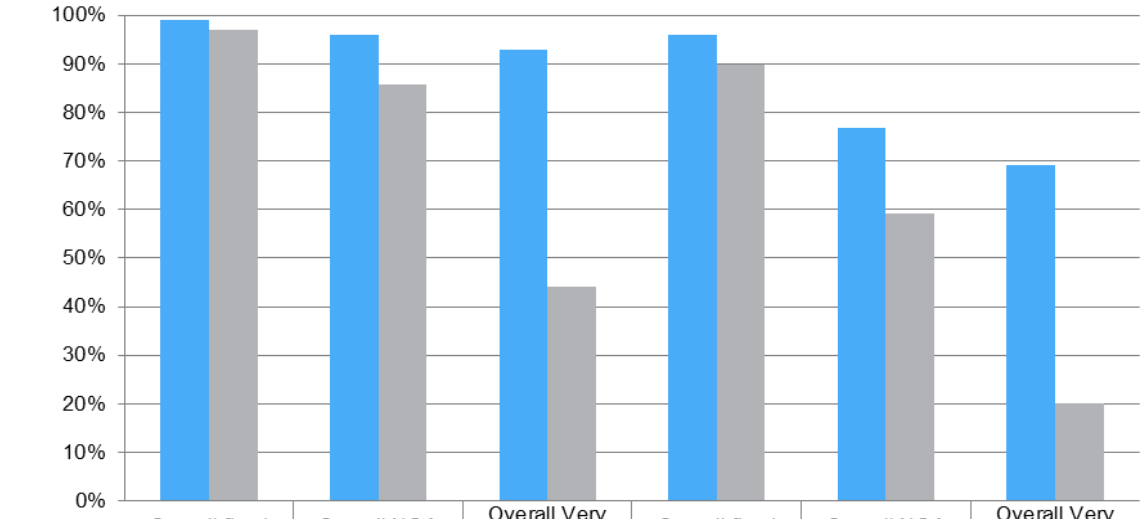
5.7 Denmark

5.7.1 National coverage by broadband technology

In this edition of the study, Denmark continued to exceed the EU average for all combination categories (fixed, NGA and Very High Capacity Networks). At a national level, both fixed broadband and NGA coverage remained relatively stable, as they achieved high coverage levels (over 95.0%) in past years already. At a rural level, fixed broadband saw a slight decrease in coverage, owing to variations in number of households and substitution by mobile broadband solutions. Rural NGA coverage increased by 6.1 percentage points, to reach 76.7% of rural households of Denmark.

Very high capacity networks (VHCN), i.e. combined coverage of DOCSIS 3.1 and FTTP, reached 93.0% of Danish households, the second highest coverage level recorded in this study.

Denmark: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Denmark	99.0%	96.0%	93.0%	96.0%	76.7%	69.2%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

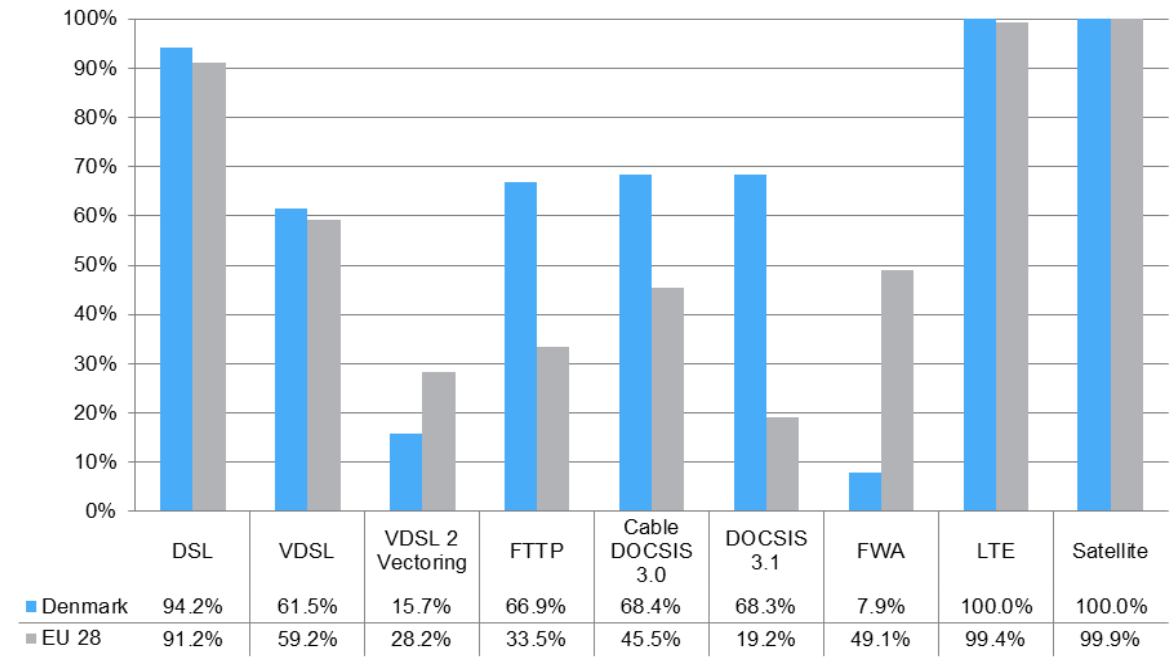
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Examining individual technologies, as was the case last year, DSL coverage recorded a slight decrease (1.0 percentage point), owing to gradual replacement of copper networks with FTTP and in some instances, to mobile broadband substitution. DSL however remained the most prevalent technology, with 94.2% of households covered. Fixed Wireless Access (FWA) was available to 7.9% of Danish households.

Looking at NGA technologies, FTTP coverage increased by 2.5 percentage points since mid-2018, reaching 66.9% of Danish households. Cable modem DOCSIS 3.0 coverage remained stable, at 68.4% of homes passed, and DOCSIS 3.1 was accessible to 68.3% of households, meaning that at the end of June 2019, almost all cable network footprint had been updated to the DOCSIS 3.1 standard. Lastly, VDSL coverage also recorded an increase in coverage, to reach 61.5% of homes, up from 60.2% at mid-2018, and VDSL 2 Vectoring was available to 15.7% of Danish households.

In terms of mobile broadband coverage, as mentioned in previous iterations of the study, Denmark was one of the early LTE adopters, and achieved universal LTE coverage already in 2016. At the end of June 2019, average LTE coverage also stood at 100.0%.

Denmark: Coverage by technology, total, 2019

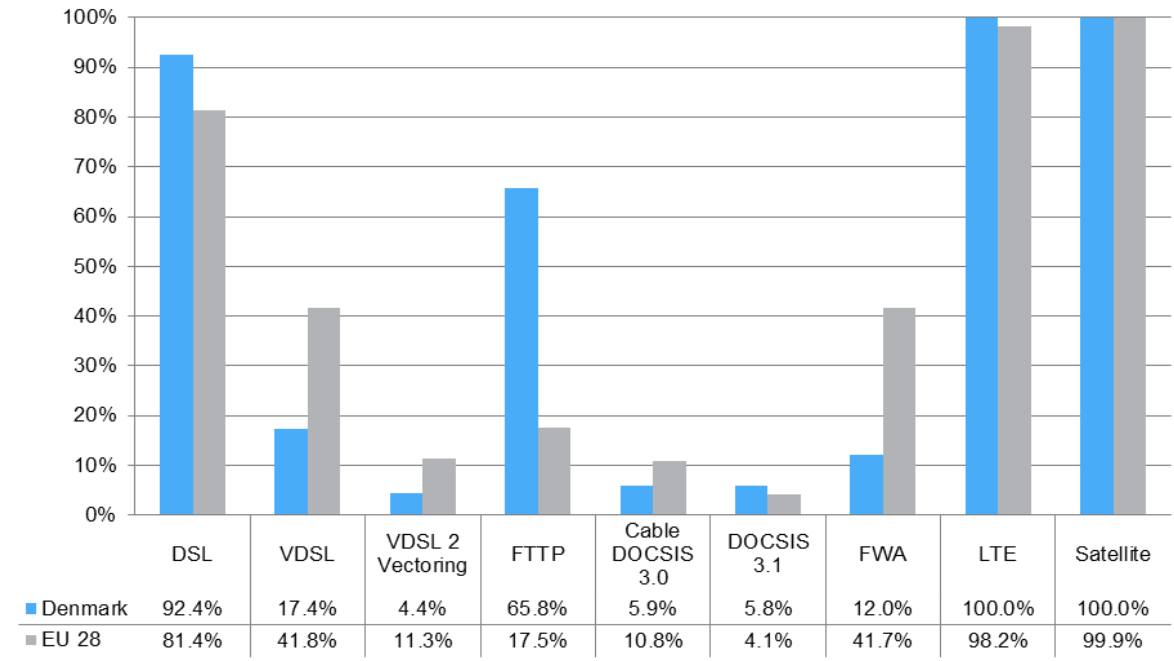


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Denmark	94.2%	61.5%	15.7%	66.9%	68.4%	68.3%	7.9%	100.0%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural regions of Denmark, DSL remained the most prevalent technology, with 92.4% of homes passed. As was the case on a national level, DSL recorded a slight decrease in coverage, down 0.6 percentage point from 93.0% in mid-2018. Fixed Wireless Access was accessible to 12.0% of rural Danish homes.

Denmark: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Denmark	92.4%	17.4%	4.4%	65.8%	5.9%	5.8%	12.0%	100.0%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

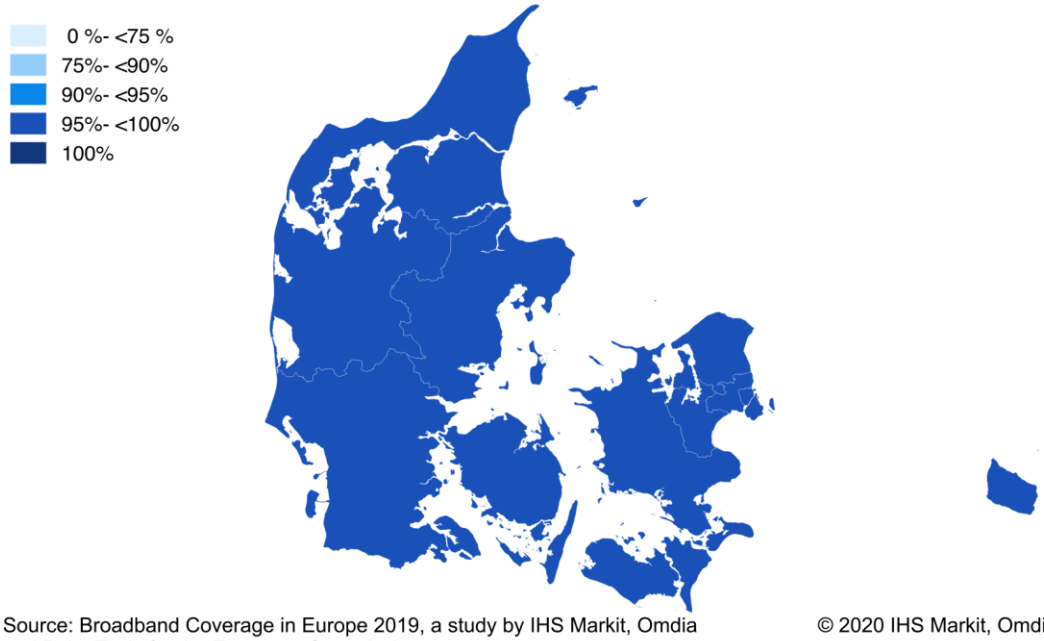
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

FTTP remained by far the most prevalent NGA technology available to rural households, with 65.8% availability. This is the second highest coverage level recorded among the study countries. VDSL availability increased by 1.3 percentage point, to reach 17.4% of rural households, and VDSL 2 Vectoring was available to just 4.4% of homes. Cable modem DOCSIS 3.0 coverage remained stable at 5.9% of households covered, whilst DOCSIS 3.1 services were available to 5.8% of rural households.

5.7.2 Regional coverage by broadband technology

Overall fixed broadband coverage exceeded 98.0% in all Danish regions at the end of June 2019. There is nearly full coverage (99.7%) in the highly urbanised regions of Byen København, Sydjylland, and Københavns omegn.

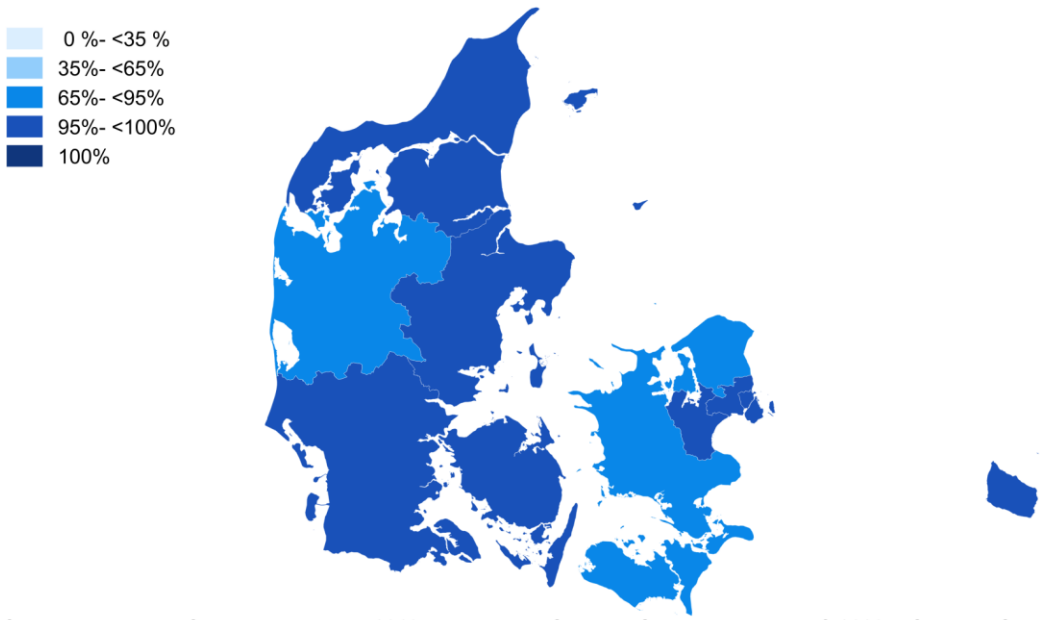
Denmark: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

In this iteration of the study, NGA coverage across regions ranged from 90.1% in Vest- og Sydsjælland, to near-universal (99.2%) in the region of Byen København.

Denmark: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.7.3 Data tables for Denmark

Statistic	National
Population	5,781,190
Persons per household	2.1
Rural proportion	10.6%

	Denmark 2019		Denmark 2018		Denmark 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	94.2%	92.4%	95.2%	93.0%	96.1%	93.4%	91.2%	81.4%
VDSL	61.5%	17.4%	60.2%	16.1%	62.0%	16.8%	59.2%	41.8%
VDSL 2 Vectoring	15.7%	4.4%	-	-	-	-	28.2%	11.3%
FTTP	66.9%	65.8%	64.4%	60.8%	62.7%	54.8%	33.5%	17.5%
Cable modem DOCSIS 3.0	68.4%	5.9%	68.4%	5.2%	68.8%	5.6%	45.5%	10.8%
DOCSIS 3.1	68.3%	5.8%	-	-	-	-	19.2%	4.1%
FWA	7.9%	12.0%	-	-	-	-	49.1%	41.7%
LTE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	100.0%	-	99.0%	-	97.5%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.0%	96.0%	99.5%	97.9%	99.5%	97.5%	97.1%	89.7%
NGA broadband	96.0%	76.7%	95.4%	70.6%	94.6%	65.5%	85.8%	59.3%
Very High Capacity Networks	93.0%	69.2%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	99.3%	-	99.2%	-	99.2%	-	95.7%	-
At least 30 Mbps	96.4%	-	95.3%	-	94.6%	-	83.3%	-
At least 100 Mbps	94.3%	-	92.6%	-	91.2%	-	68.4%	-
At least 1 Gbps	80.3%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

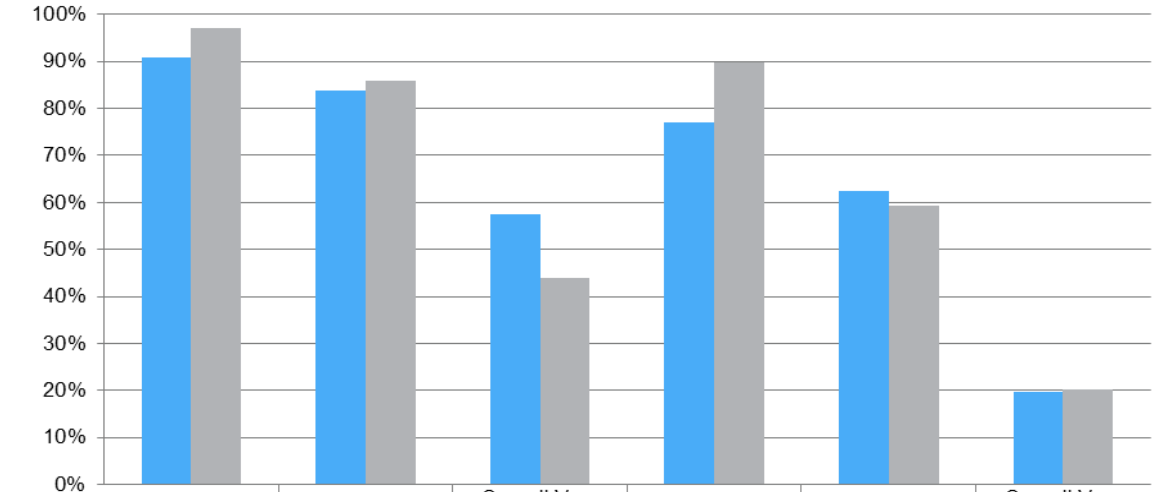
All restatements are highlighted in italics.

5.8 Estonia

5.8.1 National coverage by broadband technology

Overall fixed broadband coverage in Estonia remained stable in mid-2019 with 90.9% of households having access to fixed broadband services, a coverage level below the EU average of 97.1%. NGA broadband availability improved slightly over the study period, gaining 0.8 percentage point to reach 83.7% of households. At a rural level, both overall fixed broadband and NGA broadband coverage levels recorded slight increases of 0.9 and 1.4 percentage points, respectively. At there were no recorded upgrades to DOCSIS 3.1 at the end of June 2019, coverage of very high capacity networks (VHCN) was equal to FTTP coverage, reaching 57.4% of all Estonian households and 19.8% of rural households.

Estonia: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Estonia	90.9%	83.7%	57.4%	77.0%	62.4%	19.8%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

All individual technologies in Estonia recorded slight increases in coverage or remained stable. DSL remained stable, at 69.2% of homes passed, below the EU average of 91.2%.

Availability of NGA broadband in Estonia improved slightly over the study period. FTTP recorded the largest coverage increase at the national level in Estonia, growing by 3.2 percentage points and reaching 57.4% of households, well over the EU average of 33.5%. Cable modem DOCSIS 3.0 also recorded a modest coverage increase of 1.7 percentage point since mid-2018, with DOCSIS 3.0 networks passing 67.4% of Estonian homes. Rather than focusing on DCOSIS 3.1 upgrades, Estonian cable operators choose to transition to FTTP network rollout all the way to customer premises.

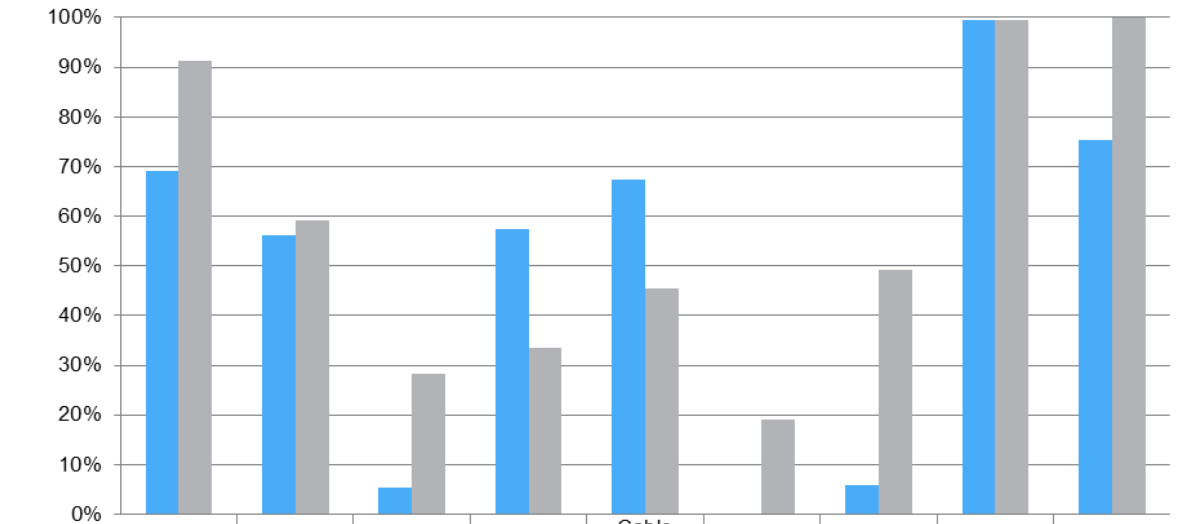
Incumbent operator Telia Eesti continued to upgrade copper lines to VDSL and launched VDSL2+ in 2018 and 2019.[10] As a result, by the end of June 2019, VDSL and VDSL 2 Vectoring reached 56.1% and 5.3% of households, respectively.

Looking at mobile broadband coverage, LTE remained stable, having recorded a 0.1 percentage point increase in coverage since mid-2019, to reach 99.4% of Estonian households. Estonia thus matched the EU average for LTE coverage, which also stood at 99.4% at the end of June 2019. When considering average coverage of all LTE network operators, 97.9% Estonians had access to LTE services.

Satellite broadband coverage remained unchanged in 2019, reaching 75.4% of Estonia, due to technical requirements for larger dishes to receive the satellite signal in some areas.

[10] https://www.telia.ee/uudised/telia-vaseklientideni-jouab-nuud-kordades-kiirem-internet

Estonia: Coverage by technology, total, 2019

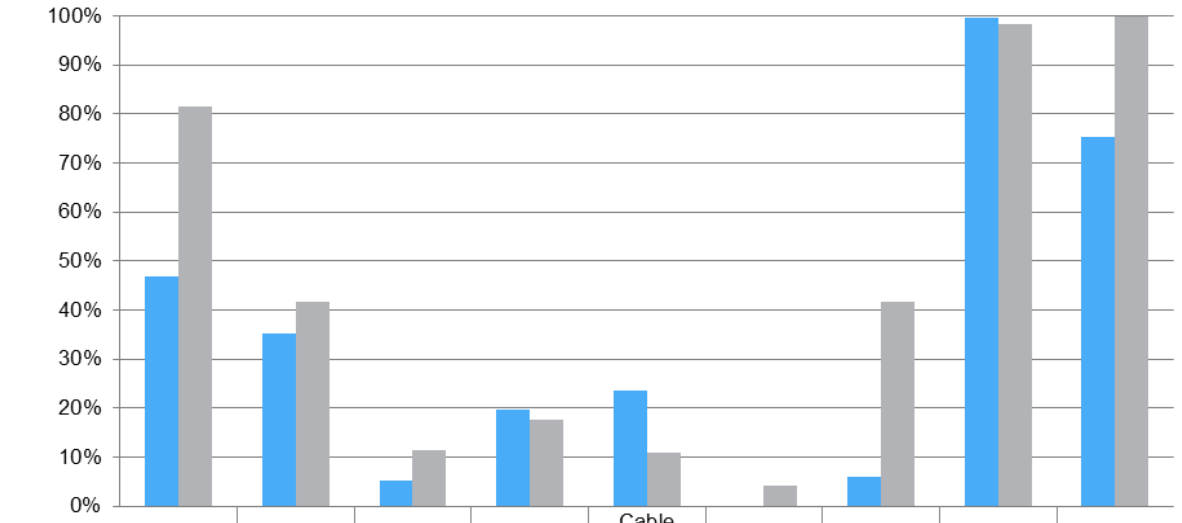


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Estonia	69.2%	56.1%	5.3%	57.4%	67.4%	-	5.8%	99.4%	75.4%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

In rural regions, DSL coverage remained the same as in mid-2018, with 47.0% of rural homes passed by DSL networks. Whilst availability of FWA services stood at 5.9% of households.

Estonia: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Estonia	47.0%	35.3%	5.3%	19.8%	23.5%	-	5.9%	99.5%	75.4%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

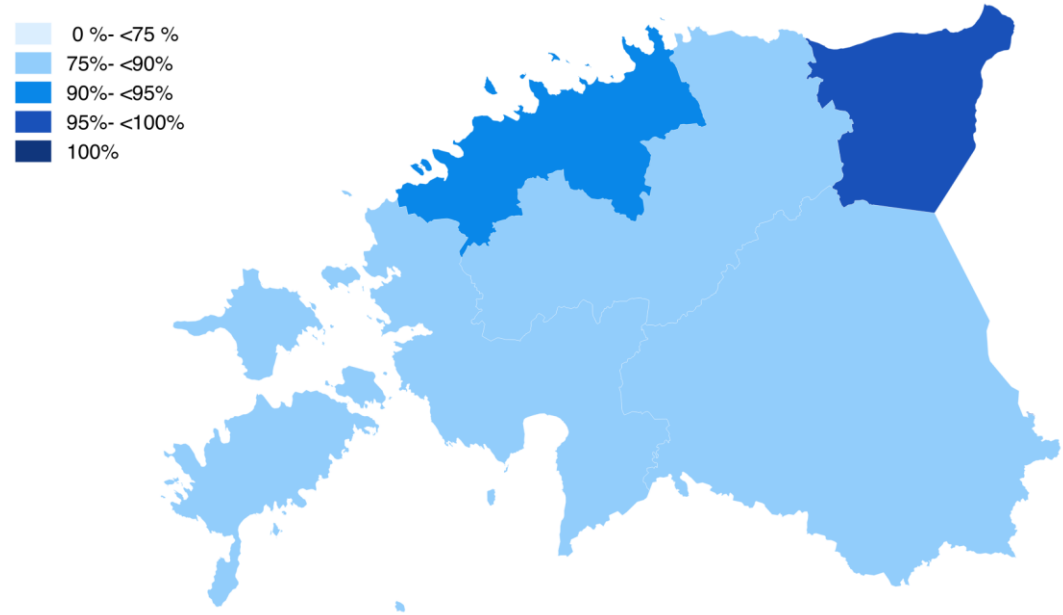
Looking at NGA broadband coverage of rural Estonia, VDSL remained the most prevalent technology, reaching 35.3% of rural households, the same coverage level as recorded in mid-2018. Cable modem DOCSIS 3.0 remained the second most prevalent NGA technology in rural Estonia, and recorded a slight coverage increase (0.2 percentage point), to reach 23.5% of rural households. Lastly, FTTP saw a 1.8 percentage point increase in coverage since mid-2018, and covered 19.8% of rural homes of Estonia, slightly higher than the EU average of 17.5%.

Mobile broadband coverage improved slightly over the study period, to reach 99.5% of rural Estonian households.

5.8.2 Regional coverage by broadband technology

Overall fixed broadband coverage amplitude in Estonian regions remained narrow, with coverage ranging from 86.5% in Lõuna-Eesti and 95.0% in Kirde-Eesti.

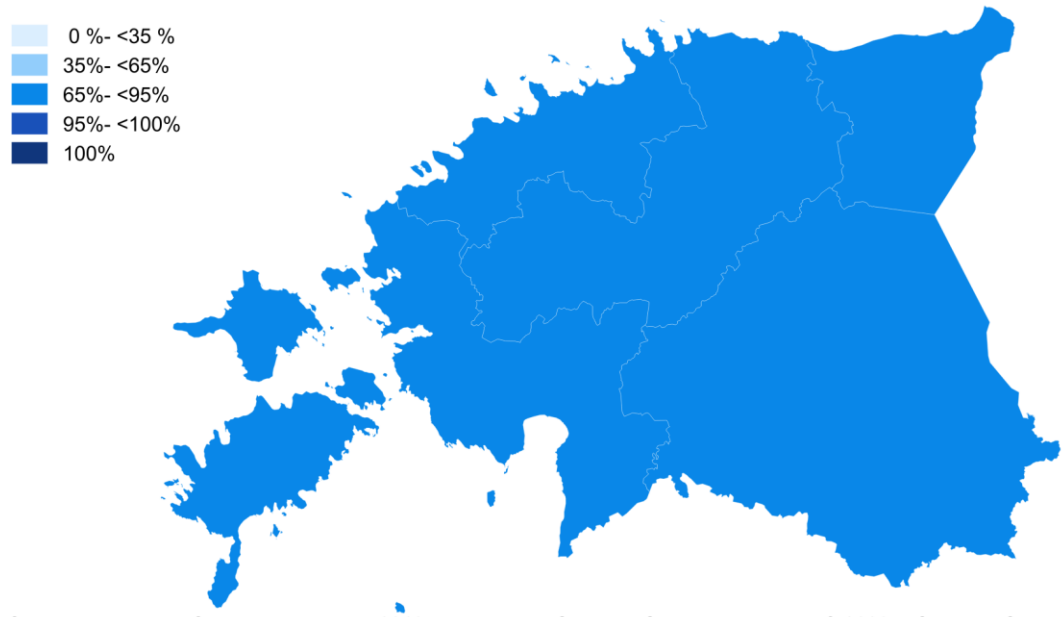
Estonia: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Disparities in NGA coverage remained similar to mid-2018, with coverage ranging from 79.8% and 86.9%. The highest levels remained in the least rural regions of Estonia, namely Põhja-Eesti and Kirde-Eesti.

Estonia: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.8.3 Data tables for Estonia

Statistic	National
Population	1,319,133
Persons per household	2.2
Rural proportion	21.2%

	Estonia 2019		Estonia 2018		Estonia 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	69.2%	47.0%	*69.1%*	47.0%	69.3%	32.4%	91.2%	81.4%
VDSL	56.1%	35.3%	55.2%	35.3%	55.1%	21.7%	59.2%	41.8%
VDSL 2 Vectoring	5.3%	5.3%	-	-	-	-	28.2%	11.3%
FTTP	57.4%	19.8%	54.2%	18.0%	50.7%	16.8%	33.5%	17.5%
Cable modem DOCSIS 3.0	67.4%	23.5%	65.7%	23.3%	55.6%	12.7%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	5.8%	5.9%	-	-	-	-	49.1%	41.7%
LTE	99.4%	99.5%	99.3%	99.3%	98.5%	98.5%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	97.9%	-	98.6%	-	97.6%	-	96.5%	-
Satellite	75.4%	75.4%	75.4%	75.4%	75.4%	75.4%	99.9%	99.9%
Overall fixed broadband	90.9%	77.0%	91.6%	76.1%	89.5%	71.9%	97.1%	89.7%
NGA broadband	83.7%	62.4%	82.9%	61.0%	80.4%	37.8%	85.8%	59.3%
Very High Capacity Networks	57.4%	19.8%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	85.1%	-	*85.0%*	-	84.9%	-	95.7%	-
At least 30 Mbps	83.7%	-	82.8%	-	78.6%	-	83.3%	-
At least 100 Mbps	74.3%	-	68.5%	-	61.1%	-	68.4%	-
At least 1 Gbps	28.7%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Marleit and Point Topic.

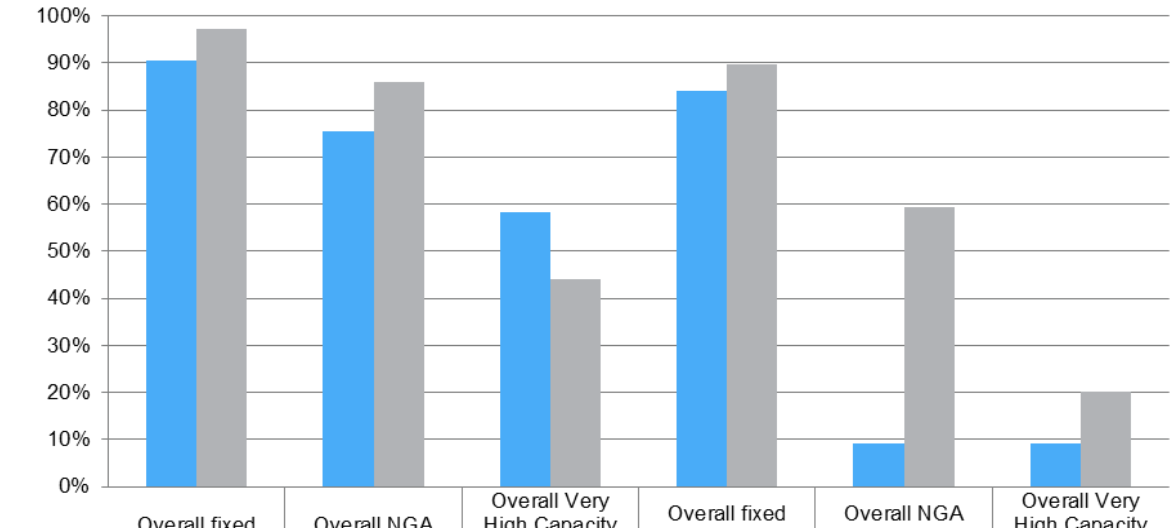
All restatements are highlighted in italics.

5.9 Finland

5.9.1 National coverage by broadband technology

Overall fixed broadband coverage in Finland continued to gradually decrease in Finland, owing to gradual DSL decommissioning and replacement by mobile broadband solutions. In this iteration of the study, fixed broadband decreased by 3.9 percentage points to pass 90.5% of households at a national level, and by 0.2 percentage point to pass 84.1% of households at a rural level. In terms of NGA coverage, high-speed broadband services were available to three-quarters (75.4%) of Finnish households, but reached only 9.1% of rural households, this study's lowest rural NGA coverage level. Very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, passed 58.2% of homes, well above the EU average of 44.0%.

Finland: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Finland	90.5%	75.4%	58.2%	84.1%	9.1%	9.1%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Examining coverage of the individual technologies, DSL remained the most prevalent fixed broadband technology in Finland, despite a continuous decrease witnessed in the last two years. The decrease in DSL coverage is explained by the gradual disconnection of copper lines, which are replaced by fibre optic networks or substituted by mobile broadband. By mid-2019, DSL coverage fell by 5.5 percentage points and reached 81.0% of Finnish households.

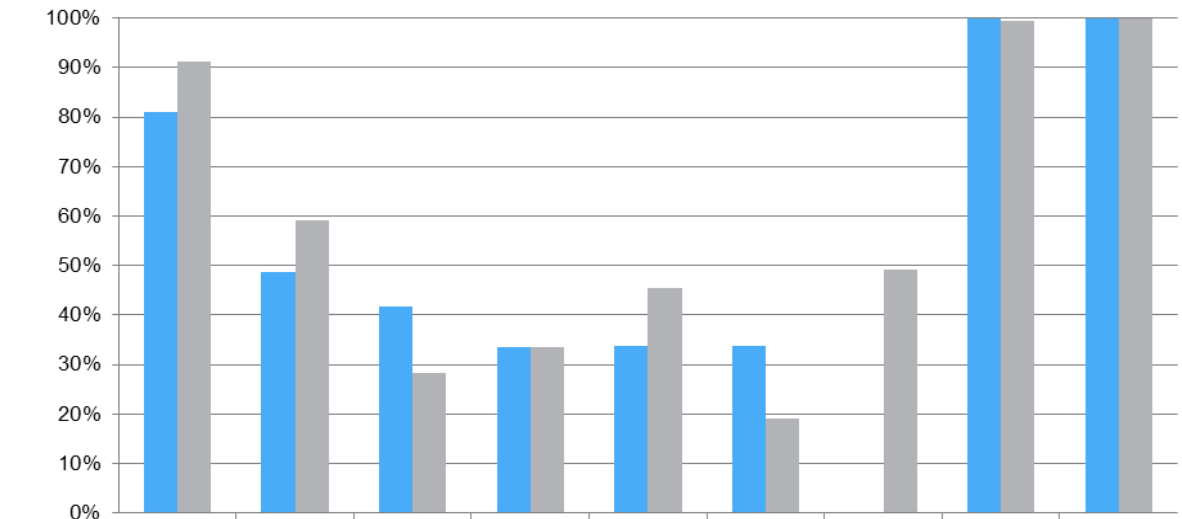
In the twelve months to the end of June 2019, VDSL continued to be the NGA technology with the highest coverage in Finland, reaching 48.6% of households. In addition, VDSL2 Vectoring services were available to 41.8% of Finnish households.

Cable DOCSIS 3.0 recorded a slight decrease in availability, passing a third (33.8%) of homes. Moreover, Finnish cable operators were one of the early adopters of DOCSIS 3.1 and by the end of June 2019, all cable networks in the country were upgraded to the DOCSIS 3.1 standard.

Following a 2.0 percentage point increase compared to mid-2018, FTTP broadband services were available to a third (33.5%) of households

In terms of mobile broadband coverage, as mentioned in previous iterations of the study, Finland was one of the early LTE adopters, and achieved universal LTE coverage already in 2017. At the end of June 2019, average LTE coverage stood at 99.1%.

Finland: Coverage by technology, total, 2019



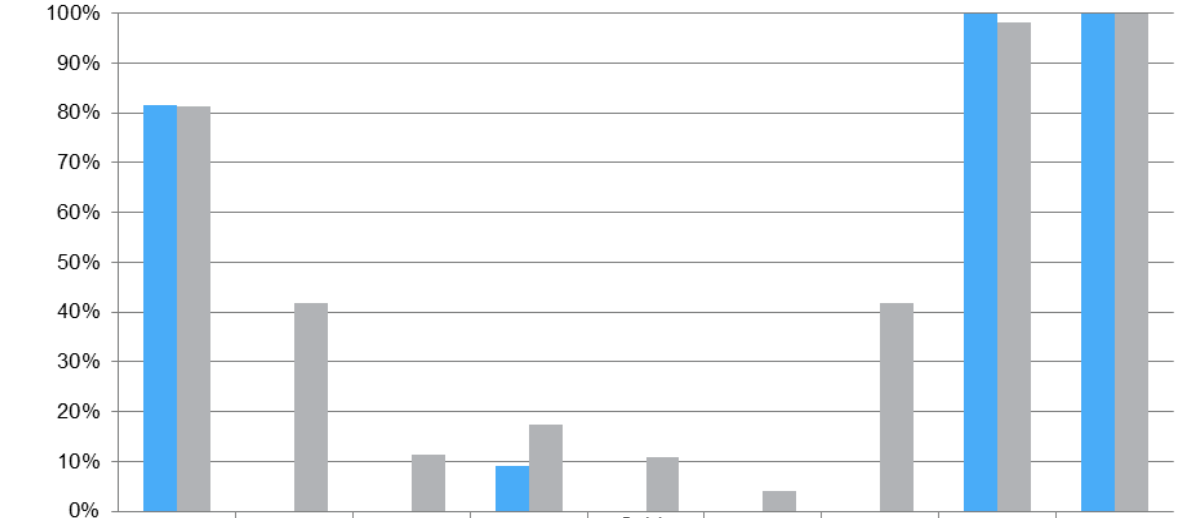
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Finland	81.0%	48.6%	41.8%	33.5%	33.8%	33.8%	-	100.0%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Rural broadband coverage in Finland remained broadly unchanged over the twelve months to mid-2019. VDSL and DOCSIS 3.0 technologies remained absent in rural areas. DSL covered 81.7% of households, slightly above the EU average of 81.4%. By mid-2019, FTTP networks passed 9.1% of rural homes.

LTE remained stable and was available to almost all rural Finnish households, with 99.9% of households covered.

Finland: Coverage by technology, rural areas, 2019



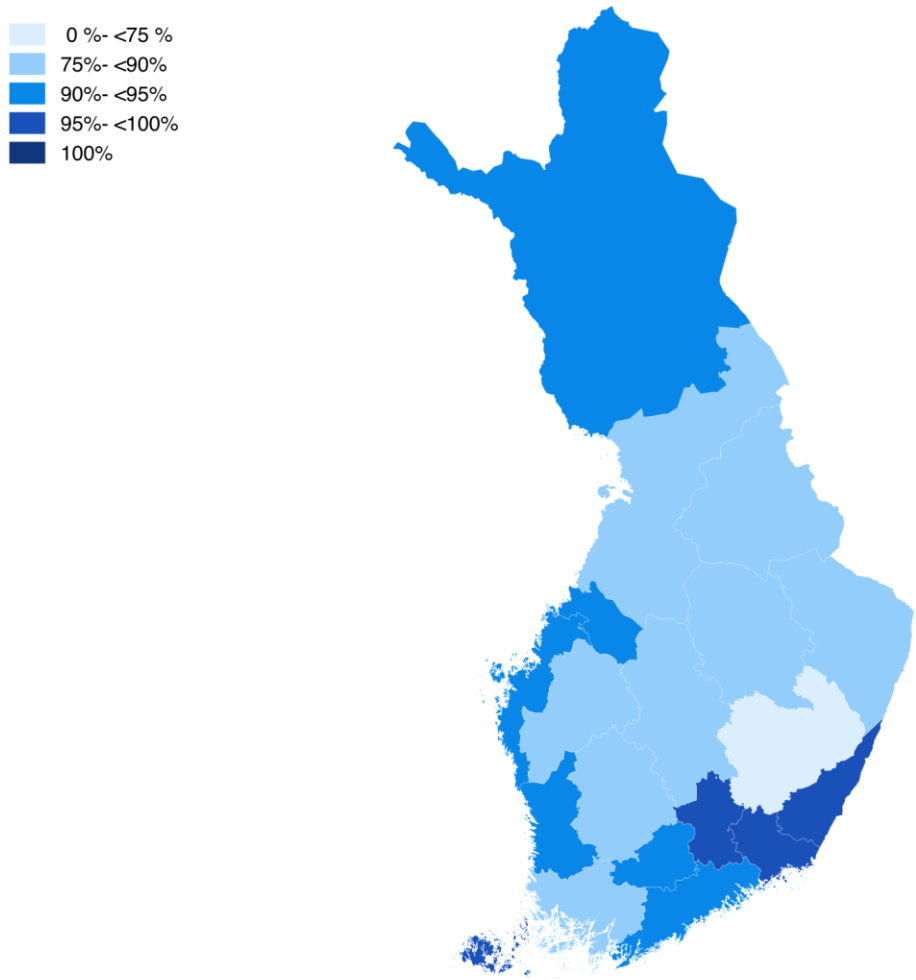
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Finland	81.7%	-	-	9.1%	-	-	-	99.9%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.9.2 Regional coverage by broadband technology

In this iteration of the study, only one Finnish region recorded fixed broadband coverage levels below 80.0%, namely Etelä-Savo, with 74.5% of households passed. Åland remained the region with the highest fixed broadband coverage, with 98.5% of households passed. As mentioned in previous iterations of this study, Finland was a peculiar case in the sense that broadband coverage levels were not strongly correlated to the degree of urbanisation. Out of the three regions with the most rural households, only one was among the regions with the lowest fixed coverage.

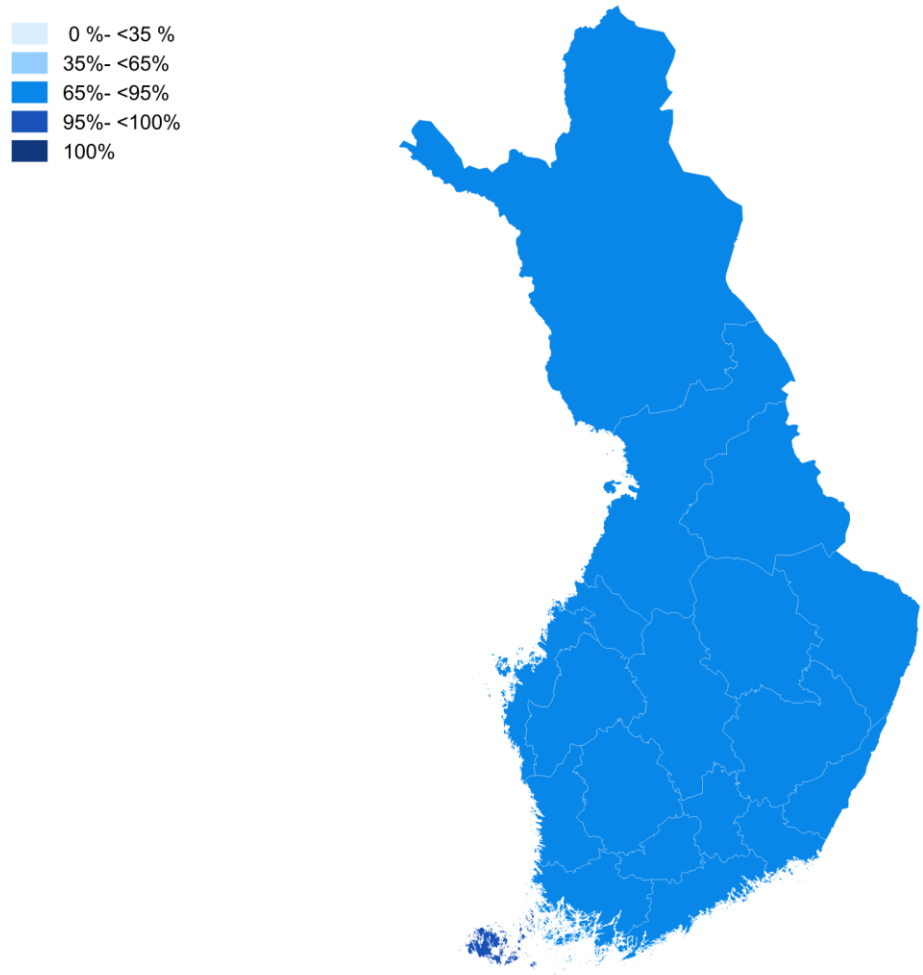
Finland: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at NGA coverage levels, the variance between regions significantly decreased this year, with coverage ranging between 67.4% (Etelä-Pohjanmaa) and 98.5% in Åland, meaning that all fixed broadband in this region was NGA-based.

Finland: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.9.3 Data tables for Finland

Statistic	National
Population	5,513,268
Persons per household	2.1
Rural proportion	17.7%

	Finland 2019		Finland 2018		Finland 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	81.0%	81.7%	*86.5%*	*81.8%*	94.0%	81.7%	91.2%	81.4%
VDSL	48.6%	0.0%	48.5%	0.0%	*48.5%*	0.0%	59.2%	41.8%
VDSL 2 Vectoring	41.8%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	33.5%	9.1%	*31.4%*	*9.3%*	*31.7%*	*8.3%*	33.5%	17.5%
Cable modem DOCSIS 3.0	33.8%	0.0%	*34.1%*	0.0%	*36.2%*	0.0%	45.5%	10.8%
DOCSIS 3.1	33.8%	0.0%	-	-	-	-	19.2%	4.1%
FWA	0.0%	0.0%	-	-	-	-	49.1%	41.7%
LTE	100.0%	99.9%	*100.0%*	*99.9%*	*99.6%*	99.6%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	99.1%	-	98.3%	-	97.0%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	90.5%	84.1%	*94.4%*	*84.3%*	97.0%	84.0%	97.1%	89.7%
NGA broadband	75.4%	9.1%	*73.9%*	*9.3%*	*74.1%*	*8.3%*	85.8%	59.3%
Very High Capacity Networks	58.2%	9.1%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	93.0%	-	*94.4%*	-	96.5%	-	95.7%	-
At least 30 Mbps	73.0%	-	*70.6%*	-	*66.0%*	-	83.3%	-
At least 100 Mbps	58.0%	-	*51.8%*	-	*43.4%*	-	68.4%	-
At least 1 Gbps	35.0%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

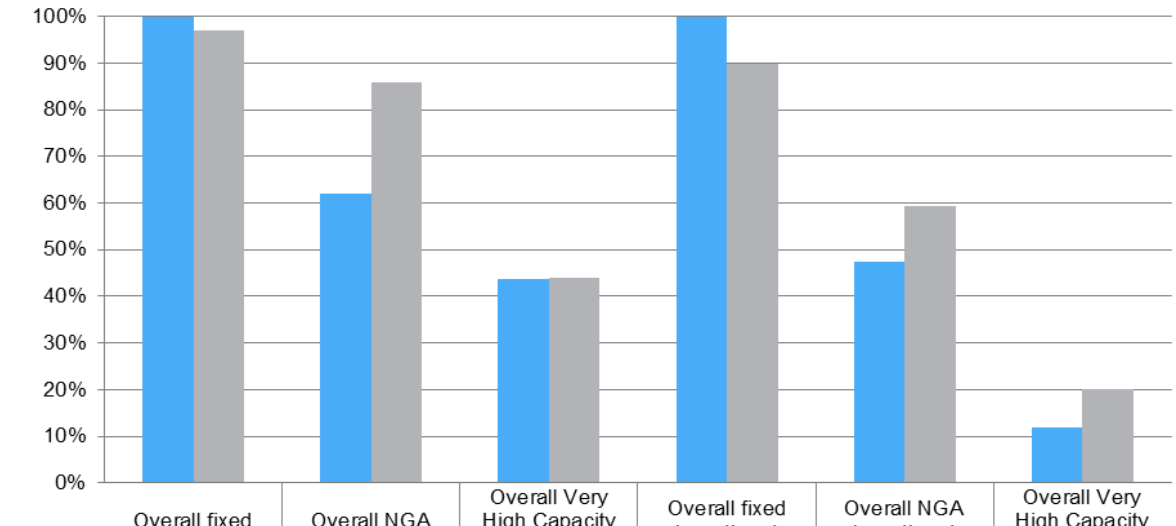
All restatements are highlighted in italics.

5.10 France

5.10.1 National coverage by broadband technology

With France achieving universal fixed broadband coverage already in 2017, the focus has been on improving availability of NGA technologies. By the end of June 2019, NGA coverage grew by 3.6 percentage points at a national level reaching 62.1% of all households. In rural areas availability of NGA services increased by 1.0 percentage point, with 47.5% of rural homes passed by at least one NGA network. Despite these increases in coverage, France remained below the EU average for both categories. Very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, passed 43.8% of homes, on par with the EU average of 44.0%. In rural areas, 11.9% of French rural households were covered by networks with the potential of delivering gigabit speeds.

France: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
France	100.0%	62.1%	43.8%	100.0%	47.5%	11.9%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual technologies, DSL remained the most widespread fixed broadband technology in France, with over 99.9% of homes passed. Fixed Wireless Access (FWA) was accessible to 84.6% of households across the country.[11] Use of FWA technology to boost high-speed broadband availability has been encouraged by the French government, leading to all four main French operators to launch 4G boxes aimed at households with slow fixed connections.[12]

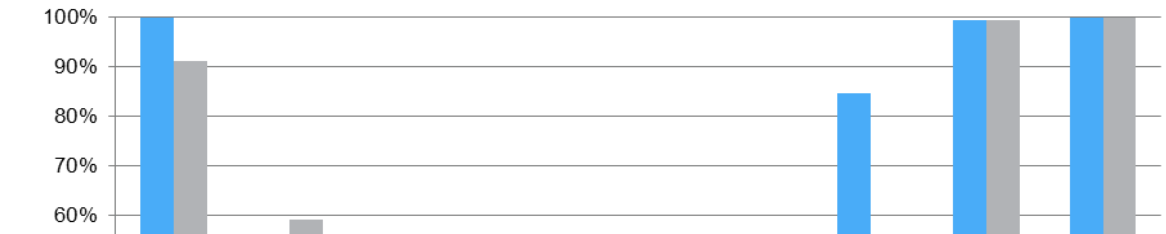
Examining NGA broadband availability, FTTP remained by far the most prevalent NGA broadband technology in France, growing by 6.0 percentage points since mid-2018 and reaching 43.8% of households. The second most prevalent NGA technology remained cable modem DOCSIS 3.0, which recorded a slight 1.6 percentage point decrease in coverage since the last iteration of this study, owing to gradual upgrade of cable networks to FTTH. Lastly, VDSL coverage remained relatively stable, at 19.7% of homes passed. Both VDSL 2 Vectoring and DOCSIS 3.1 were absent from the French market, with operators focusing on the deployment of fibre rather than upgrading existing networks. Very High Capacity Networks (VHCN) coverage was thus equal to that of FTTP.

In this iteration of the study, LTE coverage growth continued to slow down as LTE approaches universal coverage. At the end of June 2019, 99.5% of French households were covered, compared to 99.3% in mid-2018. When considering average coverage of all LTE network operators, 98.6% of people in France had access to LTE services.

[11] Results are being fine-tuned: work is being carried out with operators to improve the accuracy of the data provided by ARCEP for this category.

[12] https://www.amenagement-numerique.gouv.fr/fr/bonhautdebit-aidefinanciere

France: Coverage by technology, total, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
France	100.0%	19.7%	-	43.8%	27.0%	-	84.6%	99.5%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

In rural areas, DSL remained the most widespread fixed broadband technology, passing 99.9% of rural homes. Fixed Wireless Access was available to 83.3% of rural households, which were the main beneficiaries of the state initiative promoting FWA access as a substitution for slow fixed connections.

By mid-2019, FTTP coverage of French rural regions stood at almost 11.9%, remaining below the EU average of 17.5%. VDSL remained the most prevalent NGA technology in rural regions of France, with 40.8% of households covered. VDSL is often preferred by operators to cover rural regions with NGA broadband as VDSL is faster to deploy than FTTP. Cable modem DOCSIS 3.0 coverage remained insignificant, reaching less than 1.0% (0.7%) of rural households.

France: Coverage by technology, rural areas, 2019

	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
France	99.9%	40.8%	-	11.9%	0.7%	-	83.3%	99.8%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

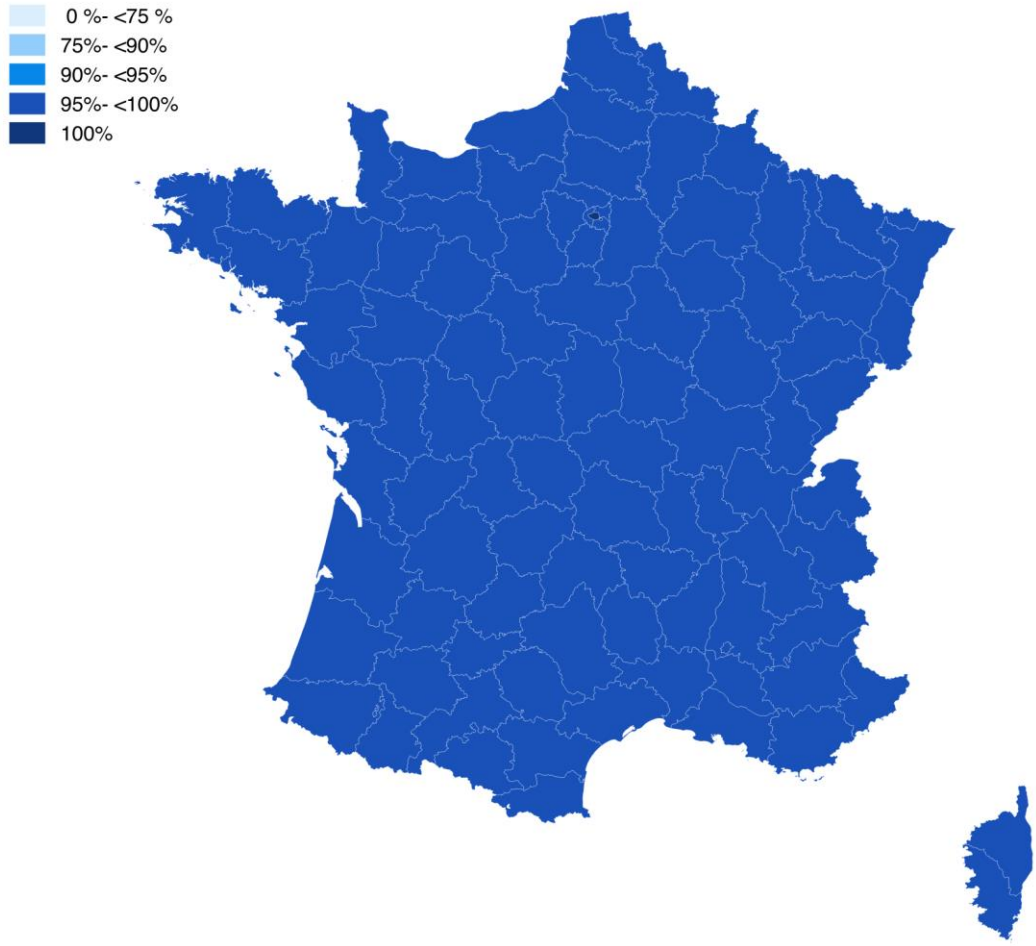
Rural LTE coverage remained stable at 99.8% of households, with the focus of the four main operators turning to mobile network rollouts in completely uncovered zones in France[13].

[13] https://www.latribune.fr/technos-medias/telecoms/mobile-pres-de-1-200-zones-blanches-en-cours-de-resorption-830830.html

5.10.2 Regional coverage by broadband technology

Availability of fixed broadband services remained unchanged in France in this iteration of the study as the country reached universal coverage both for overall and fixed broadband networks.

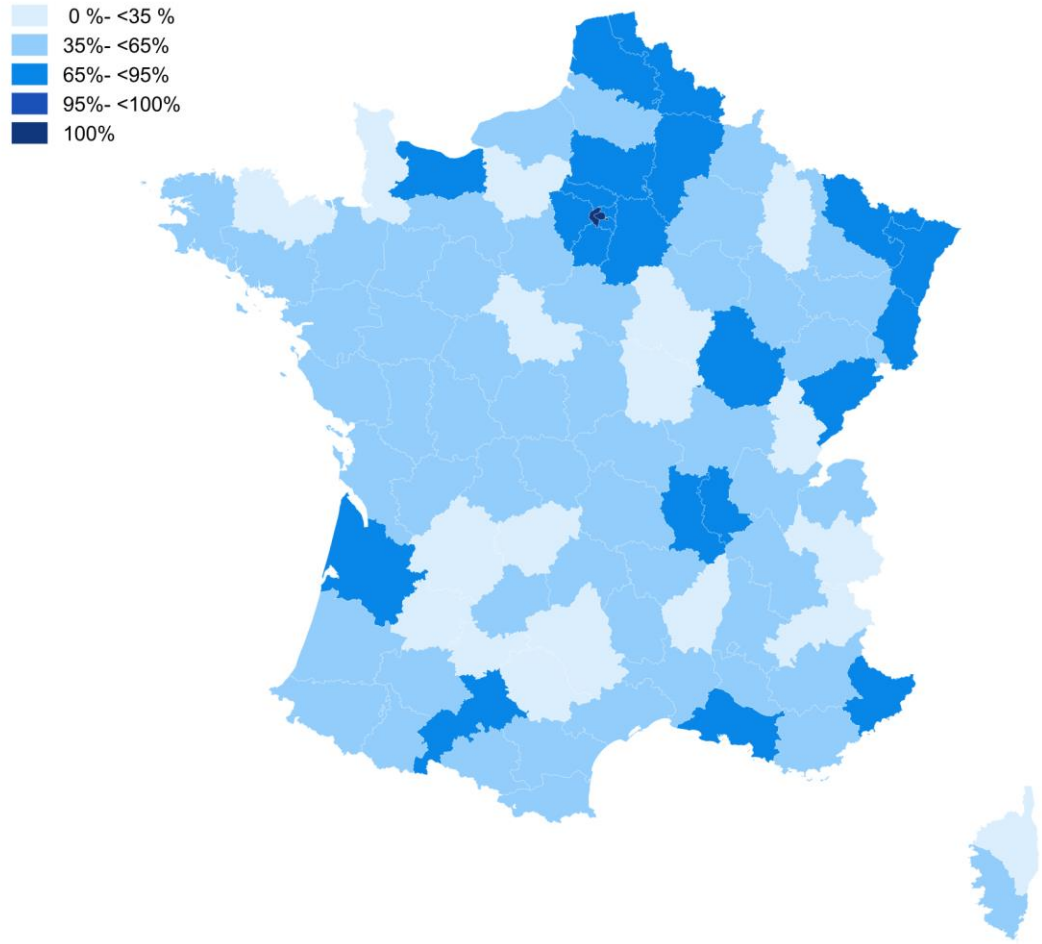
France: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

However, considerable variations remained in terms of NGA coverage, ranging from 12.7% in the Guyane region to universal coverage in Paris. Similar to last year, only two regions (Paris and its neighbouring region Hauts-de-Seine) recorded NGA levels above 90.0%, highlighting the disparity in NGA coverage of French regions.

France: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

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

Coverage data for French NUTS 3 areas outside mainland Europe			
NUTS 3	**Description**	Overall fixed broadband coverage	NGA broadband coverage
FRA10	**Guadeloupe**	100.0%	51.2%
FRA20	**Martinique**	100.0%	39.2%
FRA30	**Guyane**	100.0%	12.7%
FRA40	**La Réunion**	100.0%	100.0%

5.10.3 Data tables for France

Statistic	National
Population	66,729,957
Persons per household	2.3
Rural proportion	15.8%

	France 2019		France 2018		France 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	99.9%	100.0%	99.9%	100.0%	100.0%	91.2%	81.4%
VDSL	19.7%	40.8%	19.6%	40.8%	18.9%	33.9%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	43.8%	11.9%	37.8%	9.3%	28.3%	4.3%	33.5%	17.5%
Cable modem DOCSIS 3.0	27.0%	0.7%	28.6%	1.3%	27.8%	1.1%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	84.6%	83.3%	-	-	-	-	49.1%	41.7%
LTE	99.5%	99.8%	99.3%	99.8%	98.0%	87.5%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	98.6%	-	95.3%	-	88.6%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	97.1%	89.7%
NGA broadband	62.1%	47.5%	58.5%	46.5%	51.9%	37.3%	85.8%	59.3%
Very High Capacity Networks	43.8%	11.9%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	99.7%	-	97.6%	-	97.5%	-	95.7%	-
At least 30 Mbps	62.0%	-	58.5%	-	55.5%	-	83.3%	-
At least 100 Mbps	50.3%	-	*47.5%*	-	39.2%	-	68.4%	-
At least 1 Gbps	46.6%[14]	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

[14] In some instances, cable modem DOCSIS 3.0 networks are capable of achieving at least 1Gbps. Those were thus taken into account in the At least 1Gbps speed coverage category, but not in the VHCN coverage category (which is limited to FTTP and DOCSIS 3.1).

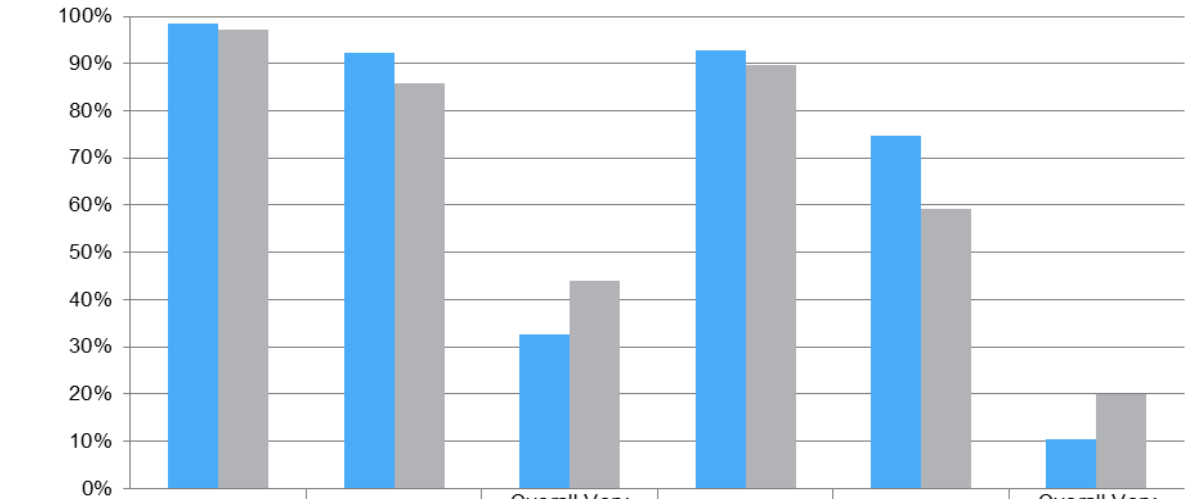
5.11 Germany

5.11.1 National coverage by broadband technology

During the twelve months to June 2019, overall fixed broadband and NGA coverage in Germany grew, especially in rural areas. At a national level, fixed broadband coverage rose by 1.1 percentage points reaching 98.6% of all households. Following a 3.2 percentage point increase, 92.8% of rural homes were passed by at least one fixed broadband network. NGA networks covered 92.2% of the total households, growing by 4.3 percentage points compared to mid-2018 and recorded even more considerable growth in rural areas, where NGA coverage grew by 8.3 percentage points to 74.6%. Consequently, Germany ranked above the EU average for overall fixed and NGA broadband, both at a national and rural level.

However, the country recorded lower coverage levels of very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, than the EU average both at a country total and rural level. At the end of June 2019, a third (32.7%) of German households were covered by networks with a potential to offer gigabit speeds. When looking at rural areas, VHCN services were available to 10.3% of rural households.

Germany: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Germany	98.6%	92.2%	32.7%	92.8%	74.6%	10.3%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

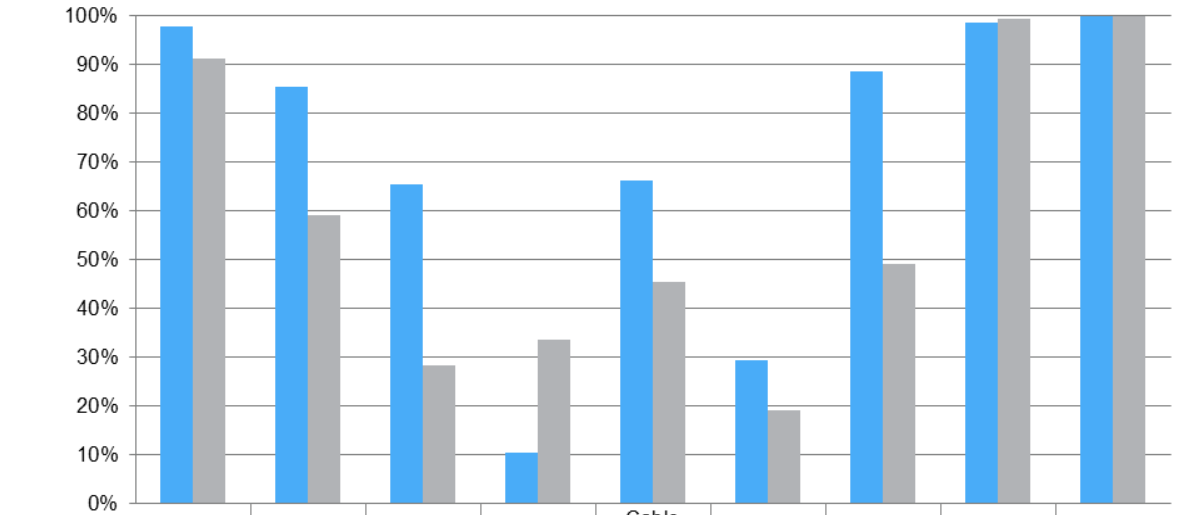
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual technologies, as seen in previous years, DSL remained the most prevalent fixed broadband technology, passing 97.9% of households, up from 97.4% in mid-2018. With the incumbent, Deutsche Telekom, focusing heavily on upgrading its copper network both VDSL and VDSL2 Vectoring recorded much higher coverage levels than the EU average. In fact, VDSL coverage increased significantly in the twelve months to mid-2019, growing by 8.7 percentage points and reaching 85.6% of German households. VDSL2 Vectoring services, capable of providing at least 100Mbps download speeds, were available to more than two thirds (65.4%) of German households.

Cable modem DOCSIS 3.0 recorded a 2.4 percentage point increase, with 66.3% of German households having access to high-speed cable broadband services, well above the EU average of 45.5%. Furthermore, almost half of these networks were upgraded to DOCSIS 3.1 standard, passing 29.3% of homes. Despite a 2.0 percentage point annual increase, FTTP availability remained very limited with only 10.5% of German homes passed by FTTP networks.

As was the case last year, Germany recorded one of the lowest LTE coverage out of all the countries studied in this report. In mid-2019, LTE availability stood at 98.6%, up from 97.5% in mid-2018 but remained below the EU average (99.4%). The average coverage of all LTE network operators grew by 3.6 percentage points to 93.7%.

Germany: Coverage by technology, total, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Germany	97.9%	85.6%	65.4%	10.5%	66.3%	29.3%	88.7%	98.6%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

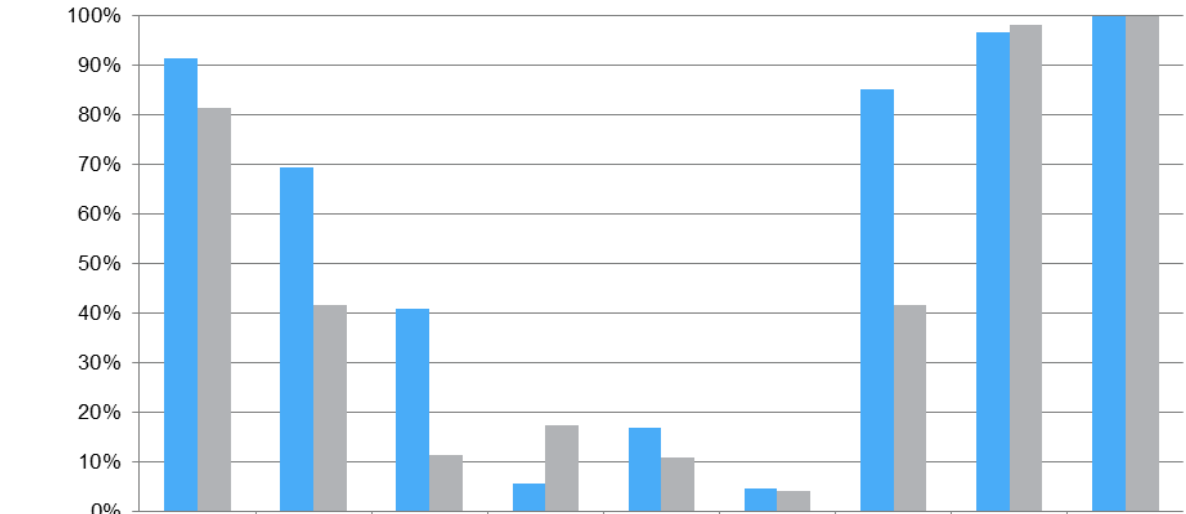
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

In rural areas, DSL was the most widespread fixed broadband technology, with 91.3% of rural households covered. In addition, the percentage of rural networks upgraded to VDSL and VDSL 2 Vectoring was significant. At the end of June 2019, VDSL services were available to nearly 7 in 10 (69.3%) rural households, following a 13.2 percentage point increase compared to mid-2018, and 41.0% of rural households were covered by VDSL2 Vectoring.

However, coverage of other NGA technologies remained limited in rural areas. Cable modem DOCSIS 3.0 networks reached 16.9% of rural households, having increased by 1.7 percentage points. DOCSIS 3.1 networks passed 4.7% of rural homes. And despite continuous growth, only 5.6% of rural households were able to subscribe to FTTP services.

Looking at rural mobile broadband coverage, rural LTE coverage increased by 6.1 percentage points but at 96.7% stood below the EU average (98.2%).

Germany: Coverage by technology, rural areas, 2019



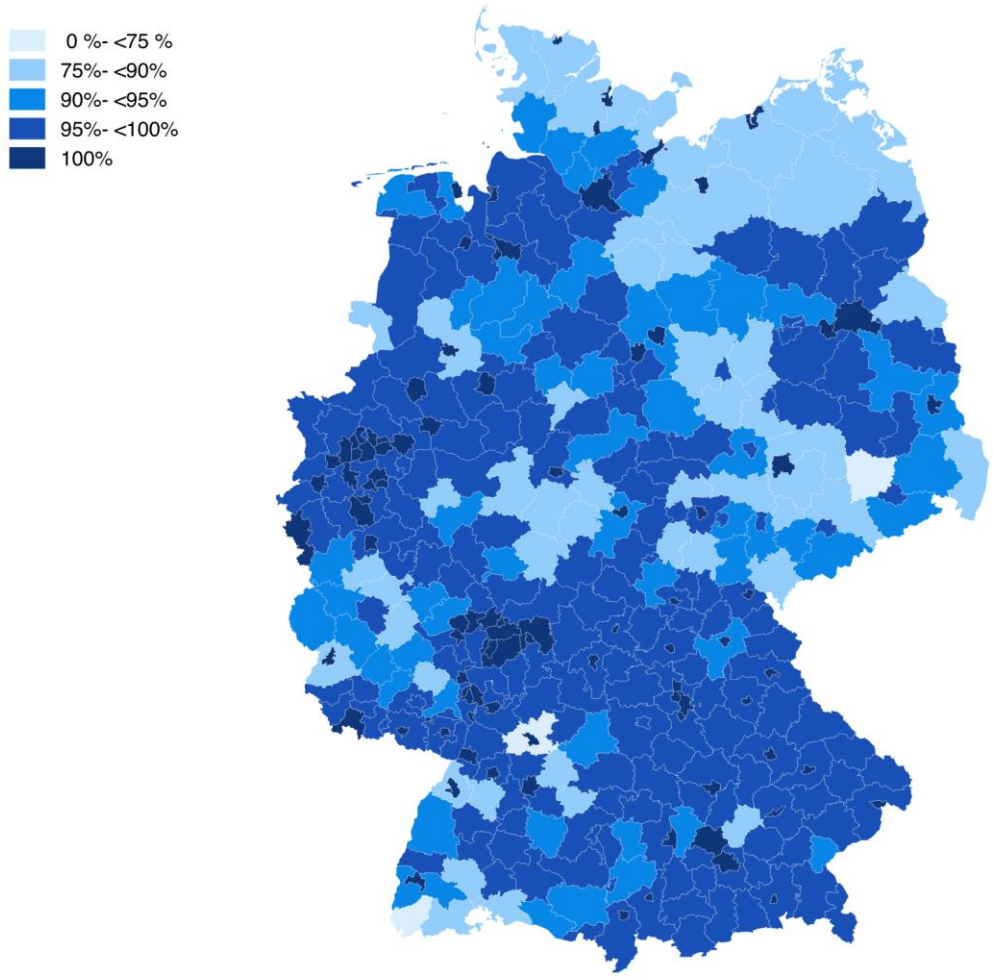
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Germany	91.3%	69.3%	41.0%	5.6%	16.9%	4.7%	85.1%	96.7%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.11.2 Regional coverage by broadband technology

As was the case in previous iterations of this study, there was some variation in fixed broadband coverage among German regions. Whilst some regions recorded universal coverage, fixed broadband was available to 82.9% of households in the region of Lüchow-Dannenberg.

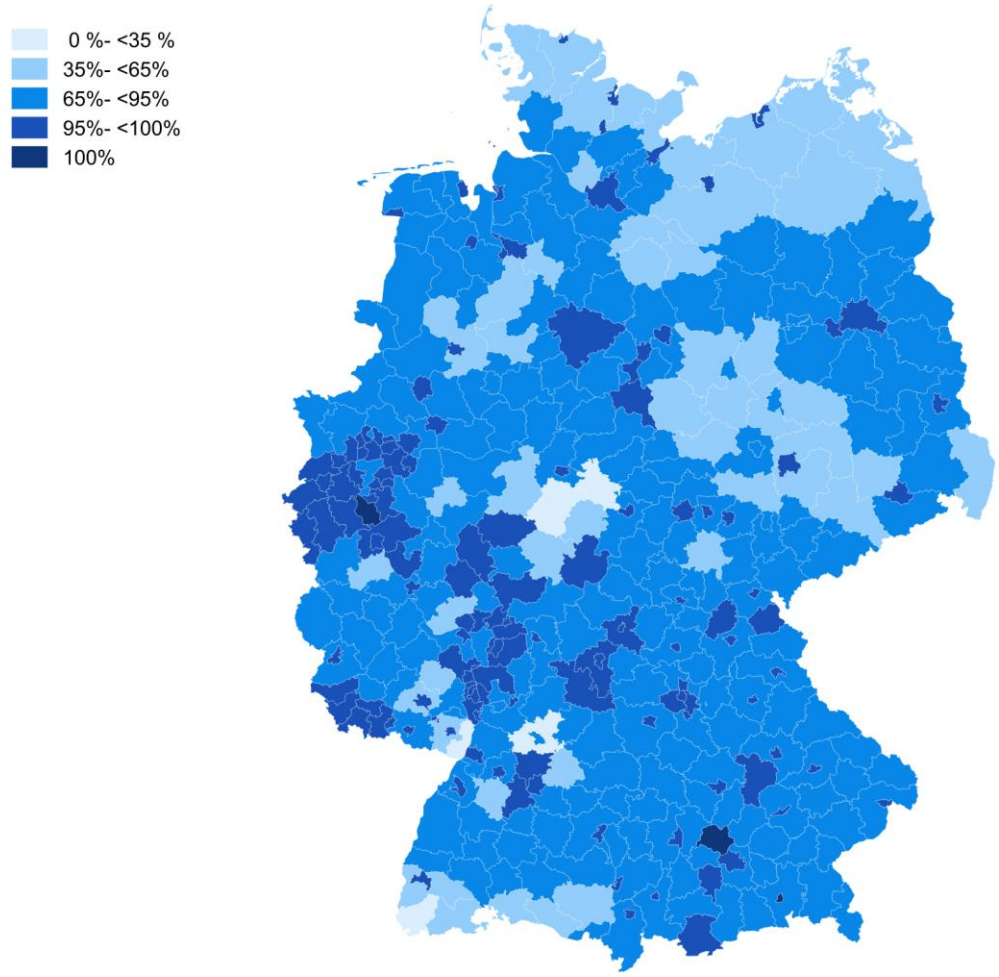
Germany: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

NGA coverage differences are traditionally higher across German regions, varying from half of the households in Schwalm, to near universal coverage in Rosenheim.

Germany: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.11.3 Data tables for Germany

Statistic	National
Population	82,792,351
Persons per household	2.0
Rural proportion	10.8%

	Germany 2019		Germany 2018		Germany 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	97.9%	91.3%	97.4%	89.2%	97.1%	87.8%	91.2%	81.4%
VDSL	85.6%	69.3%	76.9%	56.1%	69.0%	44.6%	59.2%	41.8%
VDSL 2 Vectoring	65.4%	41.0%	-	-	-	-	28.2%	11.3%
FTTP	10.5%	5.6%	8.5%	3.6%	7.3%	2.4%	33.5%	17.5%
Cable modem DOCSIS 3.0	66.3%	16.9%	63.9%	15.2%	63.7%	15.0%	45.5%	10.8%
DOCSIS 3.1	29.3%	4.7%	-	-	-	-	19.2%	4.1%
FWA	88.7%	85.1%	-	-	-	-	49.1%	41.7%
LTE	98.6%	96.7%	97.5%	90.6%	96.5%	87.9%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	93.7%	-	90.1%	-	87.7%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	98.6%	92.8%	97.5%	89.6%	97.7%	89.1%	97.1%	89.7%
NGA broadband	92.2%	74.6%	87.9%	66.2%	84.1%	53.9%	85.8%	59.3%
Very High Capacity Networks	32.7%	10.3%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	98.5%	-	97.5%	-	97.1%	-	95.7%	-
At least 30 Mbps	92.2%	-	87.9%	-	84.1%	-	83.3%	-
At least 100 Mbps	81.8%	-	66.3%	-	65.4%	-	68.4%	-
At least 1 Gbps	34.1%[15]	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.
All restatements are highlighted in italics.

[15] In some instances, cable modem DOCSIS 3.0 networks are capable of achieving at least 1Gbps. Those were thus taken into account in the At least 1Gbps speed coverage category, but not in the VHCN coverage category (which is limited to FTTP and DOCSIS 3.1).

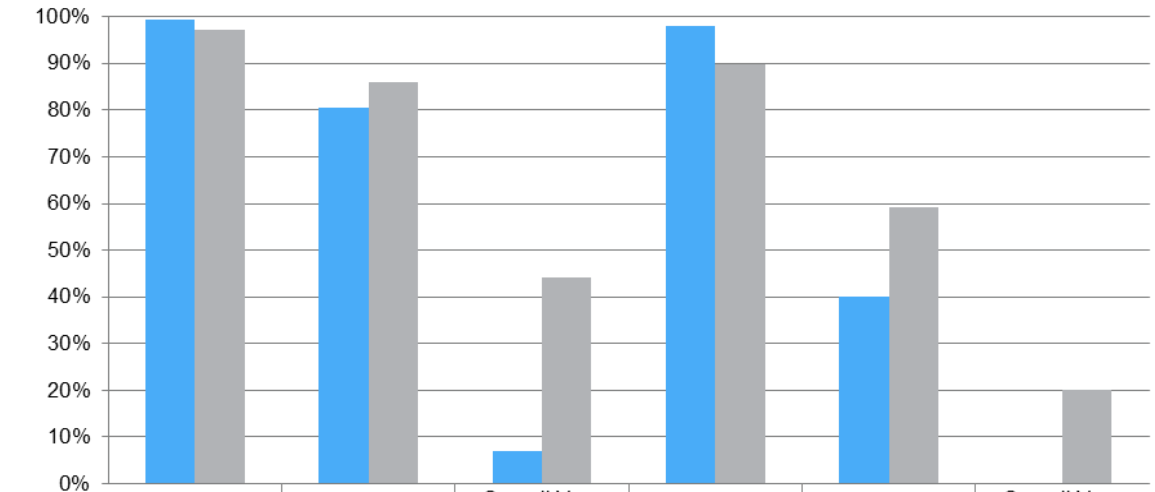
5.12 Greece

5.12.1 National coverage by broadband technology

Overall fixed broadband coverage in Greece continued to increase in this iteration of the study, gaining 3.1 percentage points, to become near-universal, with 99.5% of Greek households covered. In terms of NGA coverage, Greece recorded the most significant coverage increase of this year's study, growing nearly fifteen percentage points (14.7), to reach 80.6% of households. In rural regions, fixed broadband and NGA broadband coverage levels also increased to reach 98.1% and 40.1% of rural households, respectively.

However, with the absence of cable networks in Greece, coverage of very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, remained limited to that of FTTP, which is only available to 7.1% of Greece households, which are located in urban areas.

Greece: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Greece	99.5%	80.6%	7.1%	98.1%	40.1%	0.0%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

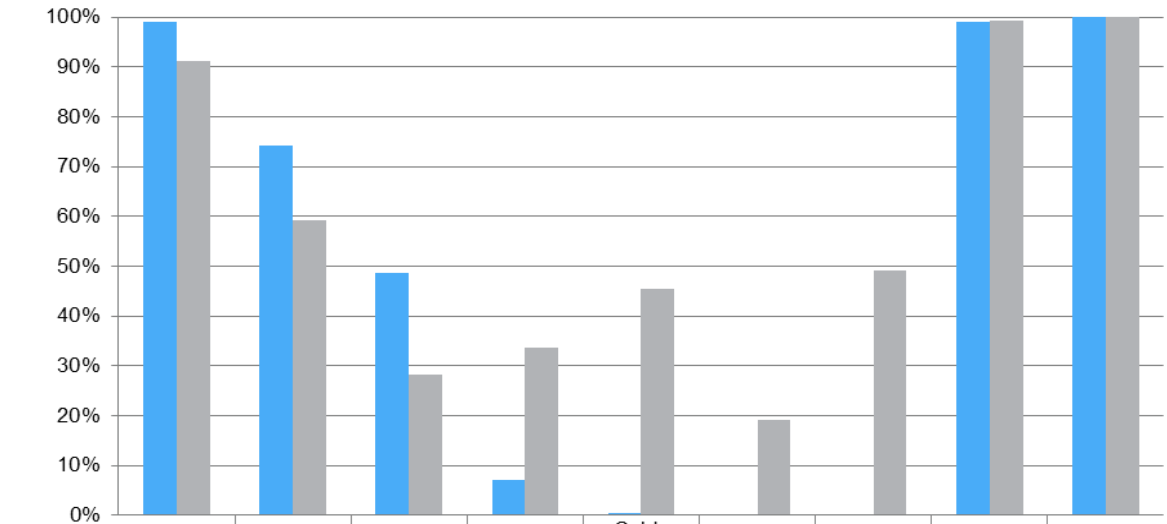
As in previous years, DSL remained the most prevalent fixed broadband technology in Greece, with 98.9% of households covered on a national level. Fixed Wireless Access (FWA) coverage was insignificant for the Greek market, with less than 1.0% (0.9%) of Greek households covered.

Looking at NGA technologies, VDSL and VDSL 2 Vectoring remained the only widespread NGA technologies in Greece, with 74.2% and 48.7% of households covered respectively. VDSL coverage improved noticeably since mid-2018, by 8.6 percentage points. FTTP coverage also recorded a significant increase in coverage, owing to the deployment of fibre optic networks by Vodafone Greece in the regions of Athens, Thessaloniki, Patras and Pereia.[16] FTTP coverage in Greece increased from below 1.0% (0.4%) in mid-2018 to 7.1% in mid-2019.

In terms of mobile broadband, LTE slightly improved over the study period, to reach 99.1% of Greek households. In terms of average LTE coverage of all operators, on average 97.0% of people in Greece had access to LTE services.

[16] https://www.commsupdate.com/articles/2019/12/03/vodafone-greece-reaches-300000-premises-with-fibre-networks/

Greece: Coverage by technology, total, 2019

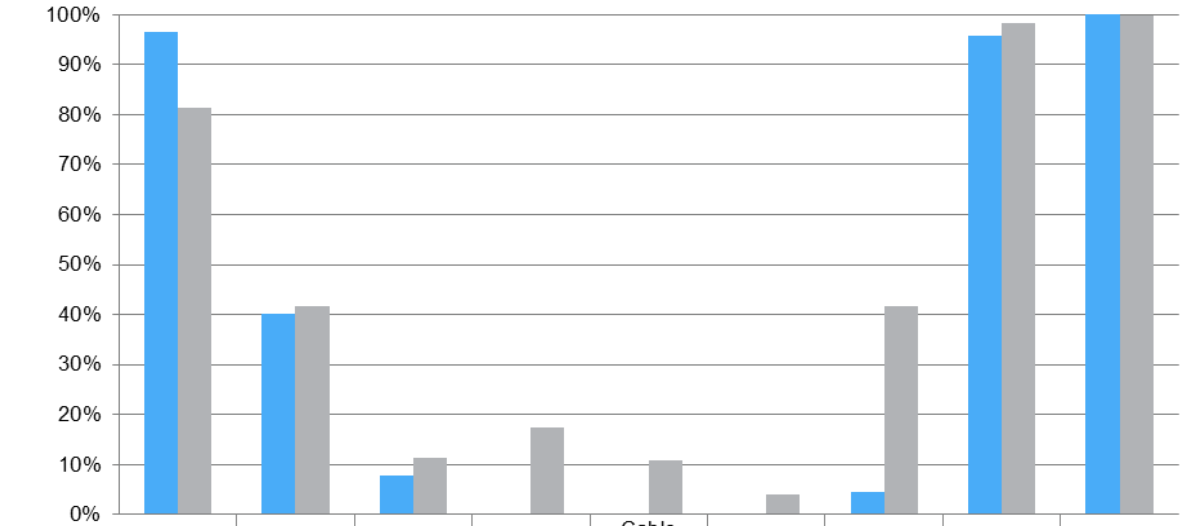


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Greece	98.9%	74.2%	48.7%	7.1%	0.5%	-	-	99.1%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission © 2020 IHS Markit, Omdia

In rural regions of Greece, DSL remained by far the most prevalent technology, covering 96.4% of rural households, and having recorded a slight increase (0.4 percentage point) in availability since mid-2018.

Greece: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Greece	96.4%	40.1%	7.7%	-	-	-	4.5%	95.8%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission © 2020 IHS Markit, Omdia

In terms of NGA coverage, as was the case last year, VDSL was the only NGA broadband technologies available to rural households. VDSL recorded an increase of 2.9 points of coverage since mid-2018, to reach 40.1% of rural Greek households. VDSL 2 Vectoring was available to 7.7% of rural households. FTTP and cable (DOCSIS 3.0 and 3.1) remained absent from rural Greek regions.

Looking at mobile broadband in rural regions of Greece, rural LTE coverage continued to increase in this iteration of the study, albeit at a slower rate than in previous editions. At the end of June 2019, LTE covered 95.8% of rural Greek households, up 2.3 percentage points since mid-2018. Despite this increase, rural LTE coverage of Greece remained below the EU average of 98.2%.

5.12.2 Regional coverage by broadband technology

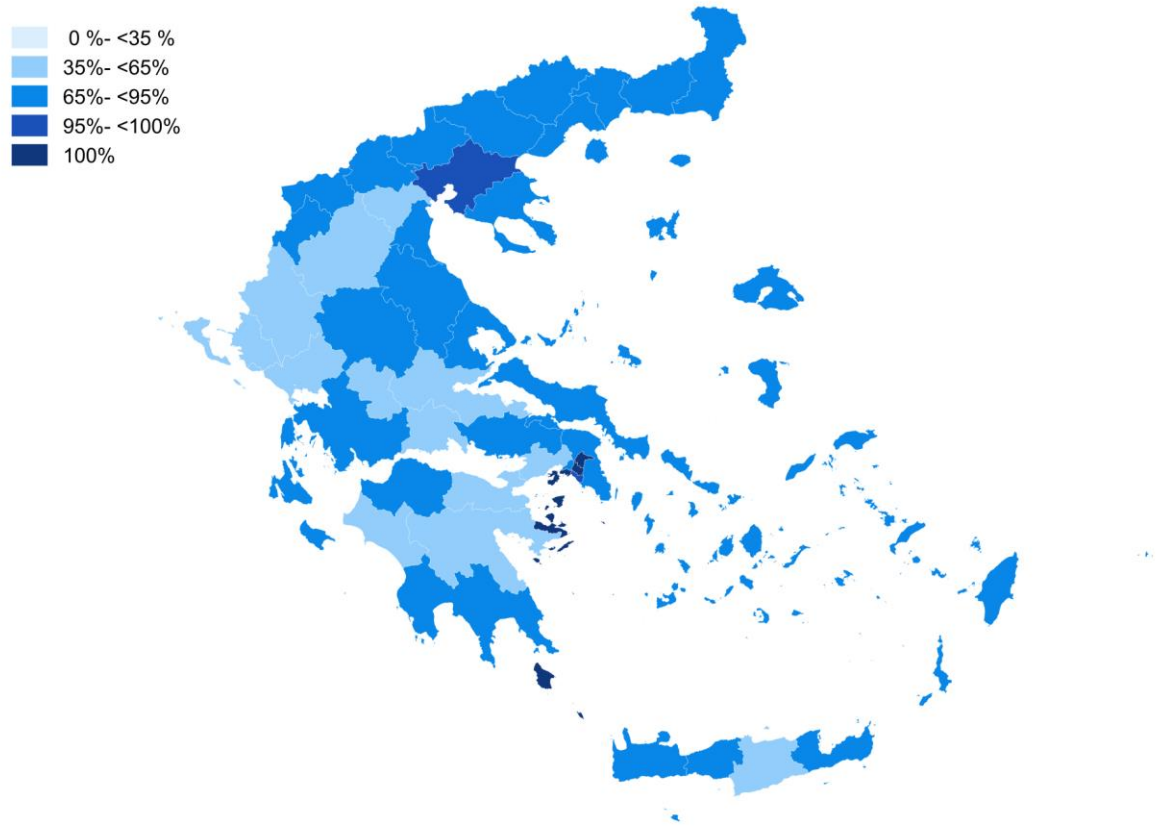
Over the study period, the gap in fixed broadband coverage between Greek regions continued to narrow down. Evrytania remained the region with the lowest fixed broadband coverage, at 97.0% of households passed, and recorded a 2.1 percentage point increase in coverage since mid-2018.

Greece: Overall fixed broadband coverage, 2019

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

As was the case in most countries in this study, NGA coverage variance across Greek regions was much larger than variance of fixed broadband coverage. This year, NGA coverage ranged from 45.8% in Irakleio and universal coverage (100.0%) in the Central and North districts of Athens (Voreios Tomeas Athinon and Kentrikos Tomeas Athinon) and the city of Piraeus (Peiraias, Nisoi).

Greece: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.12.3 Data tables for Greece

Statistic	National
Population	10,741,165
Persons per household	2.5
Rural proportion	20.6%

	Greece 2019		Greece 2018		Greece 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	98.9%	96.4%	96.4%	*96.0%*	96.1%	87.0%	91.2%	81.4%
VDSL	74.2%	40.1%	65.7%	*37.2%*	52.3%	32.4%	59.2%	41.8%
VDSL 2 Vectoring	48.7%	7.7%	-	-	-	-	28.2%	11.3%
FTTP	7.1%	0.0%	0.4%	0.0%	0.4%	0.0%	33.5%	17.5%
Cable modem DOCSIS 3.0	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	0.9%	4.5%	-	-	-	-	49.1%	41.7%
LTE	99.1%	95.8%	98.2%	93.5%	94.0%	76.0%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	97.0%	-	92.3%	-	86.2%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.5%	98.1%	96.4%	*96.3%*	96.2%	87.2%	97.1%	89.7%
NGA broadband	80.6%	40.1%	65.9%	*37.2%*	52.5%	32.4%	85.8%	59.3%
Very High Capacity Networks	7.1%	0.0%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	99.5%	-	95.3%	-	95.0%	-	95.7%	-
At least 30 Mbps	79.7%	-	61.0%	-	48.6%	-	83.3%	-
At least 100 Mbps	41.6%	-	0.4%	-	0.4%	-	68.4%	-
At least 1 Gbps	7.0%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

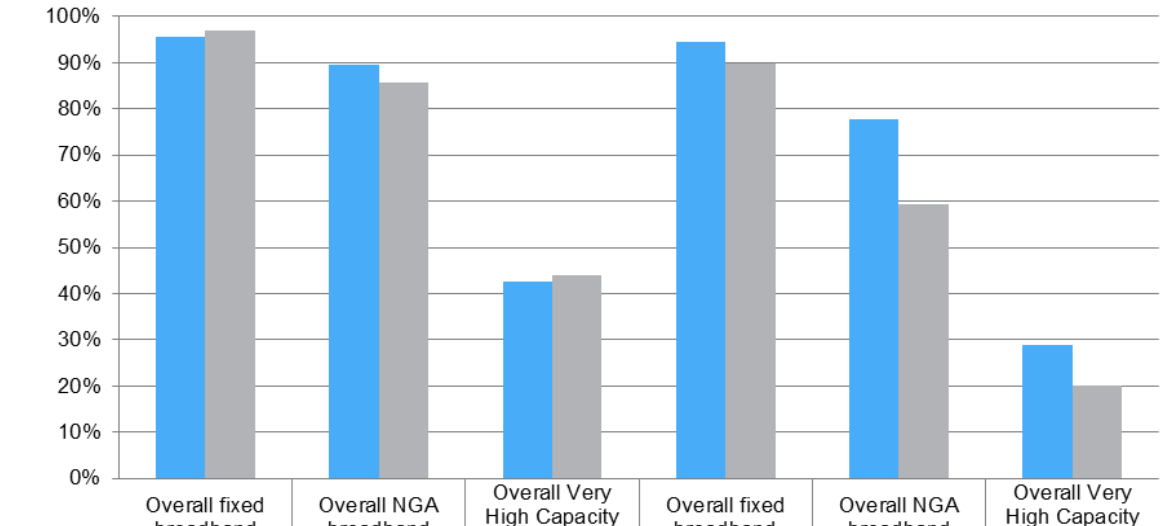
All restatements are highlighted in italics.

5.13 Hungary

5.13.1 National coverage by broadband technology

By mid-2019, overall fixed broadband coverage improved slightly, from 94.4% reported in mid-2018 to 95.5% of households, yet remained below the EU average of 97.1%. At a rural level, fixed broadband coverage rose by 2.9 percentage points, to reach 94.6% of rural homes, almost 5 percentage points above the EU average. NGA coverage also recorded improvements, having grown by 2.8 percentage points at a national level, and by a notable 13.1 percentage points at a rural level. At the end of June 2019, nearly 9 in 10 (89.6%) Hungarian households had access to NGA broadband services. In rural areas 77.7% of rural homes were passed by NGA networks. This fast improvement in rural NGA coverage levels owes mainly to the fast deployment of FTTP.

Hungary: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Hungary	95.5%	89.6%	42.6%	94.6%	77.7%	28.9%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

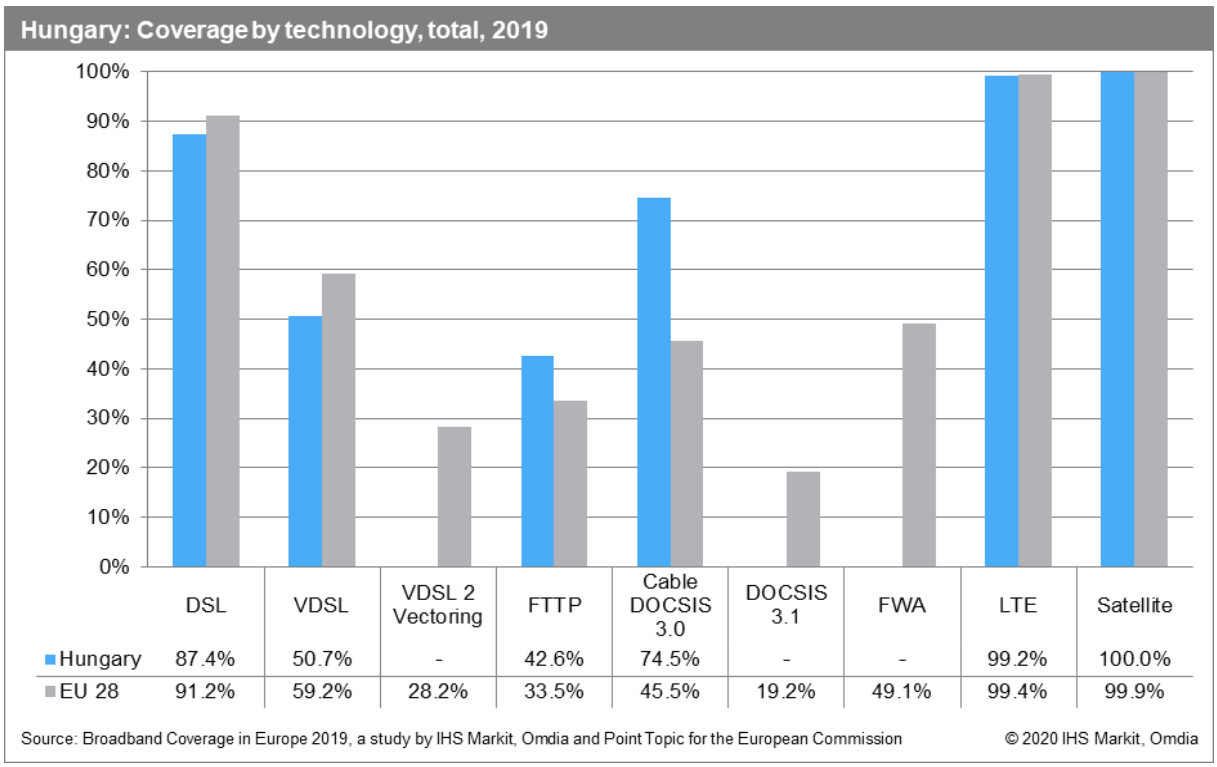
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual technologies, DSL services were available to 87.4% of households. VDSL coverage increased considerably, growing by 7.0 percentage points compared to mid-2018 and reaching a half (50.7%) of Hungarian households. At the end of June 2019, deployment of VDSL2 Vectoring had started, but data was not available yet for this iteration of the study. The situation was similar for FWA coverage in Hungary.

Cable modem DOCSIS 3.0 grew by 3.0 percentage points, to reach 74.5% of homes, and remained the most common NGA broadband technology in Hungary. Cable operators had so far only focused on DOCSIS 3.0 upgrades, and have now started deploying DOCSIS 3.1, however no data was yet available at the end of June 2019.

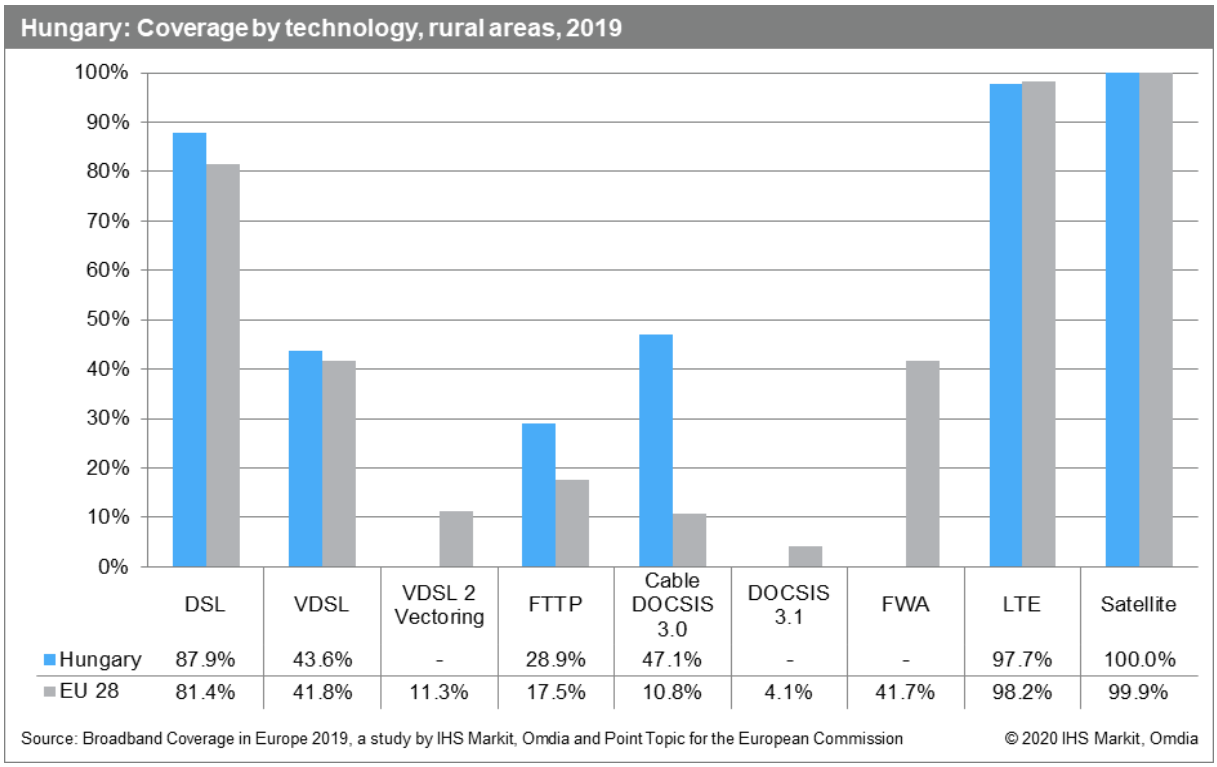
Following a 6.7 percentage point increase, FTTP networks passed 42.6% of Hungarian homes by the end of June 2019. As was the case last year, both FTTP and cable modem DOCSIS 3.0 remained above the EU average, with cable modem DOCSIS 3.0 exceeding it by almost a third (29.0 percentage points).

Mobile broadband coverage in Hungary remained stable, with 99.2% of households covered. Yet not all mobile network operators in Hungary provide same level of coverage as average LTE coverage indicates that 96.8% of Hungarians were covered by LTE networks.



As was the case at a national level, all three NGA technologies recorded notable increases in coverage since mid-2018. The most prevalent, cable modem DOCSIS 3.0, gained 9.3 percentage points in coverage, to reach 47.1% of rural households. VDSL recorded a 5.8 percentage point increase in coverage since mid-2018, to reach 43.6% of rural homes. FTTP recorded an impressive 13.3 percentage point increase, with 28.9% of rural homes passed. Coverage levels for all three NGA technologies were above the EU average.

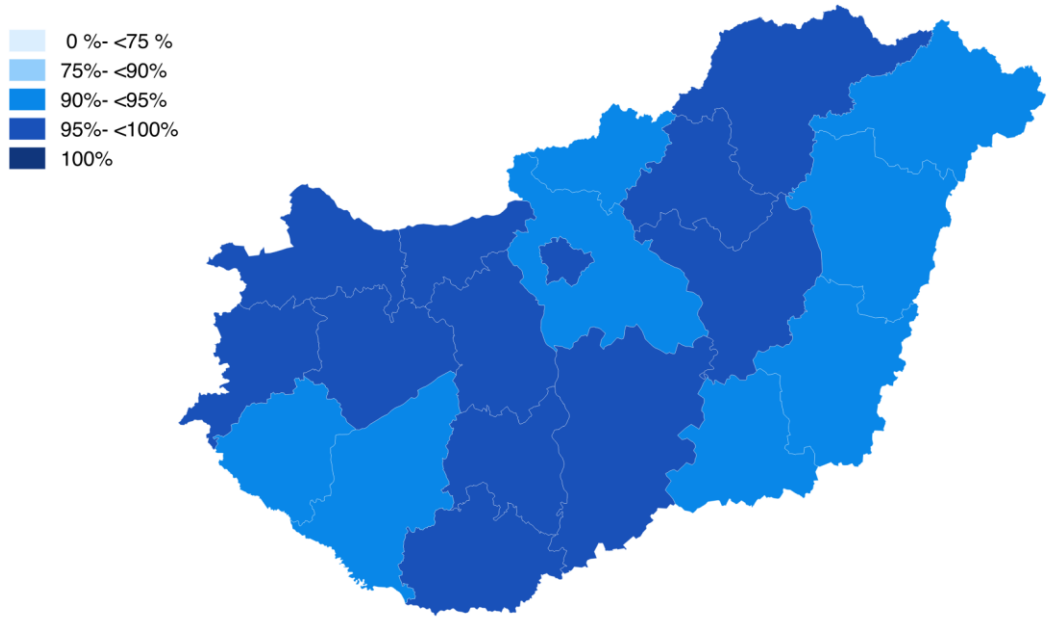
Looking at mobile broadband coverage of rural regions, LTE coverage remained stable for the third year in a row, with 97.7% of rural households covered.



5.13.2 Regional coverage by broadband technology

On a regional level, fixed broadband coverage improved and exceeded 90.0% in all regions of Hungary this year.

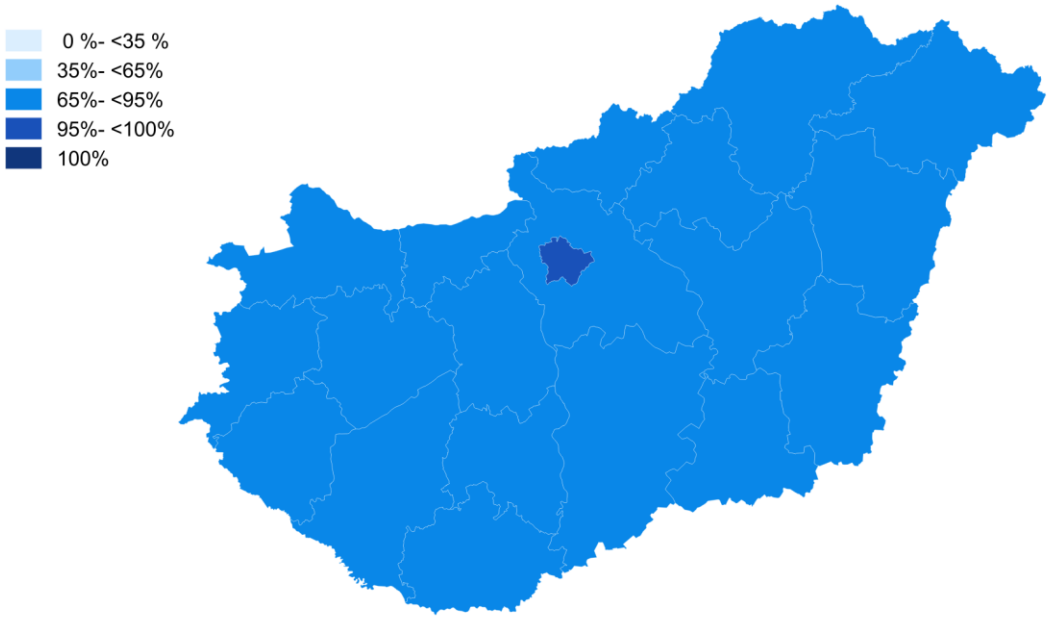
Hungary: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

NGA coverage in Hungary continued to vary across regions, with no region recording coverage levels below 80.0%. Coverage ranged between 96.9% in Bupapest and 82.1% in Szabolcs-Szatmár-Bereg, whose coverage increased by 8.6 percentages points since mid-2018.

Hungary: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.13.4 Data tables for Hungary

Statistic	National
Population	9,766,849
Persons per household	2.2
Rural proportion	31.8%

	Hungary 2019		Hungary 2018		Hungary 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	87.4%	87.9%	86.2%	82.8%	90.5%	74.0%	91.2%	81.4%
VDSL	50.7%	43.6%	43.7%	37.8%	40.2%	29.0%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	42.6%	28.9%	35.9%	15.6%	29.8%	6.8%	33.5%	17.5%
Cable modem DOCSIS 3.0	74.5%	47.1%	71.5%	37.8%	68.3%	25.3%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	0.0%	0.0%	-	-	-	-	49.1%	41.7%
LTE	99.2%	97.7%	99.2%	97.7%	99.2%	97.7%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	96.8%	-	96.3%	-	91.5%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	95.5%	94.6%	94.4%	91.6%	95.2%	86.8%	97.1%	89.7%
NGA broadband	89.6%	77.7%	86.8%	64.6%	82.7%	58.1%	85.8%	59.3%
Very High Capacity Networks	42.6%	28.9%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	95.8%	-	94.0%	-	94.8%	-	95.7%	-
At least 30 Mbps	86.2%	-	85.5%	-	81.7%	-	83.3%	-
At least 100 Mbps	79.0%	-	78.0%	-	72.4%	-	68.4%	-
At least 1 Gbps	33.1%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

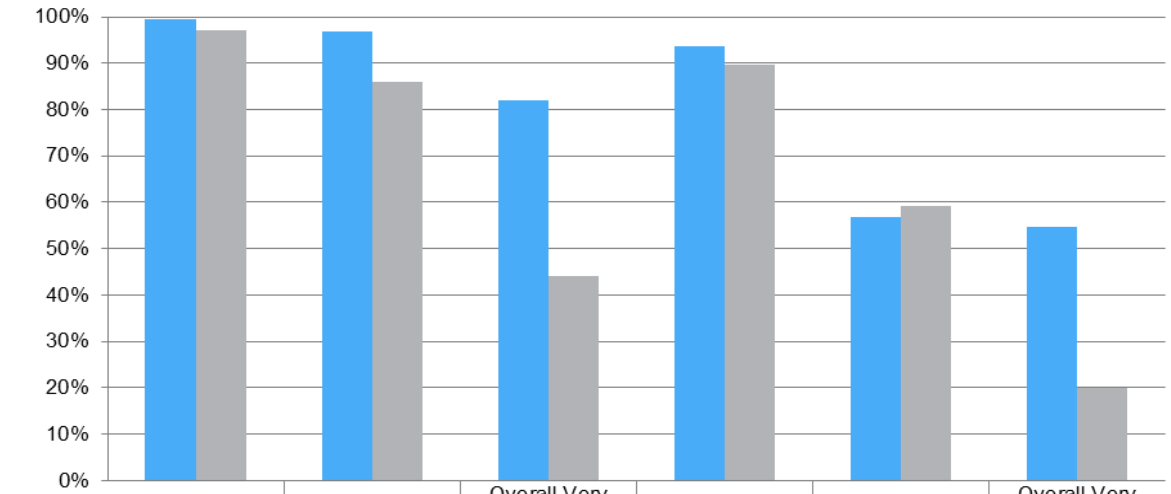
5.14 Iceland

5.14.1 National coverage by broadband technology

Overall fixed broadband coverage in Iceland continued to improve over the study period and neared universal coverage with 99.5% of Icelandic homes passed by at least one fixed broadband network. At a rural level, fixed broadband coverage improved substantially, growing by 8.5 points of coverage, to reach 93.5% of rural homes. In terms of NGA broadband, coverage also increased at both levels; NGA broadband was available to 96.9% of Icelandic homes, and to 56.9% of rural Icelandic homes.

Due to the high proliferation of FTTP networks, Iceland ranked as one of the leaders in terms of coverage of very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP. At the end of June 2019, 82.0% of all households and 54.7% of rural households were passed by networks capable of delivering gigabit speed connectivity.

Iceland: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Iceland	99.5%	96.9%	82.0%	93.5%	56.9%	54.7%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual broadband technologies in Iceland, DSL remained the most common fixed broadband technology available to Icelandic households. DSL was accessible to 97.4% of households. Fixed Wireless Access was available to 2.2% of households.

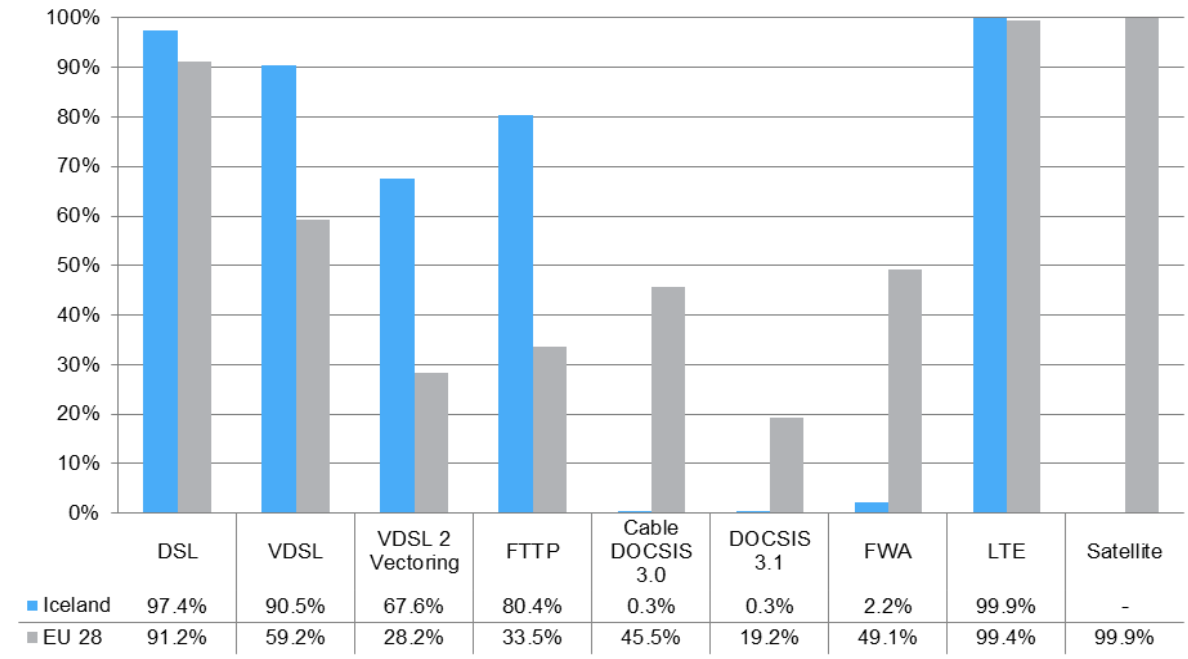
Looking at NGA technologies, VDSL remained the most prevalent NGA technology in Iceland and increased by 2.5 percentage points, with 90.5% of households having access to VDSL services at the end of June 2019. Moreover, VDSL 2 Vectoring was available to 67.6% of households.

The second most prevalent NGA technology, FTTP, recorded 4.2 percentage point increase since mid-2018, and reached 80.4% of households. FTTP coverage in Iceland was over double the EU average, which stood at 33.5%.

Only very small number of homes (0.3%) were passed by cable DOCSIS 3.0 network. Even though limited, the DOCSIS 3.0 footprint was fully upgraded to the DOCSIS 3.1 standard.

In terms of mobile broadband, LTE coverage remained almost universal, at 99.9% of households covered.

Iceland: Coverage by technology, total, 2019



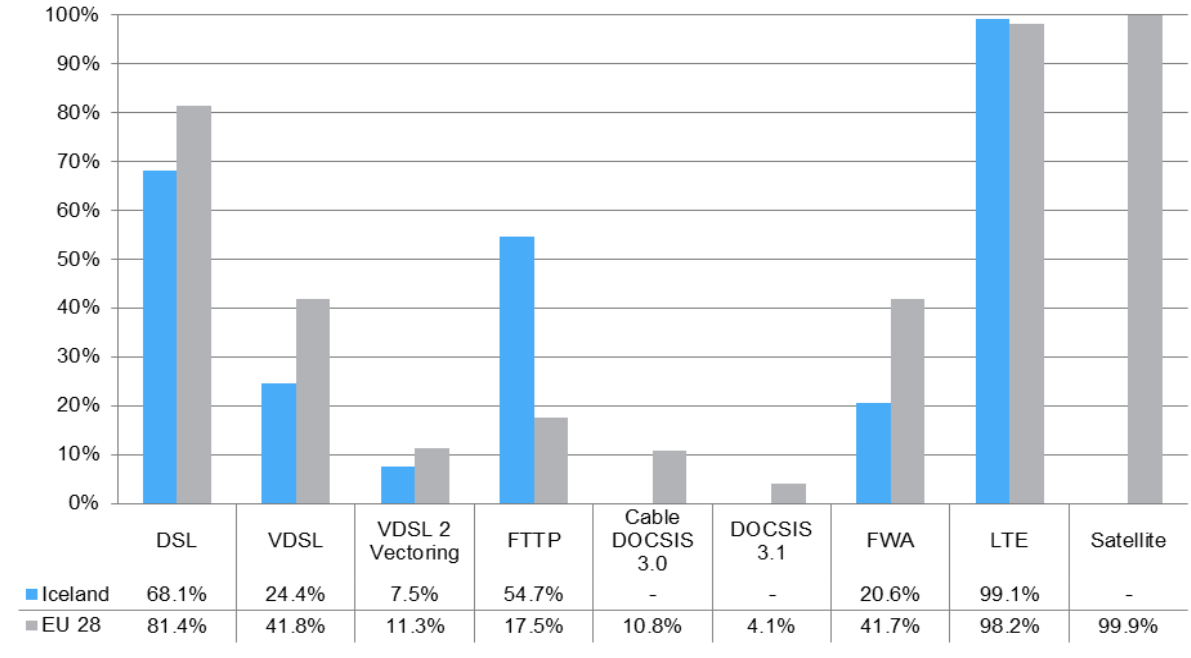
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Iceland	97.4%	90.5%	67.6%	80.4%	0.3%	0.3%	2.2%	99.9%	-
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

DSL remained the most widespread technology in rural areas, with 68.1% of households passed, up from 65.2% in mid-2018. Fixed Wireless Access (FWA) was accessible to 20.6% of rural households, a substantially higher coverage level than reported at a national level, which can be explained by the low number of rural households in Iceland, and the common use of Fixed Wireless Access in remote and hard to reach areas.

Looking at NGA broadband in rural Iceland, FTTP remained by far the most prevalent technology, with more than half (54.7%) of rural homes covered, having gained 15.3 percentage points of coverage since mid-2018. VDSL services were available to 24.4% of rural households, whilst cable modem DOCSIS 3.0 and DOCSIS 3.1 remained absent in rural areas.

Iceland: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Iceland	68.1%	24.4%	7.5%	54.7%	-	-	20.6%	99.1%	-
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

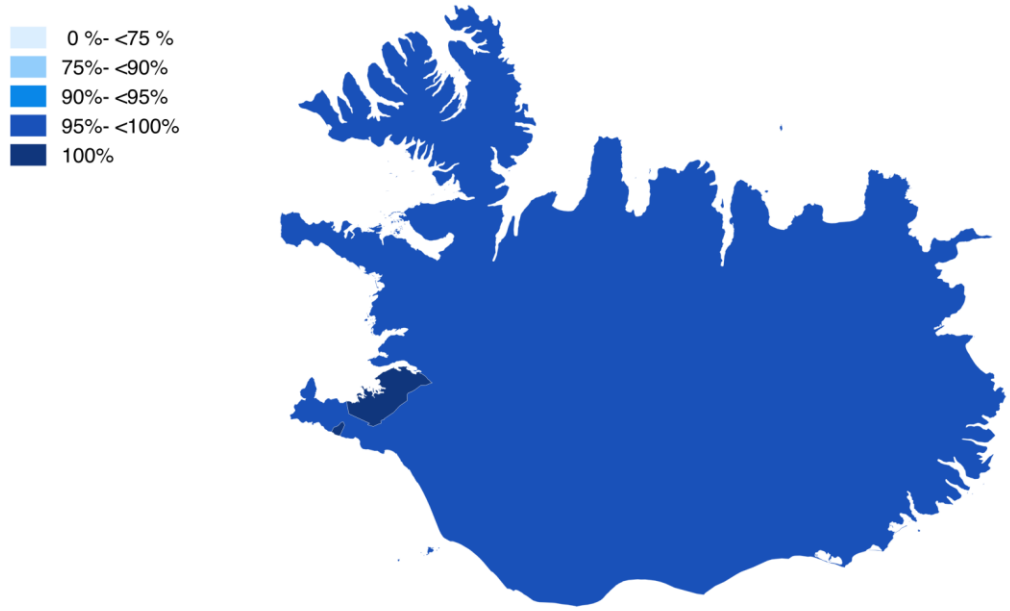
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Over the study period, LTE coverage continued to increase in rural regions, and gained 0.4 percentage point of coverage, to reach 99.1% of rural Icelandic homes.

5.14.2 Regional coverage by broadband technology

In this iteration of the study, fixed broadband was universally available for the first time in Höfudborgarsvædi. In the other Icelandic region of Landsbyggd, coverage improved to reach 98.8% of households.

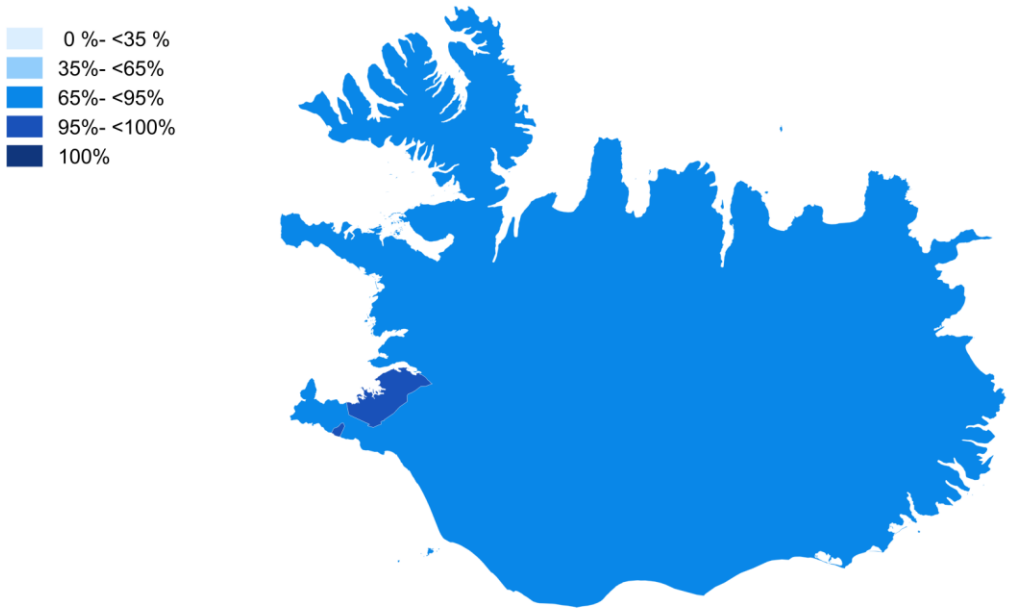
Iceland: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

NGA coverage remained near-universal in Höfudborgarsvædi, with 99.6% of households passed. The region of Landsbyggd had 92.5% of households covered by NGA broadband.

Iceland: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.14.3 Data tables for Iceland

Statistic	National
Population	354,937
Persons per household	2.5
Rural proportion	7.0%

	Iceland 2019		Iceland 2018		Iceland 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	97.4%	68.1%	*93.9%*	*65.2%*	*90.5%*	*67.0%*	91.2%	81.4%
VDSL	90.5%	24.4%	*88.0%*	*24.6%*	*88.1%*	*24.6%*	59.2%	41.8%
VDSL 2 Vectoring	67.6%	7.5%	-	-	-	-	28.2%	11.3%
FTTP	80.4%	54.7%	*76.2%*	*39.4%*	*72.3%*	*29.1%*	33.5%	17.5%
Cable modem DOCSIS 3.0	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	45.5%	10.8%
DOCSIS 3.1	0.3%	0.0%	-	-	-	-	19.2%	4.1%
FWA	2.2%	20.6%	-	-	-	-	49.1%	41.7%
LTE	99.9%	99.1%	*99.9%*	*98.7%*	*98.6%*	*94.9%*	99.4%	98.2%
LTE average operator coverage (DESI indicator)	99.6%	-	*95.0%*	-	*94.7%*	-	96.5%	-
Satellite	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	99.9%	99.9%
Overall fixed broadband	99.5%	93.5%	*98.1%*	*85.0%*	*96.7%*	*86.1%*	97.1%	89.7%
NGA broadband	96.9%	56.9%	*95.7%*	*51.8%*	*95.8%*	*58.4%*	85.8%	59.3%
Very High Capacity Networks	82.0%	54.7%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	96.6%	-	*97.3%*	-	*98.0%*	-	95.7%	-
At least 30 Mbps	95.6%	-	*95.7%*	-	*95.9%*	-	83.3%	-
At least 100 Mbps	83.3%	-	*74.3%*	-	*70.4%*	-	68.4%	-
At least 1 Gbps	77.0%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

Following a review of data available from the NRA and a revision of the proportion of rural households, figures for 2013-2018 have been restated. All restatements are highlighted in italics.

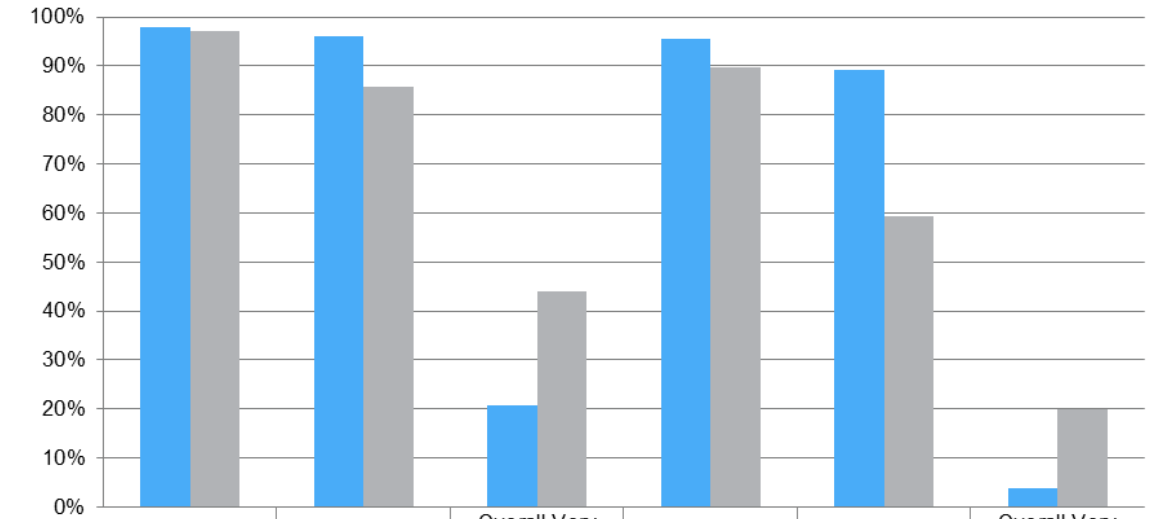
5.15 Ireland

5.15.1 National coverage by broadband technology

Overall fixed broadband coverage in Ireland remained stable over the study period, with 97.8% of Irish households having access to at least one fixed broadband network at the end of June 2019. Rural fixed broadband coverage increased slightly (0.4 percentage point) since mid-2018, to reach 95.4% of rural homes. NGA services were available to 96.0% of all Irish households and 89.0% of rural homes were passed by NGA networks.

However, when looking at coverage of very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, only 20.8% of all households and just 3.8% of rural homes we passed by networks capable of supporting gigabit speeds.

Ireland: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Ireland	97.8%	96.0%	20.8%	95.4%	89.0%	3.8%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual technologies, DSL remained the most prevalent broadband technology, reaching 93.9% of households. Fixed Wireless Access (FWA) was available to just under a third (29.7%) of Irish households.

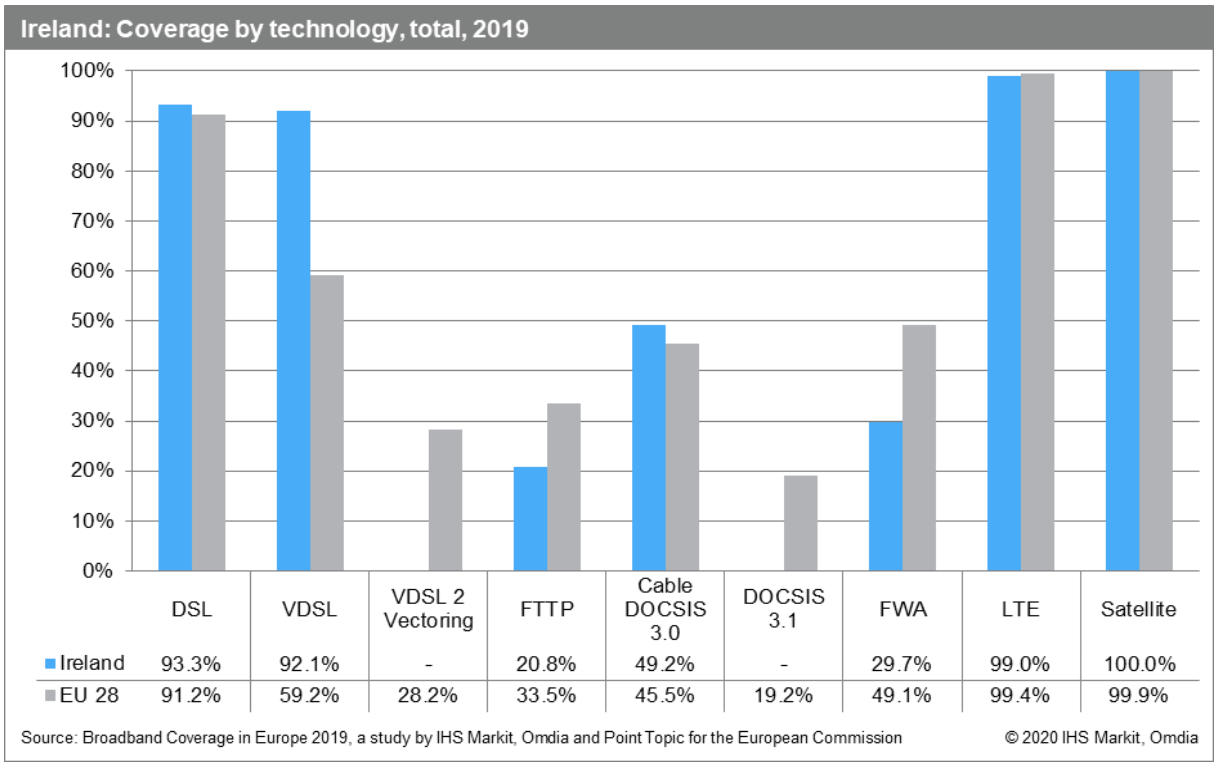
Considering individual NGA technologies, VDSL remained by far the most common NGA access technology in Ireland, with 92.1% of households covered, up from 91.0% in mid-2018. VDSL coverage has now almost matched DSL coverage, meaning that almost all of the DSL networks have now been upgraded to the VDSL standard in Ireland. However, VDSL2 Vectoring has not been deployed in the country, limiting the speeds achievable over legacy copper networks.

The second most prevalent NGA technology, cable modem DOCSIS 3.0 recorded a slight increase in coverage of 0.5 percentage point since mid-2018 and reached almost half (49.2%) of Irish households. Whilst the leading cable operator in Ireland, Virgin Media, has been preparing to launch DOCSIS 3.1, there we no deployments recorded at the end of June 2019 as most of the upgrades were scheduled for the second half of the year.

Lastly, FTTP recorded a significant 7.9 percentage point increase in coverage over the study period, to reach 20.8% of homes. Despite this increase, FTTP coverage in Ireland remained below the EU average of 33.5%.

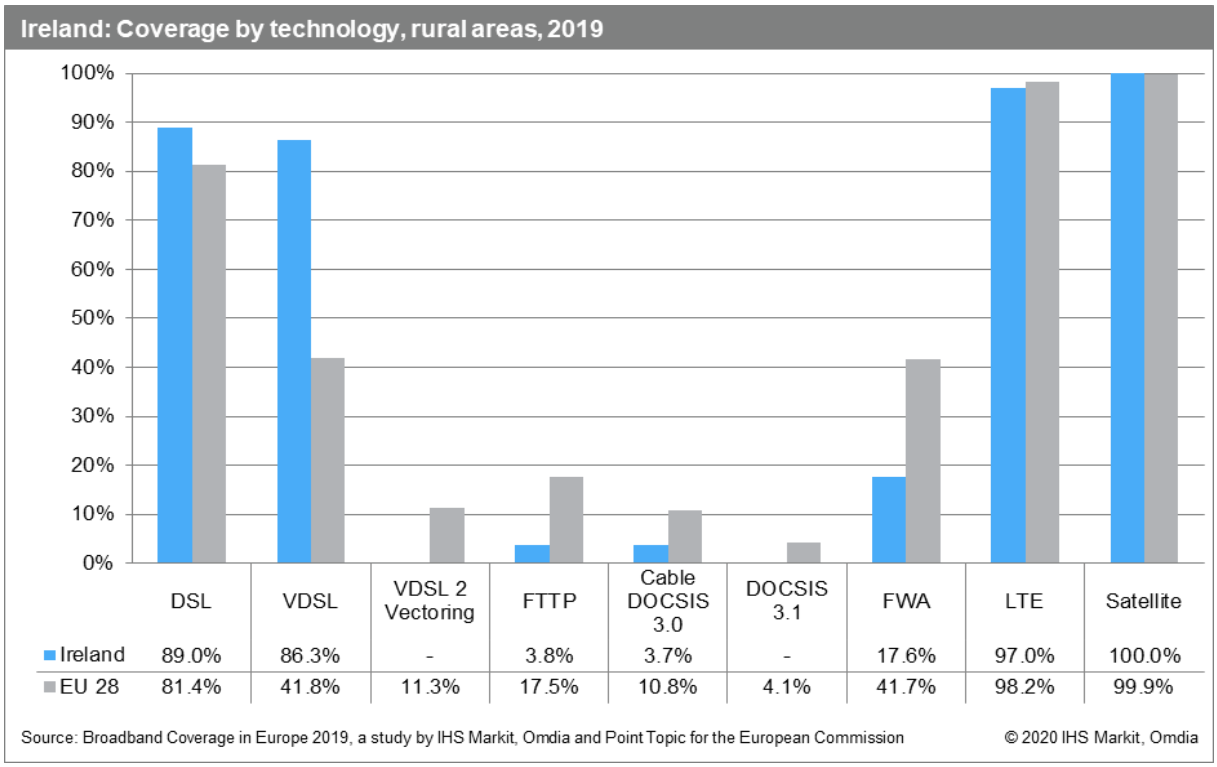
In terms of mobile broadband, LTE coverage improved over the study period growing by 3.2 percentage points to reach 99.0% of Irish households. In terms of average LTE service availability, when average

coverage of all LTE network operators is considered, LTE services were available to 98.7% of households.



Looking at rural areas of Ireland, DSL remained the most common broadband technology available to 89.0% households. Wireless Access was available to 17.6% of rural households.

In terms of rural NGA coverage, VDSL remained the only technology with significant coverage in Ireland, with 86.3% of households covered, increasing by 4.1 percentage points since mid-2018. Both rural FTTP and cable DOCSIS 3.0 coverage remained limited, standing at 3.8% and 3.7%, respectively.

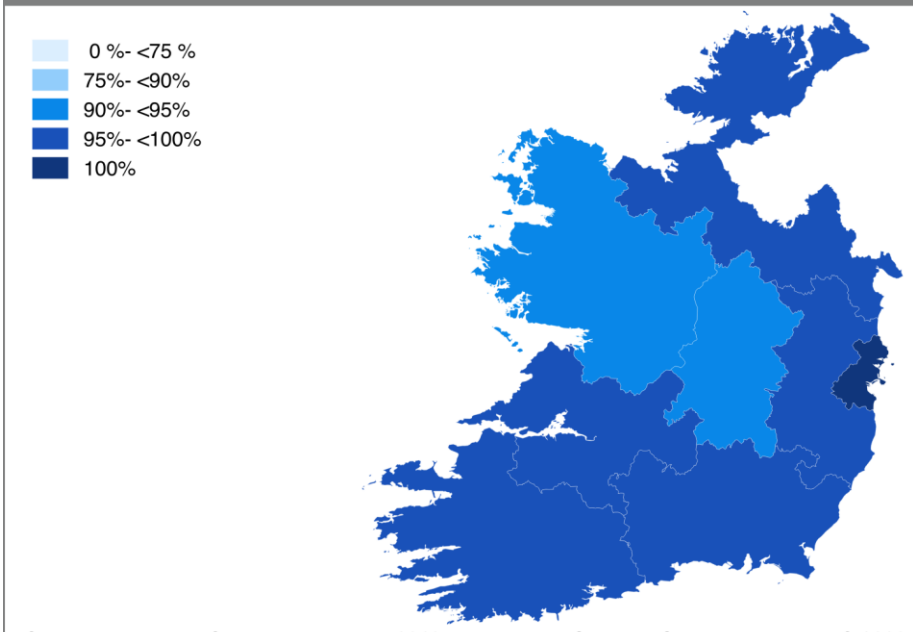


Rural LTE coverage recorded a significant 9.3 percentage point increase since mid-2018, reaching 97.0% of rural households, slighlty below the EU average of 98.2%.

5.15.2 Regional coverage by broadband technology

Overall fixed broadband in Ireland continued to vary across regions, with Dublin having universal coverage (100.0%) and West Ireland recording the lowest fixed broadband coverage level, at 94.0%. All Irish regions recorded coverage levels above 90.0%.

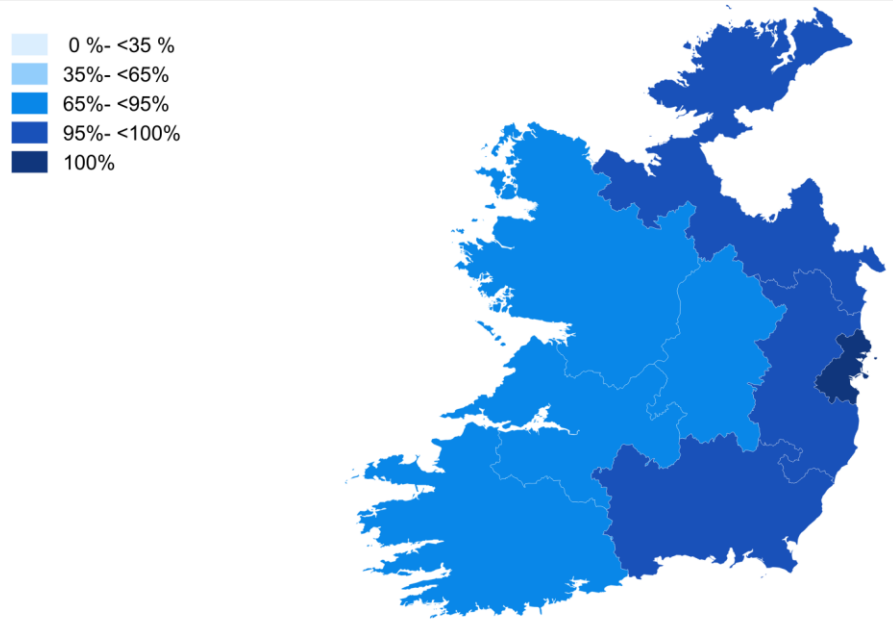
Ireland: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

For the first time in this study, NGA coverage was above 90.0% in all Irish regions. Dublin recorded universal NGA coverage (100.0%), and West Ireland recorded the lowest, with 91.5% of households covered.

Ireland: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.15.3 Data tables for Ireland

Statistic	National
Population	4,784,383
Persons per household	2.8
Rural proportion	33.5%

	Ireland 2019		Ireland 2018		Ireland 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	93.3%	89.0%	93.2%	89.0%	93.2%	87.0%	91.2%	81.4%
VDSL	92.1%	86.3%	91.0%	84.9%	86.1%	73.1%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	20.8%	3.8%	12.9%	2.7%	8.3%	1.2%	33.5%	17.5%
Cable modem DOCSIS 3.0	49.2%	3.7%	48.7%	3.4%	48.6%	3.4%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	29.7%	17.6%	-	-	-	-	49.1%	41.7%
LTE	99.0%	97.0%	95.8%	87.7%	97.2%	91.6%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	98.7%	-	95.7%	-	92.1%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.8%	95.4%	97.8%	95.0%	97.4%	94.8%	97.1%	89.7%
NGA broadband	96.0%	89.0%	95.9%	89.7%	92.8%	78.6%	85.8%	59.3%
Very High Capacity Networks	20.8%	3.8%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	96.9%	-	96.3%	-	96.2%	-	95.7%	-
At least 30 Mbps	89.7%	-	88.8%	-	87.5%	-	83.3%	-
At least 100 Mbps	59.1%	-	55.4%	-	52.3%	-	68.4%	-
At least 1 Gbps	9.5%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

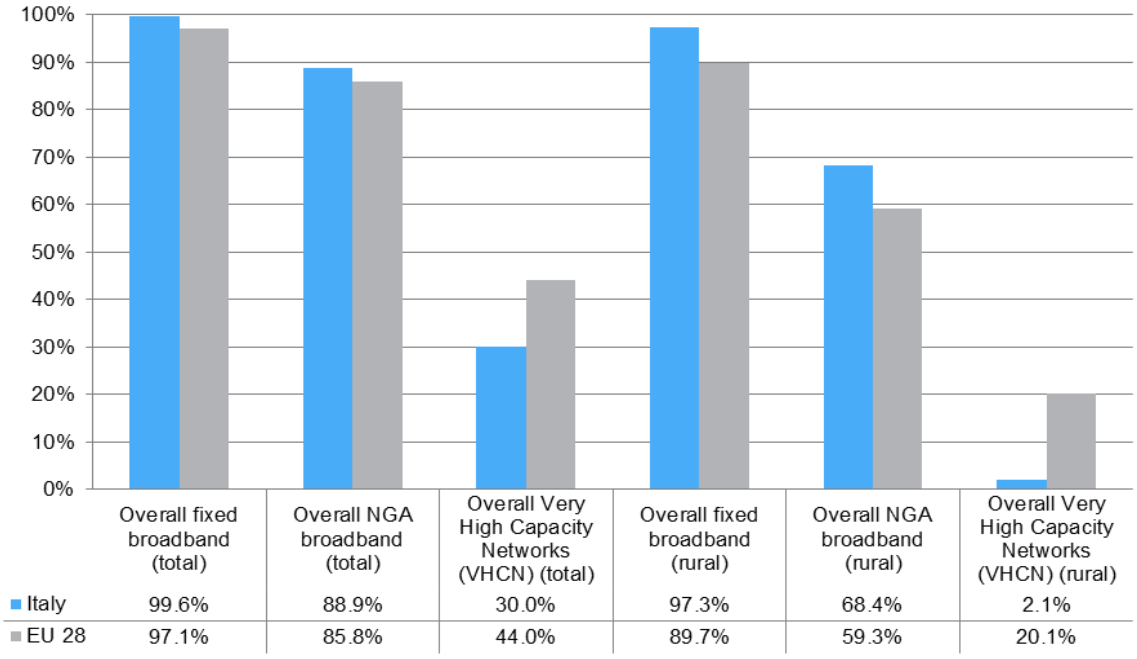
All restatements are highlighted in italics.

5.16 Italy

5.16.1 National coverage by broadband technology

By mid-2018 nearly all (99.6%) of Italian households were coverage by at least one fixed broadband network. At a rural level, fixed broadband was available to 97.3% of rural households. In terms of NGA broadband, high speed broadband services based on NGA technologies were available to 88.9% of Italian households, and to 68.4% of rural Italian households. Since mid-2018, NGA coverage improved slightly at a national level (by one percentage point) and recorded a dramatic growth at a rural level, having increased by 25.0 percentage points, which was the second largest rural NGA coverage increased recorded in this study. In both categories (fixed broadband and NGA), Italy recorded coverage levels above the EU average. Very High Capacity Networks (VHCN) passed 30.0% of Italian households at a national level, and 2.1% of rural households. In the absence of cable networks in Italy, VHCN coverage equals FTTP coverage. At both national and rural level, Italy's VHCN coverage stood below the EU average.

Italy: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Italy	99.6%	88.9%	30.0%	97.3%	68.4%	2.1%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

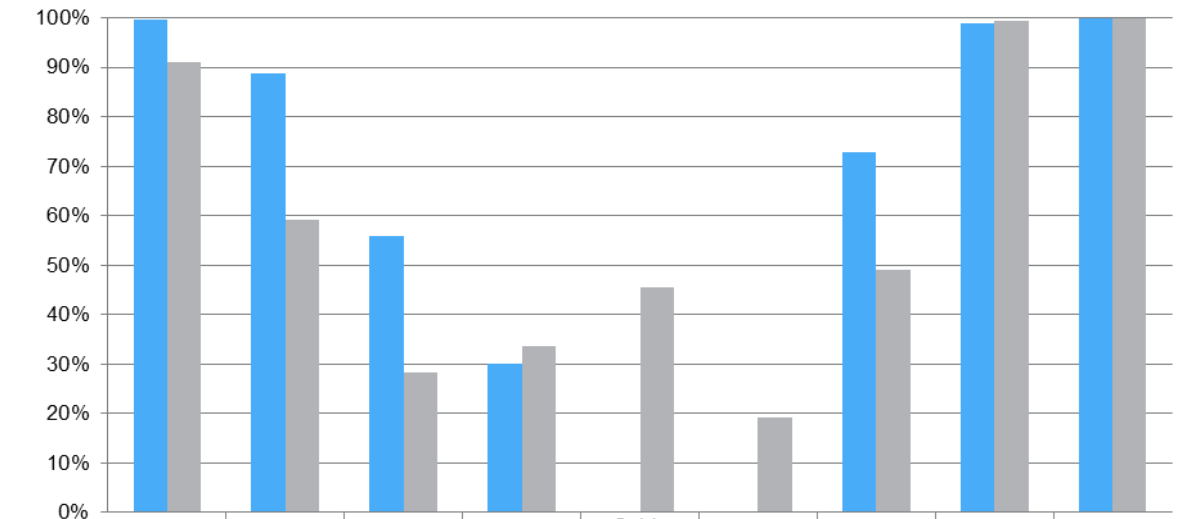
Looking at individual technologies, DSL remained the most widespread broadband technology in Italy, with an almost-universal coverage level (99.6% of households passed). Fixed Wireless Access (FWA) was available to 72.9% of households.

In terms of NGA broadband technologies, the Italian market remained largely dominated by VDSL, which was available to 88.9% of households, up one percentage point since mid-2018. Whilst VDSL 2 Vectoring has not yet been deployed in Italy, the nature of the legacy copper network grid, with large number of cabinets positioned close to customer premises means that the VDSL network is capable of reaching speeds higher than 100Mbps. In order to not skew the results unfavourably the research team has decided to classify those households close enough to the cabinet to receive at least 100Mbps coverage as passed by VDSL2 Vectoring. At the end of June 2019, these services were available to 55.8% of Italian households.

Given the absence of cable networks (DOCSIS 3.0 or DOCSIS 3.1) in Italy, FTTP remained the only other NGA technology available to Italian households. FTTP coverage increased substantially over the study period, growing by 6.1 percentage points and reaching 30.0% of households. Despite this increase, FTTP coverage in Italy remained below the EU average of 33.5%.

In terms of mobile broadband coverage, LTE availability remained stable over the study period, with 98.9% of Italian households covered, and slightly below the EU average of 99.4%. When considering average coverage of all mobile network operators, 97.1% of Italians had access to LTE services.

Italy: Coverage by technology, total, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Italy	99.6%	88.9%	55.8%	30.0%	-	-	72.9%	98.9%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

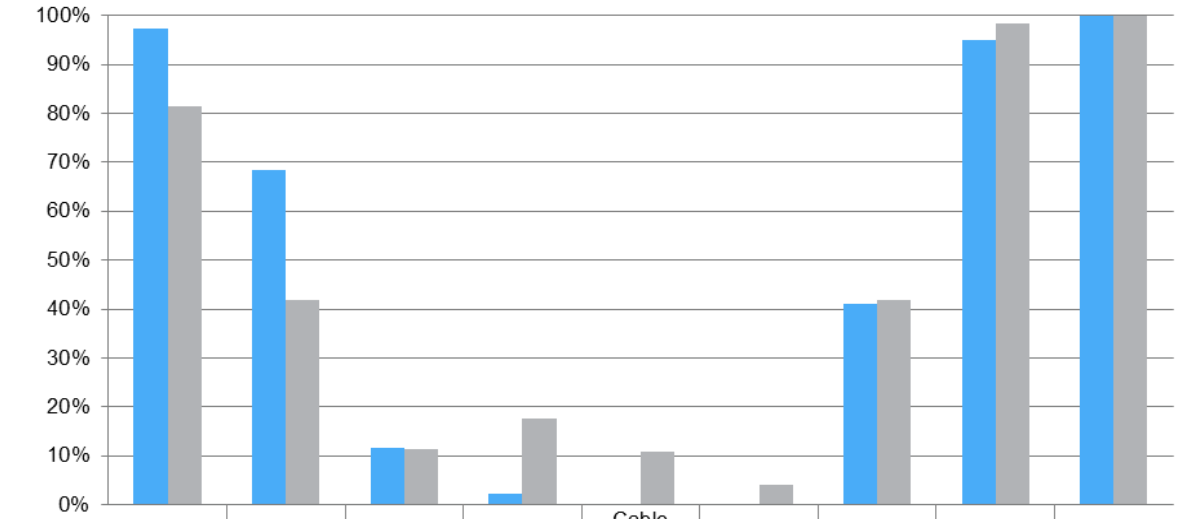
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Taking a closer look at rural regions of Italy, DSL remained the key technology providing fixed access to rural areas. At the end of June 2019, DSL was available to 97.3% of rural households. FWA was accessible to 41.0% of rural households.

In terms of rural NGA coverage, VDSL was the only significant NGA technology increasing by 25.8 percentage points, to reach 68.4% of rural households at the end of June 2019. This considerable increase in coverage is a result of Italian operators focus on upgrading legacy copper lines in rural regions. VDSL2 Vectoring was available to 11.6% of rural households. Rural FTTP coverage increased by 1.3 percentage point over the study period, however its coverage remained very limited, with only 2.1% of rural Italian households passed.

Rural LTE coverage improved noticeably over the study period, growing by 4.3 percentage points, to reach 95.0% of rural homes.

Italy: Coverage by technology, rural areas, 2019



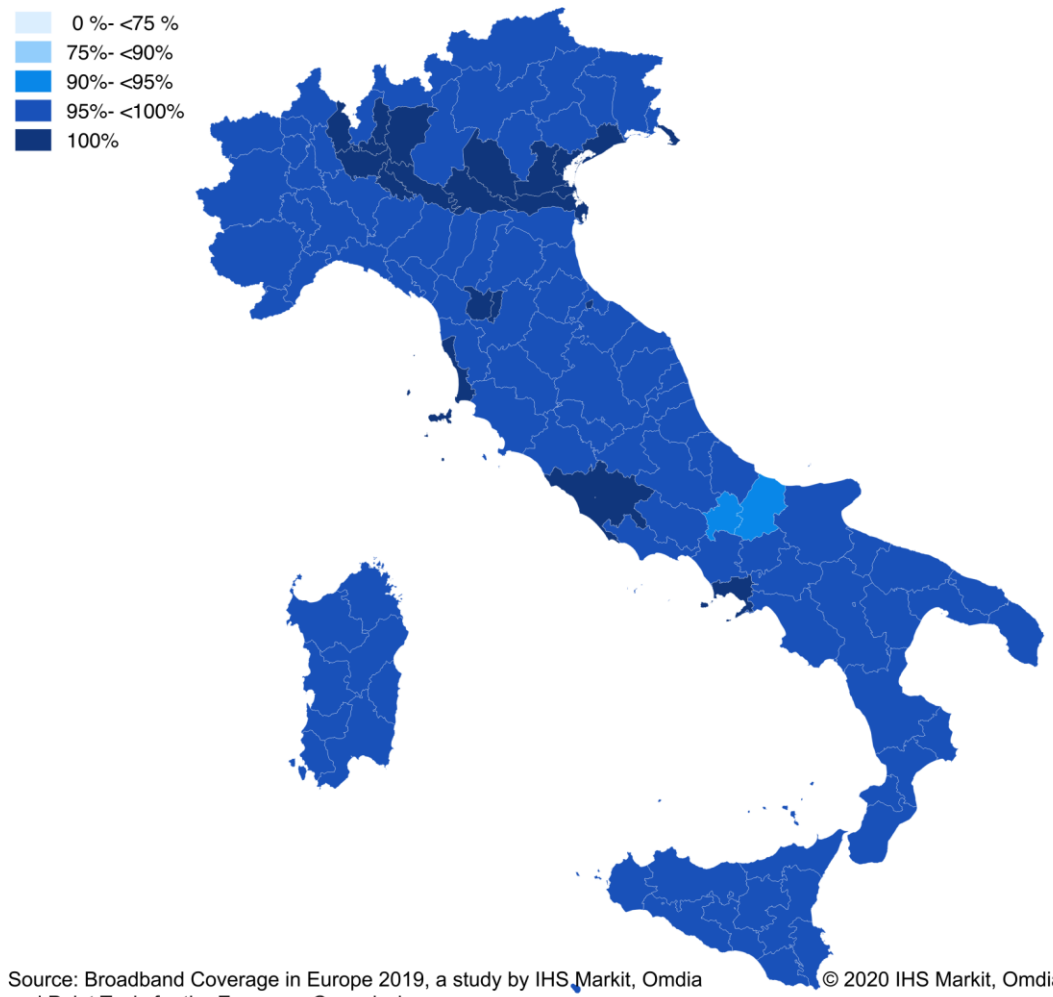
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Italy	97.3%	68.4%	11.6%	2.1%	-	-	41.0%	95.0%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.16.2 Regional coverage by broadband technology

As was the case in previous iterations of this study, no Italian region recorded fixed broadband coverage below 90.0%. This year, coverage ranged between 92.7% in Isernia and universal coverage (100.0%) in eighteen Italian regions.

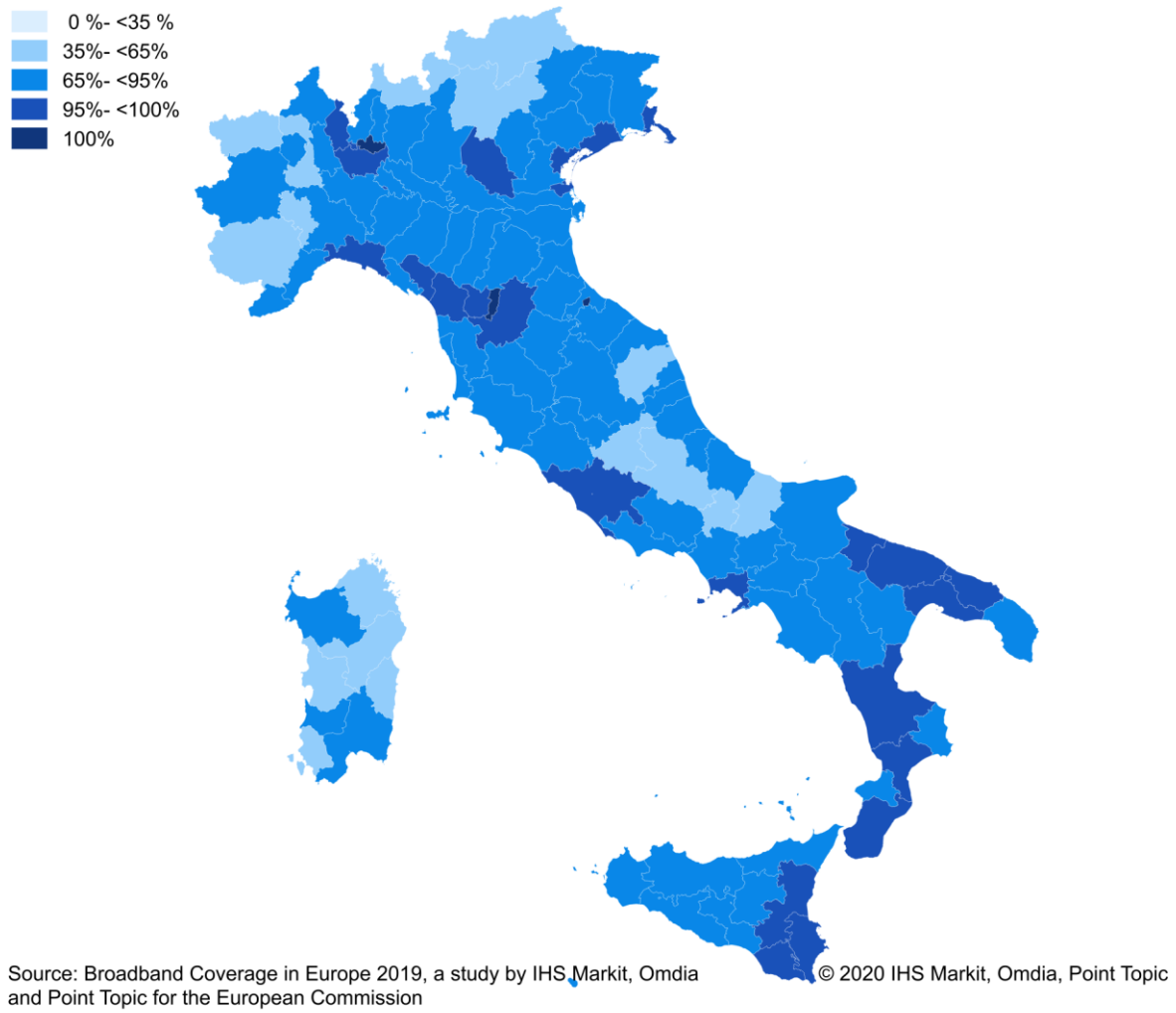
Italy: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

As is the case in most countries of this study, NGA coverage disparities across regions were higher than fixed broadband coverage variations. This year, however, no Italian region recorded NGA coverage below 40.0%, when last year some regions had coverage levels below 5.0%. At the end of June 2019, NGA coverage across Italian regions ranged from 45.9% in Nuoro and universal coverage (100.0%) in the Lombardy province of Monza and Brianza, and the Tuscany province of Prato.

Italy: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.16.3 Data tables for Italy

Statistic	National
Population	60,483,973
Persons per household	2.4
Rural proportion	12.1%

	Italy 2019		Italy 2018		Italy 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.6%	97.3%	99.7%	97.4%	98.6%	90.9%	91.2%	81.4%
VDSL	88.9%	68.4%	87.9%	42.6%	82.4%	38.4%	59.2%	41.8%
VDSL 2 Vectoring	55.8%	11.6%	-	-	-	-	28.2%	11.3%
FTTP	30.0%	2.1%	23.9%	0.8%	21.7%	0.8%	33.5%	17.5%
Cable modem DOCSIS 3.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	72.9%	41.0%	-	-	-	-	49.1%	41.7%
LTE	100.0%	95.0%	98.9%	90.7%	98.7%	89.2%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	97.1%	-	97.1%	-	91.1%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.6%	97.3%	*99.5%*	*97.4%*	99.3%	94.8%	97.1%	89.7%
NGA broadband	88.9%	68.4%	*87.9%*	43.4%	86.8%	39.2%	85.8%	59.3%
Very High Capacity Networks	30.0%	2.1%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	96.1%	-	*96.0%*	-	*95.9%*	-	95.7%	-
At least 30 Mbps	77.5%	-	*76.7%*	-	*75.7%*	-	83.3%	-
At least 100 Mbps	61.0%	-	*23.9%*	-	21.7%	-	68.4%	-
At least 1 Gbps	30.0%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

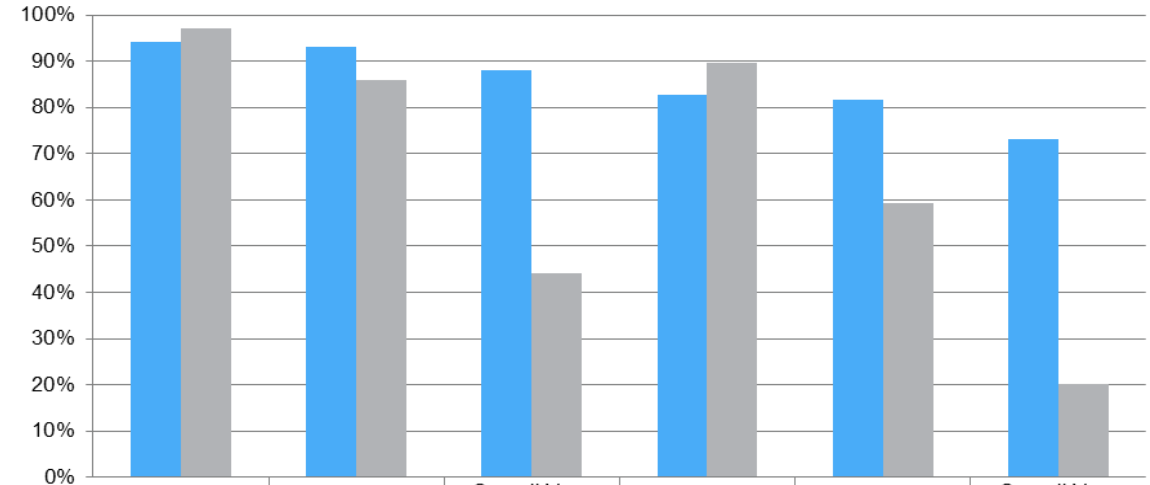
All restatements are highlighted in italics.

5.17 Latvia

5.17.1 National coverage by broadband technology

By mid-2019, overall fixed broadband coverage in Latvia stood at 94.0% at a national level, and at 82.8% at a rural level, both below the EU average. However, in terms of NGA broadband availability, Latvia continued to fare well compared to the EU average. NGA broadband was accessible to 93.1% of households at a national level, over the EU average of 85.8%, and to 81.7% of rural households, well above the EU average of 59.3%. In terms of overall Very High Capacity Networks (VHCN) availability, those were available to 88.1% of Latvian households, double the EU average of 44.0%.

Latvia: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Latvia	94.0%	93.1%	88.1%	82.8%	81.7%	73.2%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

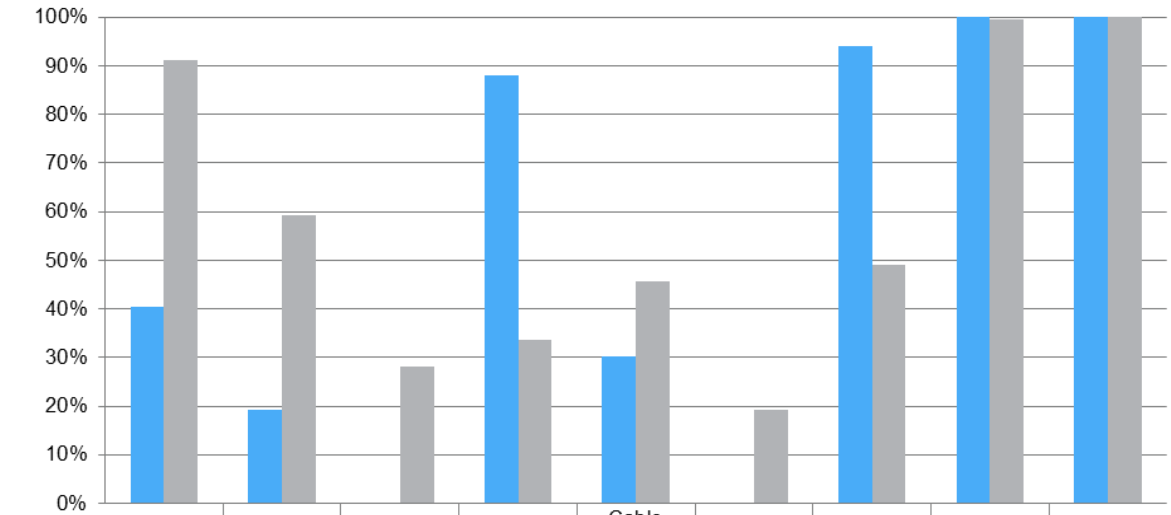
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Examining individual technologies, over the twelve months to the end of June 2019, DSL decreased by 0.2 percentage points. With only 40.5% of households having access to DSL, Latvia was the study country with the lowest DSL availability. Moreover, VDSL coverage also recorded a slight decrease, from 19.3% in mid-2018 to 19.1% at the end of June 2019.

The widespread availability of FTTP in Latvia remained the most noteworthy feature of the Latvian market. At the end of June 2019, FTTP services were available to 88.1% of Latvian households, more than double the EU average, which stood at 33.5%. As mentioned in previous reports, the structure of the Latvian market is highly determined by the incumbent Lattelecom, who has been developing the country's FTTP-dominant broadband infrastructure since 2009. Due to the rapid development of FTTP, availability of the remaining NGA technologies is lower than the EU average. Only 19.1% of the Latvian households had access to VDSL, while DOCSIS 3.0 is available to 30.1%

Looking at mobile broadband, LTE coverage grew by 1.4 percentage point and guaranteed for the first time universal coverage for Latvian homes. When considering average LTE coverage of all mobile network operators, 99.3% of Latvians had access to LTE services.

Latvia: Coverage by technology, total, 2019

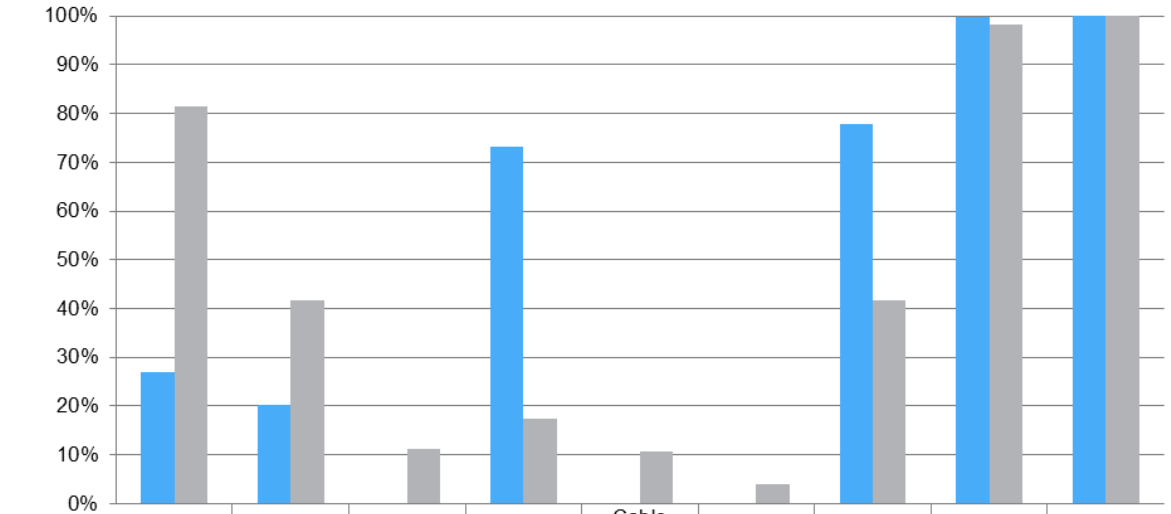


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Latvia	40.5%	19.1%	-	88.1%	30.1%	-	94.0%	100.0%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Rural DSL decreased slightly over the study period, from 27.2% in mid-2018 to 27.0% of rural homes covered at the end of June 2019. Fixed Wireless Access was available 77.7% of rural households.

Latvia: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Latvia	27.0%	20.3%	-	73.2%	-	-	77.7%	99.8%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.6%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

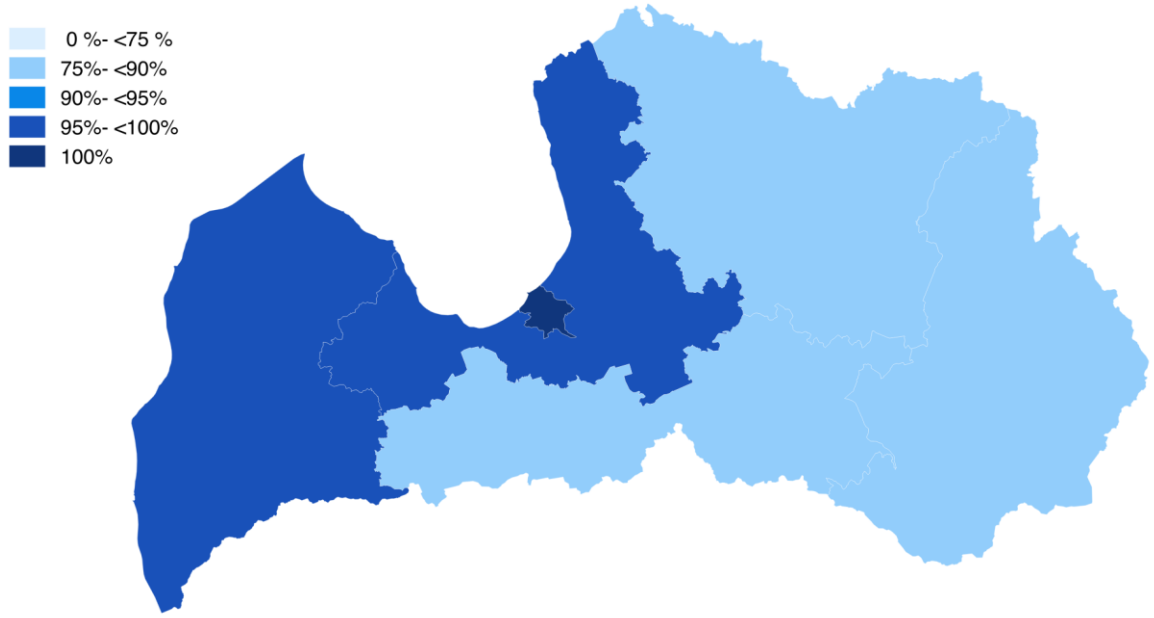
In rural regions of Latvia, FTTP remained the most widespread NGA technology, covering 73.2% of households, well over the EU average of 17.5%. VDSL availability remained relatively stable, at 20.3% of rural Latvian households covered. Meanwhile, both cable modem DOCSIS 3.0 and DOCSIS 3.1 remained absent from Latvia's rural areas.

LTE coverage improved over the study period increasing by 4.8 percentage points, to reach 99.8% of rural homes.

5.17.2 Regional coverage by broadband technology

As was the case in previous years, variations in fixed broadband coverage across Latvian regions could be noted, with coverage ranging from 82.7% in Latgale to universal coverage in Riga.

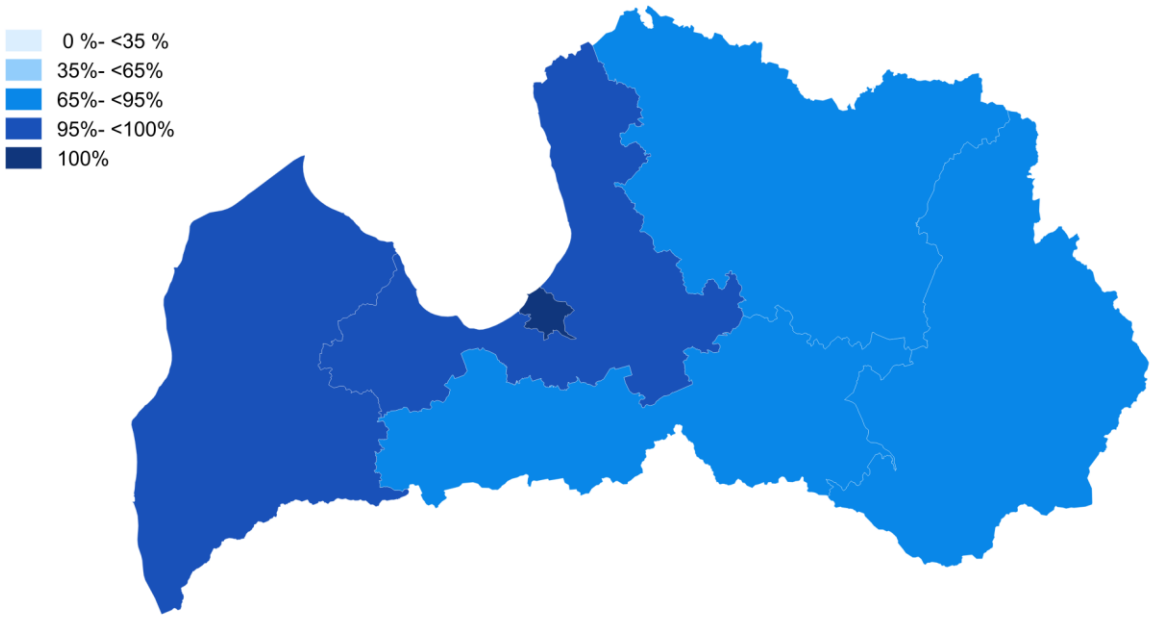
Latvia: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at regional NGA coverage, as was the case last year, NGA broadband was available to all households in Riga, and neared universal coverage in the regions of Kurzeme and Pieriga. Latgale recorded the lowest NGA coverage, at 76% of households.

Latvia: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.17.3 Data tables for Latvia

Statistic	National
Population	1,934,379
Persons per household	2.4
Rural proportion	26.9%

	Latvia 2019		Latvia 2018		Latvia 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	40.5%	27.0%	40.7%	27.2%	41.4%	26.1%	91.2%	81.4%
VDSL	19.1%	20.3%	19.3%	20.4%	17.8%	17.0%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	88.1%	73.2%	87.8%	73.6%	85.7%	70.1%	33.5%	17.5%
Cable modem DOCSIS 3.0	30.1%	0.0%	29.4%	0.0%	29.2%	0.0%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	100.0%	99.8%	-	-	-	-	49.1%	41.7%
LTE	100.0%	99.8%	98.6%	95.0%	98.4%	94.4%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	99.3%	-	98.3%	-	97.7%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	94.0%	82.8%	93.9%	83.7%	92.8%	82.7%	97.1%	89.7%
NGA broadband	93.1%	81.7%	93.0%	82.1%	91.5%	77.6%	85.8%	59.3%
Very High Capacity Networks	88.1%	73.2%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	93.6%	-	93.9%	-	92.6%	-	95.7%	-
At least 30 Mbps	92.8%	-	91.5%	-	90.7%	-	83.3%	-
At least 100 Mbps	89.6%	-	87.8%	-	86.9%	-	68.4%	-
At least 1 Gbps	0.0%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

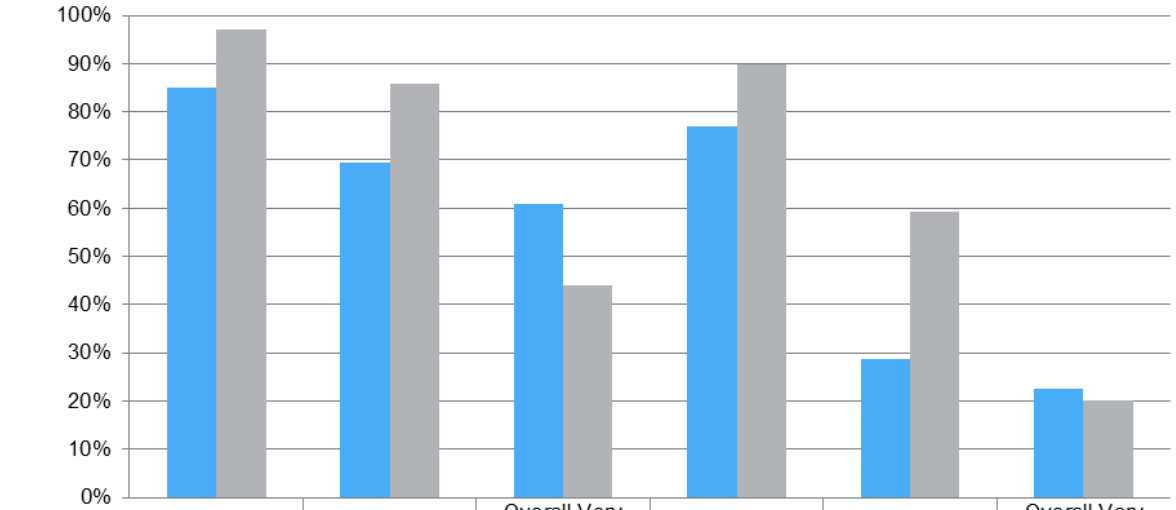
5.18 Lithuania

5.18.1 National coverage by broadband technology

Overall fixed broadband in Lithuania reached 85.1% of Lithuanian households at a national level, and 77.0% of households at a rural level at the end of June 2019. Despite increases at both levels, Lithuania remained below the EU average for fixed broadband coverage. A similar situation was observed in terms of NGA coverage, which remained below the EU average on both national and rural level. By mid-2019, 69.4% of homes were passed by at least one NGA network, but only fewer than a third of rural households had access to high speed broadband services.

However, when examining coverage of very high capacity networks, i.e. DOCSIS 3.1 and FTTP, Lithuania reached above average levels with more than two thirds (61.0%) of households being covered by networks capable of delivering gigabit speeds owing to a widespread FTTP network.

Lithuania: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Lithuania	85.1%	69.4%	61.0%	77.0%	28.7%	22.5%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

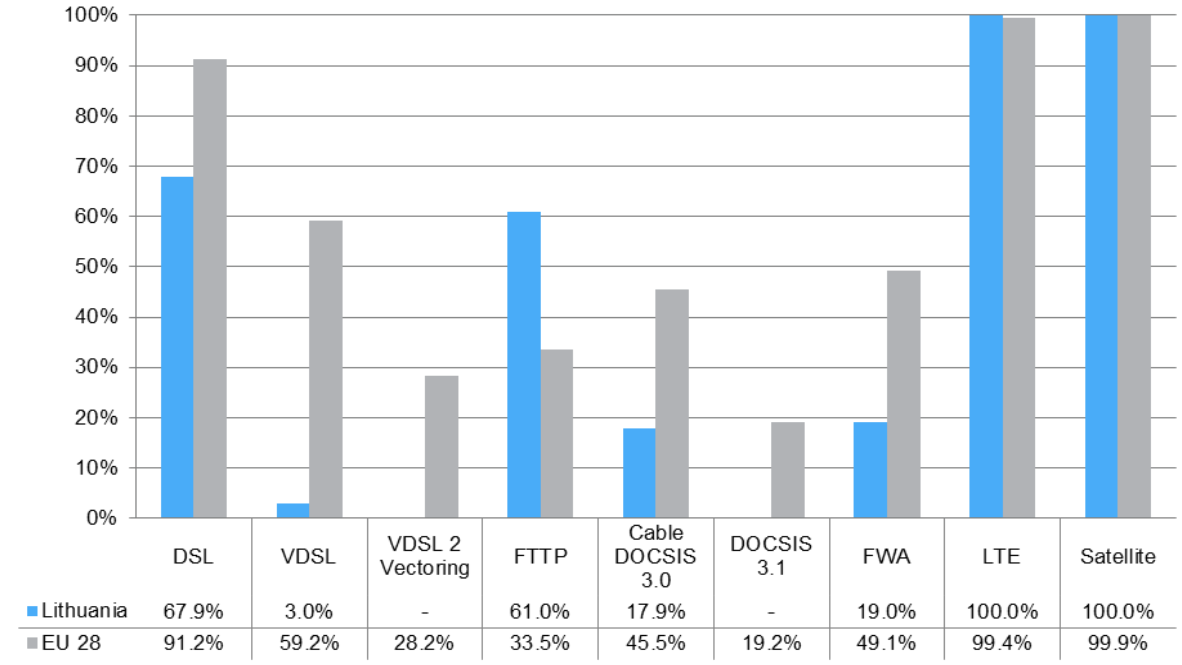
Looking at individual technologies, despite a 2.0 percentage point decrease compared to mid-2018, DSL remained the most prevalent broadband technology available to 67.9% of Lithuanian households. The decrease in DSL coverage can be attributed to a trend seen in a number of Baltic and Nordic countries where legacy copper lines are being decommissioned and replaced by FTTP and mobile networks.

As such, FTTP remained by far the dominant NGA technology in Lithuania, with 61.0% of homes passed at the end of June 2019. Cable modem DOCSIS 3.0 remained the second most prevalent NGA technology, with high speed cable broadband services available to 17.9% of Lithuanian households covered. No DOCSIS 3.1 deployments were recorded in Lithuania by mid-2019.

Lastly, VDSL gained 0.7 percentage point in coverage, however this NGA technology remained very limited, passing only 3.0% of Lithuanian homes. As copper network upgrades are not a priority for Lithuanian operators, VDSL2 Vectoring has not been deployed in the country.

In terms of mobile broadband, Lithuania saw a slight improvement in LTE coverage, which lead LTE to be universally available for the first time to all Lithuanian households.

Lithuania: Coverage by technology, total, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Lithuania	67.9%	3.0%	-	61.0%	17.9%	-	19.0%	100.0%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

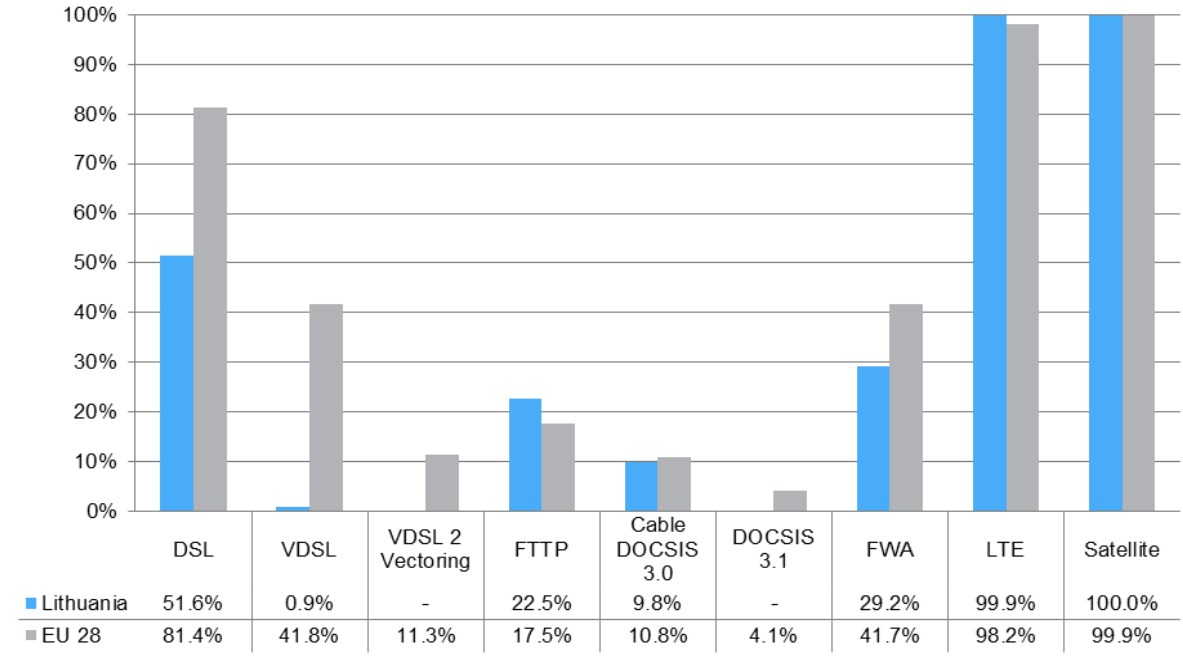
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at Lithuania's rural areas, DSL remained the most widely available technology over the study period. It was available to 51.6% of rural households in Lithuania. FWA was available to 29.2% of rural Lithuanian households.

Looking at NGA broadband coverage of rural regions, FTTP remained the most prevalent technology, with 22.5% of households covered, slightly up from 21.8% in mid-2018. Cable DOCSIS 3.0 networks covered 9.8% of rural households and VDSL services were available to less than 1% of rural households at the end of June 2019.

Lastly, mobile broadband coverage improved over the study period, and increased by 2.6 percentage points, to reach over 99.9% of rural households.

Lithuania: Coverage by technology, rural areas, 2019



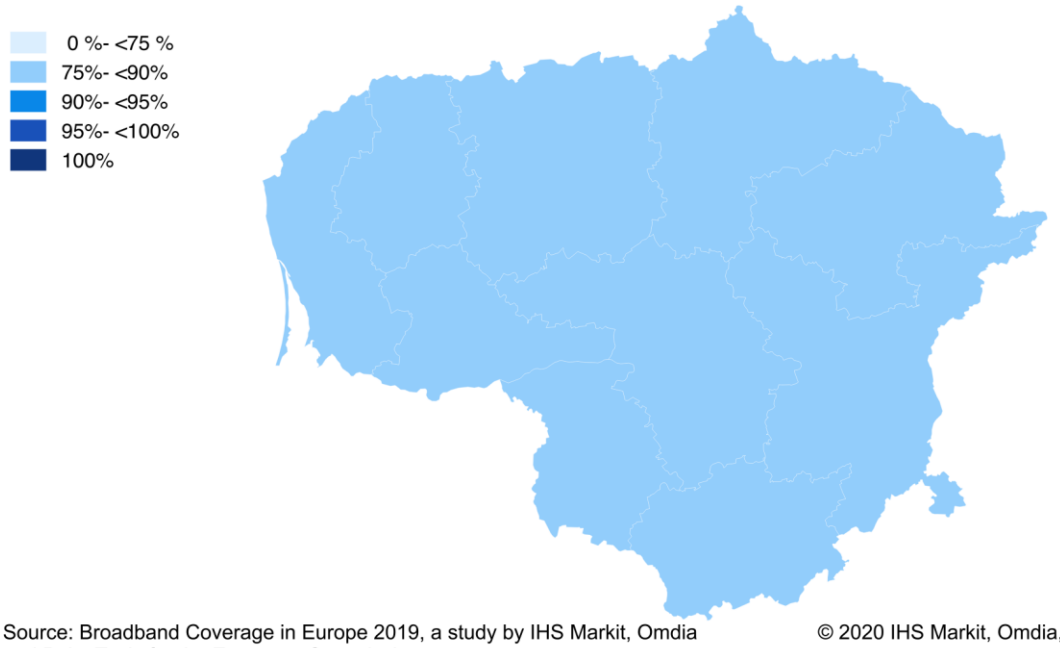
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Lithuania	51.6%	0.9%	-	22.5%	9.8%	-	29.2%	99.9%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.18.2 Regional coverage by broadband technology

Overall fixed broadband coverage remained stable and homogenous across all Lithuanian regions, with coverage exceeding 70.0% in all regions. Coverage was the lowest in the region of Taurages, with 76.3% of homes covered, and highest in the Kauno region, with 87.6% of households covered.

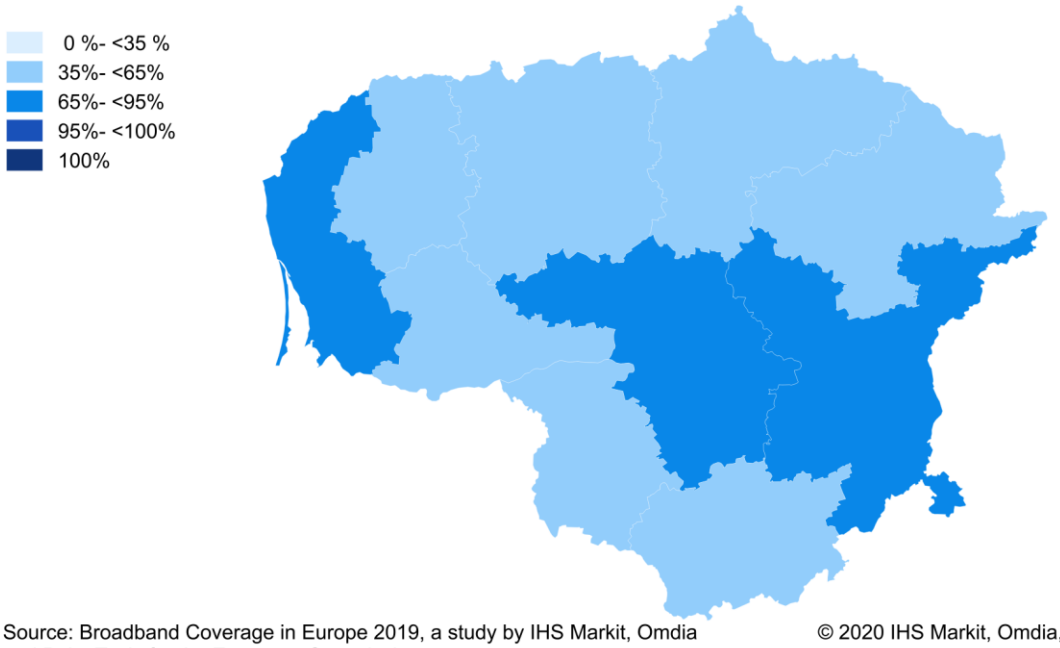
Lithuania: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Variance between Lithuanian regions in terms of NGA coverage remained substantial, with coverage levels ranging from 40.0% in Marijampoles and 87.4% in the capital region of Vilnius.

Lithuania: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.18.3 Data tables for Lithuania

Statistic	National
Population	2,847,904
Persons per household	2.4
Rural proportion	30.1%

	Lithuania 2019		Lithuania 2018		Lithuania 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	67.9%	51.6%	69.9%	50.2%	69.9%	49.3%	91.2%	81.4%
VDSL	3.0%	0.9%	2.3%	0.9%	1.2%	0.8%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	61.0%	22.5%	60.6%	21.8%	54.4%	19.5%	33.5%	17.5%
Cable modem DOCSIS 3.0	17.9%	9.8%	18.1%	9.5%	17.1%	8.5%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	19.0%	29.2%	-	-	-	-	49.1%	41.7%
LTE	100.0%	99.9%	99.2%	97.3%	99.1%	97.0%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	99.8%	-	97.7%	-	97.7%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	85.1%	77.0%	84.9%	66.3%	82.0%	63.8%	97.1%	89.7%
NGA broadband	69.4%	28.7%	62.7%	27.5%	54.4%	24.5%	85.8%	59.3%
Very High Capacity Networks	61.0%	22.5%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	85.1%	-	84.9%	-	82.0%	-	95.7%	-
At least 30 Mbps	63.6%	-	62.7%	-	54.4%	-	83.3%	-
At least 100 Mbps	61.2%	-	60.6%	-	54.4%	-	68.4%	-
At least 1 Gbps	60.9%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

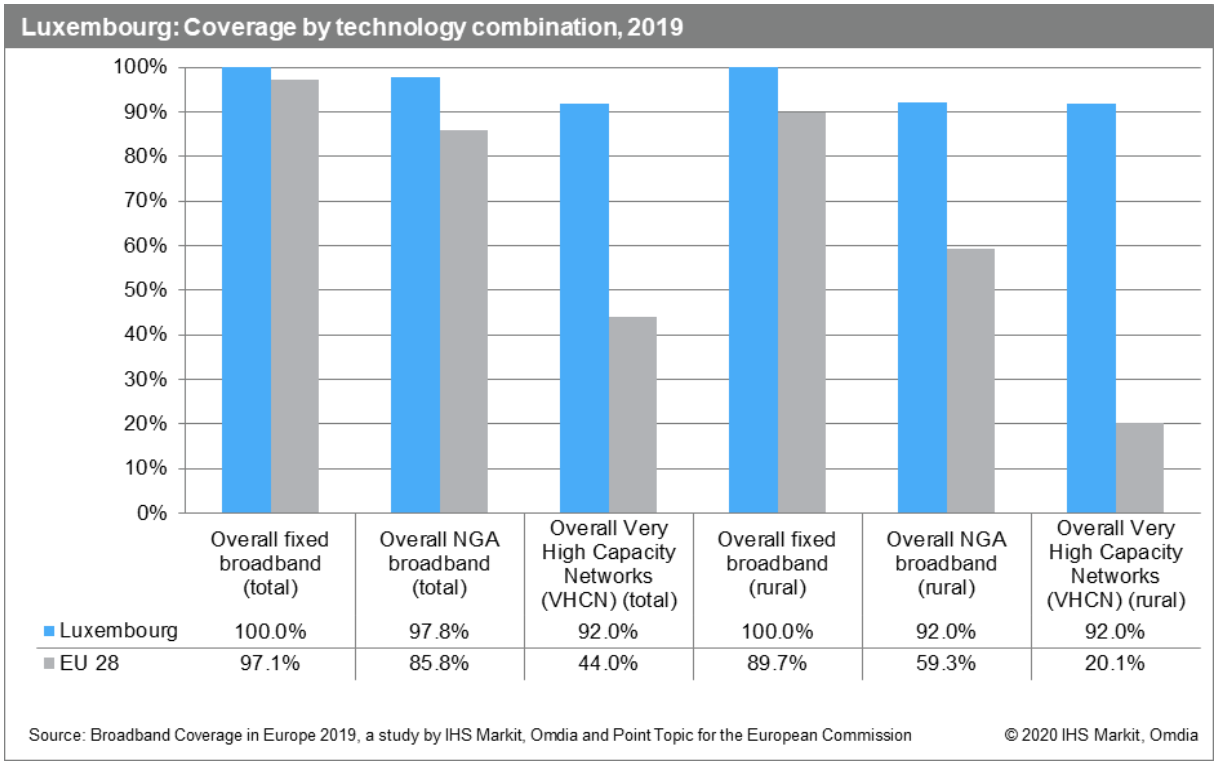
All restatements are highlighted in italics.

5.19 Luxembourg

5.19.1 National coverage by broadband technology

Given that Luxembourg already achieved universal fixed broadband coverage in previous years, operators in the country are focusing on expansion of NGA networks. At the end of June 2019, NGA broadband service were available to 97.8% of all households, and to 92.0% of rural households. In terms of Very High Capacity Networks (VHCN), i.e. DOCSIS 3.1 and FTTP, Luxembourg recorded the third highest coverage level of this study, and the second highest rural VHCN coverage level of this study. As was the case in previous years, Luxembourg exceeded the EU average for all technology combination categories.

It should be noted that Luxembourg benefits from the fact that it covers a geographically small and densely populated area in comparison to its neighbours. Therefore, extending NGA technologies such as FTTP and DOCSIS 3.1 has been somewhat easier in Luxembourg than in other European countries.

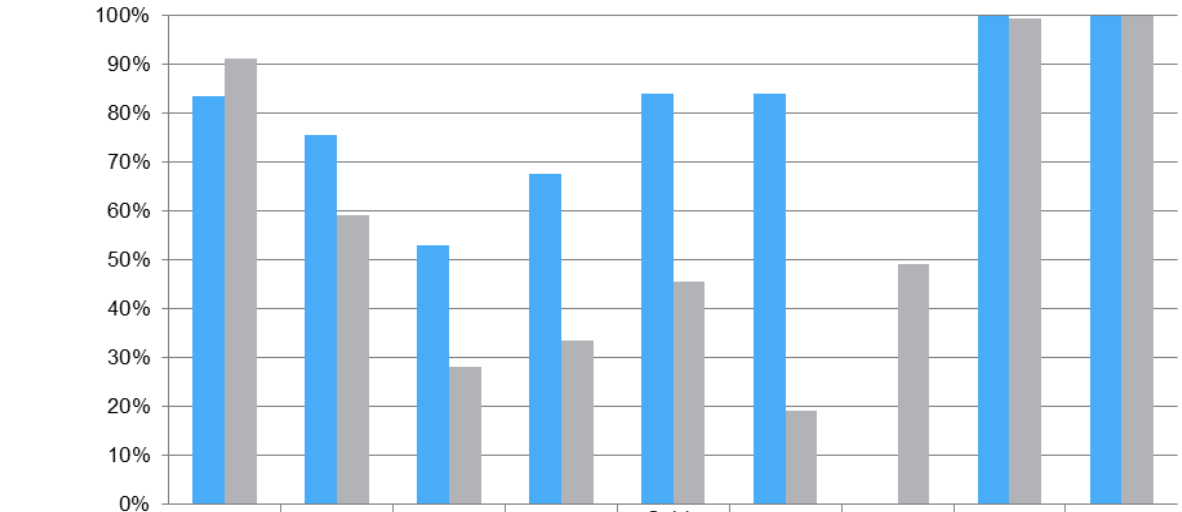


Looking at individual technologies, DSL and VDSL switches offs continued over the study period. DSL coverage dropped by 5.6 percentage points, to reach 83.4% of households. VDSL recorded a 2.8 percentage point decrease in coverage with VDSL services available to three quarters (75.5%) of households. In addition, more than a half (52.9%) of households had access to services running on VDSL2 Vectoring and capable of delivering at least 100Mbps download speeds.

As was the case in previous years, cable remained the most prevalent NGA technology, accessible to 83.9% of Luxembourgish households, with the whole network having been updated to the DOCSIS 3.1 standard by mid-2019. FTTP coverage continued to improve, and gained 4.1 points of coverage, to reach 67.5% of households.

In terms of mobile broadband, LTE coverage continued to increase, to reach 99.8% of households, whilst the average LTE coverage of all operators reached 98.0% at the end of June 2019.

Luxembourg: Coverage by technology, total, 2019



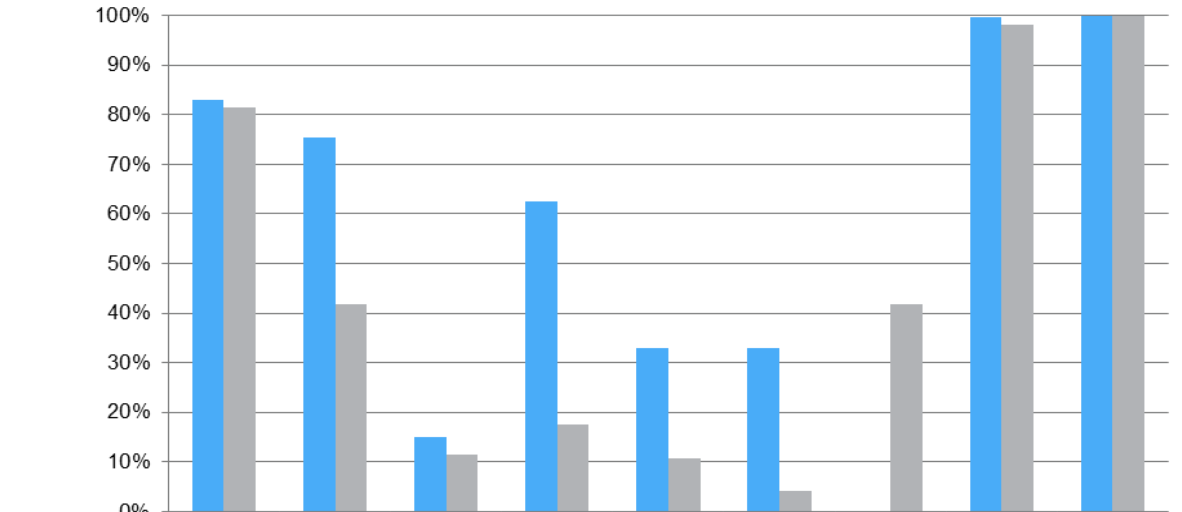
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Luxembourg	83.4%	75.5%	52.9%	67.5%	83.9%	83.9%	-	99.8%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural areas of Luxembourg, as was the case at a national level, both DSL and VDSL recorded decreases in coverage, owing to operators' focus on upgrading copper lines to fibre optic networks. DSL decreased by 14.0 percentage points, whilst VDSL decreased by 10.3 percentage points. VDSL2 Vectoring was available to 15.0% of rural homes. FTTP remained the most prevalent NGA technology in rural areas, and reached 62.4% of rural households, having recorded the most significant increase of this study in terms of rural FTTP coverage, 25.4 percentage points. Luxembourg thus had the second highest level of rural FTTP coverage in all 31 countries of this study. Cable modem DOCSIS 3.0 and DOCSIS 3.1 remained relatively stable, at around a third (33.0%) of rural Luxembourgish households covered.

In terms of mobile broadband, LTE coverage continued to expand in rural areas, and gained 3.7 points of coverage, to reach 99.6% of rural Luxembourgish households.

Luxembourg: Coverage by technology, rural areas, 2019

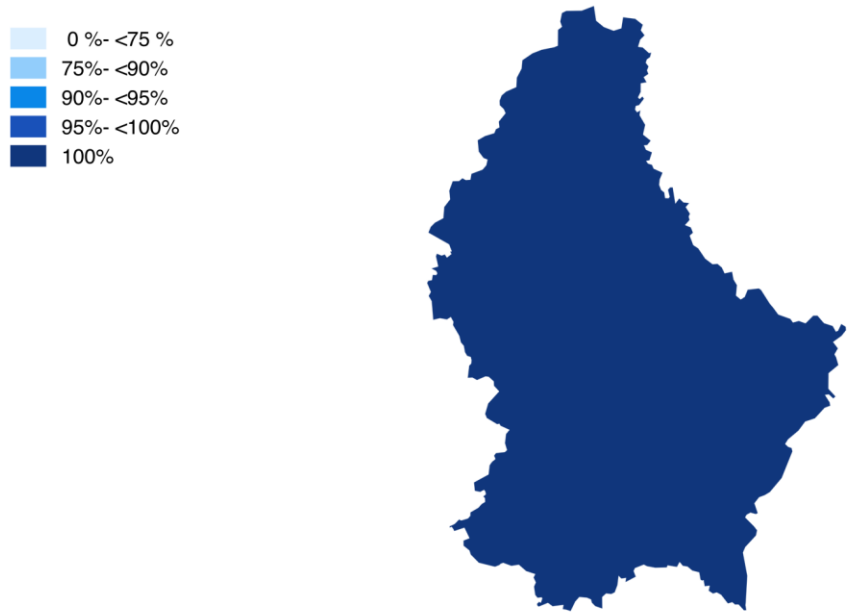


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Luxembourg	83.0%	75.5%	15.0%	62.4%	33.0%	33.0%	-	99.6%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

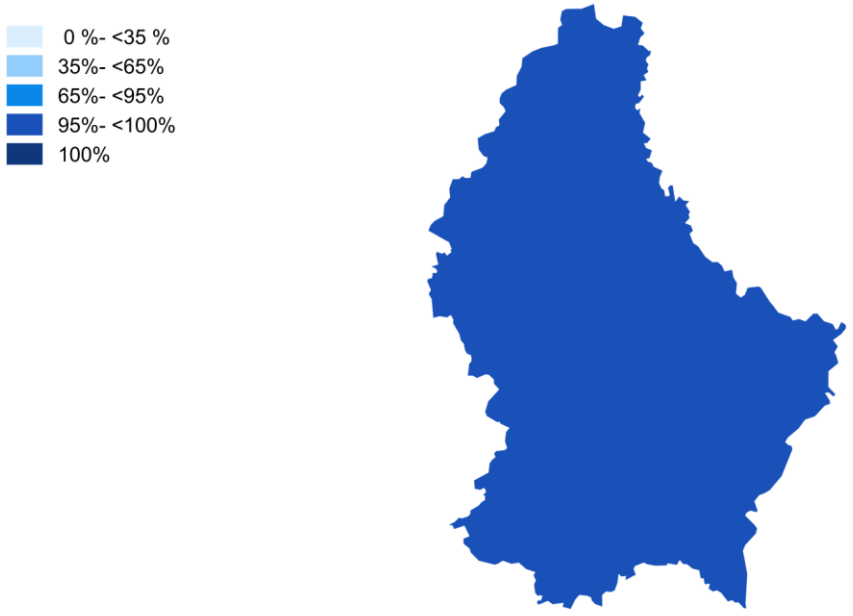
5.19.2 Regional coverage by broadband technology

Luxembourg: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Luxembourg: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.19.3 Data tables for Luxembourg

Statistic	National
Population	602,005
Persons per household	2.5
Rural proportion	11.5%

	Luxembourg 2019		Luxembourg 2018		Luxembourg 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	83.4%	83.0%	89.0%	97.0%	100.0%	99.7%	91.2%	81.4%
VDSL	75.5%	75.5%	78.3%	85.8%	87.2%	89.1%	59.2%	41.8%
VDSL 2 Vectoring	52.9%	15.0%	-	-	-	-	28.2%	11.3%
FTTP	67.5%	62.4%	63.4%	37.0%	57.2%	35.1%	33.5%	17.5%
Cable modem DOCSIS 3.0	83.9%	33.0%	84.0%	32.6%	73.2%	0.0%	45.5%	10.8%
DOCSIS 3.1	83.9%	33.0%	-	-	-	-	19.2%	4.1%
FWA	0.0%	0.0%	-	-	-	-	49.1%	41.7%
LTE	99.8%	99.6%	98.7%	95.9%	98.6%	95.2%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	98.0%	-	99.0%	-	98.3%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	97.1%	89.7%
NGA broadband	97.8%	92.0%	97.6%	92.9%	94.6%	94.5%	85.8%	59.3%
Very High Capacity Networks	92.0%	92.0%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	100.0%	-	100.0%	-	100.0%	-	95.7%	-
At least 30 Mbps	97.8%	-	97.6%	-	93.2%	-	83.3%	-
At least 100 Mbps	94.6%	-	94.0%	-	86.6%	-	68.4%	-
At least 1 Gbps	67.5%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

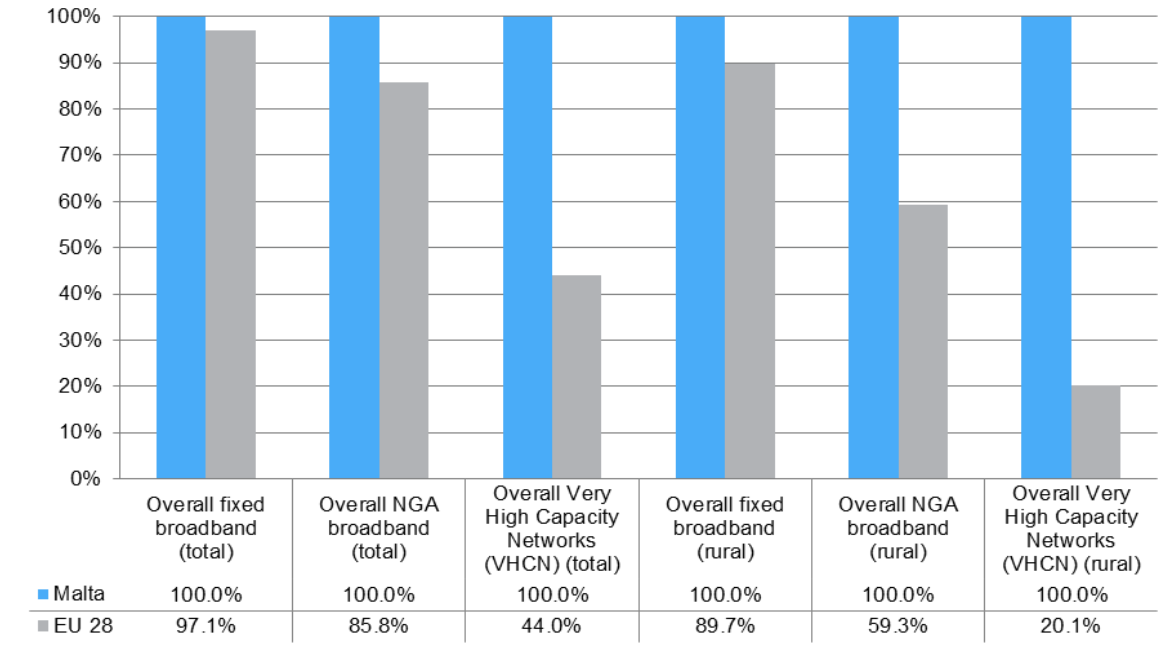
All restatements are highlighted in italics.

5.20 Malta

5.20.1 National coverage by broadband technology

In line with previous iterations of the study, Malta recorded no change in coverage for any of the two combination categories, having already achieved universal fixed broadband and NGA coverage in past years, both at a national and rural level. By mid-2019, Malta was the only country of this study to have recorded universal Very High Capacity Networks (VHCN) coverage, i.e. combined DOCSIS 3.1 and FTTP coverage.

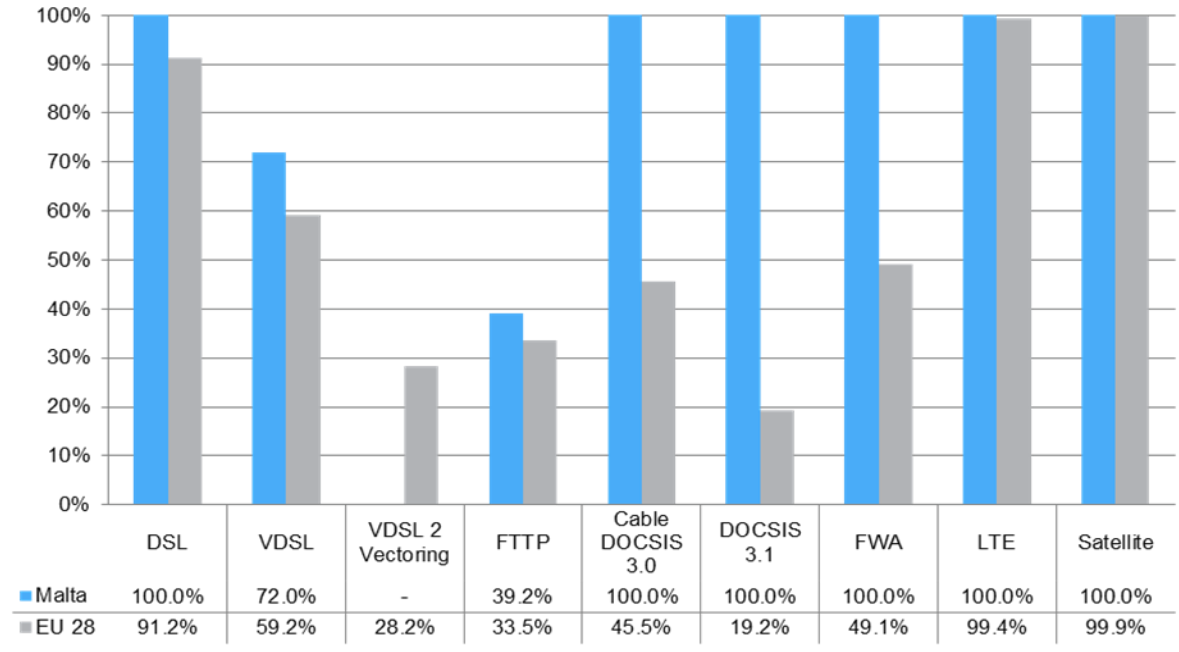
Malta: Coverage by technology combination, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

As is the case with a number of countries covering a geographically small area, achieving universal broadband coverage has been somewhat easier in Malta than in other, larger European countries. Indeed, Malta is a small, very densely populated island with limited rural population (only 1.0% of households were identified as rural).

Malta: Coverage by technology, total, 2019



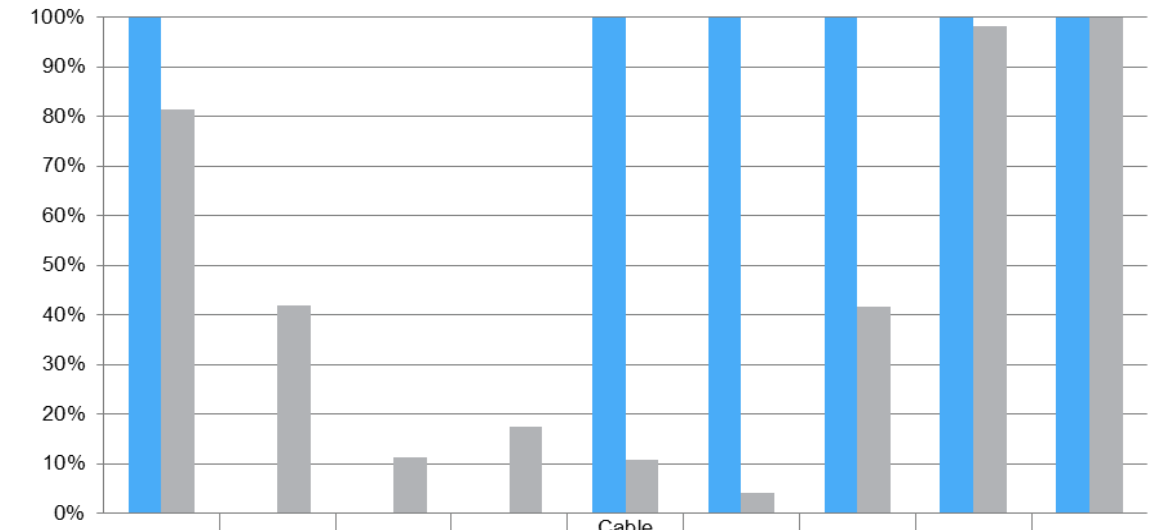
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Examining individual technologies, Malta reported complete coverage across various fixed broadband access technologies, including DSL, cable modem DOCSIS 3.0 and DOCSIS 3.1, and Fixed Wireless Access (FWA). As was the case last year, VDSL coverage remained stable, at 72.0% of Maltese households covered.

FTTP was the only individual fixed technology to record a change in coverage, as operators across the island continued to expand their FTTP networks. In the twelve months to mid-2019, FTTP coverage grew by 7.6 percentage points, to reach 39.2% of households. Expansion of fibre optic networks has been led by telecom operator GO's investments[17], whose aim was to cover half of Maltese households by the end of 2019.

In terms of mobile technologies, all mobile network operators in Malta provided universal LTE coverage.

Malta: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Malta	100.0%	-	-	-	100.0%	100.0%	100.0%	100.0%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural regions of Malta, as was the case on a national level, there were almost no changes in terms of coverage of individual fixed broadband technologies. Only cable modem DOCSIS 3.0 recorded a small 0.1 percentage point change, reaching universal coverage of all households by the end of June 2019. With universal coverage by DOCSIS 3.1, Malta was the only country of this study to record universal rural VHCN coverage. VDSL, VDSL2 Vectoring and FTTP were absent in rural areas.

LTE coverage of rural regions improved by 8.2 percentage points providing complete rural coverage for the first time in mid-2019.

[17] https://www.go.com.mt/news/go-the-only-operator-offering-true-fibre-technology-straight-to-your-living-room/

5.20.2 Regional coverage by broadband technology

Malta: Overall fixed broadband coverage, 2019

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Malta: NGA broadband coverage, 2019

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.20.3 Data tables for Malta

Statistic	National
Population	475,701
Persons per household	2.7
Rural proportion	1.0%

	Malta 2019		Malta 2018		Malta 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	91.2%	81.4%
VDSL	72.0%	0.0%	72.0%	0.0%	72.0%	0.0%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	39.2%	0.0%	23.0%	0.0%	16.0%	0.0%	33.5%	17.5%
Cable modem DOCSIS 3.0	100.0%	100.0%	99.9%	99.9%	99.9%	99.9%	45.5%	10.8%
DOCSIS 3.1	100.0%	100.0%	-	-	-	-	19.2%	4.1%
FWA	100.0%	100.0%	-	-	-	-	49.1%	41.7%
LTE	100.0%	100.0%	99.9%	90.2%	99.5%	51.1%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	100.0%	-	99.4%	-	99.3%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	97.1%	89.7%
NGA broadband	100.0%	100.0%	100.0%	99.9%	100.0%	99.9%	85.8%	59.3%
Very High Capacity Networks	100.0%	100.0%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	100.0%	-	100.0%	-	99.8%	-	95.7%	-
At least 30 Mbps	100.0%	-	99.9%	-	99.4%	-	83.3%	-
At least 100 Mbps	100.0%	-	99.9%	-	99.4%	-	68.4%	-
At least 1 Gbps	100.0%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

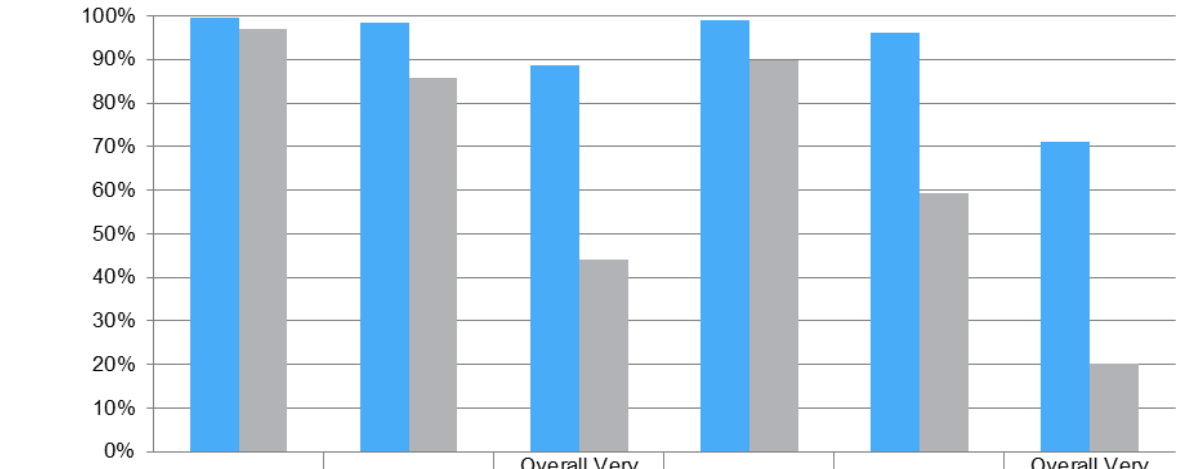
5.21 Netherlands

5.21.1 National coverage by broadband technology

In this iteration of the study, overall fixed broadband and NGA coverage remained stable in the Netherlands with near universal (99.5%) availability of fixed broadband services and NGA networks passing 98.3% of Dutch homes at the end of June 2019. A slight increase of 0.3 percentage point was recorded for rural NGA coverage and by mid-2019, 96.1% of rural households had access to high speed broadband services.

In terms of coverage of very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, the Netherlands recorded impressive coverage levels, with 88.6% of all households and 71.2% of rural homes being passed by networks capable of delivering gigabit speeds. As such the Netherlands continued to rank among the leaders in broadband coverage in all three combination categories.

Netherlands: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Netherlands	99.5%	98.3%	88.6%	98.9%	96.1%	71.2%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

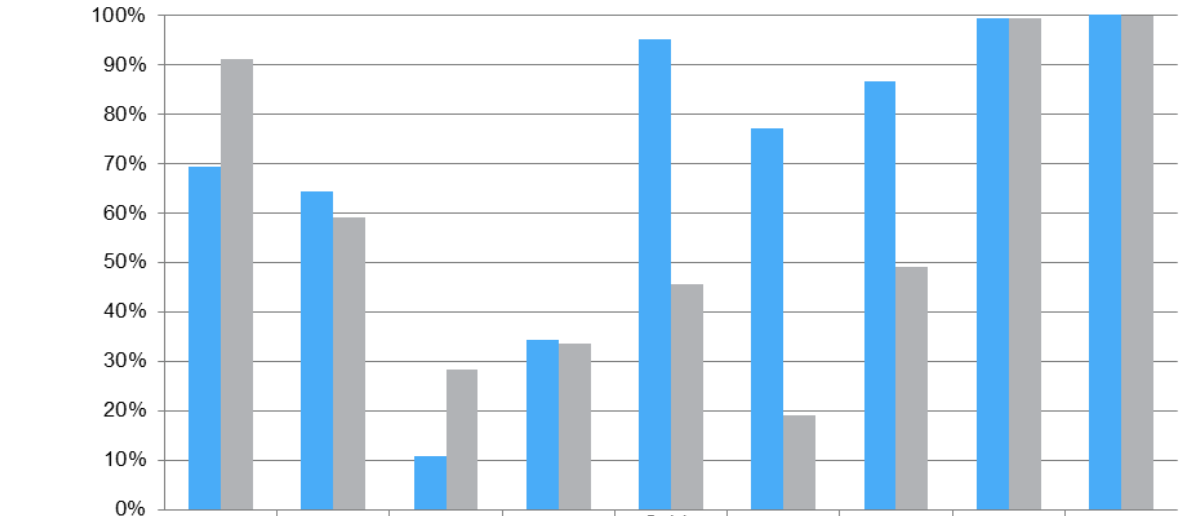
Looking at individual technologies, the Dutch market remained largely dominated by cable, with cable modem DOCSIS 3.0 being available to 95.2% of Dutch households, and DOCSIS 3.1 being available to 77.0% of households. Furthermore, cable modem DOCSIS 3.0 coverage in the Netherlands was the second highest of this study, and as mentioned, VHCN coverage in the Netherlands was comparatively high, at just over double (88.6%) the EU average of 44.0%.

As was the case in previous iterations of this study, DSL coverage continued to slowly decrease, reaching 69.4% of Dutch households, down 0.5 percentage point since mid-2018. VDSL, on the other hand, continue to slowly grow, increasing by 0.5 percentage point, to reach 63.8% of households. At the end of June 2019, VDSL2 Vectoring-enabled networks passed 10.8% of homes.

FTTP availability recorded a 2.2 percentage point increase since the end of June 2018, to reach 34.4% of households, just over the EU average of 33.5%. Lastly, Fixed Wireless Access (FWA) was available to 86.7% of Dutch households.

In terms of mobile broadband, LTE coverage remained stable at 99.4% of households covered, exactly matching the EU average. When considering the average LTE coverage of all mobile network operators 99.3% had access to LTE services.

Netherlands: Coverage by technology, total, 2019

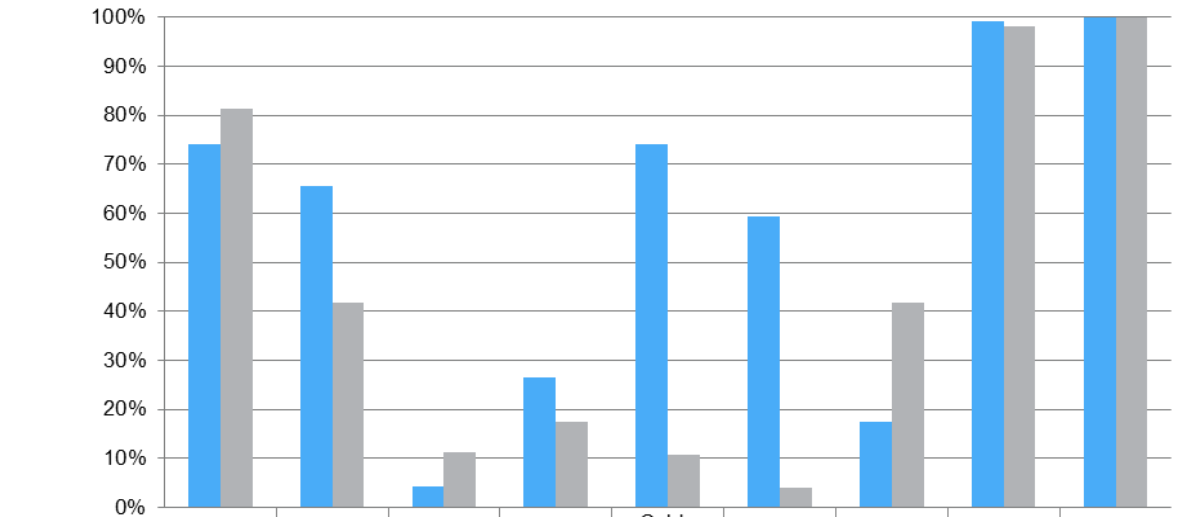


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Netherlands	69.4%	64.3%	10.8%	34.4%	95.2%	77.0%	86.7%	99.4%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural regions, DSL remained the most prevalent access technology in rural regions, with 74.2% of households passed, slightly down from 75.0% in mid-2018. Fixed Wireless Access services were available to 17.5% of homes.

Netherlands: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Netherlands	74.2%	65.5%	4.4%	26.4%	74.0%	59.4%	17.5%	99.3%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

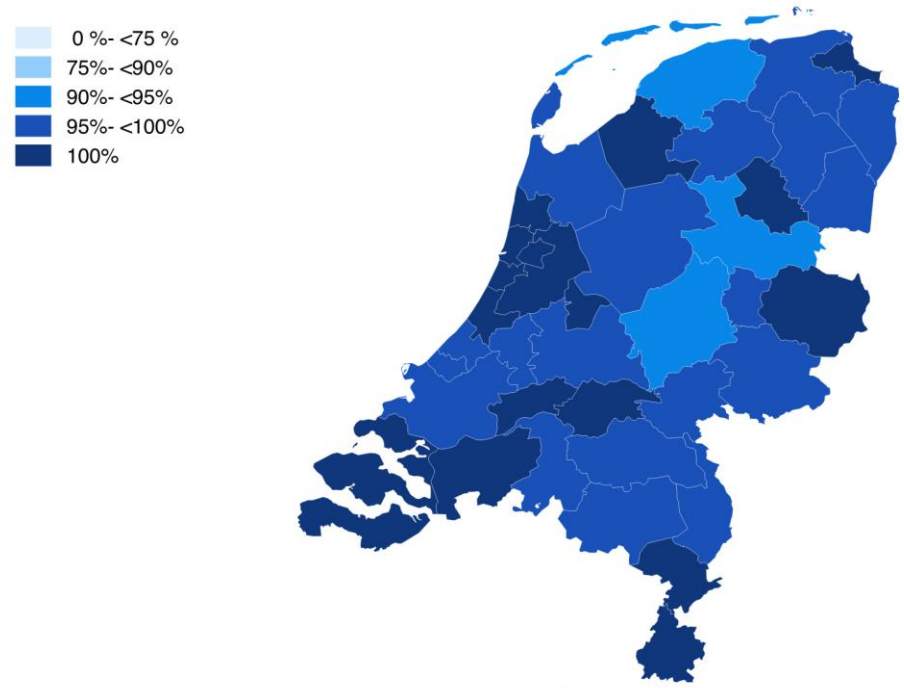
Looking at rural NGA coverage, cable DOCSIS 3.0 remained the most prevalent technology. In the twelve months to mid-2019, DOCSIS 3.0 coverage increased by 5.2 percentage points reaching nearly three quarters (74.0%) of rural households. Moreover, cable networks upgraded to DOCSIS 3.1 passed 59.4% of rural homes. VDSL coverage also improved, with 65.5% of households covered, up from 60.4% in mid-2018. Lastly, FTTP coverage also increased, by 3.7 percentage points, to reach 26.4% of rural homes.

In terms of mobile broadband, rural LTE coverage stood at 99.3% at the end of June 2019.

5.21.2 Regional coverage by broadband technology

Fixed broadband coverage of individual Dutch regions ranged between 93.0%, in Veluwe, and universal coverage (100.0%) in eighteen regions, with thus no region with coverage below 90.0%.

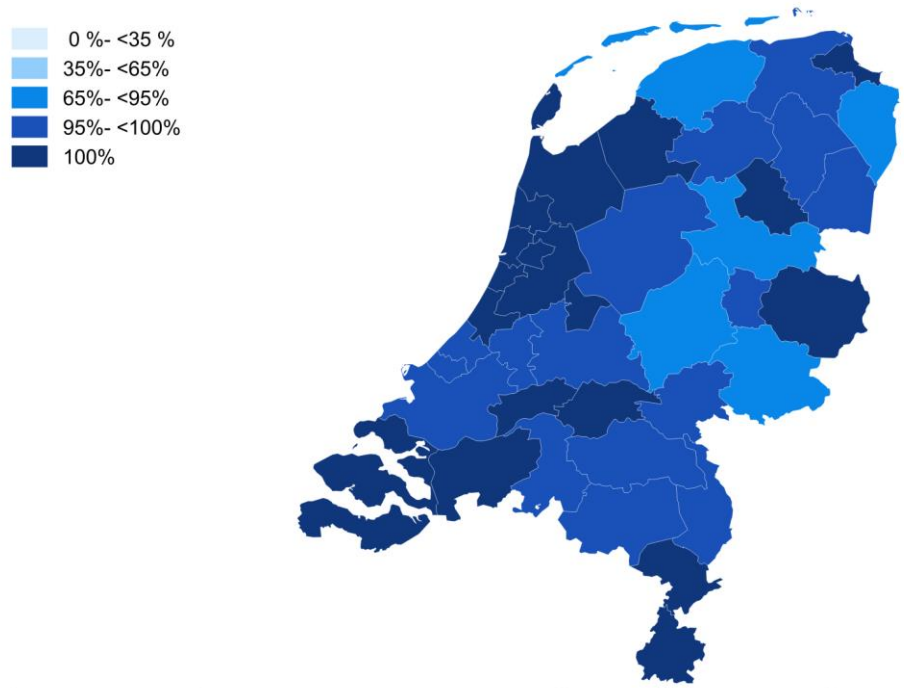
Netherlands: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

As was the case in the last iterations of this study, NGA broadband coverage remained slightly varied across Dutch regions. NGA availability ranged from 91.4% in Oost-Groningen to 100.0% in eighteen of the forty regions of the Netherlands.

Netherlands: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.21.3 Data tables for Netherlands

Statistic	National
Population	17,153,563
Persons per household	2.2
Rural proportion	7.2%

	Netherlands 2019		Netherlands 2018		Netherlands 2017		EU28 2019	
Technology	Total	Rural	Total	*Rural*	Total	Rural	Total	Rural
DSL	69.4%	74.2%	*69.6%*	*75.0%*	*69.8%*	*78.9%*	91.2%	81.4%
VDSL	64.3%	65.5%	*63.8%*	*60.4%*	*61.5%*	*59.5%*	59.2%	41.8%
VDSL 2 Vectoring	10.8%	4.4%	-	-	-	-	28.2%	11.3%
FTTP	34.4%	26.4%	*32.2%*	*22.7%*	*31.9%*	*20.3%*	33.5%	17.5%
Cable modem DOCSIS 3.0	95.2%	74.0%	95.1%	*69.0%*	*95.1%*	*66.2%*	45.5%	10.8%
DOCSIS 3.1	77.0%	59.4%	-	-	-	-	19.2%	4.1%
FWA	86.7%	17.5%	-	-	-	-	49.1%	41.7%
LTE	99.4%	99.3%	*99.4%*	99.4%	*99.4%*	*99.4%*	99.4%	98.2%
LTE average operator coverage (DESI indicator)	99.3%	-	99.6%	-	90.6%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.5%	98.9%	*99.5%*	*98.9%*	*99.5%*	*98.9%*	97.1%	89.7%
NGA broadband	98.3%	96.1%	*98.3%*	*95.8%*	*98.3%*	*93.2%*	85.8%	59.3%
Very High Capacity Networks	88.6%	71.2%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	99.5%	-	*99.5%*	-	*99.5%*	-	95.7%	-
At least 30 Mbps	98.3%	-	*98.3%*	-	*98.3%*	-	83.3%	-
At least 100 Mbps	95.8%	-	*93.0%*	-	*92.9%*	-	68.4%	-
At least 1 Gbps	10.2%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

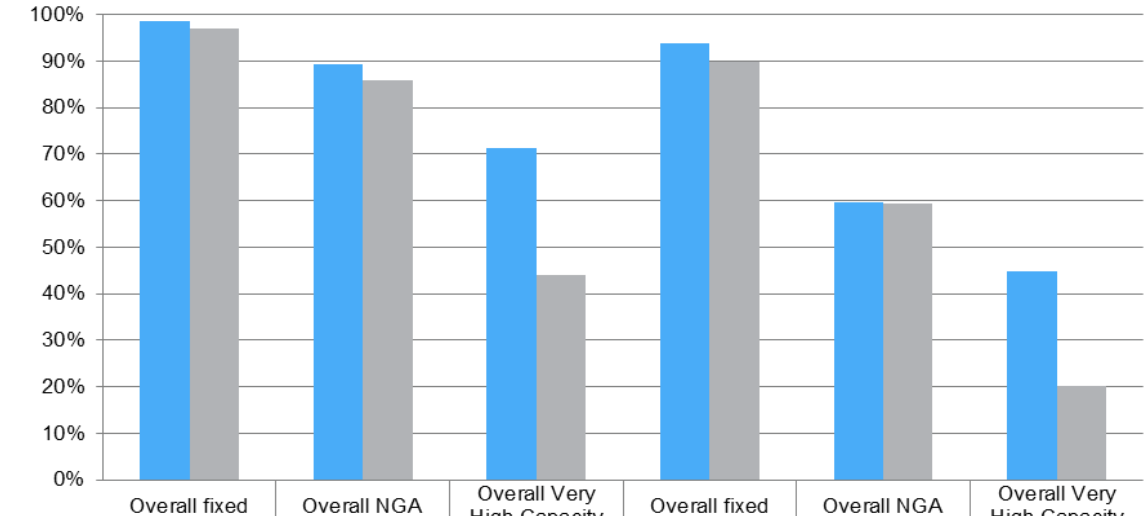
All restatements are highlighted in italics.

5.22 Norway

5.22.1 National coverage by broadband technology

Fixed broadband coverage continued to improve in Norway, growing by 1.8 percentage points at a national level, and by 7.6 percentage points at a rural level. Thus, at the end of June 2019, 98.6% of all Norwegian households and 93.8% rural households had access to at least one fixed broadband service. In terms of NGA broadband, increases in coverage were even more noticeable. Total NGA coverage increased by 5.8 percentage points with nearly 9 in 10 (89.3%) homes being passed by high speed broadband networks by mid-2019. And following an 11.2 percentage point growth, nearly two thirds (59.7%) of rural households had access to NGA broadband services. Very high capacity networks (VHCN), i.e. combined coverage of DOCSIS 3.1 and FTTP, reached 71.4% of Norwegian households at the end of June 2019.

Norway: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Norway	98.6%	89.3%	71.4%	93.8%	59.7%	44.8%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

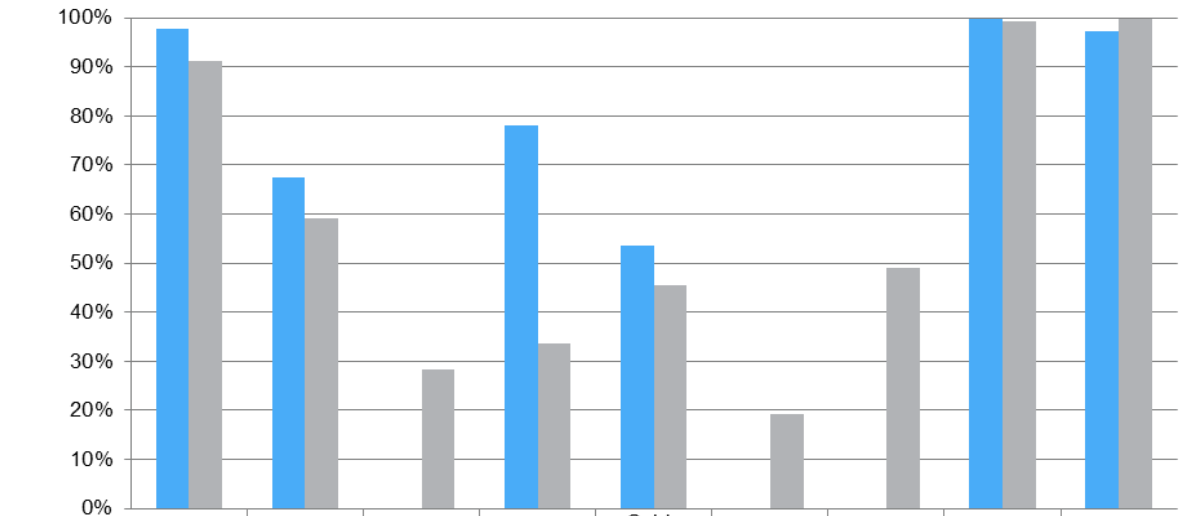
Examining individual fixed broadband technologies, DSL remained the most prevalent broadband technology, with 97.8% of households covered. Upgrades to legacy copper networks continued with VDSL coverage growing by 7.8 percentage points compared and 67.6% of households having access to VDSL broadband services at the end of June 2019. VDSL2 Vectoring has not been deployed in Norway by mid-2018.

FTTP remained the most widespread NGA technology available to Norwegian households, with 78.1% of homes passed. FTTP recorded a significant increase in coverage over the study period, having gained almost 20 percentage points (19.4 p.p.) in coverage. This was, by far, the largest increase in FTTP coverage of this edition of the study. This fast improvement in FTTP coverage can be attributed in part to Telenor's effort to modernise its network, and gradually switch customers from copper to fibre optic[18]. Following a 4.6 percentage point increase cable modem DOCSIS 3.0 networks passed 53.6% of Norwegian homes but upgrades of the cable networks to DOCSIS 3.1 have not yet commenced.

In terms of mobile broadband coverage, LTE gained a 0.1 percentage point in coverage, and continued to near universal coverage, at 99.9% of households covered.

[18] https://www.telecompaper.com/news/telenor-norway-to-move-30000-customers-off-copper-in-2019--1278360

Norway: Coverage by technology, total, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Norway	97.8%	67.6%	-	78.1%	53.6%	-	-	99.9%	97.2%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

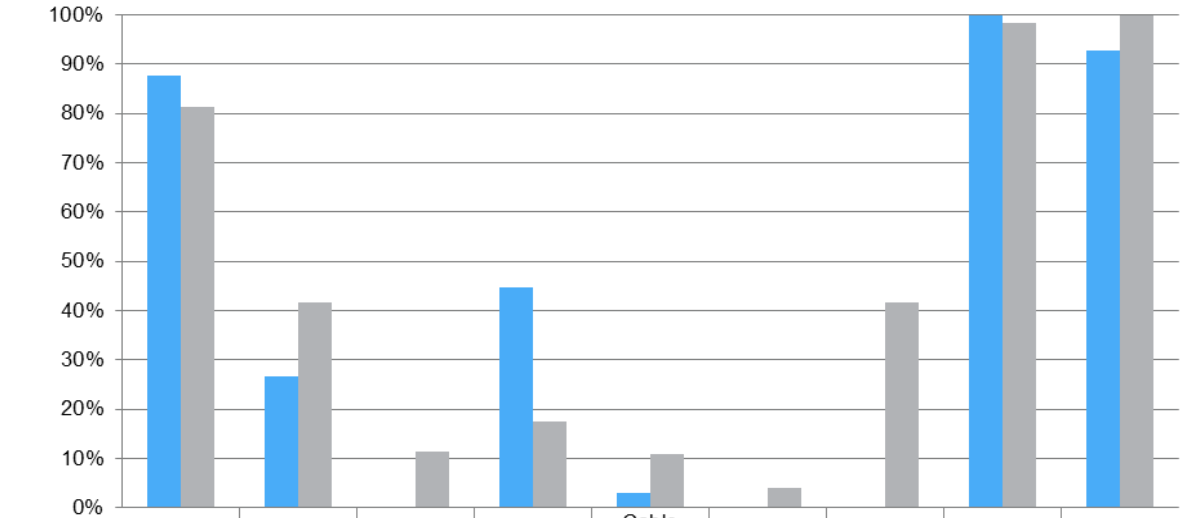
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural regions of Norway, as mentioned fixed broadband coverage increased by 7.6 percentage points since the last iteration of this study. As was the case on a national level, DSL remained the most prevalent broadband technology reaching 87.6% of rural households.

In terms of NGA broadband technologies, FTTP coverage saw a 12.2 percentage point coverage increase, to reach 44.8% of rural homes. FTTP availability remained over double the EU average, which stood at 17.5%. VDSL also recorded an increase, and passed 26.7% of rural households, still below the EU average of 41.8%. Cable modem DOCSIS 3.0 coverage remained limited, with only 2.9% of rural Norwegian homes passed.

Mobile broadband coverage of rural Norway continued to improve, with LTE nearing universal coverage, at 99.9% of households covered.

Norway: Coverage by technology, rural areas, 2019



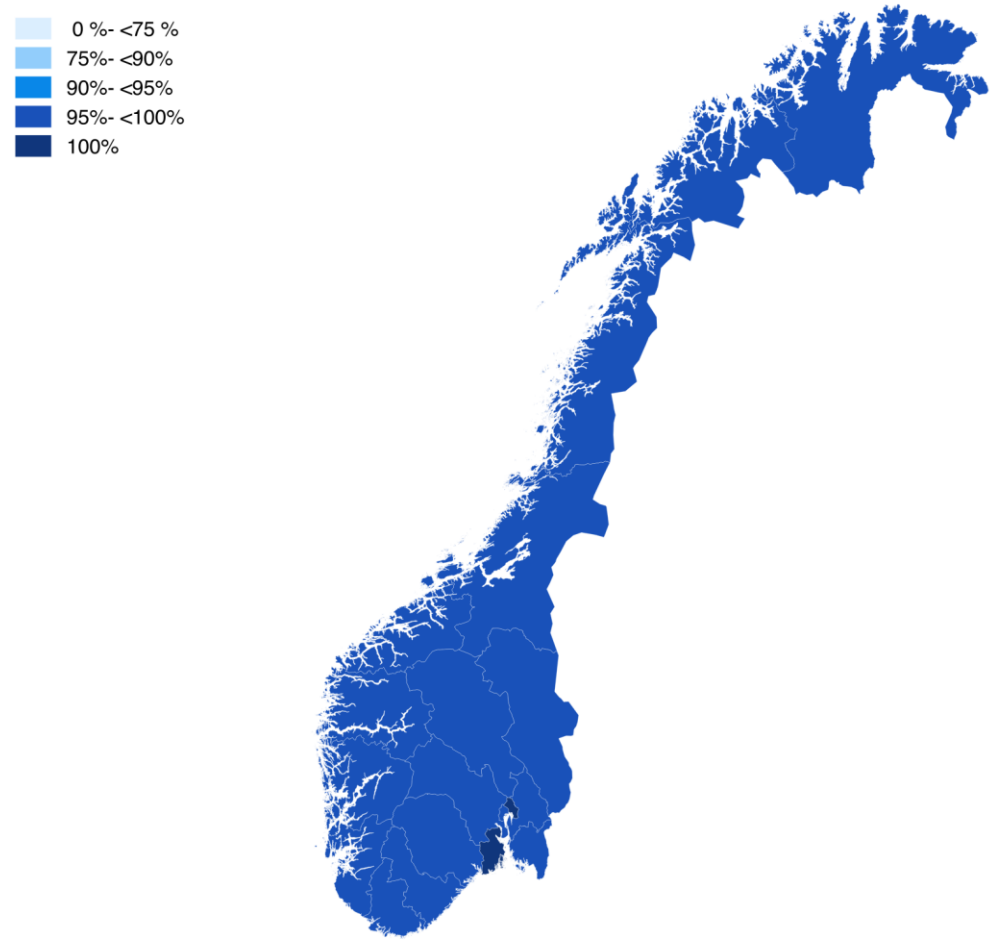
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Norway	87.6%	26.7%	-	44.8%	2.9%	-	-	99.9%	92.7%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.22.2 Regional coverage by broadband technology

Overall fixed broadband coverage in regions of Norway ranged this year from 95.4% in Nordland, and universal (100.0%) coverage in the capital region of Oslo and the region of Vestfold. All Norwegian regions recorded coverage levels over 90.0% in this iteration of the study.

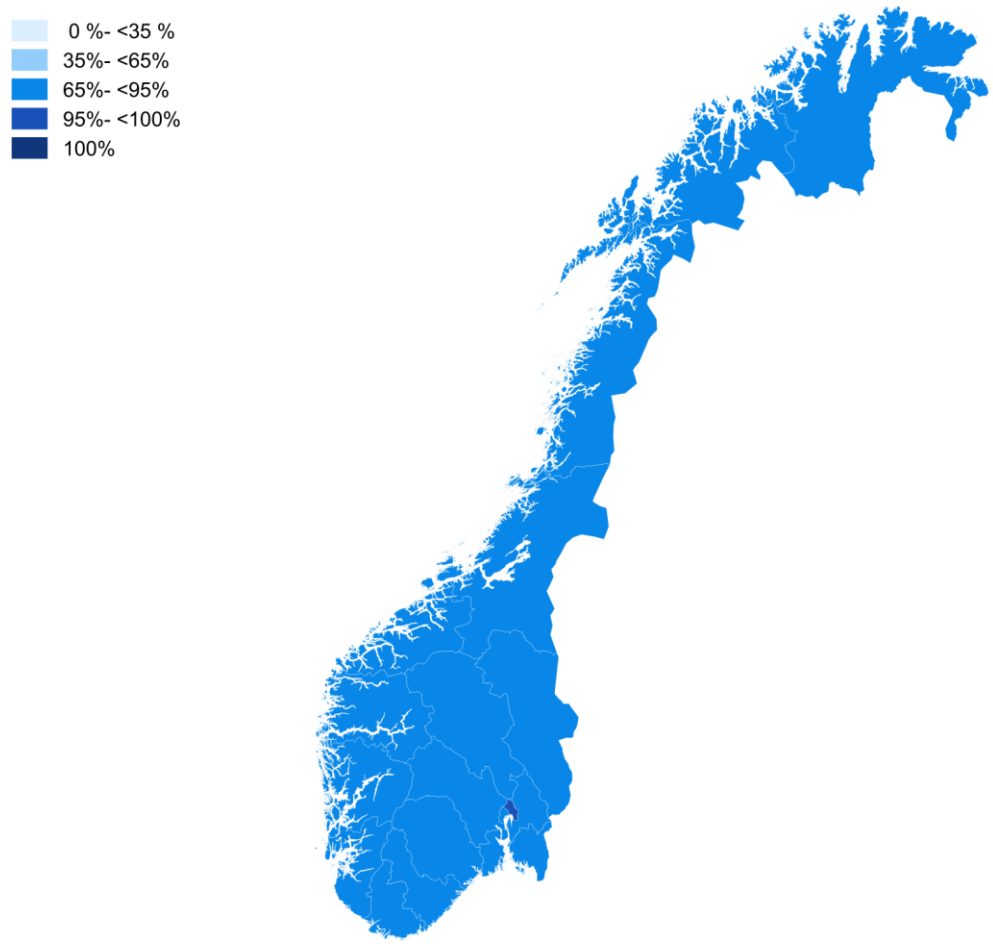
Norway: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Variance in terms of regional NGA coverage continued to decrease, with NGA coverage ranging this year between 76.7% in Oppland and 98.8% in Oslo.

Norway: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.22.3 Data tables for Norway

Statistic	National
Population	5,277,899
Persons per household	2.2
Rural proportion	17.9%

	Norway 2019		Norway 2018		Norway 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	97.8%	87.6%	93.8%	73.5%	91.6%	65.4%	91.2%	81.4%
VDSL	67.6%	26.7%	59.8%	24.6%	56.6%	20.4%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	78.1%	44.8%	58.7%	32.6%	51.9%	22.9%	33.5%	17.5%
Cable modem DOCSIS 3.0	53.6%	2.9%	49.0%	2.6%	51.3%	4.5%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	0.0%	0.0%	-	-	-	-	49.1%	41.7%
LTE	99.9%	99.9%	99.8%	99.6%	99.7%	98.7%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	99.9%	-	99.5%	-	99.4%	-	96.5%	-
Satellite	97.2%	92.7%	97.2%	92.7%	97.2%	92.7%	99.9%	99.9%
Overall fixed broadband	98.6%	93.8%	96.8%	86.2%	94.4%	74.7%	97.1%	89.7%
NGA broadband	89.3%	59.7%	83.5%	48.5%	86.5%	40.2%	85.8%	59.3%
Very High Capacity Networks	71.4%	44.8%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	98.6%	-	96.8%	-	94.4%	-	95.7%	-
At least 30 Mbps	89.3%	-	86.0%	-	83.8%	-	83.3%	-
At least 100 Mbps	85.7%	-	82.0%	-	79.8%	-	68.4%	-
At least 1 Gbps	54.2%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

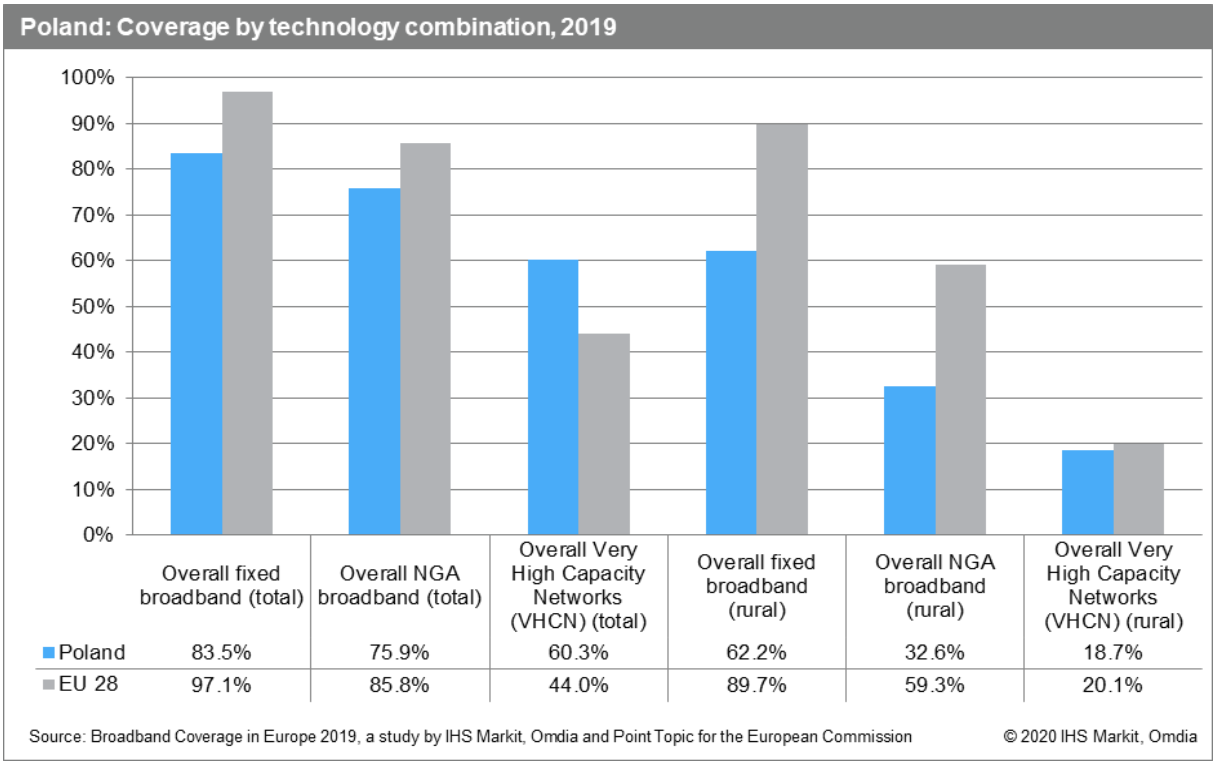
All restatements are highlighted in italics.

5.23 Poland

5.23.1 National coverage by broadband technology

Over the study period, Poland recorded improvements in fixed broadband coverage both at a national and rural level. At a national level, coverage increased by 4.2 percentage points, to reach 83.5% of households, and at a rural level, coverage increased by almost 10 percentage points (9.5 p.p.), to reach 62.2%. Similar improvements were recorded in terms of NGA coverage, with coverage reaching 75.9% of homes at a national level, and 32.6% at a rural level. Despite these improvements, Poland remained below the EU average for these categories and recorded the lowest rural fixed broadband coverage of the study.

In terms of coverage of very high capacity networks (VHCN), two thirds (60.3%) of Polish homes were passed by either DOCSIS 3.1 or FTTP networks, well over the EU average of 44.0%.



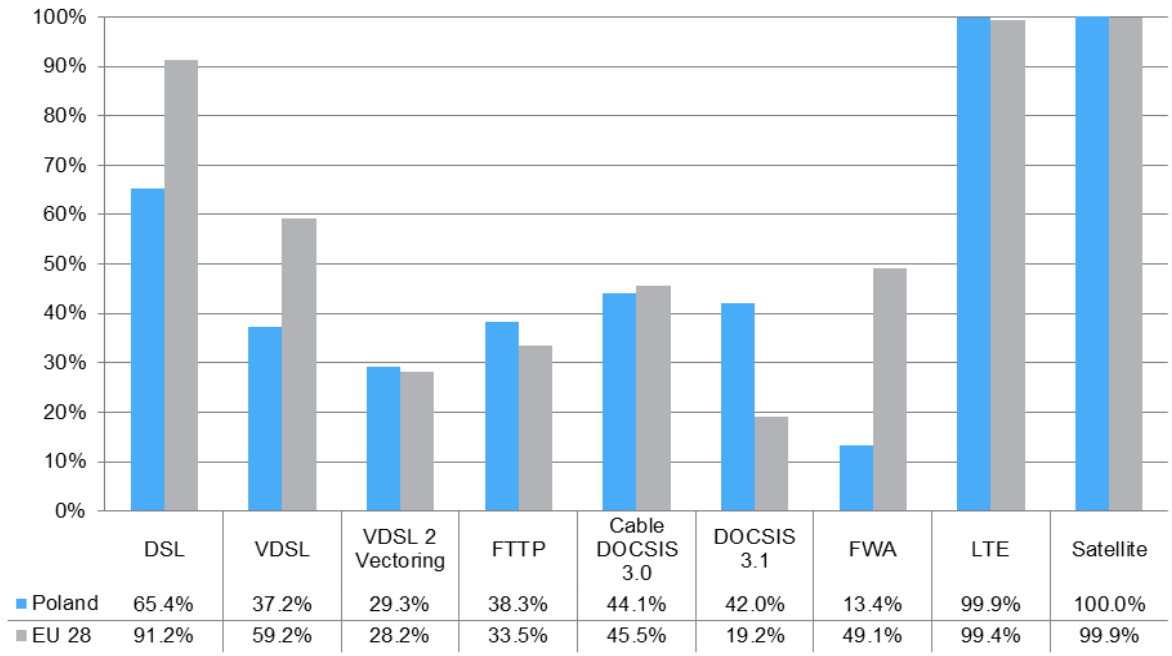
Looking at individual fixed broadband technologies, DSL remained the most prevalent technology in Poland, with 65.4% of households having access to DSL broadband services. This comparable lower coverage level means that Poland was part of a group of only seven countries that recorded DSL coverage levels below 70.0%. Fixed Wireless Access (FWA) was available to 13.4% of Polish households.

Examining NGA technologies in Poland, cable DOCSIS 3.0 was the most prevalent technology available to 44.1% of Polish households following a 4.0 percentage point growth in the twelve months to the end of June 2019. Moreover, Polish cable operators have been one of the early movers in terms of DOCSIS 3.1 upgrades and by mid-2019, 42.0% of homes were passed by DOCSIS 3.1 networks. This means that 95% of the cable network footprint in Poland has been upgraded to the DOCSIS 3.1 standard.

In the twelve months to the end of June 2019, FTTP recorded a significant 9.2 percentage point increase with FTTP services available to 38.3% of Polish households. As a result, FTTP overtook VDSL as the second NGA technology for the first time. VDSL services were available to 37.2% of households and nearly a third of homes (29.3%) were passed by VDSL2 Vectoring-enabled networks.

Mobile broadband coverage of Poland remained universal, at over 99.9% of households covered, and 99.2% had access to LTE services when average coverage of all mobile network operators is considered.

Poland: Coverage by technology, total, 2019

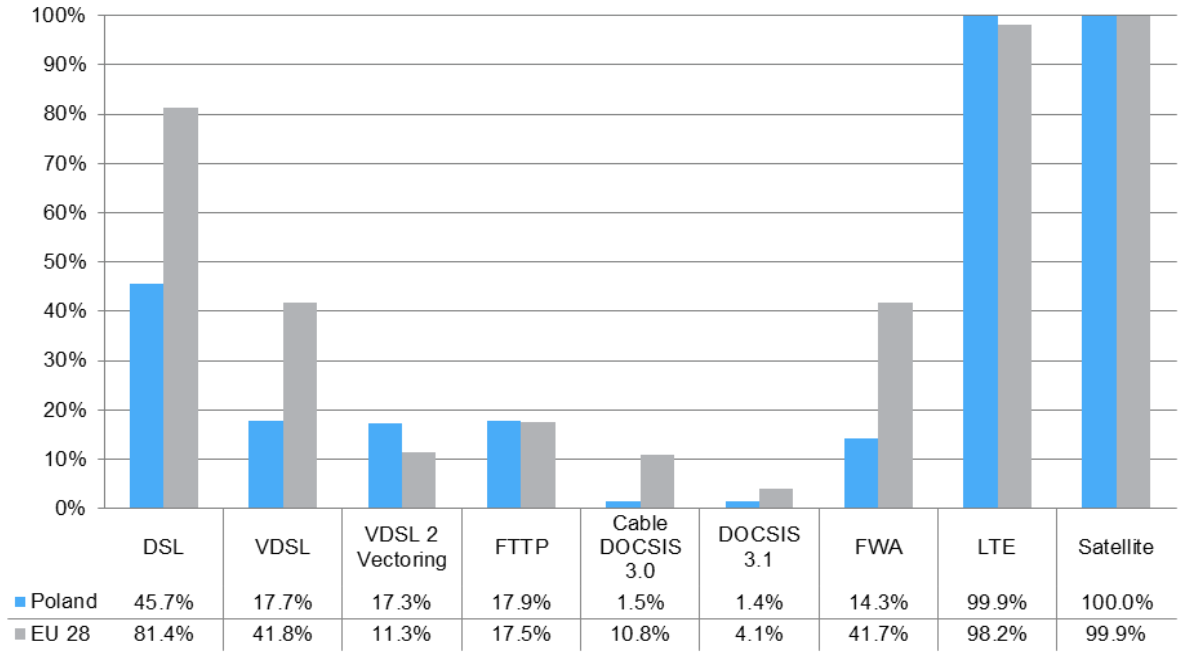


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Poland	65.4%	37.2%	29.3%	38.3%	44.1%	42.0%	13.4%	99.9%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural areas of Poland, DSL continued to expand and remained by far the most prevalent fixed broadband technology, with 45.7% of households covered, up from 43.0% in mid-2018. Despite this slight improvement, Poland still had the second lowest DSL rural coverage among countries of this study. FWA coverage stood at 14.3% of rural Polish homes.

Poland: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Poland	45.7%	17.7%	17.3%	17.9%	1.5%	1.4%	14.3%	99.9%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

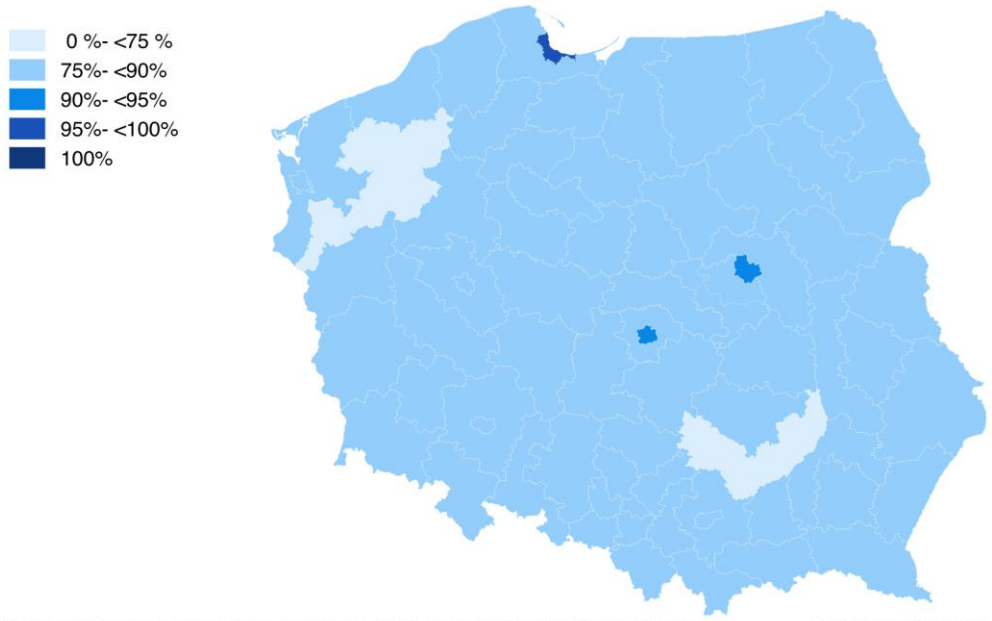
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual NGA technologies in rural areas of Poland, for the first time FTTP overtook VDSL as the most widespread technology available to rural households growing by 4.2 percentage points to reach 17.9% of rural Polish households. In parallel, VDSL, the former most prevalent NGA technology in rural Poland, recorded a 0.4 percentage point increase in coverage, to reach 17.7% of homes. Cable modem DOCSIS 3.0 and DOCSIS 3.1 remained limited, at 1.5% and 1.4% of rural households covered respectively. Mobile broadband coverage remained stable over the study period, at over 99.9% of rural households covered in Poland.

5.23.2 Regional coverage by broadband technology

As was the case in previous iterations of this study, there was a significant variance between Polish regions in terms of fixed broadband coverage. The country's urban centres of Warszawa, Lódz, Poznan, and Trojmiejski remained the only regions with fixed broadband coverage levels over 90.0%. This year, only one Polish region (Sandomiersko jedrzejowski) recorded fixed broadband coverage below 70.0%, a significant improvement to mid-2018, when thirteen Polish regions recorded coverage levels below 70.0%. This year, no region reported fixed broadband coverage levels below 60.0%.

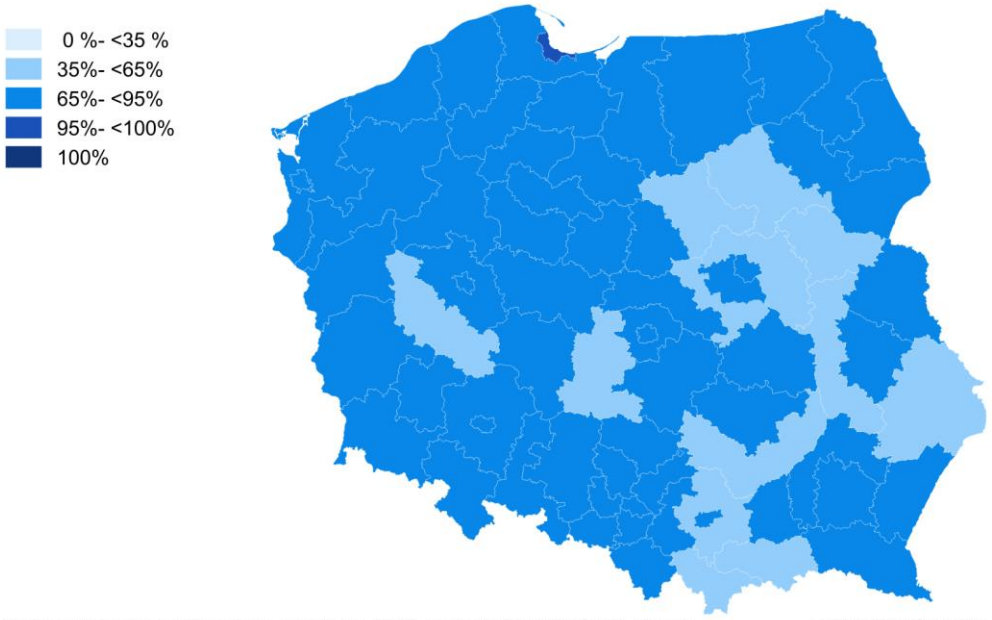
Poland: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Variance across Polish regions in terms of availability of NGA broadband continued to decrease over the study period, however it still remained significant, with coverage ranging between 41.8% and 97.1%.

Poland: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.23.3 Data tables for Poland

Statistic	National
Population	37,981,299
Persons per household	2.6
Rural proportion	32.6%

	Poland 2019		Poland 2018		Poland 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	65.4%	45.7%	64.1%	43.0%	65.2%	42.5%	91.2%	81.4%
VDSL	37.2%	17.7%	35.4%	17.3%	37.8%	16.8%	59.2%	41.8%
VDSL 2 Vectoring	29.3%	17.3%	-	-	-	-	28.2%	11.3%
FTTP	38.3%	17.9%	29.1%	13.7%	21.3%	9.5%	33.5%	17.5%
Cable modem DOCSIS 3.0	44.1%	1.5%	40.0%	1.5%	39.4%	1.4%	45.5%	10.8%
DOCSIS 3.1	42.0%	1.4%	-	-	-	-	19.2%	4.1%
FWA	13.4%	14.3%	-	-	-	-	49.1%	41.7%
LTE	99.9%	99.9%	100.0%	99.9%	99.9%	99.8%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	99.2%	-	93.3%	-	91.0%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	83.5%	62.2%	79.3%	52.7%	81.5%	55.4%	97.1%	89.7%
NGA broadband	75.9%	32.6%	66.3%	29.0%	64.8%	25.6%	85.8%	59.3%
Very High Capacity Networks	60.3%	18.7%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	69.3%	-	68.8%	-	68.3%	-	95.7%	-
At least 30 Mbps	59.6%	-	53.0%	-	50.2%	-	83.3%	-
At least 100 Mbps	51.3%	-	40.4%	-	35.4%	-	68.4%	-
At least 1 Gbps	24.4%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

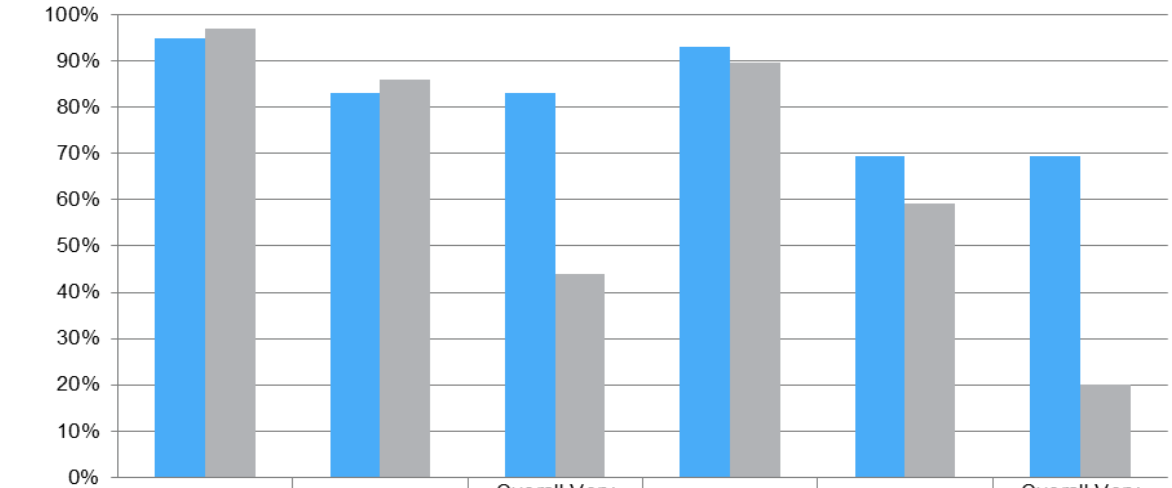
5.24 Portugal

5.24.1 National coverage by broadband technology

Fixed broadband coverage reached 94.9% of all Portuguese households and 93.0% of rural households at the end of June 2019. NGA availability increased at both a national and a rural level, to reach 83.0% and 69.4% of homes respectively. Portugal stood below the EU average for fixed broadband and NGA at a national level but surpassed the EU average for both combination categories at a rural level.

In terms of coverage of very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, Portugal was one of the leaders in this category as 83% of homes were passed by at least one network potentially capable of delivering gigabit connection speeds. At a rural level, nearly 7 in 10 (69.4%) of rural households had access to these services, also well above the EU average of 20.1%.

Portugal: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Portugal	94.9%	83.0%	83.0%	93.0%	69.4%	69.4%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

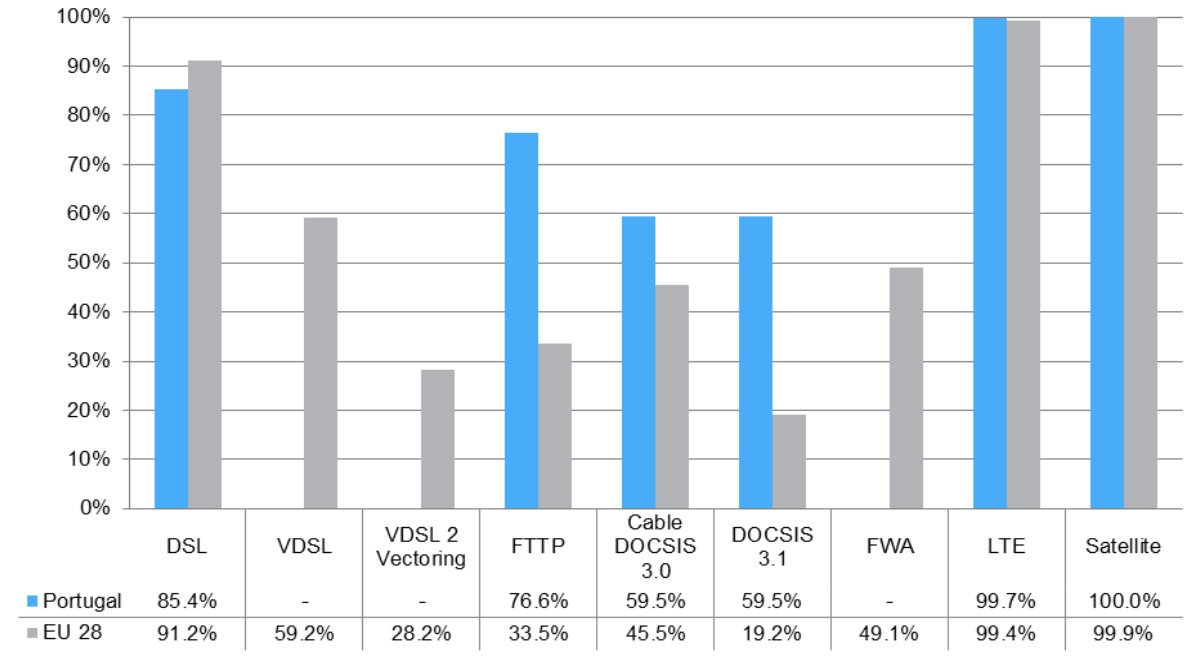
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual technologies, DSL recorded a slight decrease in coverage for the second year in a row, from 86.0% in mid-2018 to 85.4% in mid-2019, yet, remained the most prevalent broadband technology in Portugal. As mentioned in the previous iterations of this study, Portuguese operators have opted for FTTP deployment, rather than upgrading DSL to VDSL, explaining gradual disconnection of DSL networks in favour of fibre optic networks.

Therefore, in terms of NGA broadband, FTTP and cable modem DOCSIS 3.0/DOCSIS 3.1 were the only NGA technologies providing high speed broadband connectivity to Portuguese households. FTTP remained the most prevalent technology, with 76.6% of homes passed, up 6.4 percentage points since mid-2018. Cable modem DOCSIS 3.0 coverage also grew, to reach 59.5% of households, with the entirety of the network having been upgraded to DOCSIS 3.1, leading to DOCSIS 3.1 coverage to also stand at 59.5% of households at the end of June 2019.

In terms of mobile broadband, LTE coverage continued to improve over the study period, to reach 99.7% of Portuguese households. However, there are differences in terms of reach of the individual mobile operators' networks as on average 95.9% of people in Portugal had access to LTE services.

Portugal: Coverage by technology, total, 2019



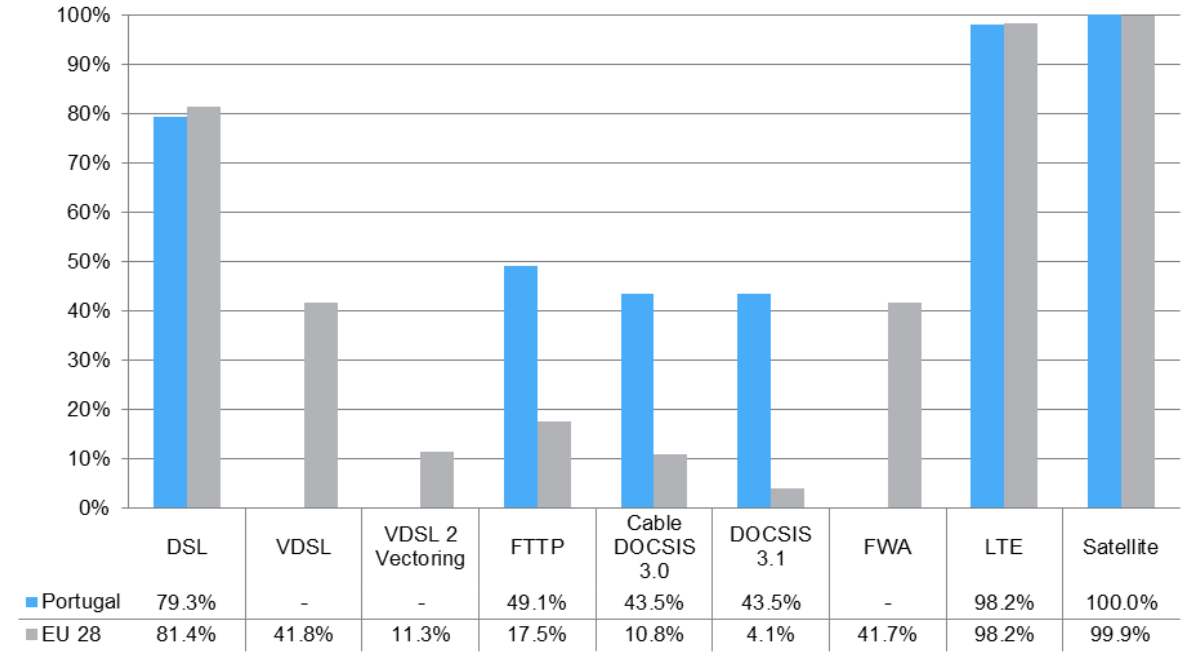
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Portugal	85.4%	-	-	76.6%	59.5%	59.5%	-	99.7%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural areas, DSL remained the most prevalent technology in rural areas reaching 79.3% of rural households. In terms of NGA broadband, FTTP coverage improved slightly over the study period, to reach just under half (49.1%) of rural Portuguese households, up from 48.2% in mid-2018. Cable modem DOCSIS 3.0 coverage remained relatively stable, at 43.5% of homes. DOCSIS 3.1 coverage also stood at 43.5%.

LTE coverage of rural areas continued to improve this year, and increased by 3.6 percentage points, to reach 98.2% of rural households, and with this increase, matched this year the EU average of 98.2%.

Portugal: Coverage by technology, rural areas, 2019



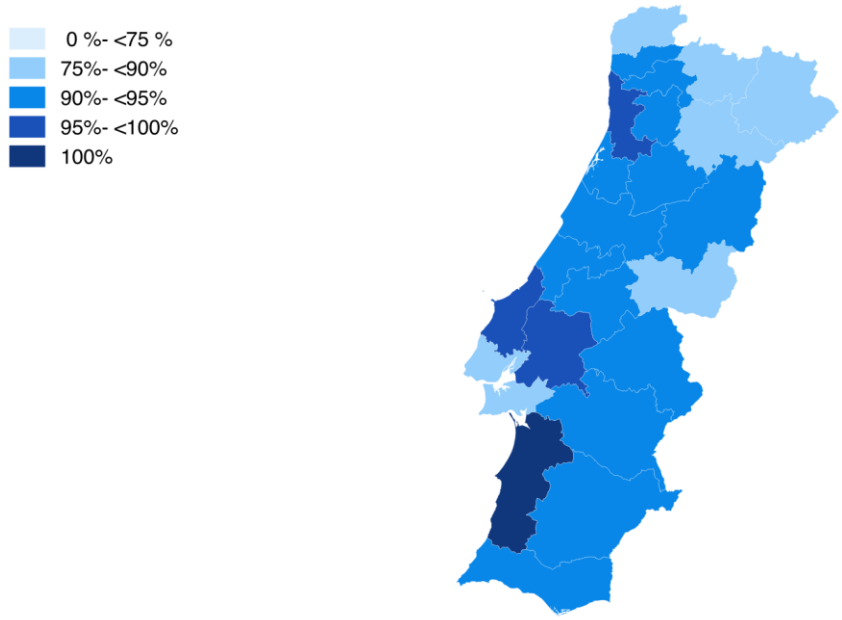
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Portugal	79.3%	-	-	49.1%	43.5%	43.5%	-	98.2%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.24.2 Regional coverage by broadband technology

In this iteration of the study, fixed broadband coverage levels continued to vary across Portuguese regions, with no region recording coverage below 80.0%. Coverage ranged from universal (100.0%) in Alentejo Literal, to 80.2% in Alto Minho. Out of the 25 Portuguese regions, only 6 had fixed broadband availability below 90.0%.

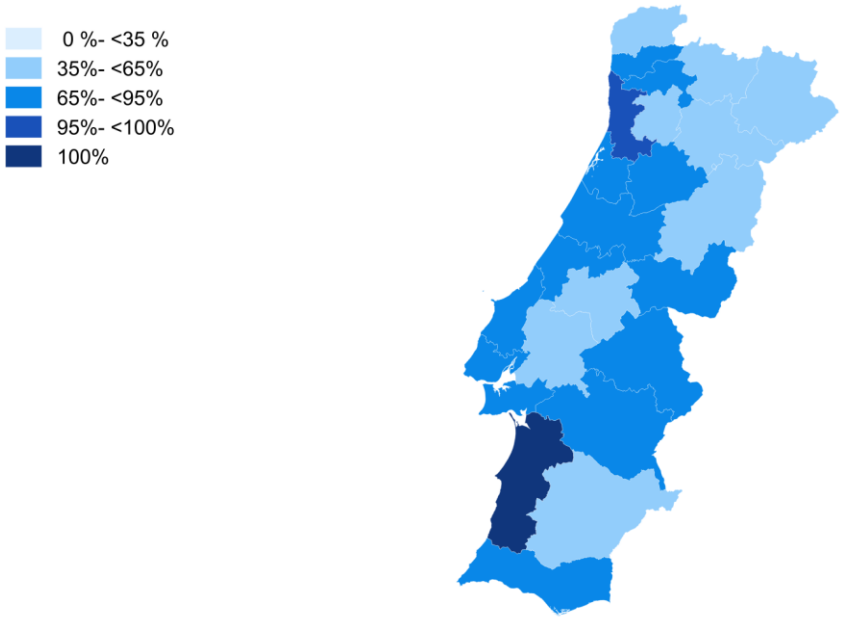
Portugal: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

As is commonly the case, NGA broadband availability varied more significantly than fixed broadband. NGA broadband levels varied between 40.9% in Baixo Alentejo and 100.0% in Alentejo Litoral. This year, four regions had NGA coverage above 90.0%, up from three last year.

Portugal: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

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

Coverage data for Portuguese NUTS 3 areas outside mainland Europe			
NUTS 3	**Description**	Overall fixed broadband coverage	NGA broadband coverage
P200	**Região Autónoma dos Açores**	93.6%	93.6%
P300	**Região Autónoma da Madeira**	95.0%	76.5%

5.24.3 Data tables for Portugal

Statistic	National
Population	10,291,027
Persons per household	2.5
Rural proportion	14.4%

	Portugal 2019		Portugal 2018		Portugal 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	85.4%	79.3%	86.0%	83.9%	86.1%	80.2%	91.2%	81.4%
VDSL	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	76.6%	49.1%	70.2%	48.2%	63.6%	42.2%	33.5%	17.5%
Cable modem DOCSIS 3.0	59.5%	43.5%	56.3%	43.3%	56.2%	46.1%	45.5%	10.8%
DOCSIS 3.1	59.5%	43.5%	-	-	-	-	19.2%	4.1%
FWA	0.0%	0.0%	-	-	-	-	49.1%	41.7%
LTE	99.7%	98.2%	99.2%	94.6%	98.9%	93.5%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	95.9%	-	95.9%	-	93.6%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	94.9%	93.0%	*93.6%*	*93.3%*	93.5%	93.7%	97.1%	89.7%
NGA broadband	83.0%	69.4%	75.6%	66.6%	71.7%	65.5%	85.8%	59.3%
Very High Capacity Networks	83.0%	69.4%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	91.6%	-	91.7%	-	91.4%	-	95.7%	-
At least 30 Mbps	83.0%	-	75.6%	-	71.7%	-	83.3%	-
At least 100 Mbps	76.6%	-	70.2%	-	63.6%	-	68.4%	-
At least 1 Gbps	70.5%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

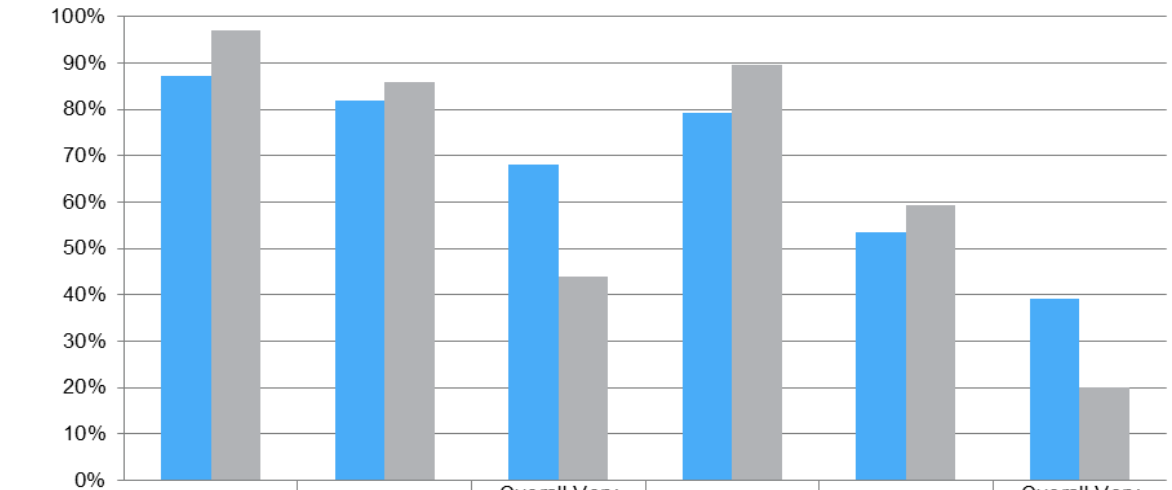
5.25 Romania

5.25.1 National coverage by broadband technology

Overall fixed broadband coverage in Romania increased slightly over the study period, to reach 87.4% of households, up from 87.1% in mid-2018. In rural areas nearly 8 in 10 (79.3%) of rural households had access to fixed broadband services. NGA coverage grew by 6.4 percentage points, to reach 82.0% of Romanian households. At a rural level, this improvement was even more significant, with rural NGA coverage growing by 13.0 percentage points and reaching 53.4% of rural households at the end of June 2019.

Whilst NGA coverage levels remained below the EU average despite the recorded annual increases, coverage of very high capacity networks, i.e. DOCSIS 3.1 and FTTP, was much higher than EU average at both national and rural level. By mid-2019, 68.1% of all homes and 39.1% of rural homes in Romania were passed by networks potentially capable of delivering gigabit speeds.

Romania: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Romania	87.4%	82.0%	68.1%	79.3%	53.4%	39.1%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

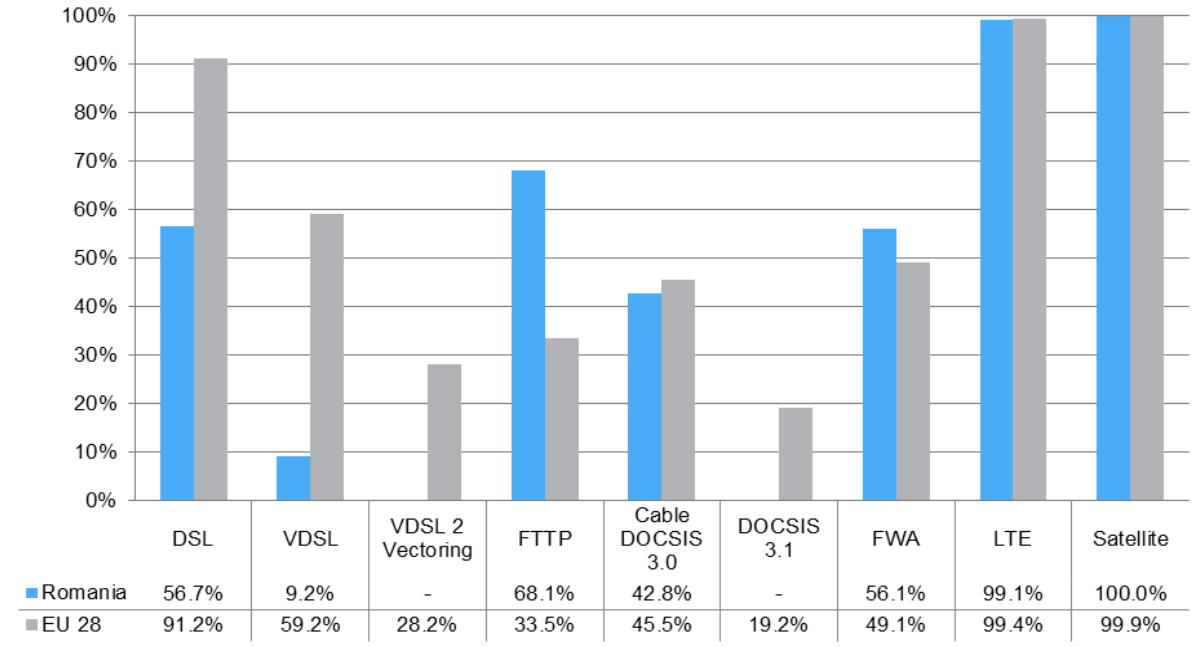
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual technologies, DSL continued to slowly decrease, with 56.7% of households covered, 1.1 percentage point less than in mid-2018. As is the case in several study countries, this decrease in DSL coverage is due to the incumbent Telekom Romania's focus on investing in fibre deployment and gradual decommissioning of legacy copper networks. Fixed Wireless Access (FWA) in Romania is mainly compound of WiMAX access, with 56.1% of houses covered at the end of June 2019.

Looking at NGA technologies, FTTP coverage continued to increase in this iteration of the study, with 68.1% of households covered, up from 62.7% in mid-2018. Cable modem DOCSIS 3.0 remained the second most prevalent NGA broadband technology Romania, having increased by 5.1 percentage points, to reach 42.8% of homes. As of mid-2019, cable operators in Romania have not launched any DOCSIS 3.1 upgrades to their networks. Lastly, VDSL remained the least common NGA technology in Romania, with less than 10.0% (9.2%) of households covered. VDSL2 Vectoring has not been deployed.

In terms of mobile broadband coverage, LTE coverage continued to expand, and reached 99.1% of Romanian households, up from 96.3% in mid-2018. The average LTE coverage of all mobile network operators also grew considerably by 8.1% to 85.4%.

Romania: Coverage by technology, total, 2019



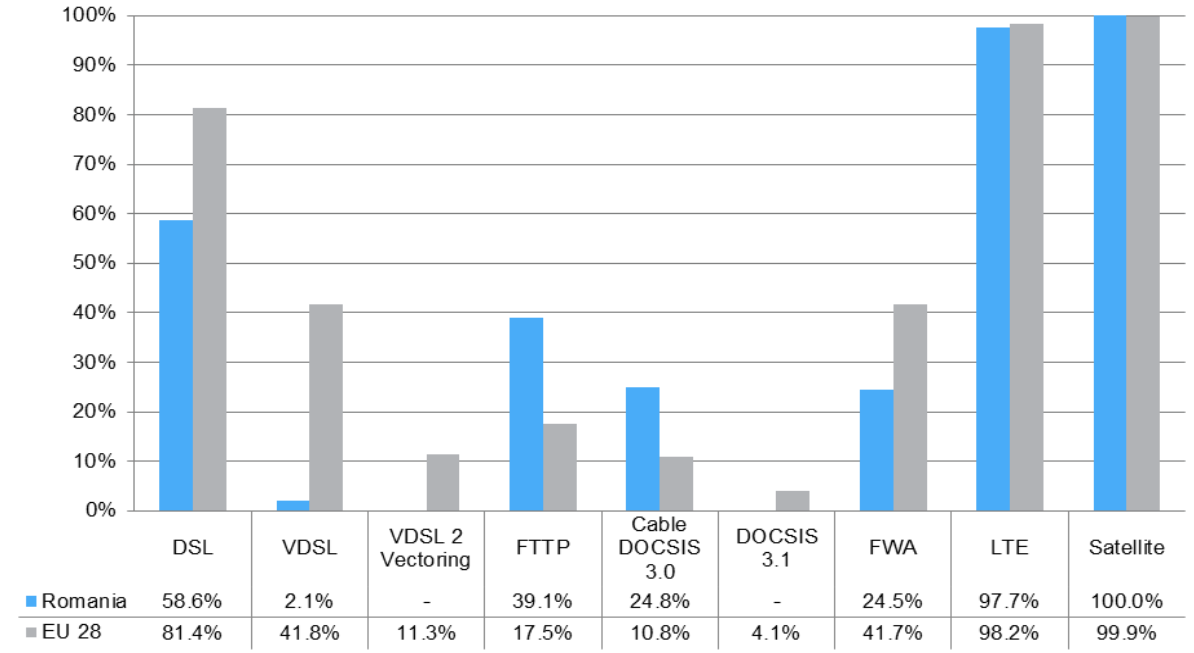
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Romania	56.7%	9.2%	-	68.1%	42.8%	-	56.1%	99.1%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural regions of Romania, overall fixed broadband coverage recorded a slight decrease, owing mainly to decreasing DSL coverage levels and reallocation of WiMAX bandwidth to mobile services. Despite a 0.9 percentage point decrease in coverage since mid-2018, DSL remained the most prevalent broadband technology in rural areas, with 58.6% of homes passed.

Looking at NGA technologies in rural areas of Romania, FTTP grew by a notable 8.9 percentage points, and remained by far the most prevalent NGA technology, passing 39.1% of rural households, over double the EU average of 17.5%. The second most prevalent technology remained cable modem DOCSIS 3.0, reaching 24.8% of Romanian rural homes, well above the EU average of 10.8%. Lastly, VDSL coverage remained limited, reaching only 2.1% of rural households by the end of June 2019.

Romania: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Romania	58.6%	2.1%	-	39.1%	24.8%	-	24.5%	97.7%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

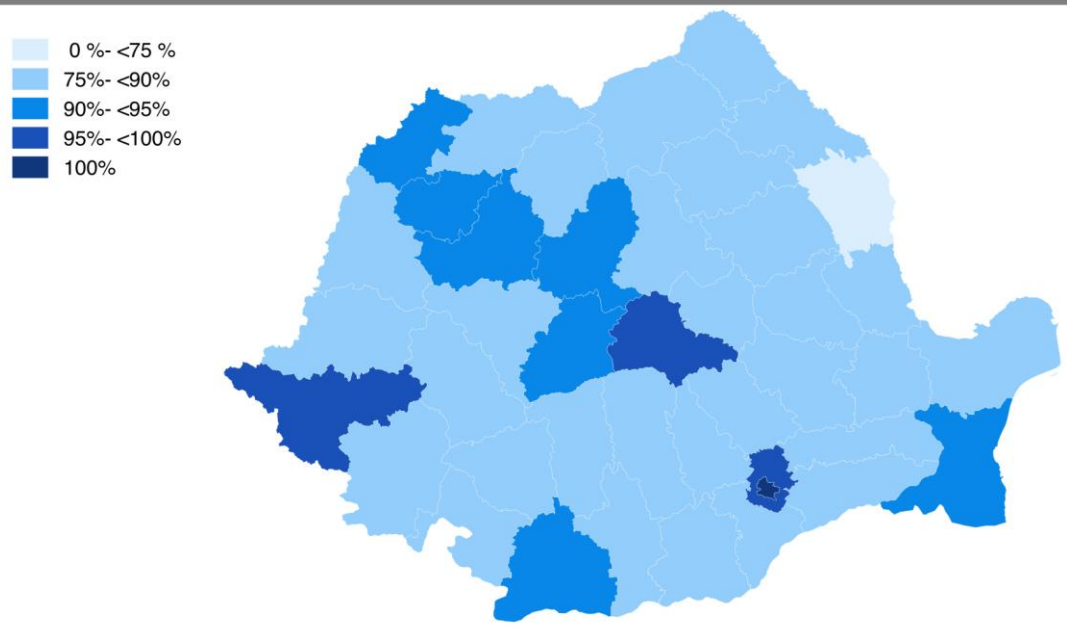
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

At the end of June 2019, 97.7% of rural households had access to LTE coverage, up from 91.1% in mid-2018. Despite this increase, Romania remained slightly below the EU average of 98.2%.

5.25.2 Regional coverage by broadband technology

Fixed broadband coverage across Romanian regions remained varied, ranging from universal coverage in the capital region of Bucharest, to 73.6% in the region of Vaslui, which became the only region to record fixed broadband levels under 75.0%. This year, the total number of regions having recorded coverage levels over 90.0% rose from nine to eleven.

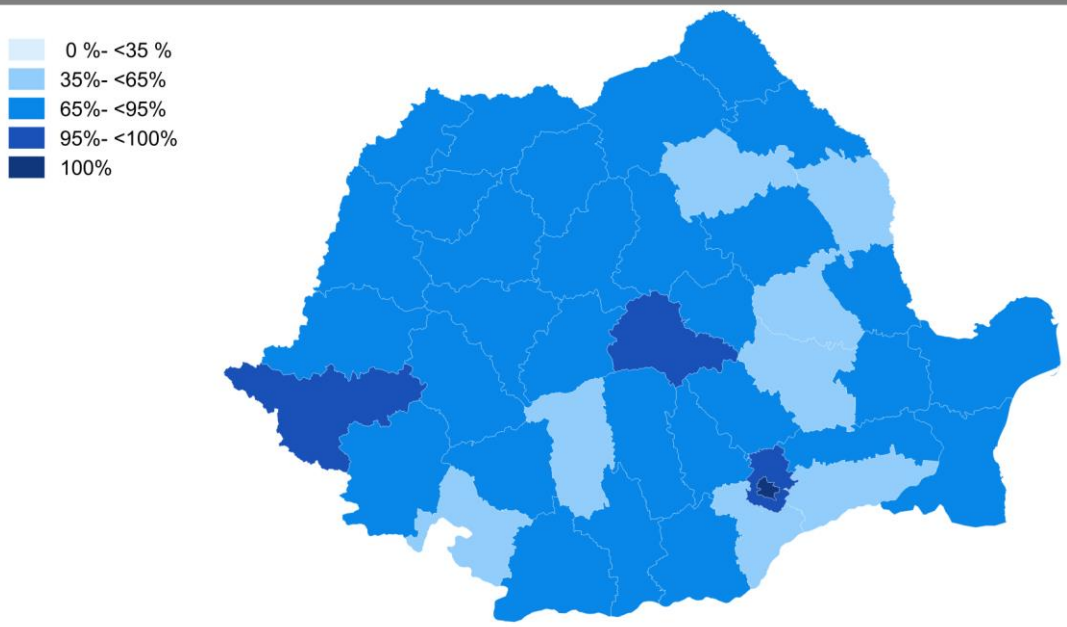
Romania: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

NGA availability remained varied across Romanian regions, ranging from 43.8% in Vaslui, to 100.0% in the capital region of Bucharest. In this iteration of the study, only the region of Vaslui remained under 50.0% of NGA broadband availability.

Romania: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.25.3 Data tables for Romania

Statistic	National
Population	19,530,631
Persons per household	2.6
Rural proportion	21.0%

	Romania 2019		Romania 2018		Romania 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	56.7%	58.6%	57.8%	59.5%	61.9%	66.0%	91.2%	81.4%
VDSL	9.2%	2.1%	8.6%	1.8%	9.4%	1.9%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	68.1%	39.1%	62.7%	30.1%	61.0%	29.1%	33.5%	17.5%
Cable modem DOCSIS 3.0	42.8%	24.8%	37.7%	16.1%	35.9%	13.8%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	56.1%	24.5%	-	-	-	-	49.1%	41.7%
LTE	99.1%	97.7%	96.3%	91.1%	93.6%	84.8%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	85.4%	-	77.3%	-	72.0%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	87.4%	79.3%	87.1%	79.6%	88.1%	82.7%	97.1%	89.7%
NGA broadband	82.0%	53.4%	75.6%	40.4%	74.0%	38.6%	85.8%	59.3%
Very High Capacity Networks	68.1%	39.1%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	93.9%	-	93.8%	-	94.2%	-	95.7%	-
At least 30 Mbps	83.9%	-	81.2%	-	67.9%	-	83.3%	-
At least 100 Mbps	77.7%	-	73.8%	-	64.9%	-	68.4%	-
At least 1 Gbps	0.0%[19]	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

[19] In Romania, speeds are strictly specified based on transport layer protocol payload, according to the provisions of REGULATION (EU) 2015/2120. Practically, an internet offer with maximum/advertised "best-effort" speed of 1 Gbps it is considered as a 940 Mbps offer and, thus, below the Gigabit threshold. Therefore, since the measurements are made at a higher layer in the network, the maximum/advertised speeds are lower than the standard theoretically marketed "best-effort" speeds.

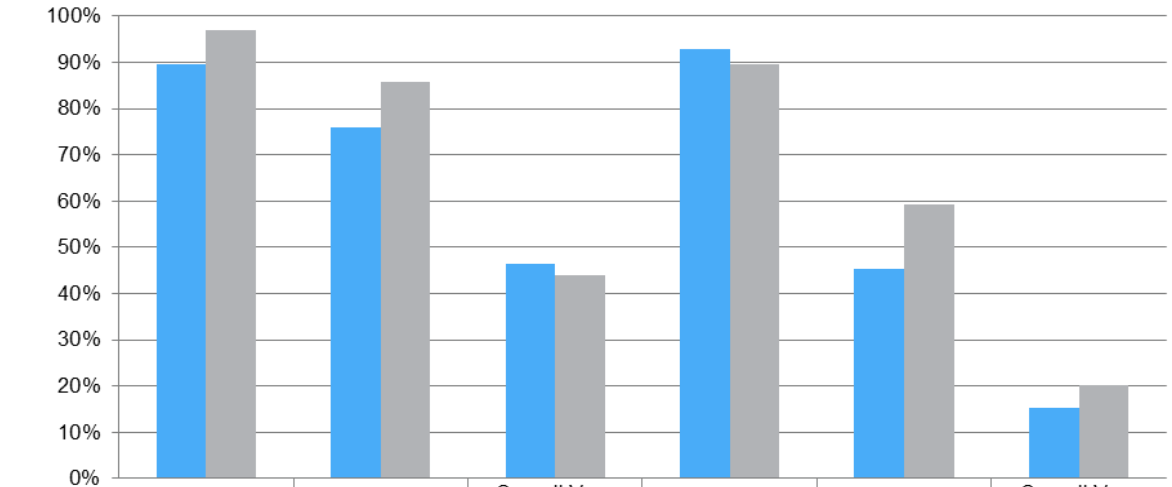
5.26 Slovakia

5.26.1 National coverage by broadband technology

At the end of June 2019, nearly 9 in 10 (89.7%) of Slovakian homes were passed by at least one fixed broadband network, one of the lowest coverage levels among the study countries. In terms of NGA broadband, NGA coverage increased by 3.4 percentage points at a national level, to reach 76.0% of households, and by 1.4 percentage point at a rural level, with 45.3% of rural households having access to high speed broadband services.

In terms of very high capacity networks (VHCN) coverage, i.e. DOCSIS 3.1 and FTTP, 46.5% of all Slovakian homes were passed by networks capable of delivering gigabit speed connectivity, slightly above the EU average of 44.0%.

Slovakia: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Slovakia	89.7%	76.0%	46.5%	92.8%	45.3%	15.3%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual broadband technologies, Slovakia remained one of the study countries with comparatively low DSL coverage. By mid-2019, DSL coverage reached 63.1% of Slovak households, down from 65.9% in mid-2018. Similarly to Czechia, Fixed Wireless Access (FWA) technologies provide broadband connectivity to a significant amount of households. These services, often provided by small, local operators, were available to 78.1% of households at the end of June 2019.

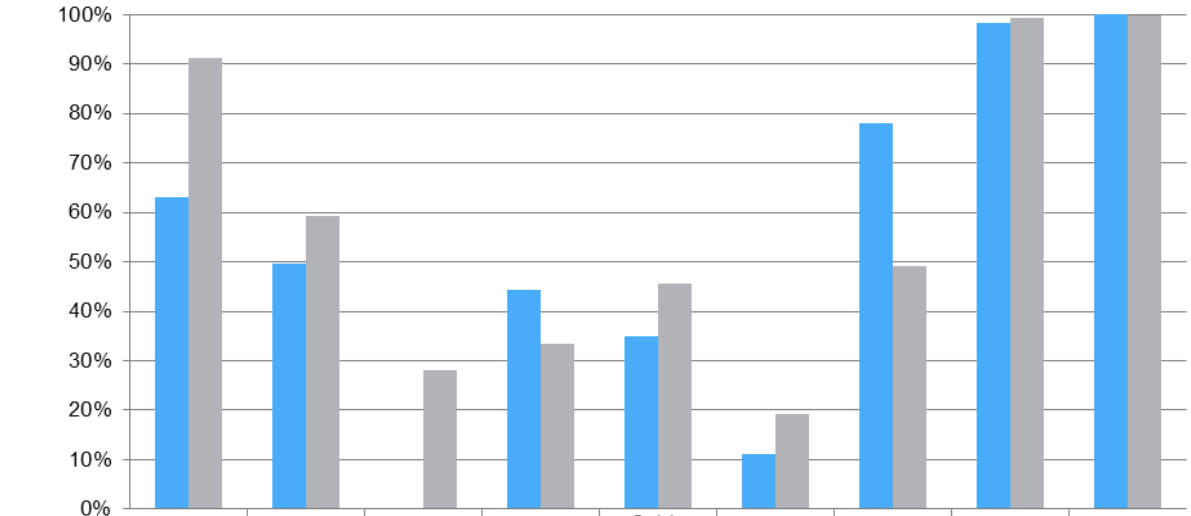
In terms of NGA broadband technologies, this year, VDSL coverage increased substantially, and surpassed FTTP coverage, to become the most widespread NGA technology in Slovakia. VDSL grew by 10.1 percentage points, to reach just under half (49.6%) of all households. FTTP coverage also increased over the study period, albeit at a slower pace, to reach 44.3% of households.

Cable modem DOCSIS 3.0 also increased over the study period, to become available to 34.8% of Slovak homes, up from 30.0% in mid-2018. DOCSIS 3.1 was available to 11.2% of households, with further deployments expected from cable operator UPC throughout the course of the year.[20]

LTE coverage continued to improve and reached 98.4% of Slovak households at the end of June 2019, exactly one percentage point below the EU average. However, there continue to be differences in terms of reach of the individual mobile operators' networks as on average 88.8% of Slovaks had access to LTE services.

[20] https://www.commsupdate.com/articles/2019/05/30/upc-launches-gigabit-service-in-slovakia/

Slovakia: Coverage by technology, total, 2019

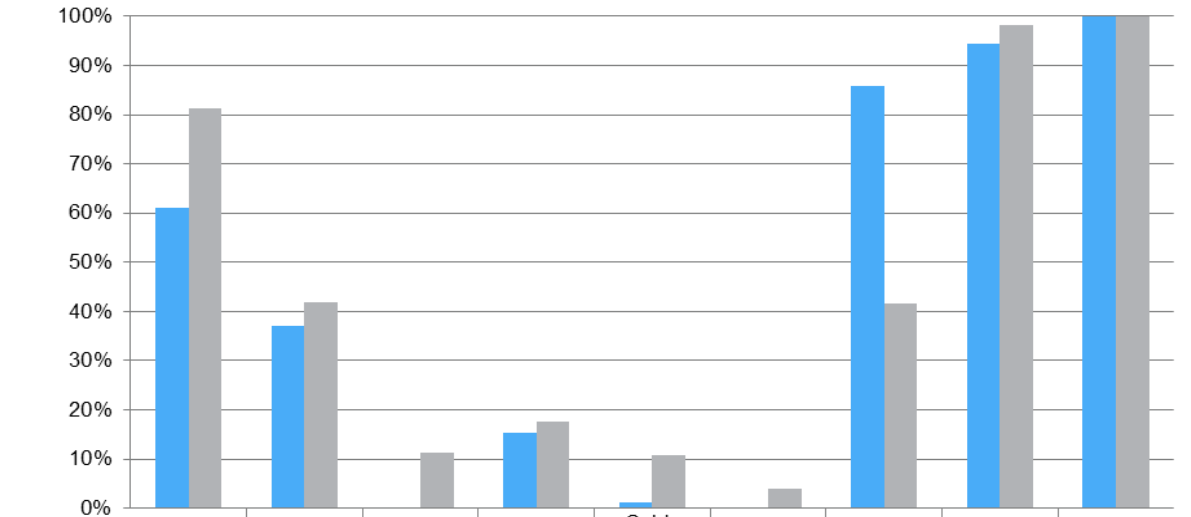


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Slovakia	63.1%	49.6%	-	44.3%	34.8%	11.2%	78.1%	98.4%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

In rural regions of Slovakia, fixed wireless solutions have traditionally been widely available, in particular WiMAX. In this iteration of the study, FWA, which includes WiMAX, was available to 85.8% of rural Slovak households. DSL was the second most widespread technology, with 61.0% of households passed, down from 62.9% in mid-2018.

Slovakia: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Slovakia	61.0%	37.0%	-	15.3%	1.2%	-	85.8%	94.4%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

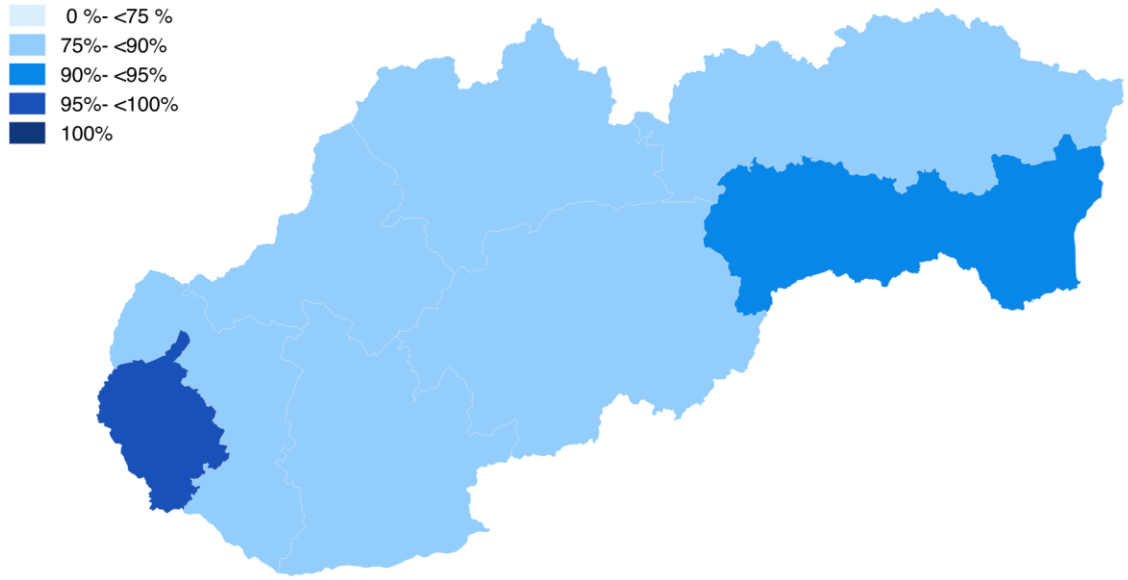
In terms of rural NGA coverage, VDSL remained the most common access technology in rural Slovakia, available to 37.0% of rural households. Rural FTTP coverage, continued to record year-on-year growth reaching 15.3% of Slovak rural households, up from 11.9% in mid-2018. Lastly, cable coverage remained limited with DOCSIS 3.0 reaching only 1.2% of households, and DOCSIS 3.1 being absent altogether.

Rural LTE coverage continued to improve this year by 3.5 percentage points and reached 94.4% of rural households.

5.26.2 Regional coverage by broadband technology

In terms of fixed broadband coverage variations between Slovak regions, the gap this year continued to narrow. At the end of June 2019, fixed broadband coverage ranged from 86.0% in the Nitriansky region, and 98.5% in the region of the Slovak capital, Bratislava.

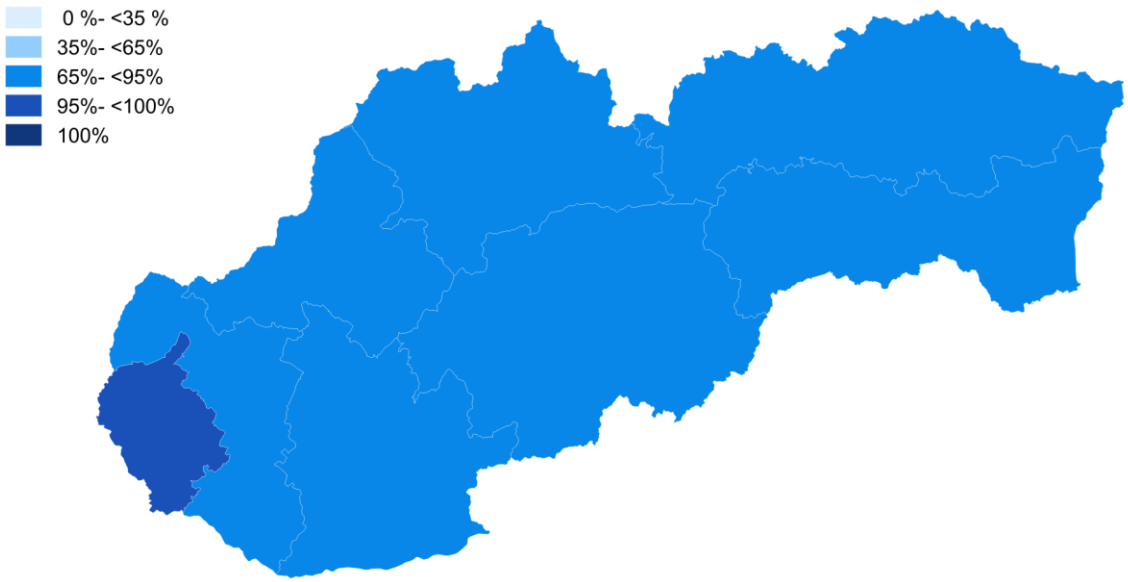
Slovakia: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

The capital region of Bratislava also recorded the highest level of NGA coverage, where it reached 98.5% of households. As was the case last year, the Presovsky region recorded the lowest NGA availability in Slovakia, with 65.9% of households covered.

Slovakia: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.26.3 Data tables for Slovakia

Statistic	National
Population	5,443,120
Persons per household	2.8
Rural proportion	28.5%

	Slovakia 2019		Slovakia 2018		Slovakia 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	63.1%	61.0%	*65.9%*	*62.9%*	74.6%	69.5%	91.2%	81.4%
VDSL	49.6%	37.0%	39.5%	37.8%	36.1%	32.9%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	44.3%	15.3%	*42.9%*	*11.9%*	*41.2%*	*9.2%*	33.5%	17.5%
Cable modem DOCSIS 3.0	34.8%	1.2%	*30.0%*	0.2%	29.7%	0.3%	45.5%	10.8%
DOCSIS 3.1	11.2%	0.0%	-	-	-	-	19.2%	4.1%
FWA	78.1%	85.8%	-	-	-	-	49.1%	41.7%
LTE	98.4%	94.4%	97.4%	90.9%	96.3%	87.1%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	88.8%	-	86.6%	-	81.5%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	89.7%	92.8%	*80.0%*	91.1%	*88.3%*	91.1%	97.1%	89.7%
NGA broadband	76.0%	45.3%	*72.6%*	*43.9%*	*70.2%*	*37.7%*	85.8%	59.3%
Very High Capacity Networks	46.5%	15.3%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	89.7%	-	*88.3%*	-	*87.3%*	-	95.7%	-
At least 30 Mbps	74.8%	-	*72.4%*	-	*70.0%*	-	83.3%	-
At least 100 Mbps	58.3%	-	*54.7%*	-	*53.1%*	-	68.4%	-
At least 1 Gbps	19.8%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

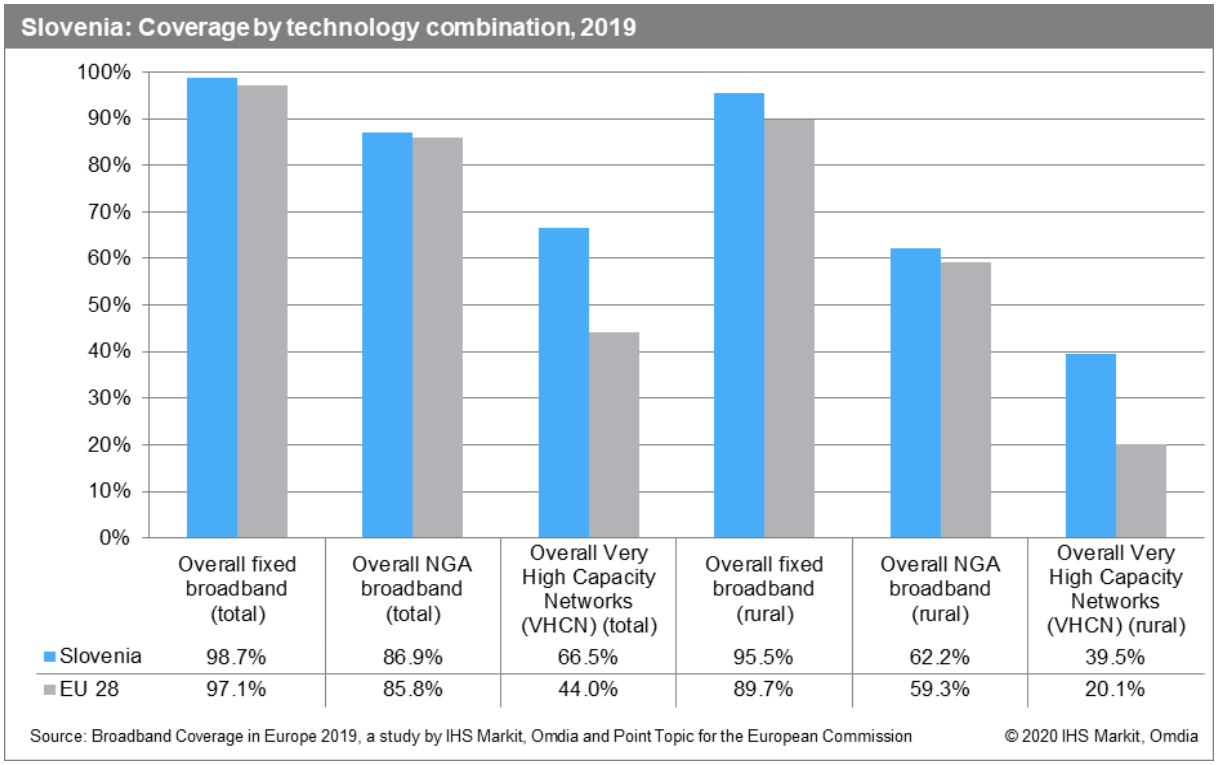
All restatements are highlighted in italics.

5.27 Slovenia

5.27.1 National coverage by broadband technology

By mid-2019, fixed broadband services were available to 98.7% of all Slovenian households and to 95.5% of rural households following a 2.2 percentage point year-on -year increase. Coverage of NGA technologies also improved at both national and rural level, growing by 1.0 percentage point at a national level with 86.9% of households having access to high speed broadband services. Rural NGA coverage improved by 2.5 percentage points and more than two thirds (62.2%) of rural homes were passed by at least one NGA network. Coverage of very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, reached 66.5% of Slovenian households but was limited to just FTTP as there were no DOCSIS 3.1 deployments by mid-2019.

Notably, Slovenia achieved coverage levels above the EU average for all combination categories, both at a national and rural level.

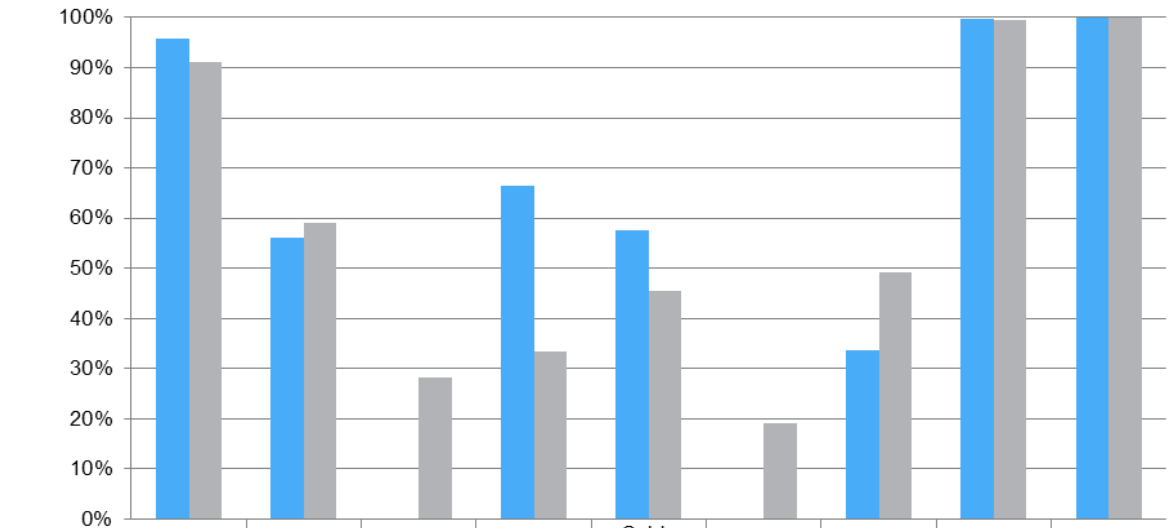


Looking at individual broadband technologies, DSL remained the most prevalent broadband technology in Slovenia and was available to 95.9% to Slovenian households. Fixed Wireless Access (FWA) was available to just over a third (33.7%) of households.

In terms of NGA broadband, FTTP remained the most prevalent NGA technology available to Slovenian households, with 66.5% of homes passed by at least one fibre optic network. Since mid-2018, FTTP coverage increased by 5.4 percentage points. VDSL coverage also increased, albeit at a slower pace than FTTP, and gained 1.0 percentage point, to reach 56.2% of households. Lastly, cable modem DOCSIS 3.0 broadband services were available to 57.6% of households. Neither DOCSIS 3.1 or VDSL2 Vectoring have been deployed in Slovenia by the end of June 2019.

LTE coverage continued to improve this year, and neared universal coverage, at 99.7% of Slovenian households covered. Considering the average coverage of LTE networks of all mobile network operators, on average 98.8% of people in Slovenia had access to LTE services at the end of June 2019.

Slovenia: Coverage by technology, total, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Slovenia	95.9%	56.2%	-	66.5%	57.6%	-	33.7%	99.7%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

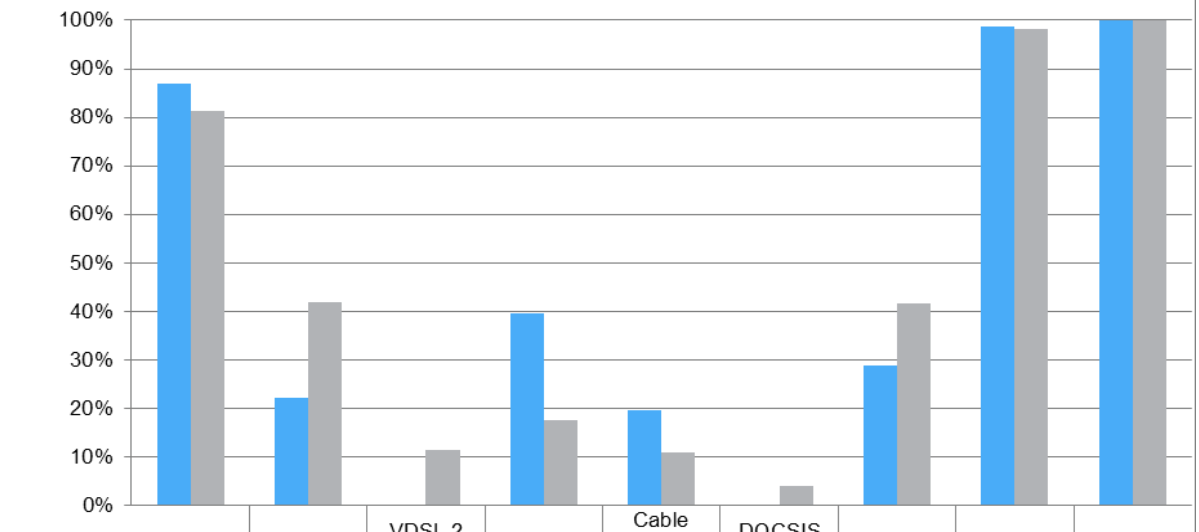
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

In rural areas, DSL was the most prevalent access technology in rural areas despite a slight 0.5 percentage point decrease. At the end of June 2019, rural DSL coverage reached 86.9% of rural households. FWA was available to 28.9% of rural households.

In terms of NGA broadband, FTTP remained the leading technology in rural areas, with 39.5% of rural households having access to FTTP broadband services, up 5.3 percentage points since mid-2018. VDSL services were available 22.1% of rural households, having slightly increased (+0.4 percentage point) since mid-2018. Cable modem DOCSIS 3.0 became this year the least prevalent NGA technology in rural Slovenia, with 19.7% of rural households covered.

Rural LTE coverage of slightly improved over the study period, to reach 98.8% of households, surpassing the EU average of 98.2%.

Slovenia: Coverage by technology, rural areas, 2019



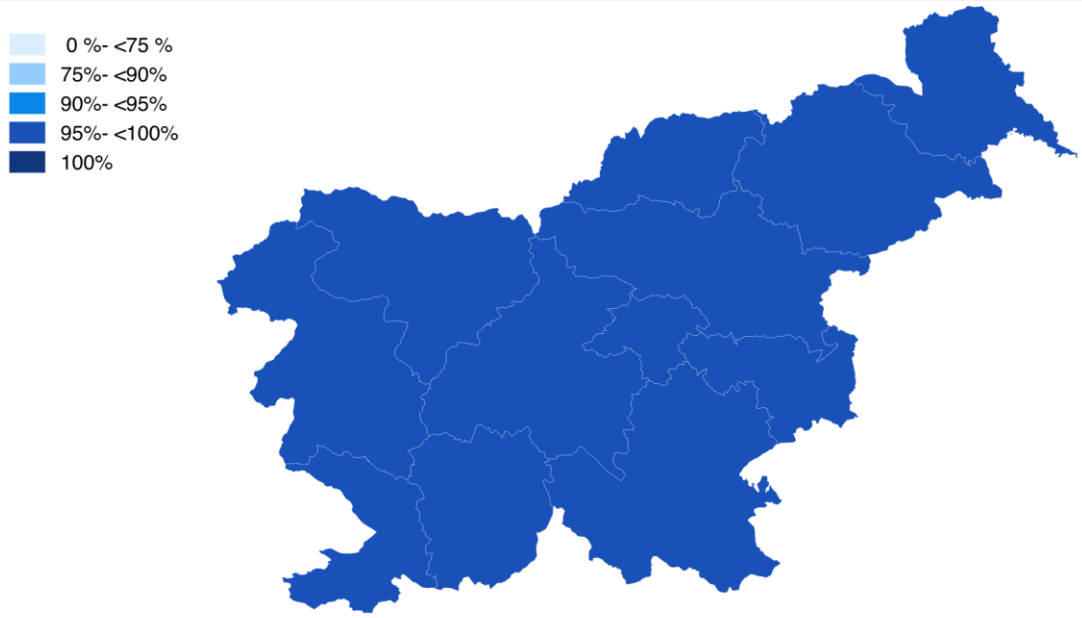
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Slovenia	86.9%	22.1%	-	39.5%	19.7%	-	28.9%	98.8%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.27.2 Regional coverage by broadband technology

Compared to the last iteration of this study, fixed broadband coverage across Slovenian regions improved, with the variance between regions decreasing from 3.8 to 2.8 percentage points. Fixed broadband coverage thus ranged from 96.8% in Posavska and 99.6% in the Gorenjska region.

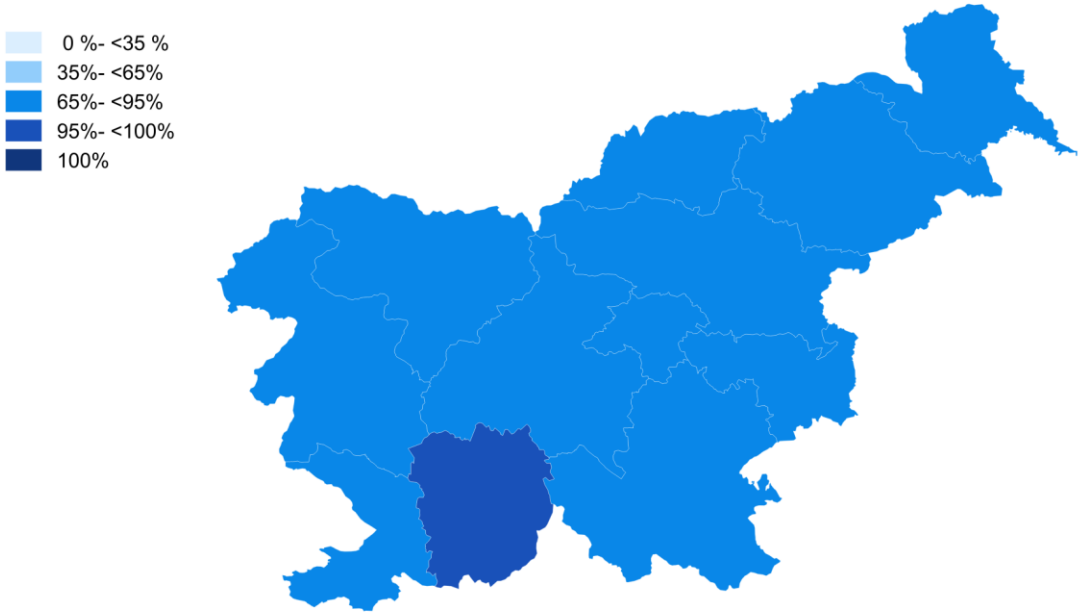
Slovenia: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

NGA coverage continued to vary more widely than fixed broadband coverage, and ranged between 79.0% in the Savinjska region and 95.2% in the Primorsko-notranjska region.

Slovenia: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.27.3 Data tables for Slovenia

Statistic	National
Population	2,054,115
Persons per household	2.4
Rural proportion	23.0%

	Slovenia 2019		Slovenia 2018		Slovenia 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	95.9%	86.9%	96.1%	87.4%	95.8%	86.7%	91.2%	81.4%
VDSL	56.2%	22.1%	55.2%	21.7%	59.0%	21.4%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	66.5%	39.5%	61.1%	34.3%	52.2%	25.8%	33.5%	17.5%
Cable modem DOCSIS 3.0	57.6%	19.7%	59.9%	21.1%	57.4%	20.6%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	33.7%	28.9%	-	-	-	-	49.1%	41.7%
LTE	99.7%	98.8%	99.5%	98.2%	98.6%	95.1%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	98.8%	-	98.2%	-	96.1%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	98.7%	95.5%	98.1%	93.3%	97.8%	92.5%	97.1%	89.7%
NGA broadband	86.9%	62.2%	85.9%	59.7%	83.2%	53.9%	85.8%	59.3%
Very High Capacity Networks	66.5%	39.5%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	98.8%	-	98.0%	-	97.7%	-	95.7%	-
At least 30 Mbps	86.9%	-	85.9%	-	83.2%	-	83.3%	-
At least 100 Mbps	80.9%	-	79.4%	-	74.3%	-	68.4%	-
At least 1 Gbps	2.0%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of August 2019. The 2018 and 2017 figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

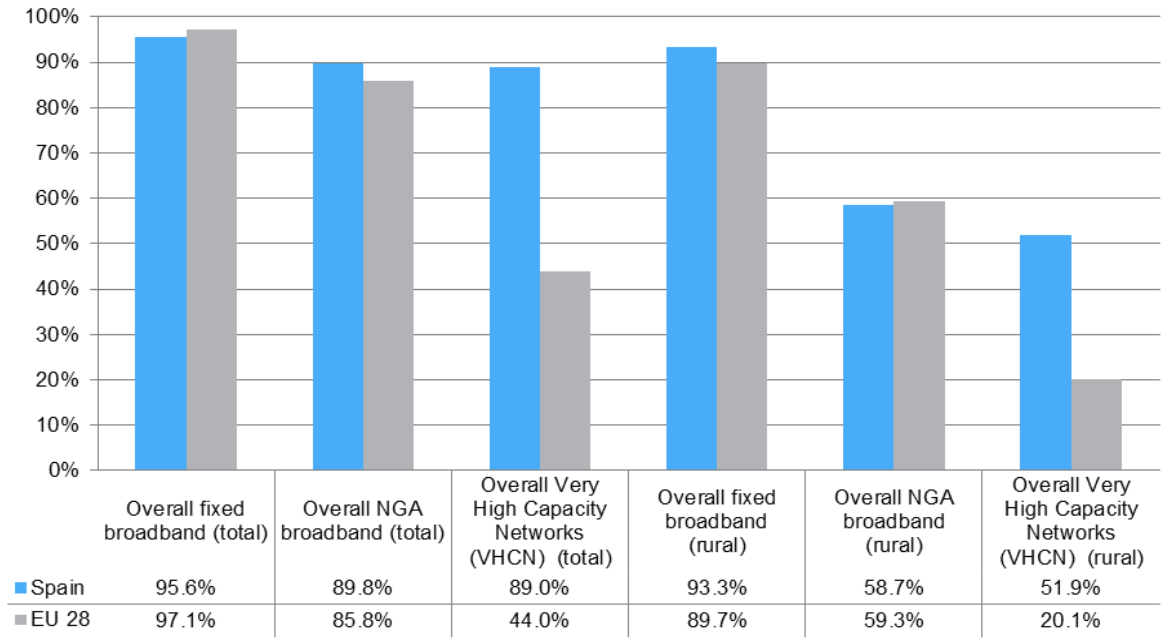
5.28 Spain

5.28.1 National coverage by broadband technology

At the end of June 2019, 95.6% of Spanish households had access to fixed broadband services, slightly below the EU average 97.1%. In rural areas fixed broadband coverage recorded a slight 0.4 percentage point increase compared to mid-2018 and reached 93.3% rural households. In terms of NGA broadband availability, coverage increased both at a national and rural level, to reach 89.8% of households nationally. Following a significant 11.1 percentage point coverage increase, nearly two thirds (58.7%) of rural households had access to high speed NGA broadband services.

Very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, covered 89.0% of households at a national level, and 51.9% of rural households. Except for national fixed broadband and rural NGA, Spain scored better coverage levels than the EU average in all three combination categories, at both national and rural levels.

Spain: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Spain	95.6%	89.8%	89.0%	93.3%	58.7%	51.9%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

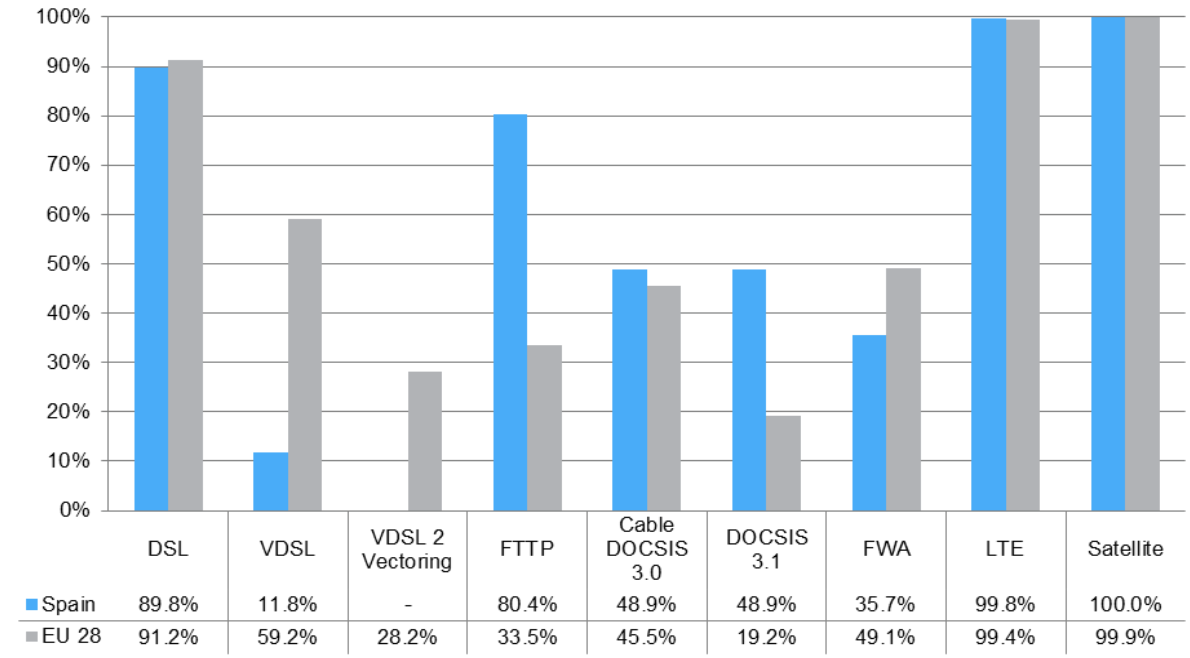
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual technologies, DSL remained the most prevalent technology in Spain, stable over the study period at 89.8% of households covered. VDSL coverage also remained unchanged, standing at 11.8% of households, highlighting the low proportion of DSL networks that had been upgraded to VDSL as Spanish operators focus on new FTTP deployments rather than copper networks upgrades. For this reason, there were no VDSL2 Vectoring deployments reported in this edition of this study. Fixed Wireless Access (FWA) was available to 35.7% of Spanish households.

In terms of NGA broadband, Spanish operators continued to expand their FTTP network infrastructure with FTTP coverage increasing by 3.0 percentage points and FTTP broadband services being available to 80.4% of households at the end of June 2019. Cable modem DOCSIS 3.0 coverage remained stable over the period, at 48.9% of homes passed. Notably, Spanish cable network operators have deployed DOCSIS 3.1 standard over the whole footprint of their cable networks by mid- 2019. The continued advancements in both FTTP and DOCSIS 3.1 availability make Spain one of the leaders among the study countries in terms of gigabit speed connectivity.

LTE coverage continued to improve in Spain over the study period, to reach 99.8% of Spanish homes. When the average coverage of LTE networks of all mobile network operators is considered, on average 95.1% of people in Spain had access to LTE services at the end of June 2018.

Spain: Coverage by technology, total, 2019

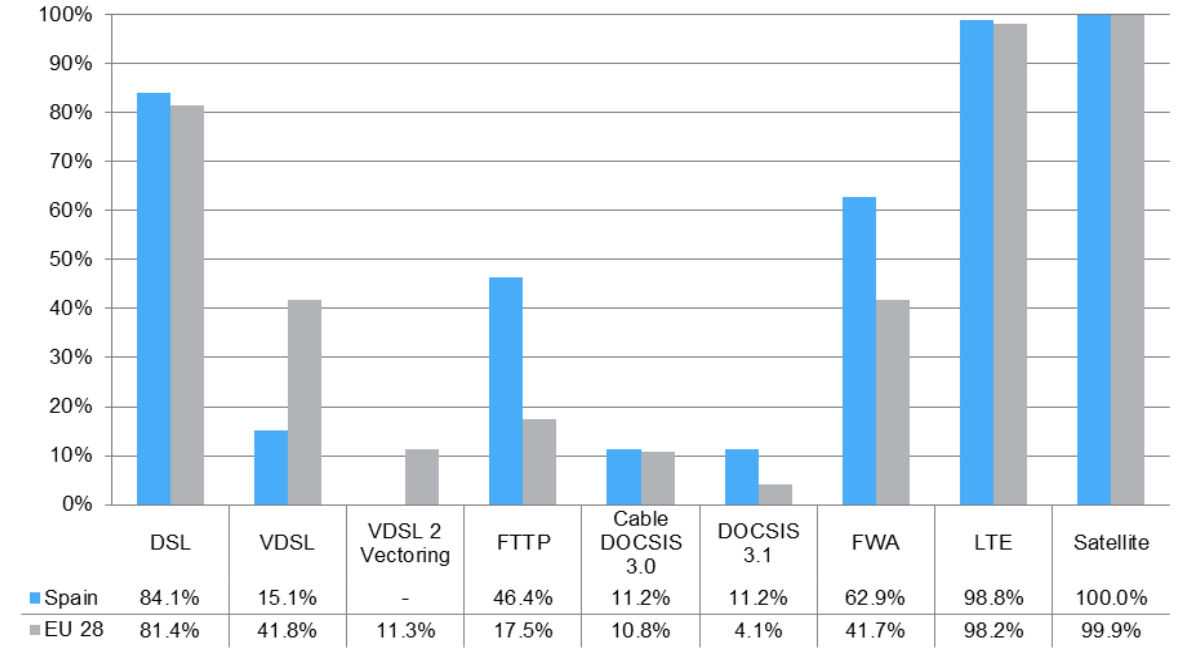


	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Spain	89.8%	11.8%	-	80.4%	48.9%	48.9%	35.7%	99.8%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural areas of Spain, as was the case on a national level, DSL was the most common broadband technology for rural households, with 84.1% of households covered. Fixed Wireless Access was this year the second most prevalent broadband access type in rural Spain, with 62.9%.

Spain: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Spain	84.1%	15.1%	-	46.4%	11.2%	11.2%	62.9%	98.8%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

In terms of rural NGA coverage, as was the case on a national level, FTTP was the most widespread technology, with 46.4% of households covered. Since mid-2018, FTTP recorded a substantial jump in coverage, having increased by 13.8 percentage points. These fast increases in FTTP coverage are driven by the "300 x 100" plan, announced by the Spanish government in March 2018, which aims to have all Spanish localities and 95.0% of the Spanish population covered by 2021[21], with a €150 million

[21] https://www.telecompaper.com/news/spain-to-bring-fibre-to-all-by-2021-in-eur-525-mln-investment--1237225

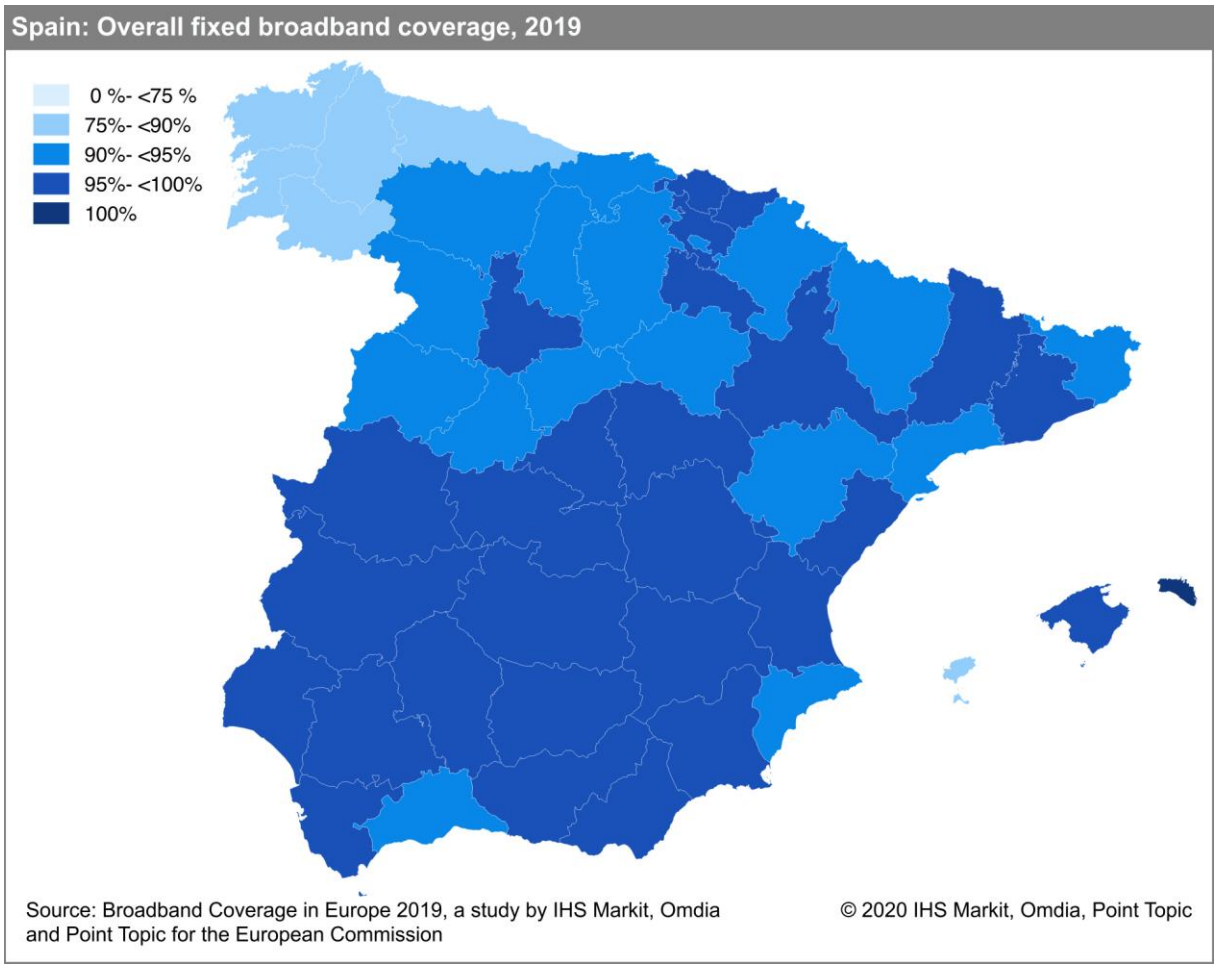
fund dedicated to rural fibre deployment[22]. VDSL was available to 15.1% of rural households, and cable modem DOCSIS 3.0 and 3.1 were both available to 11.2% of rural households. VHCN rural coverage thus stood at 51.9%, one of the highest coverage levels recorded in the study.

Lastly, rural LTE coverage stood at 98.8% of households at the end of June 2019, thus remaining above the EU average of 98.2%. Over the study period, LTE coverage of rural areas increased by 1.3 percentage point.

[22] https://www.telecompaper.com/news/spain-launches-eur-150-mln-rural-fibre-call--1240652

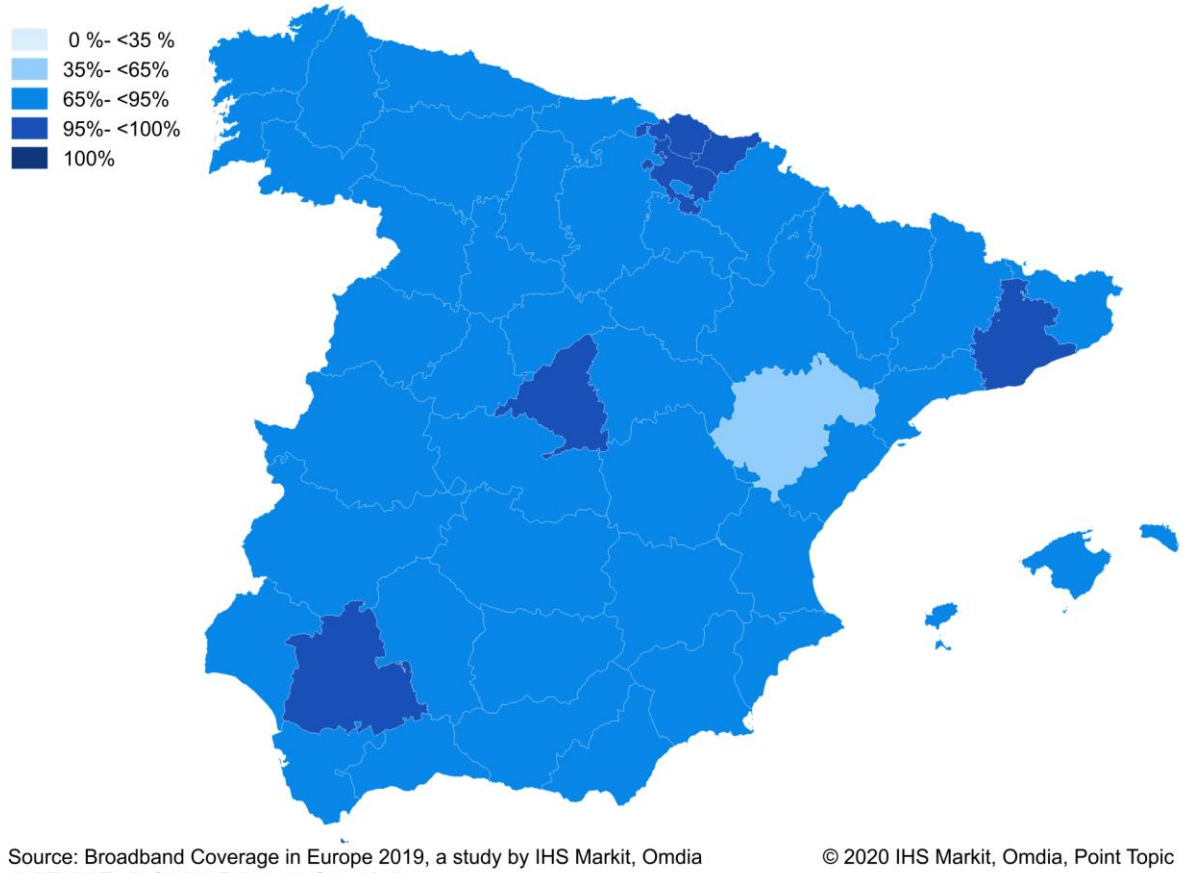
5.28.2 Regional coverage by broadband technology

As was the case in previous iterations of the study, fixed broadband coverage varied across Spanish regions. Coverage was the lowest in El Hierro, at 76.6% of households covered, and the highest in the regions of Melilla and Menorca, which had universal fixed broadband availability (100.0%). El Hierro was the only region with fixed broadband coverage below 80.0%.



NGA coverage across Spanish regions varied more widely than fixed broadband coverage, as witnessed in the majority of study countries. By mid-2019, NGA coverage ranged from 48.8% in La Palma and universal coverage in Mellila. This year, no region had NGA broadband coverage levels below 40.0%.

Spain: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

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

Coverage data for Spanish NUTS 3 areas outside mainland Europe

NUTS 3	Description	Overall fixed broadband coverage	NGA broadband coverage
ES630	Ceuta (ES)	98.4%	95.7%
ES640	Melilla (ES)	100.0%	100.0%
ES703	El Hierro	76.6%	54.0%
ES704	Fuerteventura	95.7%	63.3%
ES705	Gran Canaria	93.2%	93.2%
ES706	La Gomera	81.8%	50.8%
ES707	La Palma	90.4%	48.8%
ES708	Lanzarote	94.0%	84.7%
ES709	Tenerife	93.5%	89.6%

5.28.3 Data tables for Spain

Statistic	National
Population	46,722,980
Persons per household	2.6
Rural proportion	18.1%

	Spain 2019		Spain 2018		Spain 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	89.8%	84.1%	89.8%	84.0%	90.0%	84.1%	91.2%	81.4%
VDSL	11.8%	15.1%	11.8%	15.1%	11.8%	15.0%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	80.4%	46.4%	77.4%	32.6%	71.4%	20.9%	33.5%	17.5%
Cable modem DOCSIS 3.0	48.9%	11.2%	48.9%	13.1%	48.8%	12.6%	45.5%	10.8%
DOCSIS 3.1	48.9%	11.2%	-	-	-	-	19.2%	4.1%
FWA	35.7%	62.9%	-	-	-	-	49.1%	41.7%
LTE	99.8%	98.8%	99.5%	97.5%	97.2%	87.0%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	95.1%	-	93.7%	-	92.3%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	95.6%	93.3%	96.1%	92.9%	95.7%	*92.5%*	97.1%	89.7%
NGA broadband	89.8%	58.7%	88.2%	47.6%	85.0%	37.4%	85.8%	59.3%
Very High Capacity Networks	89.0%	51.9%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	95.6%	-	96.1%	-	95.7%	-	95.7%	-
At least 30 Mbps	91.0%	-	88.2%	-	85.0%	-	83.3%	-
At least 100 Mbps	89.0%	-	87.2%	-	83.6%	-	68.4%	-
At least 1 Gbps	89.0%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

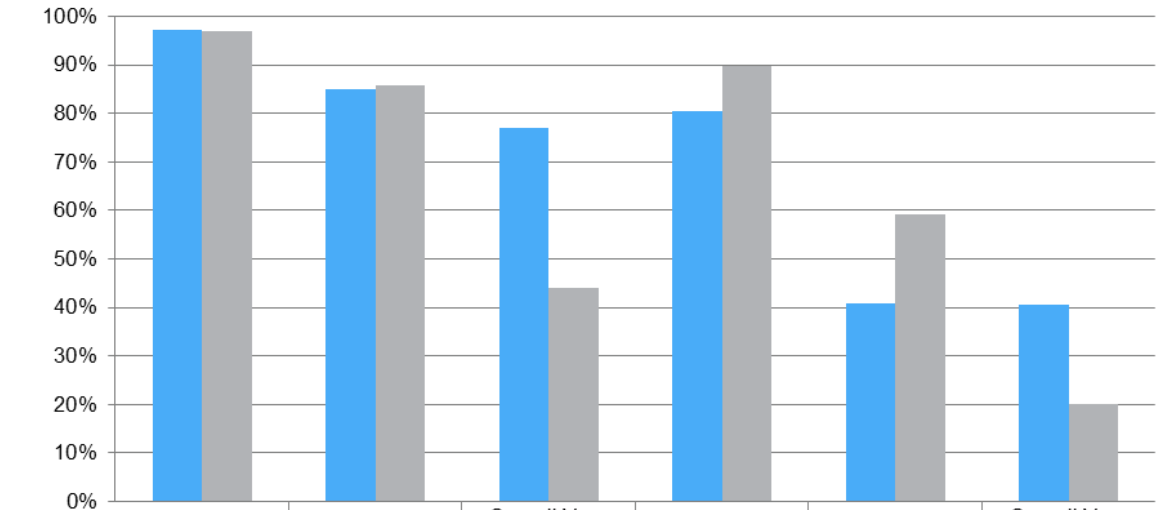
5.29 Sweden

5.29.1 National coverage by broadband technology

At the end of June 2019, fixed broadband coverage in Sweden remained above the EU average at a national level with 97.3% of homes passed by at least one fixed broadband network. With 80.5% or rural households having access to fixed broadband services, Sweden remained below the EU average of 89.7%. Looking at availability of NGA broadband, Sweden fell slightly below the EU average this year at a national level, with 85.1% of homes passed, and remained below the EU average at a rural level, despite a 9.5 percentage point increase in rural NGA availability with 40.9% of rural homes passed.

On the other hand, very high capacity Networks (VHCN), i.e. DOCSIS 3.1 and FTTP, were available to 77.1% of Swedish households, well over the EU average of 44.0%.

Sweden: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Sweden	97.3%	85.1%	77.1%	80.5%	40.9%	40.6%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

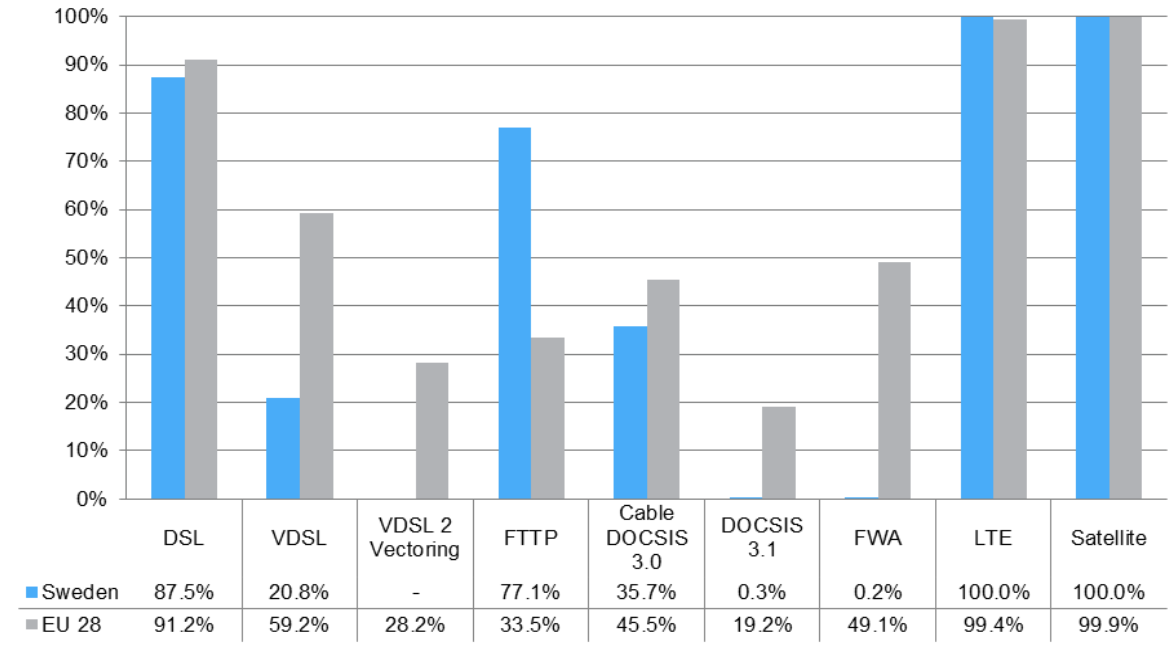
Looking at individual broadband technologies, DSL remained the most prevalent technology in Sweden with 87.5% of households covered. The incumbent Telia's continued with deployment of fibre networks, and gradual closing of copper networks[23]. As a result, both DSL and VDSL coverage decreased year-on-year. At the end of June 2019, 20.8% of Swedish households had access to VDSL broadband services compared to 22.3% in mid-2018. Moreover, there were no VDSL2 Vectoring deployments reported in Sweden.

FTTP remained by far the leading NGA technology, with FTTP networks passing 77.1% of homes and coverage expanding by 4.9 percentage points since mid-2018. Cable modem DOCSIS 3.0 continued to record decreases in coverage, standing at 35.7% of homes passed at the end of June 2019. Whilst DOCSIS 3.1 upgrades have launched in Sweden, the reach of DOCSIS 3.1 was extremely limited with only 0.3% of home passed by cable networks upgraded to the new standard.

Mobile broadband coverage of Sweden did not change over the study period, as Sweden had achieved universal LTE coverage in mid-2017 already.

[23] https://www.telia.se/privat/om/framtidensnat

Sweden: Coverage by technology, total, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Sweden	87.5%	20.8%	-	77.1%	35.7%	0.3%	0.2%	100.0%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

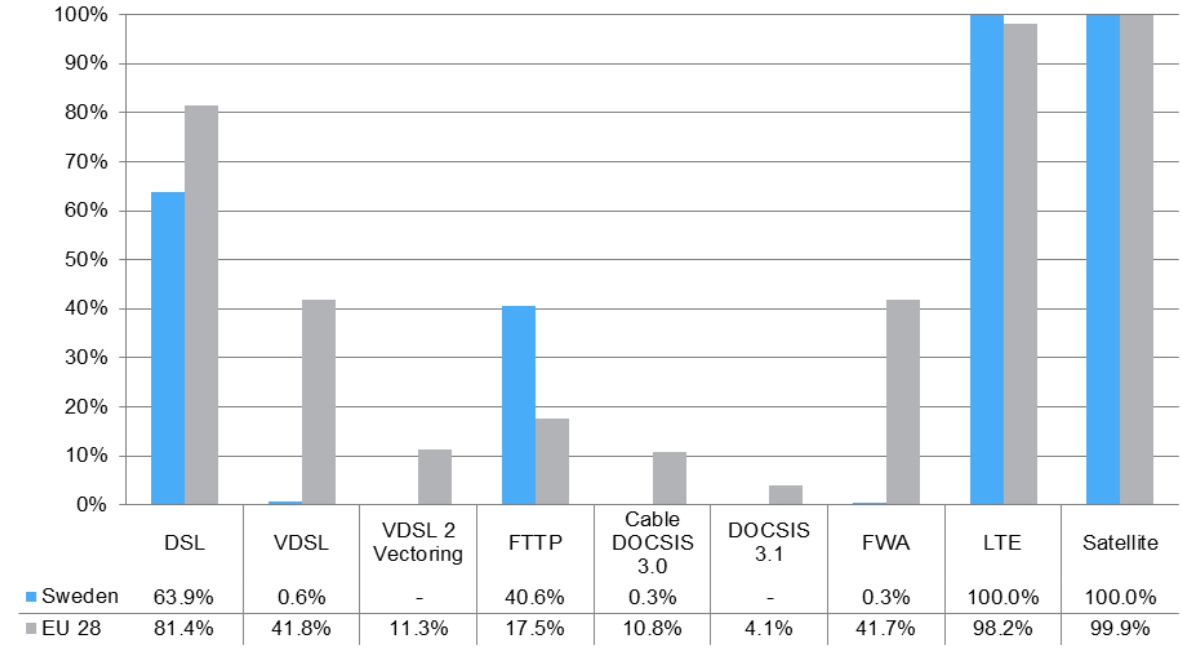
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at broadband availability in rural regions of Sweden, DSL remained the most prevalent access technology, with 63.9% of households covered. As was the case at a national level, DSL coverage recorded a decrease since mid-2018, having lost almost six percentage point (5.9) in coverage since mid-2018.

In terms of NGA broadband, FTTP remained the most prevalent technology for rural households, with 40.6% of homes passed, having recorded a substantial increase of almost 10 percentage points (9.6) in coverage since mid-2018, one of the largest increases in rural FTTP coverage of this year's study. VDSL and cable modem DOCSIS 3.0 remained insignificant, both below 1.0% of coverage, at 0.6% and 0.3% respectively.

As was the case on a national level, LTE coverage remained universal in rural regions of Sweden.

Sweden: Coverage by technology, rural areas, 2019



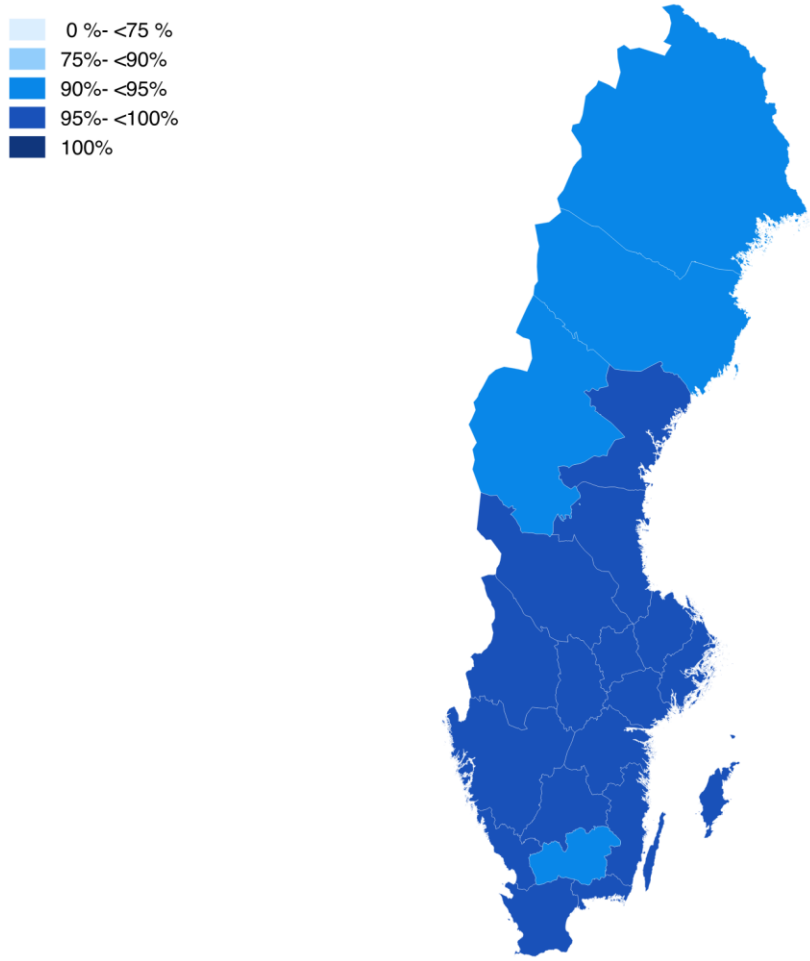
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Sweden	63.9%	0.6%	-	40.6%	0.3%	-	0.3%	100.0%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.29.2 Regional coverage by broadband technology

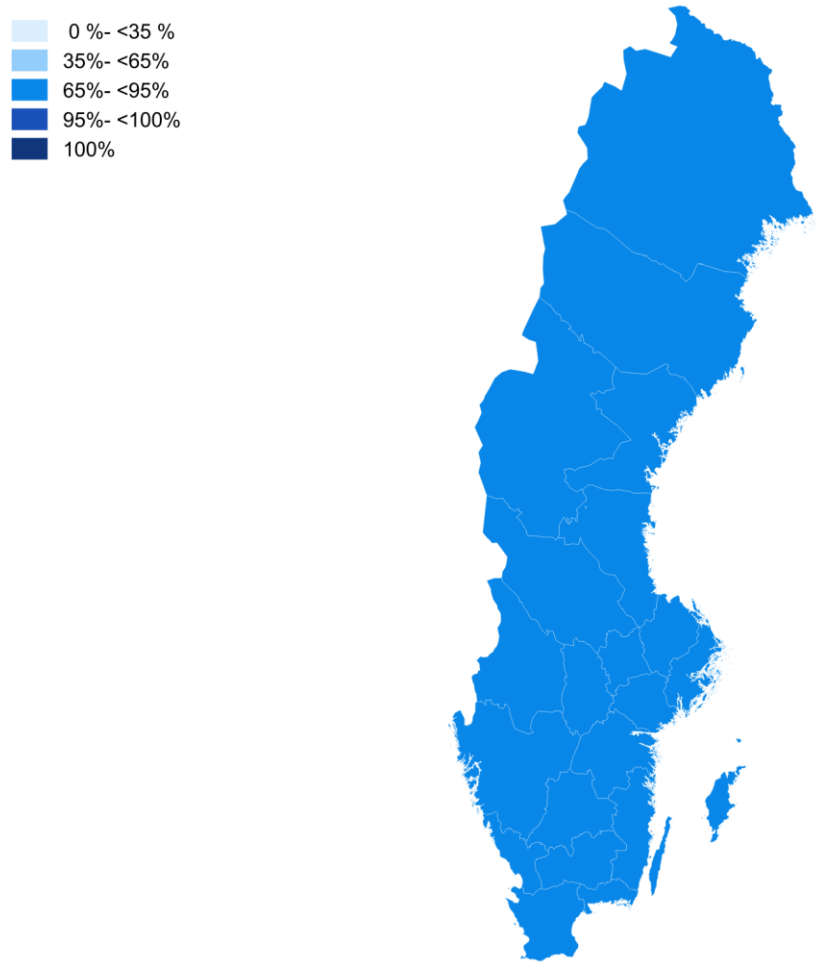
Overall fixed broadband coverage in all Swedish regions exceeded 90.0%, with the lowest coverage being registered in Jämtlands län, with 90.4% of households covered. The capital region of Stockholm recorded the highest coverage level, with 99.4% of homes passed.

Sweden: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Sweden: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

As is the case in most study countries, NGA technologies coverage recorded a higher level of variance across regions than fixed broadband. NGA broadband availability varied between 72.6% in Jämtlands län and 94.2% in the capital region of Stockholm.

5.29.3 Data tables for Sweden

Statistic	National
Population	10,120,242
Persons per household	2.1
Rural proportion	9.3%

	Sweden 2019		Sweden 2018		Sweden 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	87.5%	63.9%	90.7%	69.8%	93.2%	78.7%	91.2%	81.4%
VDSL	20.8%	0.6%	22.3%	0.6%	21.0%	0.6%	59.2%	41.8%
VDSL 2 Vectoring	0.0%	0.0%	-	-	-	-	28.2%	11.3%
FTTP	77.1%	40.6%	72.2%	31.0%	66.4%	22.2%	33.5%	17.5%
Cable modem DOCSIS 3.0	35.7%	0.3%	36.0%	0.3%	36.8%	0.3%	45.5%	10.8%
DOCSIS 3.1	0.3%	0.0%	-	-	-	-	19.2%	4.1%
FWA	0.2%	0.3%	-	-	-	-	49.1%	41.7%
LTE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	96.8%	-	96.0%	-	95.7%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.3%	80.5%	97.4%	80.8%	98.5%	85.4%	97.1%	89.7%
NGA broadband	85.1%	40.9%	86.1%	31.4%	77.7%	22.7%	85.8%	59.3%
Very High Capacity Networks	77.1%	40.6%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	97.3%	-	96.4%	-	97.2%	-	95.7%	-
At least 30 Mbps	85.1%	-	81.9%	-	77.9%	-	83.3%	-
At least 100 Mbps	82.2%	-	78.4%	-	73.3%	-	68.4%	-
At least 1 Gbps	77.1%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

5.30 Switzerland

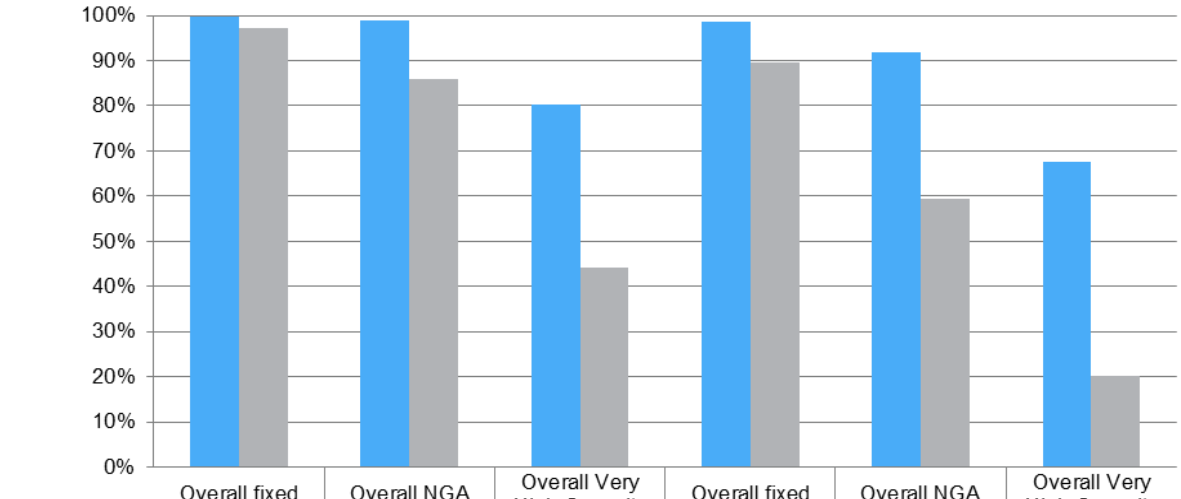
5.30.1 National coverage by broadband technology

As in the previous years, research on broadband coverage in Switzerland was included in the BCE study thanks to additional funding provided by Glasfasernetz Schweiz, a Swiss fibre optic industry association.

As fixed broadband coverage was already near universal in previous years, fixed broadband availability remained stable, at 99.8% of Swiss households covered. In a similar fashion, NGA coverage also remained stable as it neared universal coverage (99.0%). In rural regions of Switzerland, fixed broadband services were available to 98.6% of rural households, whilst NGA networks passed 91.8% of rural homes.

In terms of Very High Capacity Networks (VHCN) coverage, i.e. combined coverage of DOCSIS 3.1 and FTTP, 80.4% of all Swiss households and 67.5% of rural households were covered by networks potentially capable of delivering gigabit speeds.

Switzerland: Coverage by technology combination, 2019



	Overall fixed broadband (total)	Overall NGA broadband (total)	Overall Very High Capacity Networks (VHCN) (total)	Overall fixed broadband (rural)	Overall NGA broadband (rural)	Overall Very High Capacity Networks (VHCN) (rural)
Switzerland	99.8%	99.0%	80.4%	98.6%	91.8%	67.5%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

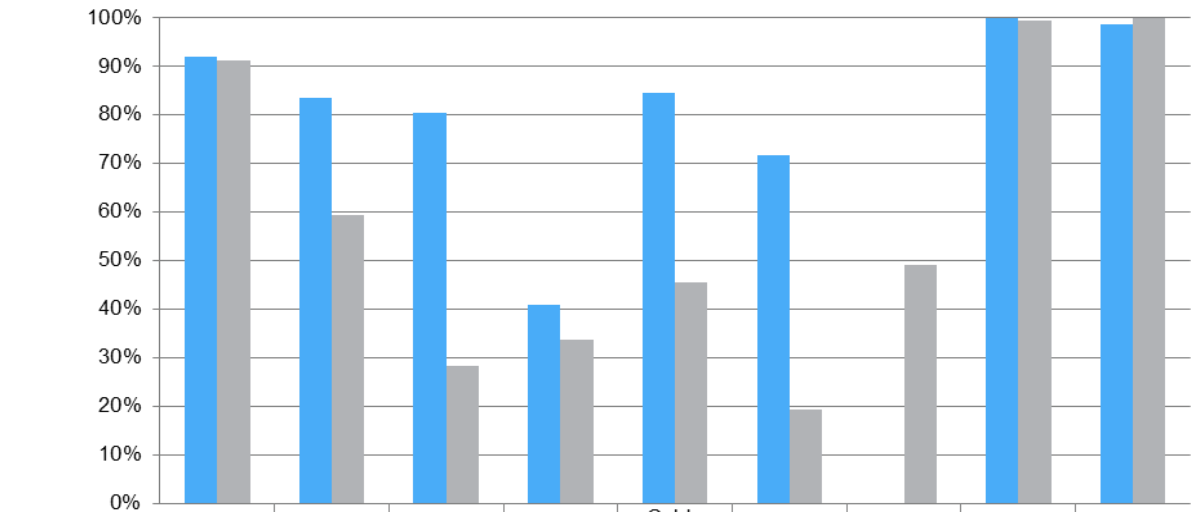
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual technologies, coverage by traditional broadband technologies remained stable this year as Switzerland continued to near universal coverage. Despite a 7.6 percentage point decrease in coverage, DSL remained the most prevalent broadband technology, reaching 91.9% of Swiss households at the end of June 2019. This decrease is a result of gradual decommission of DSL networks, which has been observed in several study countries, such as the Baltics and Nordics. Consequently, VDSL coverage also recorded decrease in coverage of 6.6 percentage points compared to mid-2018, reaching 83.5% of Swiss households. However, availability of high speed copper-based technologies was still much higher than in other study countries. Particularly in the case of VDSL 2 Vectoring, which was available to 80.2% of households, the second highest coverage level recorded in this study for this technology.

Cable modem DOCSIS 3.0 became the most widely available NGA technology in Switzerland, as 84.4% of households had access to high speed cable broadband services. By mid-2019, a significant part of cable networks has been upgraded to the DOCSIS 3.1 standard, which was available to 71.7% of Swiss households. Lastly, FTTP coverage improved significantly over the study period, with 40.9% of homes passed, up 10.6 percentage points since mid-2018.

LTE coverage remained near universal, at 99.9% of households covered.

Switzerland: Coverage by technology, total, 2019



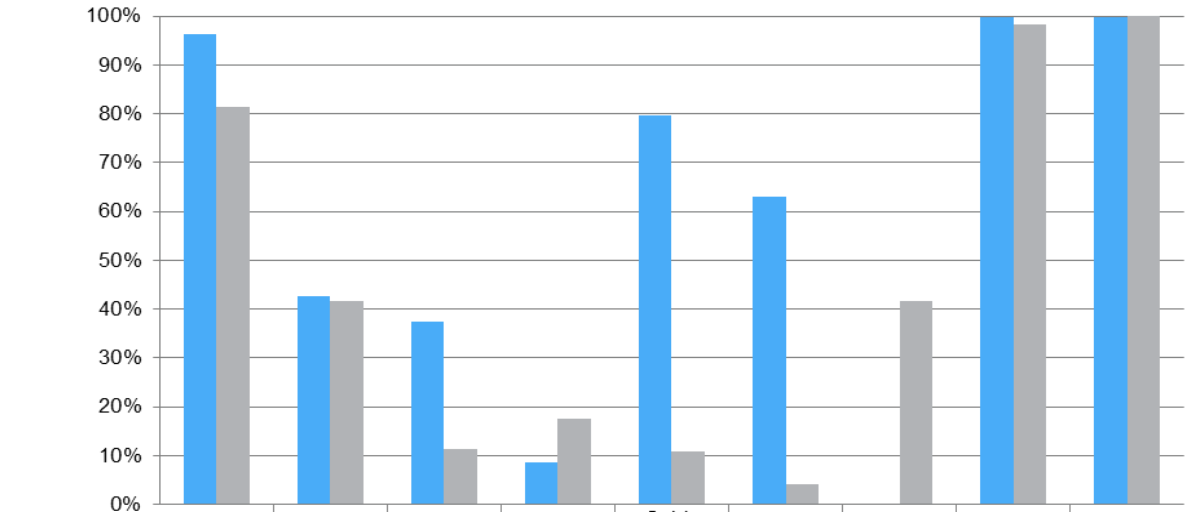
	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Switzerland	91.9%	83.5%	80.2%	40.9%	84.4%	71.7%	-	99.9%	98.6%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at individual technologies in rural regions of Switzerland, DSL remained the most widespread technology in rural Swiss areas with 96.4% of rural households having access to DSL-based broadband services.

As mentioned, Switzerland was among the best performers in this study in terms of rural NGA coverage, which stood this year at 93.8%, the third highest coverage achieved among the 31 countries of this study. Cable modem DOCSIS 3.0 remained the most prevalent rural NGA technology, with 79.8% of households covered, and DOCSIS 3.1 was available to 63.0% of households. VDSL networks passed 42.7% of rural homes, and VDSL 2 Vectoring-enabled services were available to 37.4% of rural households. Lastly, FTTP availability in rural regions of Switzerland remained low compared to other NGA technologies as only 8.6% of rural homes were passed by FTTP networks.

Switzerland: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
Switzerland	96.4%	42.7%	37.4%	8.6%	79.8%	63.0%	-	99.8%	99.7%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

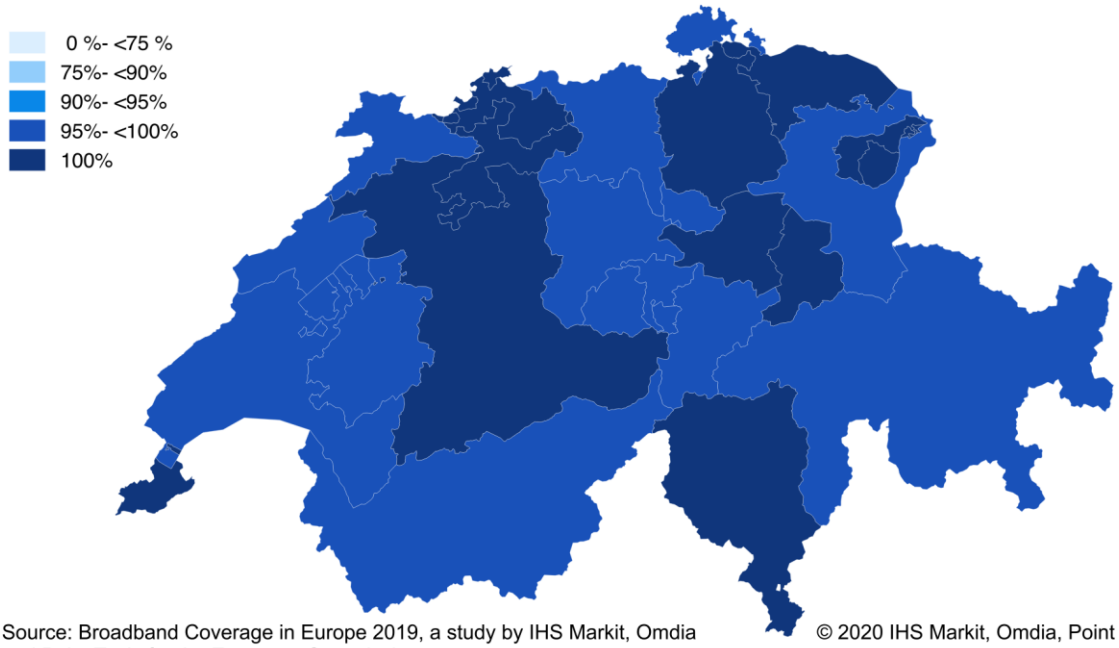
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Mobile broadband availability in rural regions of Switzerland slightly improved and continued to near universal coverage. LTE coverage increased by 0.1 percentage point over the study period, to reach 99.8% of rural households.

5.30.2 Regional coverage by broadband technology

As was the case last year, only four regions out of 26 recorded fixed broadband levels under 99.0%, with their coverage level remaining above 95.5% of households passed. Similar to last year, these four regions were Jura, Grisons (Graubünden), Obwalden and Uri.

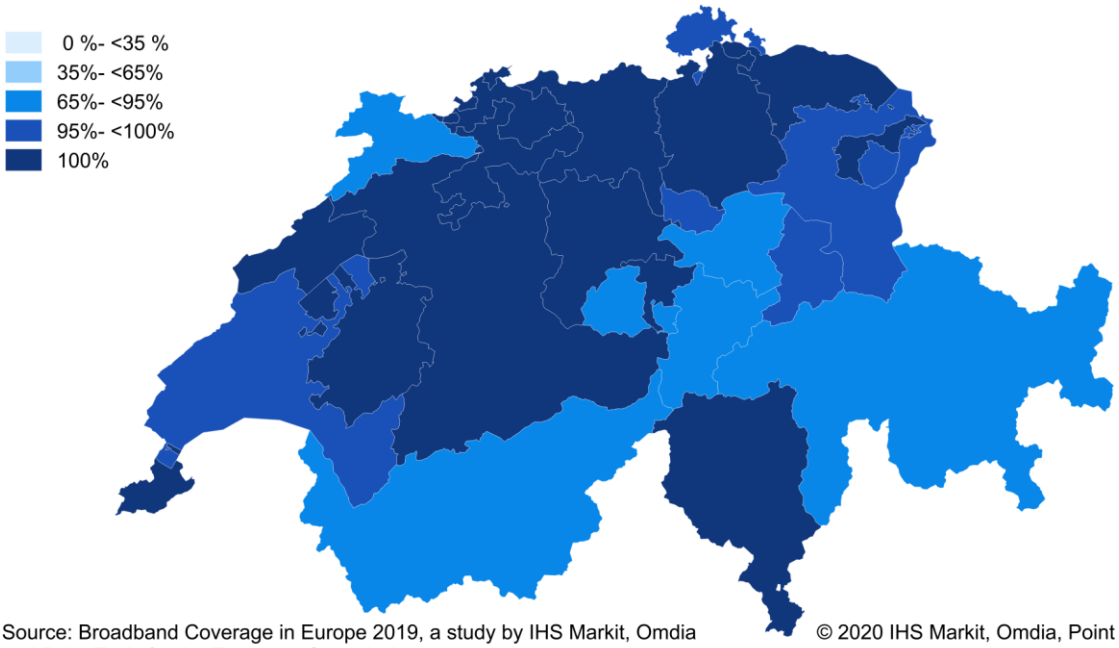
Switzerland: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

In this iteration of the study, fourteen Swiss regions recorded universal (100.0%) NGA coverage. Availability of NGA broadband thus ranged from 90.1% in Grisons (Graubünden) and 100.0% in fourteen regions.

Switzerland: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.30.3 Data tables for Switzerland

Statistic	National
Population	8,419,550
Persons per household	2.2
Rural proportion	12.5%

	Switzerland 2019		Switzerland 2018		Switzerland 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	91.9%	96.4%	99.5%	96.3%	99.5%	96.3%	91.2%	81.4%
VDSL	83.5%	42.7%	90.0%	60.4%	90.0%	60.6%	59.2%	41.8%
VDSL 2 Vectoring	80.2%	37.4%	-	-	-	-	28.2%	11.3%
FTTP	40.9%	8.6%	30.3%	8.2%	29.5%	7.6%	33.5%	17.5%
Cable modem DOCSIS 3.0	84.4%	79.8%	84.3%	79.7%	84.3%	78.1%	45.5%	10.8%
DOCSIS 3.1	71.7%	63.0%	-	-	-	-	19.2%	4.1%
FWA	0.0%	0.0%	-	-	-	-	49.1%	41.7%
LTE	99.9%	99.8%	99.9%	99.7%	99.8%	99.4%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	98.6%	-	98.6%	-	98.6%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.8%	98.6%	99.8%	98.6%	99.8%	98.6%	97.1%	89.7%
NGA broadband	99.0%	91.8%	99.0%	93.9%	99.0%	93.3%	85.8%	59.3%
Very High Capacity Networks	80.4%	67.5%	-	-	-	-	44.0%	20.1%
At least 2 Mbps	99.8%	-	99.7%	-	99.8%	-	95.7%	-
At least 30 Mbps	99.8%	-	98.9%	-	98.9%	-	83.3%	-
At least 100 Mbps	98.6%	-	98.5%	-	98.5%	-	68.4%	-
At least 1 Gbps	40.3%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

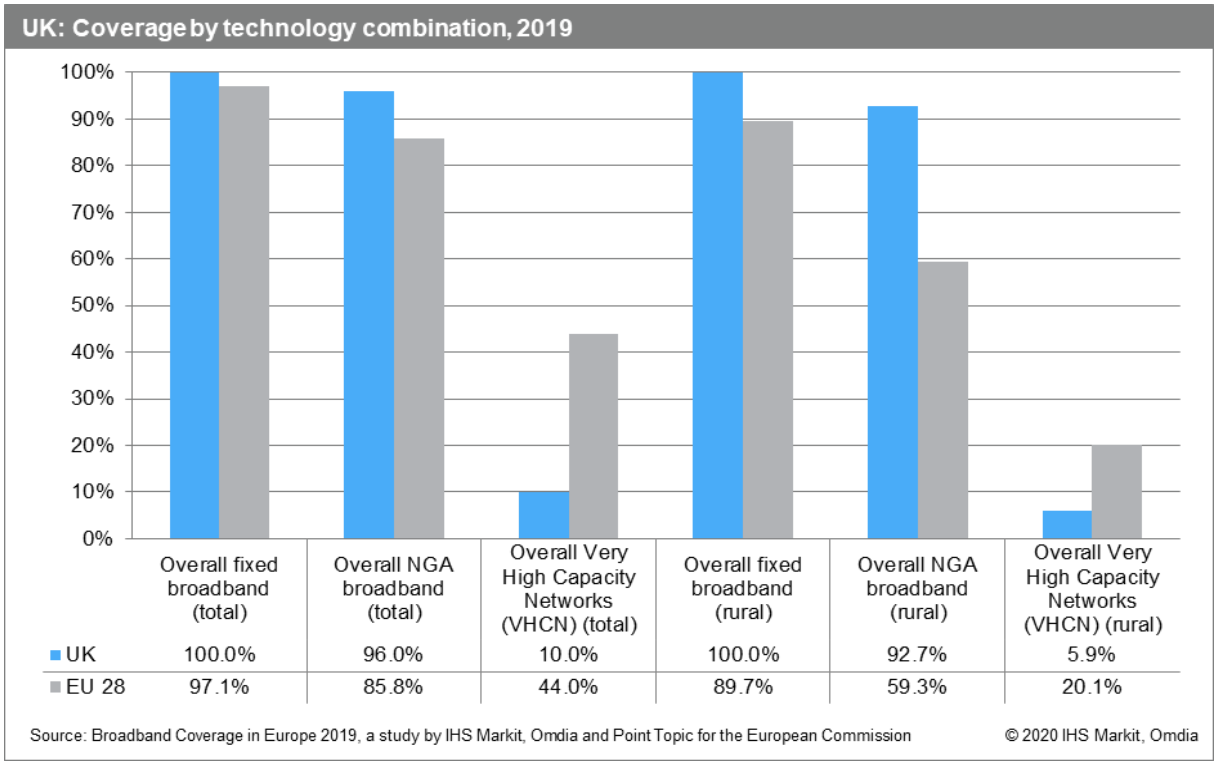
All restatements are highlighted in italics.

5.31 United Kingdom

5.31.1 National coverage by broadband technology

Over the study period, fixed broadband coverage in the UK remained stable, and universal, at both national and rural levels. Availability of NGA broadband improved at both national and rural level: NGA increased by 0.9 percentage point since mid-2018, to reach 96.0% of all households, and by 2.4 percentage points at a rural level, to reach 92.7% of rural homes. In both categories, the UK surpassed the EU average.

However, as most NGA advancements have been driven by VDSL deployments, when coverage of very high capacity networks (VHCN), i.e. DOCSIS 3.1 and FTTP, is considered, the UK recorded the second lowest level of this study at a national level with only 10% of UK homes passed by networks potentially capable of offering gigabit speeds. In rural areas, just 5.9% of rural households had access to such services.



Looking at individual technologies, DSL continued to be the most widespread broadband technology, with 97.0% of households having access to DSL-based broadband services. Fixes Wireless Access (FWA) was available to only a small portion of households, its coverage standing at 5.7% at the end of June 2019.

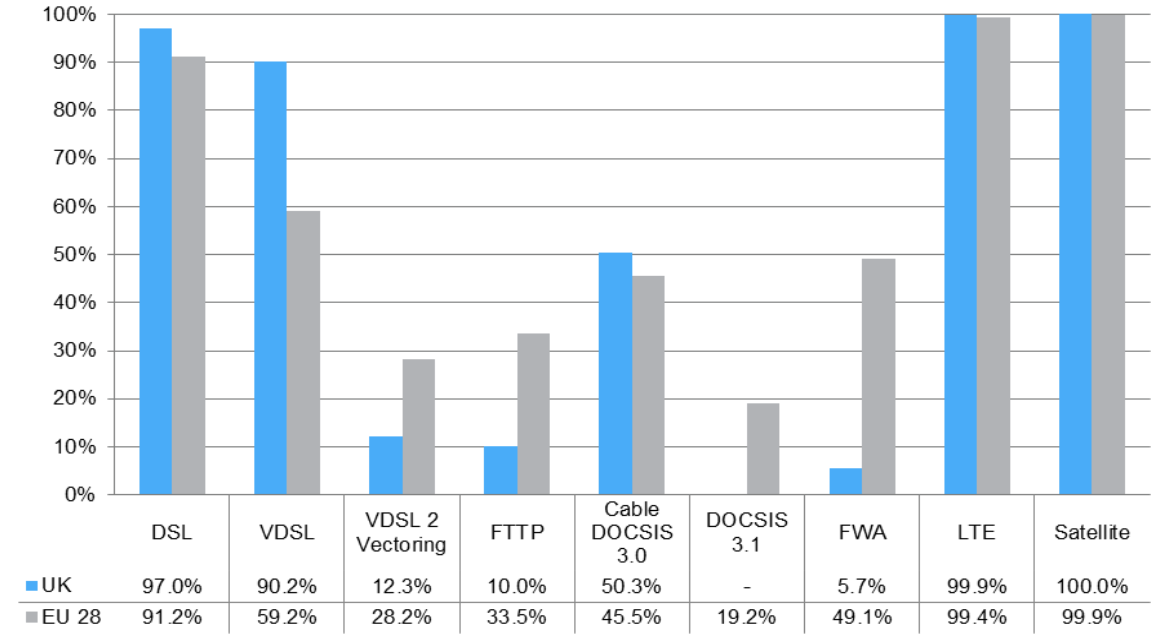
In terms of NGA technologies, VDSL remained the leading NGA technology, with 9 in 10 (90.2%) of UK households having access to VDSL services, a 0.5 percentage point increase since mid-2018. Moreover, 12.3% of UK households had access to VDSL2 Vectoring services providing download speeds higher than 100Mbps.

Cable modem DOCSIS 3.0 coverage increased slightly over the study period, to reach just over half (50.3%) of households. Whilst the UK cable operator, Virgin Media, announced plans to upgrade its network to DOCSIS 3.1, these deployments and commercial launch of DOCSIS 3.1 services were scheduled for the second half of 2019 and therefore are not reflected in this study.

Lastly, FTTP coverage also improved, and gained 6.2 percentage points of coverage, to reach 10.0% of households, yet, remained well below the EU average of 33.5%. As was the case last year, UK FTTP coverage remained among the lowest recorded in this study, with only Belgium and Greece recording lower FTTP coverage levels.

LTE coverage of the UK remained stable and near-universal at 99.9% of households covered.

UK: Coverage by technology, total, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
UK	97.0%	90.2%	12.3%	10.0%	50.3%	-	5.7%	99.9%	100.0%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	99.9%

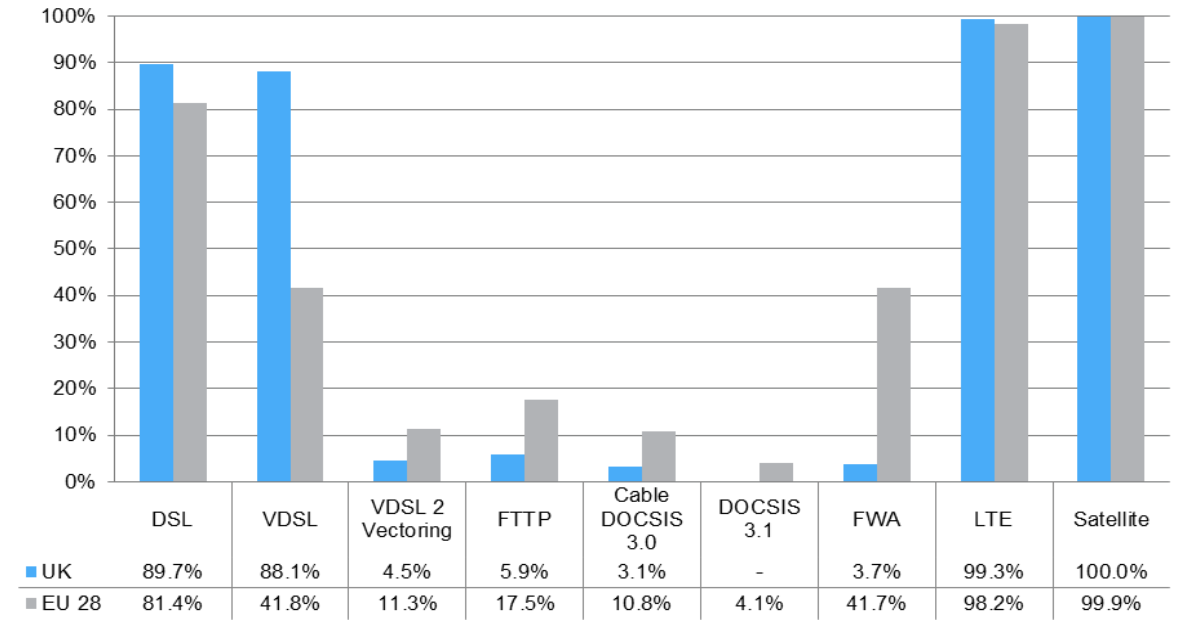
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

Looking at rural regions of the United Kingdom, DSL remained the most prevalent broadband technology, with 89.7% of rural households passed. As observed on a national level, Fixed Wireless Access coverage was not significant in the UK's rural areas, at 3.7% of households passed only.

In terms of rural NGA availability, VDSL remained the only technology with significant coverage, standing at 88.1% of rural households, up from 86.6% at the end of June 2019. VDSL 2 Vectoring, FTTP and cable modem DOCSIS 3.0 all covered less than 10.0% of rural households. VDSL2 Vectoring-enabled services were available to 4.5% or rural households at the end of June 2019. FTTP networks passed 5.9% or rural homes and DOCSIS 3.0 remained the most limited with only 3.1% rural households covered by mid-2019. Neither FTTP nor DOCSIS 3.0 recorded any change in coverage since mid-2018.

As was the case on a national level, LTE coverage of rural UK regions remained stable at 99.3% of rural households covered.

UK: Coverage by technology, rural areas, 2019



	DSL	VDSL	VDSL 2 Vectoring	FTTP	Cable DOCSIS 3.0	DOCSIS 3.1	FWA	LTE	Satellite
UK	89.7%	88.1%	4.5%	5.9%	3.1%	-	3.7%	99.3%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

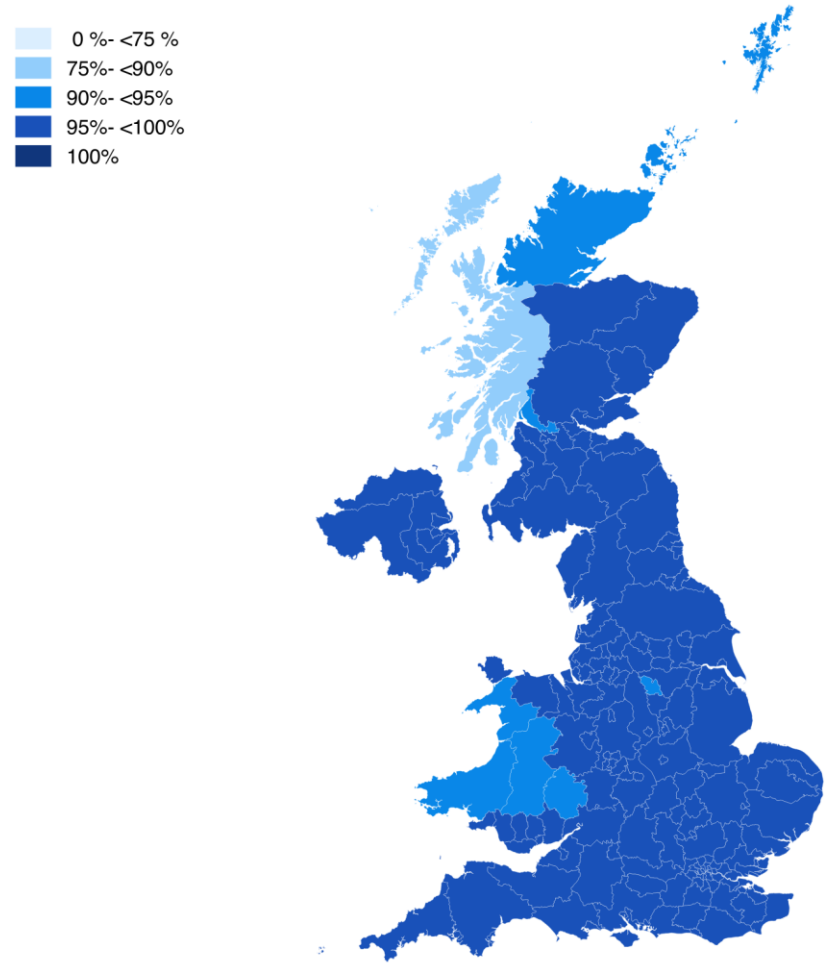
Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.31.2 Regional coverage by broadband technology

Looking at fixed broadband coverage in UK regions, this year coverage ranged from 84.9% in the Western Islands and near universal (99.9%) in twelve regions. Only two regions recorded fixed broadband availability below 90.0%, namely Western Islands and Lochaber, Skye & Lochalsh, Arran & Cumbrae and Argyll & Bute.

Looking at UK regions, fixed broadband coverage ranged from 79.3% in the Western Islands (Eilean Siar) to near-universal coverage (over 99%) in 78 regions. In this iteration of the study, only 5 regions recorded fixed broadband levels under 90%.

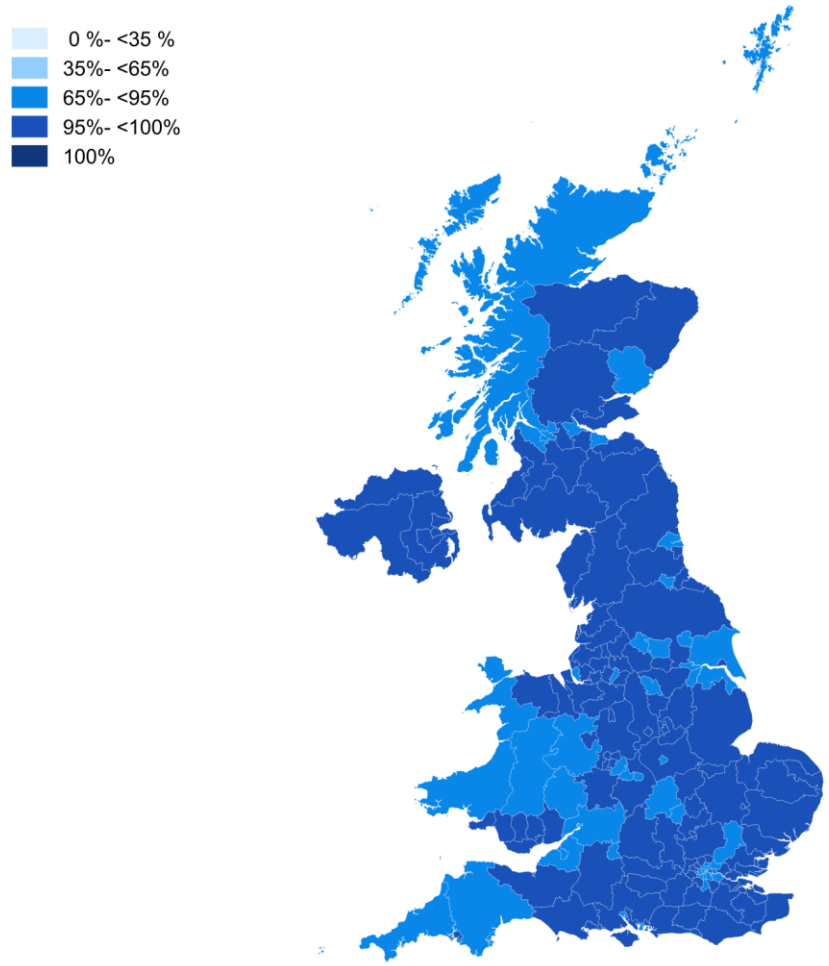
United Kingdom: Overall fixed broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

As in previous iterations of this study, regional NGA coverage remained varied. However, in this edition, the gap between regions has been narrowed further to 81.3-99.9% compared to 69.9%-99.7% in mid-2018.

United Kingdom: NGA broadband coverage, 2019



Source: Broadband Coverage in Europe 2019, a study by IHS Markit, Omdia and Point Topic for the European Commission

5.31.4 Data tables for the United Kingdom

Statistic	National
Population	65,808,573
Persons per household	2.1
Rural proportion	8.6%

	UK 2019		UK 2018		UK 2017		EU28 2019	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	97.0%	89.7%	96.9%	86.2%	97.6%	85.6%	91.2%	81.4%
VDSL	90.2%	88.1%	89.7%	86.6%	88.4%	82.9%	59.2%	41.8%
VDSL 2 Vectoring	12.3%	4.5%	-	-	-	-	28.2%	11.3%
FTTP	10.0%	5.9%	3.8%	5.9%	3.0%	4.3%	33.5%	17.5%
Cable modem DOCSIS 3.0	50.3%	3.1%	50.1%	3.1%	46.4%	2.2%	45.5%	10.8%
DOCSIS 3.1	0.0%	0.0%	-	-	-	-	19.2%	4.1%
FWA	5.7%	3.7%	-	-	-	-	49.1%	41.7%
LTE	99.9%	99.3%	99.9%	99.3%	99.5%	95.4%	99.4%	98.2%
LTE average operator coverage (DESI indicator)	98.8%	-	97.8%	-	97.5%	-	96.5%	-
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	100.0%	100.0%	100.0%	100.0%	99.9%	100.0%	97.1%	89.7%
NGA broadband	96.0%	92.7%	95.1%	90.3%	94.1%	85.8%	85.8%	59.3%
Very High Capacity Networks	10.0%	5.9%	52.5%	10.7%	48.3%	6.1%	44.0%	20.1%
At least 2 Mbps	99.2%	-	99.2%	-	99.1%	-	95.7%	-
At least 30 Mbps	94.9%	-	93.0%	-	91.8%	-	83.3%	-
At least 100 Mbps	57.0%	-	48.0%	-	47.0%	-	68.4%	-
At least 1 Gbps	0.0%	-	-	-	-	-	32.4%	-

Note: The 2019 figures represent state of broadband coverage as of end of June 2019. The 2018 (end of June) and 2017 (end of June) figures are drawn from the previous studies conducted by IHS Markit and Point Topic.

All restatements are highlighted in italics.

6.0 Appendices

6.1 Broadband coverage definitions

6.1.1 Technology definitions

The table below indicates the definitions of the individual broadband access technologies studied by this project. These definitions were included in the survey questionnaire.

Please note that the definitions are not designed to be rigorous definitions from an engineering point of view, but rather are intended to reflect practical definitions used by NRAs and ISPs.

Technology	Technology definition
DSL	DSL (for Digital Subscriber Line) is the basic technology used to provide broadband over conventional telephone lines. The types of DSL used for standard fixed broadband (mainly ADSL or ADSL2+) deliver download speeds of at least 2 Mbps. Not all DSL connections are capable of download speeds of 2Mbps and higher, these connections should not be reported in the survey, but we ask you to note this fact in STEP 4 - Technology definitions of the survey.
VDSL	VDSL (also called FTTC+VDSL for example) is a "Very-high-speed" version of DSL. VDSL is usually provisioned from a street cabinet which has fibre backhaul or directly from the telephone exchange in areas which are close to the exchange. Actual VDSL download speeds can vary and we ask you to note the typical VDSL connection speeds in STEP 4 - Technology definitions of the survey. This definition does not include implementations where fibre is provisioned to a large building, such as a block of flats, and the final connections are provided by VDSL within the building, which are defined as FTTP.
VDSL 2 Vectoring	VDSL 2 Vectoring is a solution that eliminates crosstalk between all the lines that terminate on a single DSLAM leading to an improved performance VDSL 2 lines and having the effect of as much as doubling VDSL2 speeds on very short lines (approx. 500m from the street cabinet or node).
FTTP	FTTP (fibre-to-the-premises) is broadband provided over fibre optic cables going all the way to the home or business premises. This definition also includes "FTTB", where fibre terminates at a large building and broadband distribution within the building, to different flats for example, is by a different non-fibre technology such as VDSL.
Cable modem DOCSIS 3.0	DOCSIS 3.0 broadband is delivered over a fixed cable TV network using coaxial cable according to the DOCSIS 3.0 standard, providing download speeds of 30Mbps and above.
DOCSIS 3.1	DOCSIS 3.1 broadband is delivered over a fixed cable TV network using coaxial cable according to the DOCSIS 3.1 standard, providing download speeds of 100Mbps and above.
FWA	Fixed Wireless Access is a wireless service using one of the IEEE standards for Wi-Fi, WiMAX or 4G LTE-TDD.
LTE	LTE (Long Term Evolution) is the next-generation mobile service standardised by the 3rd Generation Partnership Project and which supports peak downstream speeds of up to 100Mbps (LTE) and up to 1Gbps (LTE-Advanced).

6.1.2 Coverage definitions

The definitions included in the table below were used to determine whether households are within the coverage reach of the individual broadband technologies. These definitions were included in the survey questionnaire.

Please note that the definitions are not designed to be rigorous definitions from an engineering point of view, but rather are intended to reflect practical definitions used by NRAs and ISPs.

Technology	Coverage definition
DSL	A household has DSL coverage if it is a telephone exchange area fully enabled for DSL.
VDSL	A household has VDSL coverage if it is close enough to a VDSL-enabled cabinet or exchange to get a high-speed broadband signal.
VDSL 2 Vectoring	A household has VDSL 2 vectoring coverage if it is close enough to a VDSL2-enabled cabinet or exchange and vectoring solution is applied to receive at least 100Mbps download speed.
FTTP	A household has FTTP coverage if it can be connected now to a fibre service without requiring the construction of new fibre infrastructure and is available to be connected within reasonable time and cost limits.
Cable modem DOCSIS 3.0	A household has DOCSIS 3.0 coverage if it can be connected now to a DOCSIS service without requiring the construction of new cable TV network infrastructure and is available to be connected within reasonable time and cost limits.
DOCSIS 3.1	A household has DOCSIS 3.1 coverage if it can be connected now to a DOCSIS service without requiring the construction of new cable TV network infrastructure and is available to be connected within reasonable time and cost limits.
FWA	A household has FWA coverage for broadband if it can receive at least 2Mbps downstream from an existing service without requiring the construction of new FWA infrastructure and is available to be connected within reasonable time and cost limits.
LTE	A household has LTE coverage if it is in the stated coverage area for at least one LTE mobile network.
LTE Average operator coverage	A simple average of LTE coverage of all mobile network operators active in a study country.

6.2 Broadband coverage data tables

6.2.1 Total and rural coverage by combination categories for each country

	TOTAL			RURAL		
	Overall fixed broadband coverage*	Overall NGA coverage **	Overall VHCN coverage ***	Overall fixed broadband coverage*	Overall NGA coverage**	Overall VHCN coverage ***
AT	99.3%	84.0%	13.8%	98.0%	68.4%	10.0%
BE	100.0%	99.1%	66.5%	99.9%	97.5%	9.3%
BG	95.6%	77.1%	42.0%	85.2%	28.4%	1.3%
HR	99.9%	85.6%	43.2%	99.4%	34.5%	9.5%
CY	100.0%	100.0%	10.1%	100.0%	100.0%	2.8%
CZ	97.4%	92.1%	29.3%	94.0%	64.2%	5.9%
DK	99.0%	96.0%	93.0%	96.0%	76.7%	69.2%
EE	90.9%	83.7%	57.4%	77.0%	62.4%	19.8%
FI	90.5%	75.4%	58.2%	84.1%	9.1%	9.1%
FR	100.0%	62.1%	43.8%	100.0%	47.5%	11.9%
DE	98.6%	92.2%	32.7%	92.8%	74.6%	10.3%
EL	99.5%	80.6%	7.1%	98.1%	40.1%	0.0%
HU	95.5%	89.6%	42.6%	94.6%	77.7%	28.9%
IS	99.5%	96.9%	82.0%	93.5%	56.9%	54.7%
IE	97.8%	96.0%	20.8%	95.4%	89.0%	3.8%
IT	99.6%	88.9%	30.0%	97.3%	68.4%	2.1%
LT	85.1%	69.4%	61.0%	77.0%	28.7%	22.5%
LV	94.0%	93.1%	88.1%	82.8%	81.7%	73.2%
LU	100.0%	97.8%	92.0%	100.0%	92.0%	92.0%
MT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
NL	99.5%	98.3%	88.6%	98.9%	96.1%	71.2%
NO	98.6%	89.3%	71.4%	93.8%	59.7%	44.8%
PL	83.5%	75.9%	60.3%	62.2%	32.6%	18.7%
PT	94.9%	83.0%	83.0%	93.0%	69.4%	69.4%
RO	87.4%	82.0%	68.1%	79.3%	53.4%	39.1%
SK	89.7%	76.0%	46.5%	92.8%	45.3%	15.3%
SI	98.7%	86.9%	66.5%	95.5%	62.2%	39.5%
ES	95.6%	89.8%	89.0%	93.3%	58.7%	51.9%
SE	97.3%	85.1%	77.1%	80.5%	40.9%	40.6%
CH	99.8%	99.0%	80.4%	98.6%	93.8%	67.5%
UK	100.0%	96.0%	10.0%	100.0%	92.7%	5.9%
EU 28	97.1%	85.8%	44.0%	89.7%	59.3%	20.1%

* Fixed broadband coverage includes DSL, VDSL, VDSL 2 Vectoring, FTTP, Cable modem DOCSIS 3.0, DOCSIS 3.1, FWA
** NGA coverage includes VDSL, VDSL 2 Vectoring, FTTP, Cable modem DOCSIS 3.0, DOCSIS 3.1
*** VHCN coverage includes FTTP and DOCSIS 3.1

6.2.2 Total coverage by technology for each country

	DSL*	VDSL	VDSL 2 Vectoring	FTTP	DOCSIS 3.0**	DOCSIS 3.1	FWA	LTE	Satellite
AT	96.9%	82.0%	66.4%	13.8%	53.2%	0.0%	41.5%	99.6%	98.2%
BE	99.9%	95.5%	52.3%	3.6%	93.5%	65.6%	0.0%	100.0%	99.7%
BG	85.5%	8.8%	0.0%	42.0%	68.7%	0.0%	18.8%	99.5%	80.7%
HR	99.7%	80.8%	9.4%	31.0%	34.1%	32.5%	4.9%	99.3%	98.2%
CY	100.0%	100.0%	38.6%	10.1%	55.5%	0.0%	0.0%	99.6%	98.0%
CZ	94.9%	84.1%	83.3%	29.3%	41.1%	0.0%	62.1%	99.8%	99.6%
DK	94.2%	61.5%	15.7%	66.9%	68.4%	68.3%	7.9%	100.0%	100.0%
EE	69.2%	56.1%	5.3%	57.4%	67.4%	0.0%	5.8%	99.4%	97.9%
FI	81.0%	48.6%	41.8%	33.5%	33.8%	33.8%	0.0%	100.0%	99.1%
FR	100.0%	19.7%	0.0%	43.8%	27.0%	0.0%	84.6%	99.5%	98.6%
DE	97.9%	86.6%	65.4%	10.5%	66.3%	29.3%	88.7%	98.6%	93.7%
EL	98.9%	74.2%	48.7%	7.1%	0.5%	0.0%	0.9%	99.1%	97.0%
HU	87.4%	50.7%	0.0%	42.6%	74.5%	0.0%	0.0%	99.2%	96.8%
IS	97.4%	90.5%	67.6%	80.4%	0.3%	0.3%	2.2%	99.9%	99.6%
IE	93.3%	92.1%	0.0%	20.8%	49.2%	0.0%	29.7%	99.0%	98.7%
IT	99.6%	88.9%	55.8%	30.0%	0.0%	0.0%	72.9%	98.9%	97.1%
LT	67.9%	3.0%	0.0%	61.0%	17.9%	0.0%	19.0%	100.0%	99.8%
LV	40.5%	19.1%	0.0%	88.1%	30.1%	0.0%	100.0%	100.0%	99.3%
LU	83.4%	75.5%	52.9%	67.5%	83.9%	83.9%	0.0%	99.8%	98.0%
MT	100.0%	72.0%	0.0%	39.2%	100.0%	100.0%	100.0%	100.0%	100.0%
NL	69.4%	64.3%	10.8%	34.4%	95.2%	77.0%	86.7%	99.4%	99.3%
NO	97.8%	67.6%	0.0%	78.1%	53.6%	0.0%	0.0%	99.9%	99.9%
PL	65.4%	37.2%	29.3%	38.3%	44.1%	42.0%	13.4%	99.9%	99.2%
PT	85.4%	0.0%	0.0%	76.6%	59.5%	59.5%	0.0%	99.7%	95.9%
RO	56.7%	9.2%	0.0%	68.1%	42.8%	0.0%	56.1%	99.1%	85.4%
SK	63.1%	49.6%	0.0%	44.3%	34.8%	11.2%	78.1%	98.4%	88.8%
SI	95.9%	56.2%	0.0%	66.5%	57.6%	0.0%	33.7%	99.7%	98.8%
ES	89.8%	11.8%	0.0%	80.4%	48.9%	48.9%	35.7%	99.8%	95.1%
SE	87.5%	20.8%	0.0%	77.1%	35.7%	0.3%	0.2%	100.0%	96.8%
CH	91.9%	83.5%	80.2%	40.9%	84.4%	71.7%	0.0%	99.9%	98.6%
UK	97.0%	90.2%	12.3%	10.0%	50.3%	0.0%	5.7%	99.9%	98.8%
EU 28	91.2%	59.2%	28.2%	33.5%	45.5%	19.2%	49.1%	99.4%	96.5%

* DSL figures include VDSL and VDSL 2 Vectoring coverage
** Cable modem DOCSIS 3.0 figures include DOCSIS 3.1 coverage

6.2.3 Rural coverage by technology for each country

	DSL*	VDSL	VDSL 2 Vectoring	FTTP	DOCSIS 3.0**	DOCSIS 3.1	FWA	LTE	Satellite
AT	96.7%	39.5%	13.3%	10.0%	20.4%	0.1%	28.9%	96.6%	100.0%
BE	99.8%	94.0%	36.6%	0.1%	43.0%	9.1%	0.0%	100.0%	100.0%
BG	75.8%	3.7%	0.0%	1.3%	25.5%	0.0%	9.8%	97.3%	100.0%
HR	98.9%	20.7%	1.8%	6.3%	15.5%	4.8%	6.0%	97.0%	100.0%
CY	100.0%	100.0%	15.0%	2.8%	0.0%	0.0%	0.0%	96.6%	100.0%
CZ	87.7%	59.9%	59.3%	5.9%	3.1%	0.0%	74.6%	99.8%	100.0%
DK	92.4%	17.4%	4.4%	65.8%	5.9%	5.8%	12.0%	100.0%	100.0%
EE	47.0%	35.3%	5.3%	19.8%	23.5%	0.0%	5.9%	99.5%	75.4%
FI	81.7%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	99.9%	100.0%
FR	99.9%	40.8%	0.0%	11.9%	0.7%	0.0%	83.3%	99.8%	100.0%
DE	91.3%	69.3%	41.0%	5.6%	16.9%	4.7%	85.1%	96.7%	100.0%
EL	96.4%	40.1%	7.7%	0.0%	0.0%	0.0%	4.5%	95.8%	100.0%
HU	87.9%	43.6%	0.0%	28.9%	47.1%	0.0%	0.0%	97.7%	100.0%
IS	68.1%	24.4%	7.5%	54.7%	0.0%	0.0%	20.6%	99.1%	0.0%
IE	89.0%	86.3%	0.0%	3.8%	3.7%	0.0%	17.6%	97.0%	100.0%
IT	97.3%	68.4%	11.6%	2.1%	0.0%	0.0%	41.0%	95.0%	100.0%
LT	51.6%	0.9%	0.0%	22.5%	9.8%	0.0%	29.2%	99.9%	100.0%
LV	27.0%	20.3%	0.0%	73.2%	0.0%	0.0%	99.8%	99.8%	100.0%
LU	83.0%	75.5%	15.0%	62.4%	33.0%	33.0%	0.0%	99.6%	100.0%
MT	100.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%
NL	74.2%	65.5%	4.4%	26.4%	74.0%	59.4%	17.5%	99.3%	100.0%
NO	87.6%	26.7%	0.0%	44.8%	2.9%	0.0%	0.0%	99.9%	92.7%
PL	45.7%	17.7%	17.3%	17.9%	1.5%	1.4%	14.3%	99.9%	100.0%
PT	79.3%	0.0%	0.0%	49.1%	43.5%	43.5%	0.0%	98.2%	100.0%
RO	58.6%	2.1%	0.0%	39.1%	24.8%	0.0%	24.5%	97.7%	100.0%
SK	61.0%	37.0%	0.0%	15.3%	1.2%	0.0%	85.8%	94.4%	100.0%
SI	86.9%	22.1%	0.0%	39.5%	19.7%	0.0%	28.9%	98.8%	100.0%
ES	84.1%	15.1%	0.0%	46.4%	11.2%	11.2%	62.9%	98.8%	100.0%
SE	63.9%	0.6%	0.0%	40.6%	0.3%	0.0%	0.3%	100.0%	100.0%
CH	96.4%	42.7%	37.4%	8.6%	79.8%	63.0%	0.0%	99.8%	99.7%
UK	89.7%	88.1%	4.5%	5.9%	3.1%	0.0%	3.7%	99.3%	100.0%
EU 28	81.4%	41.8%	11.3%	17.5%	10.8%	4.1%	41.7%	98.2%	99.9%

* DSL figures include VDSL and VDSL 2 Vectoring coverage
** Cable modem DOCSIS 3.0 figures include DOCSIS 3.1 coverage

6.2.4 Broadband coverage by speed category for each country

	Broadband coverage (>2Mbps)	Broadband coverage (>30Mbps)	Broadband coverage (>100Mbps)	Broadband coverage (>1Gbps)
AT	99.2%	84.2%	65.2%	13.8%
BE	99.9%	98.3%	96.5%	49.2%
BG	95.3%	79.8%	32.6%	6.5%
HR	99.9%	85.6%	43.6%	5.9%
CY	100.0%	100.0%	71.0%	10.1%
CZ	97.4%	92.1%	75.0%	2.4%
DK	99.3%	96.4%	94.3%	80.3%
EE	85.1%	83.7%	74.3%	28.7%
FI	93.0%	73.0%	58.0%	35.0%
FR	99.7%	62.0%	50.3%	46.6%
DE	98.5%	92.2%	81.8%	34.1%
EL	99.5%	79.7%	41.6%	7.0%
HU	95.8%	86.2%	79.0%	33.1%
IS	96.6%	95.6%	83.3%	77.0%
IE	96.9%	89.7%	59.1%	9.4%
IT	96.1%	77.5%	61.0%	30.0%
LT	85.1%	63.6%	61.2%	60.9%
LV	93.6%	92.8%	89.6%	0.0%
LU	100.0%	97.8%	94.6%	67.5%
MT	100.0%	100.0%	100.0%	100.0%
NL	99.5%	98.3%	95.8%	10.2%
NO	100.0%	89.3%	85.7%	54.2%
PL	69.3%	59.6%	51.3%	24.4%
PT	91.6%	83.0%	76.6%	70.5%
RO	93.9%	83.9%	77.7%	0.0%
SK	89.7%	74.8%	58.3%	19.8%
SI	98.8%	86.9%	80.9%	2.0%
ES	95.6%	91.0%	89.0%	89.0%
SE	97.3%	85.1%	82.2%	77.1%
CH	99.8%	99.8%	98.6%	40.3%
UK	99.2%	94.9%	57.0%	0.0%
EU 28	95.7%	83.3%	68.4%	32.4%

6.2.4 Average operator LTE coverage for each country

	Average operator LTE coverage
AT	98.2%
BE	99.7%
BG	80.7%
HR	98.2%
CY	98.0%
CZ	99.6%
DK	100.0%
EE	97.9%
FI	99.1%
FR	98.6%
DE	93.7%
EL	97.0%
HU	96.8%
IS	99.6%
IE	98.7%
IT	97.1%
LV	99.8%
LT	99.3%
LU	98.0%
MT	100.0%
NL	99.3%
NO	99.9%
PL	99.2%
PT	95.9%
RO	85.4%
SK	88.8%
SI	98.8%
ES	95.1%
SE	96.8%
CH	98.6%
UK	98.8%
EU 28	96.5%

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