

Broadband Coverage in Europe 2021

Mapping progress towards the coverage
objectives of the Digital Decade

FINAL REPORT

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



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Abstract

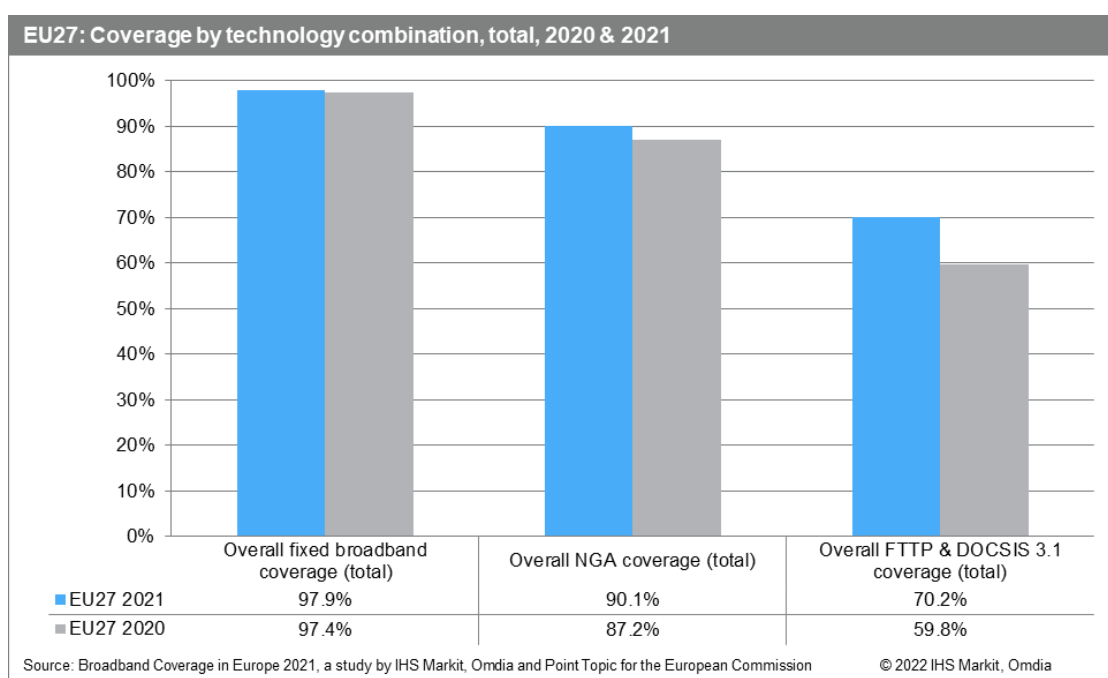
The Broadband Coverage in Europe study is designed to monitor the progress of EU Member States towards their specific broadband coverage objectives – namely: ‘Universal Broadband Coverage with speeds at least 100Mbps, upgradable to gigabit speed, by 2025’ and ‘Gigabit connectivity for all by 2030’. This report covers thirty-one countries across Europe – the EU27, plus Norway, Iceland, Switzerland and the UK, and analyses the availability of ten broadband technologies (DSL, VDSL, VDSL2 Vectoring, cable modem DOCSIS 3.0, DOCSIS 3.1, FTTP, FWA, LTE, 5G 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 FTTP & 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 États membres de l'UE vers leurs objectifs spécifiques en matière de couverture haut-débit – à savoir « une couverture universelle en haut débit avec une transmission d'au moins 100 Mb/s, pouvant être améliorée pour atteindre le très haut débit (1Gb/s) d'ici 2025 » et « la couverture par un réseau très haut-débit de tous les ménages européens d'ici 2030 ». Ce rapport étudie trente-et-un pays en Europe (l'UE-27 ainsi que la Norvège, l'Islande, la Suisse et le Royaume-Uni), et analyse la disponibilité de dix technologies haut débit (DSL, VDSL, VDSL2 Vectoring, modem câble DOCSIS 3.0, DOCSIS 3.1, FTTP, FWA, LTE, 5G et satellite) sur chacun des marchés, à la fois au niveau national et dans les zones rurales. De plus, diverses catégories et combinaisons indiquant la disponibilité d'une ou plusieurs formes de connexion haut débit sont publiées. Celles-ci comprennent la disponibilité globale du haut débit fixe, la disponibilité de l'Accès à une Nouvelle Génération (ANG) et la disponibilité globale des réseaux 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 les évolutions d'une année à l'autre. De plus, le développement de la couverture haut débit dans les différents pays étudiés est abordé de façon individuelle dans des chapitres dédiés.

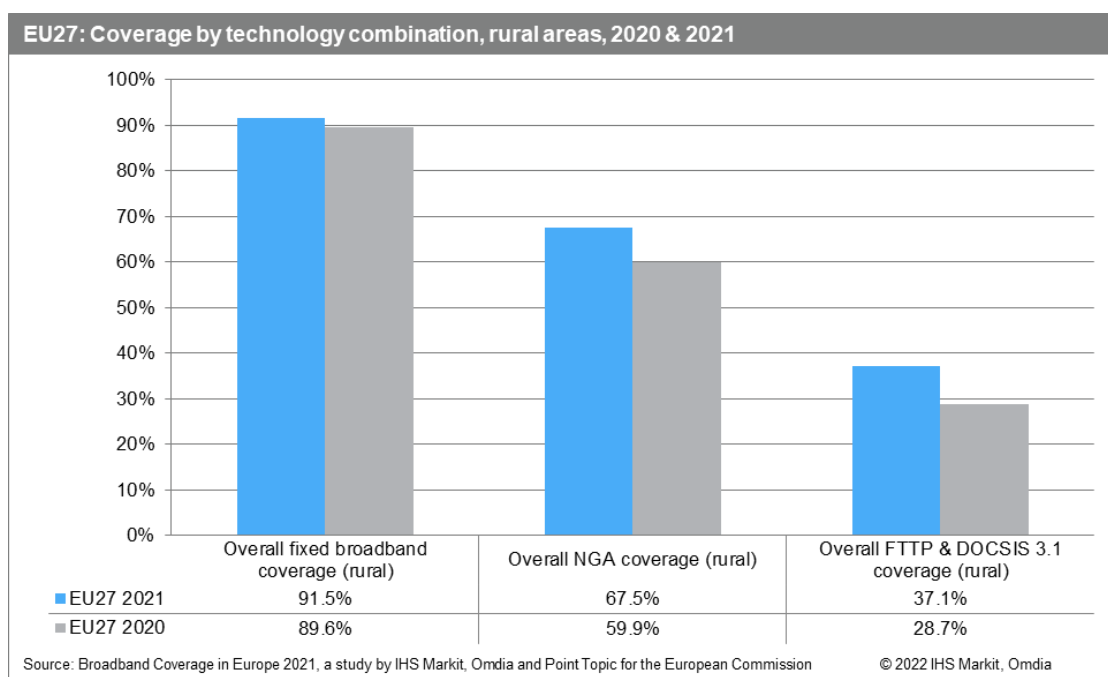
Executive Summary

- 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 Gigabit Society and Digital Decade targets – namely: ‘Universal connectivity offering a download speed of at least 100Mbps, upgradable to Gigabit speed by 2025’ and ‘Gigabit connectivity for all by 2030’.
- 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 2021 compared to the situation at the end of June 2020. For the 2021 edition, the research team reviewed the technologies and combination coverage categories included in the study and upon discussion with DG CONNECT, excluded the ‘At least 2Mbps’ speed category as all countries were reporting universal or near-universal availability. A new speed category monitoring ‘At least 1Gbps upload and download’ speed category was added instead.
- This report covers 31 countries across Europe – the EU27, plus Norway, Iceland, Switzerland, and the UK and analyses the availability of ten broadband access technologies (DSL, VDSL, VDSL2 Vectoring, cable modem DOCSIS 3.0, cable modem DOCSIS 3.1, FTTP, FWA, LTE, 5G 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 overall FTTP & DOCSIS 3.1 availability.
- Following the completion of Brexit in 2020, the UK was kept among the study countries but was excluded from the EU totals calculations shown in this report. However, the accompanying data tool includes totals for both EU27 as well as EU28 for comparison purposes.



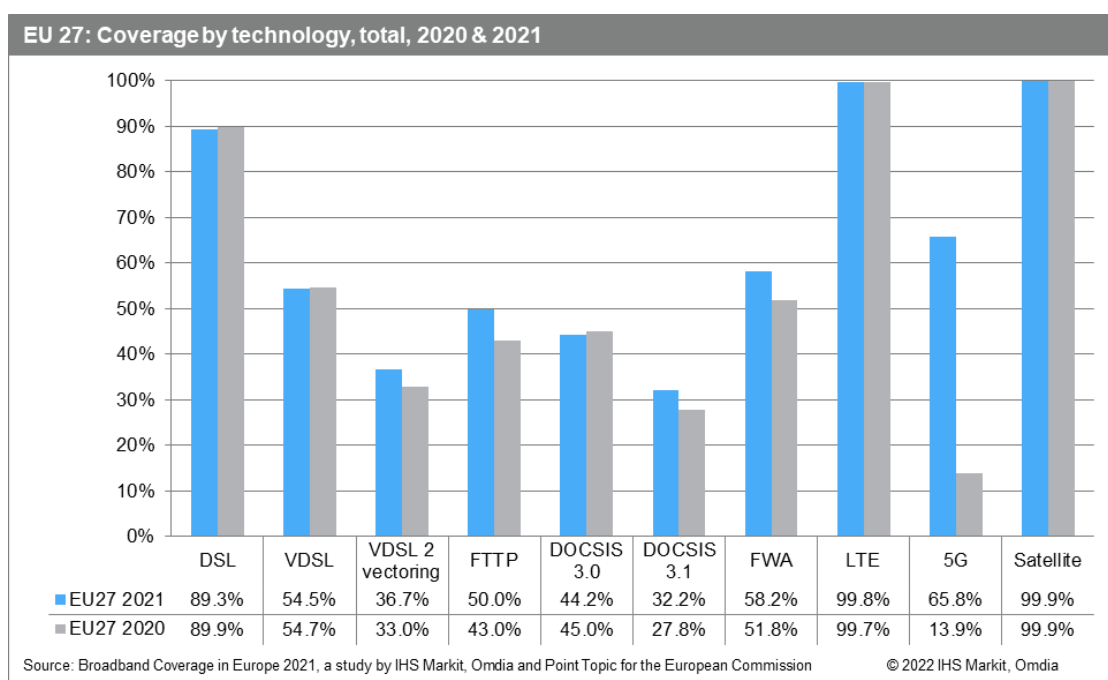
- The collected data show that more than 188 million EU households (97.9%) had access to at least one of the main fixed broadband access technologies at the end of June 2021 and over 1.2 million additional households gained access to fixed broadband services compared to the end of June 2020.

- By mid-2021, the availability of next generation access services (VDSL, VDSL2 Vectoring, DOCSIS 3.0, DOCSIS 3.1 and FTTP) services in the EU reached 90.1% households. This equates to a 2.9 percentage point increase, or 5.9 million additional households, compared to the end of June 2020. In total, 173 million households had access to next generation broadband in mid-2021.
- At the end of June 2021, 70.2% of EU homes were passed by either FTTP or cable DOCSIS 3.1 networks, i.e. those technologies currently capable of supporting gigabit speeds. This metric was first introduced in 2019 under the name Very High Capacity Networks (VHCN) coverage. Compared to mid-2020, combined coverage of FTTP & DOCSIS 3.1 networks grew significantly, increasing by 10.4 percentage points. This increase can be attributed both to the continued progress in FTTP deployments as well as to ramped up efforts of European cable operators to upgrade their networks to the DOCSIS 3.1 standard in the twelve months leading to the end of June 2021.
- Rural broadband coverage continued to be lower than national coverage across EU Member States. In mid-2021, 91.5% of rural EU homes were passed by at least one fixed broadband technology and more than two thirds (67.5%) 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 2.2 million additional rural households having access to NGA broadband services compared to the end of June 2020.



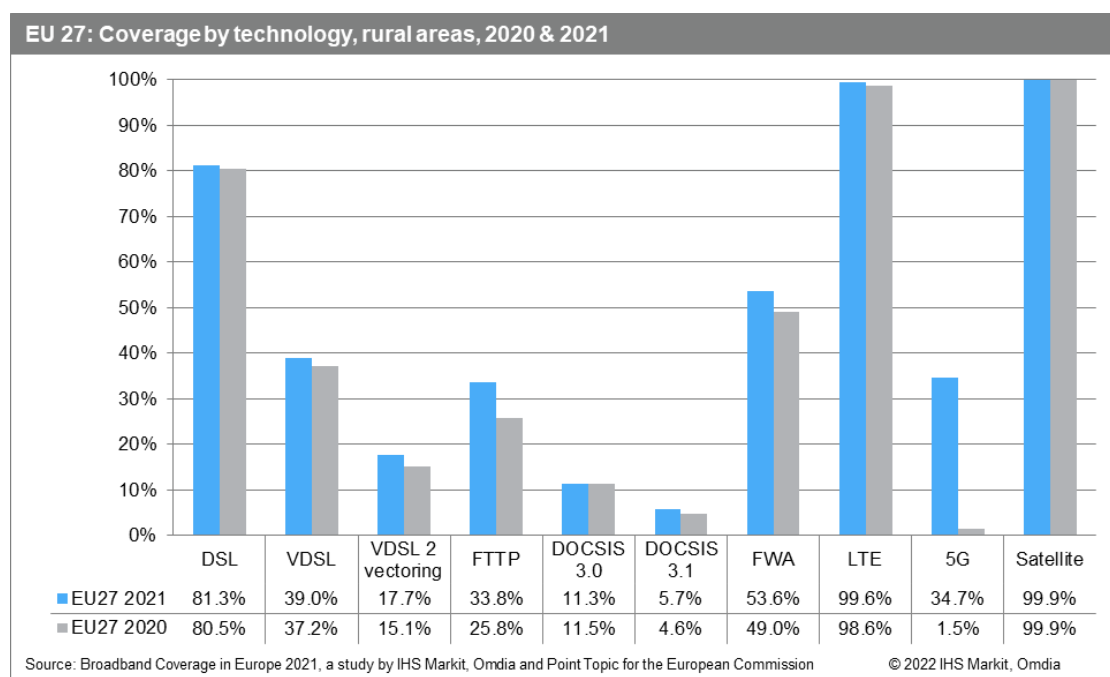
- Satellite broadband remained the most pervasive technology in Europe in terms of overall coverage. However, satellite coverage is still limited in Estonia and is absent in Iceland.
- In mid-2021, DSL remained the dominant fixed access technology in the EU27, passing 89.3% of homes. This equates to a decline of 0.5 percentage points compared to mid-2020, as new DSL deployments are limited and exceeded by total household growth. Moreover, in several countries legacy copper networks are being decommissioned and replaced by FTTP networks, thus further contributing to the over decrease in DSL coverage.
- At the end of June 2021, VDSL services were available to 54.5% of EU households, a marginal decrease of 0.2 percentage points during the twelve-month period. While VDSL remained the most pervasive NGA technology in the EU27, its reach appears to have peaked. VDSL coverage growth has been decreasing since 2018 as operators have begun to divert investments towards more advanced technologies (especially FTTP) in pursuit of the Digital Decade targets.
- Availability of VDSL2 Vectoring reached over a third (36.7%) of EU households, a 3.7 percentage point increase compared to mid-2020. This technology was tracked for the first time in 2019 to indicate coverage of higher-capacity bandwidth services offered via legacy copper networks and typically providing download speeds higher than 100Mbps.

- FTTP availability continued to grow at an increasing rate compared to previous years, rising by 7.0 percentage points to pass half (50.0%) of EU homes at the end of June 2021. FTTP was the fastest growing broadband technology and for the first time FTTP coverage level took over that of cable modem DOCSIS 3.0.
- By mid-2021, 44.2% of EU households had access to high-speed cable broadband services and 32.2% of EU homes were passed by cable networks upgraded to the DOCSIS 3.1 standard, which is capable of delivering gigabit broadband connections. While cable DOCSIS 3.0 coverage decreased marginally due to lack of new cable network deployments, DOCSIS 3.1 increased by 4.4 percentage points year-on-year.
- By the end of June 2021, nearly all EU households (99.8%) were covered by LTE mobile networks. 5G coverage made significant progress in the twelve months to mid-2021 and official data on 5G coverage is now available in many countries. Following a staggering 51.8 percentage point increase compared to mid-2020, 5G services were available to 65.8% of EU households. This growth can be mainly attributed to the introduction of dynamic spectrum sharing (DSS), which has been deployed by leading European mobile network operators.

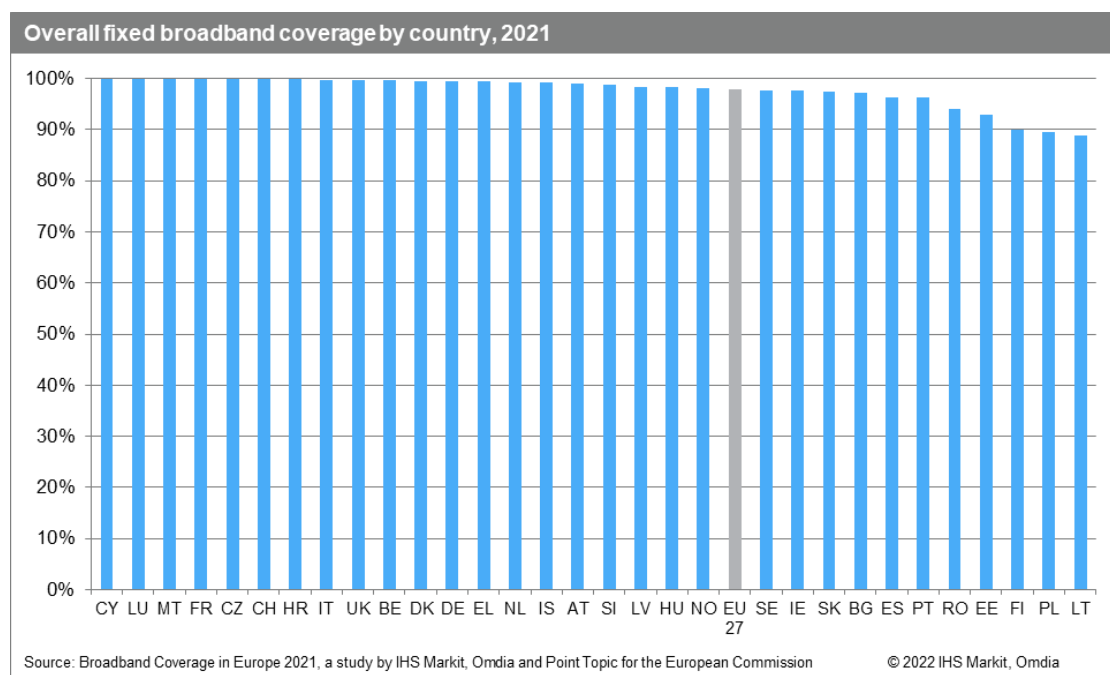


- Examining rural broadband coverage, there was a difference of 6.4 percentage points between the availability of fixed broadband services at a total level (97.9%) and at a rural level (91.5%). The gap was much wider in terms of NGA technologies, as NGA networks passed 67.5% of rural EU homes, 22.6 percentage points lower 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.
- In the twelve months to the end of June 2021, FTTP coverage expanded more quickly than other fixed broadband technologies in rural areas. Rural FTTP availability increased by 8.0 percentage points, reaching a third (33.8%) of rural EU households. This significant increase indicates increased focus of many European operators on deploying FTTP networks even in traditionally less profitable rural areas.
- Rural VDSL coverage continued to increase, albeit at a slower pace than that recorded in previous years. By mid-2020, rural VDSL coverage increased by 1.8 percentage points and reached 39.0% of rural EU households. Growth in rural VDSL services highlights the continued efforts of particularly incumbent operators to upgrade existing DSL networks in rural areas.
- Examining mobile broadband technologies, the growth in availability of LTE networks continued to decelerate as LTE coverage reaches saturation: 99.6% of rural EU homes were passed by at least one LTE network at the end of June 2021. While 5G deployments were primarily focused on urban areas, in the twelve months to the end of June 2021 availability of 5G services in rural areas increased considerably thanks to the deployment of dynamic spectrum sharing (DSS),

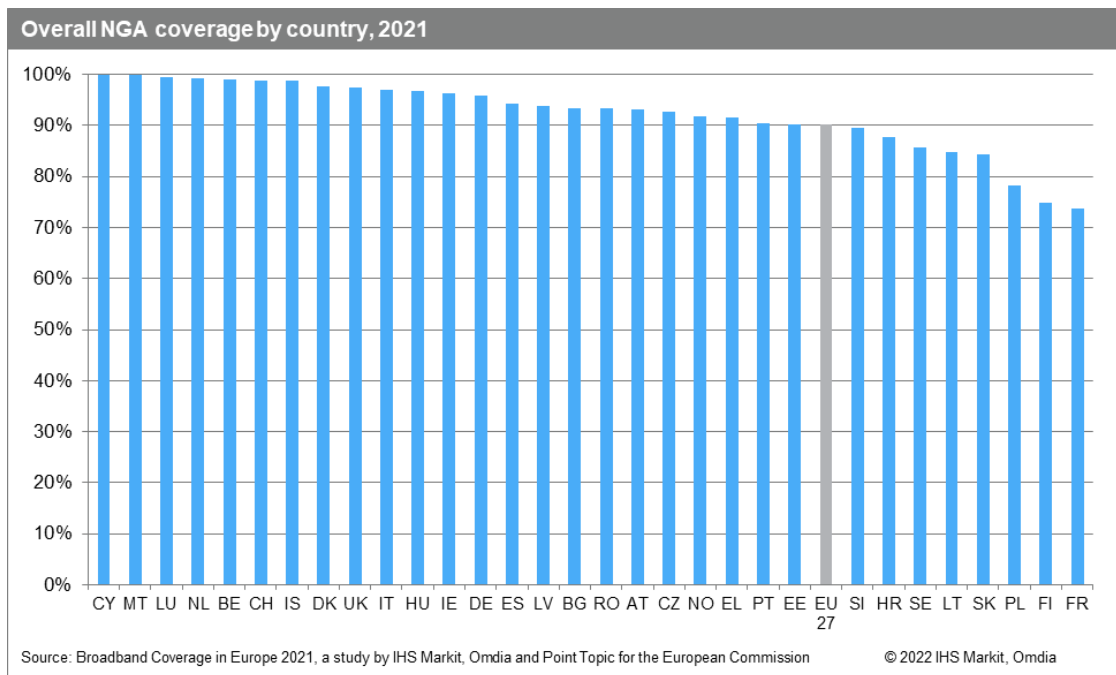
with more than a third (34.7%) of rural households being able to connect to 5G networks in mid-2021.



- Out of the 31 study countries, 26 countries registered fixed broadband coverage levels above 95%, while 20 countries had fixed broadband coverage above the EU27 average (97.9%). Several countries registered complete fixed broadband coverage including Cyprus, Luxembourg, and Malta. In three countries (Lithuania, Poland, and Finland), fixed broadband services were available to fewer than 90% of households.



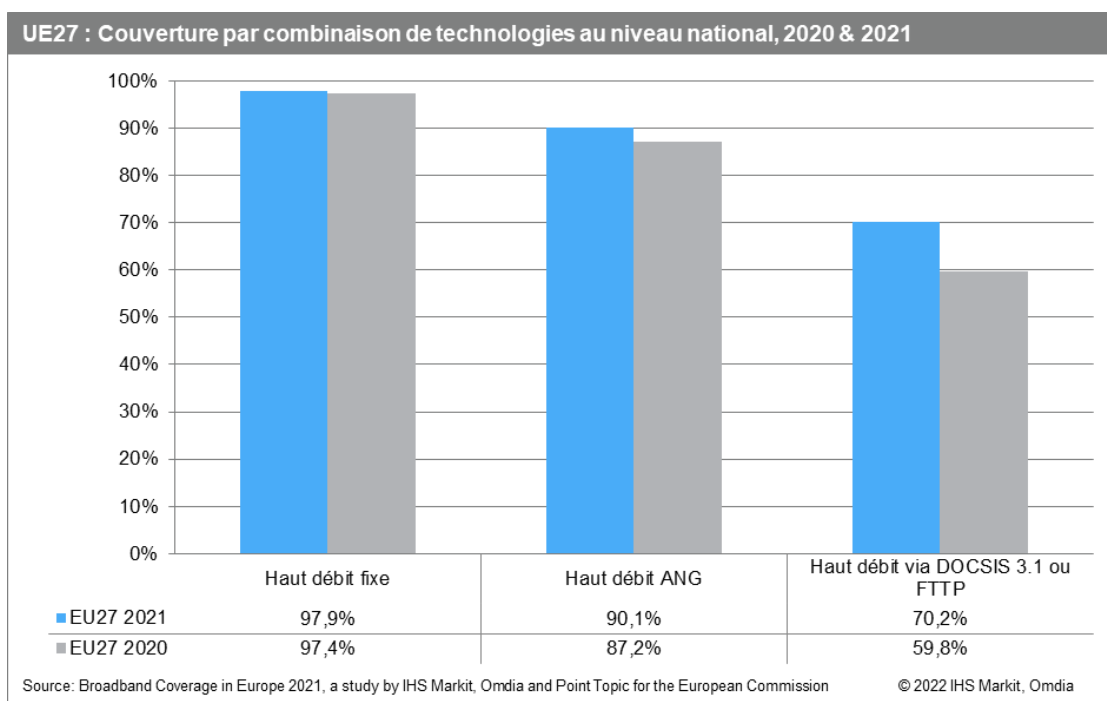
- Cyprus and Malta were the only two countries to report complete coverage for NGA technologies, while Luxembourg, the Netherlands, Belgium, Switzerland and Iceland recorded NGA coverage levels equal to or above 99%.
- Out of the 31 study countries, 23 countries reported NGA coverage above the EU27 average (90.1%). At 73.7% 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. By mid-2021, commercial 5G services were launched in 29 study countries, the only two countries where 5G networks were not deployed at the end of June 2021 were Latvia and Portugal.

Résumé

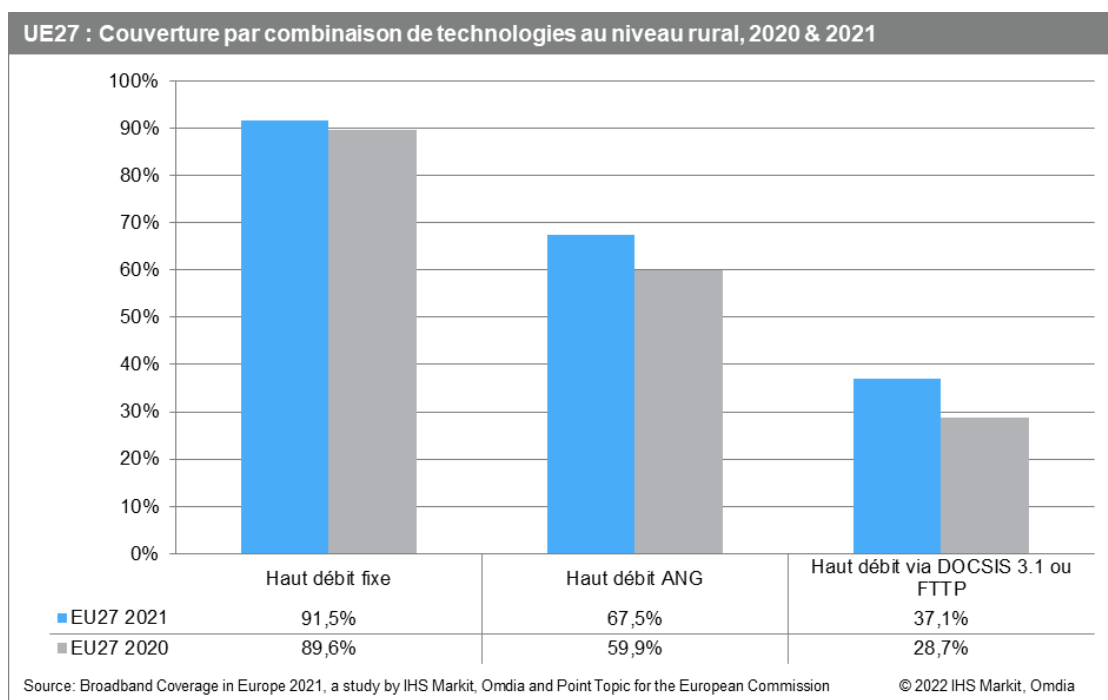
- L'étude sur la Couverture Haut Débit en Europe a été conçue pour suivre la progression des États membres de l'Union européenne (UE) vers les objectifs spécifiques de couverture du haut débit définis dans les agendas de la connectivité pour une société européenne du gigabit et de la décennie numérique, à savoir: « une couverture universelle en haut débit avec une transmission d'au moins 100 Mb/s, pouvant être améliorée pour attendre le très haut débit (1Gb/s) d'ici 2025 » et « la couverture par un réseau très haut-débit de tous les ménages européens d'ici 2030 »
- 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 trois 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 et l'analyse des évolutions temporelles.
- Les données recueillies reflètent la situation à la fin du mois de juin 2021, à comparer avec la situation fin juin 2020. Pour l'édition 2021, l'équipe de recherche a réévalué les technologies et les combinaisons de technologies incluses dans l'étude, et ont apporté deux changements, en accord avec l'équipe DG CONNECT. La catégorie de vitesse « au moins 2 Mb/s » a été supprimée, car tous les pays ont signalé une disponibilité universelle ou quasi universelle. Une nouvelle catégorie de vitesse « au moins 1 Gb/s de chargement et de téléchargement » a été ajoutée à la place.



- Ce rapport couvre trente-et-un pays à travers l'Europe, à savoir l'UE-27 ainsi que la Norvège, l'Islande, la Suisse et le Royaume-Uni, et analyse la disponibilité de dix technologies haut débit (DSL, VDSL, VDSL2 Vectoring, modem câble DOCSIS 3.0, modem câble DOCSIS 3.1, FTTP, FWA, LTE, 5G et satellite) sur chacun des marchés, au niveau national et dans les zones rurales. De plus, trois combinaisons 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 la disponibilité globale des réseaux FTTP et DOCSIS 3.1.
- Suite à la fin des négociations du Brexit en 2020, le Royaume-Uni a été conservé parmi les pays de l'étude, mais a été exclu des calculs totaux de l'UE présentés dans ce rapport.

Cependant, l'outil de données d'accompagnement comprend des totaux pour l'UE 27 et l'UE 28 à des fins de comparaison.

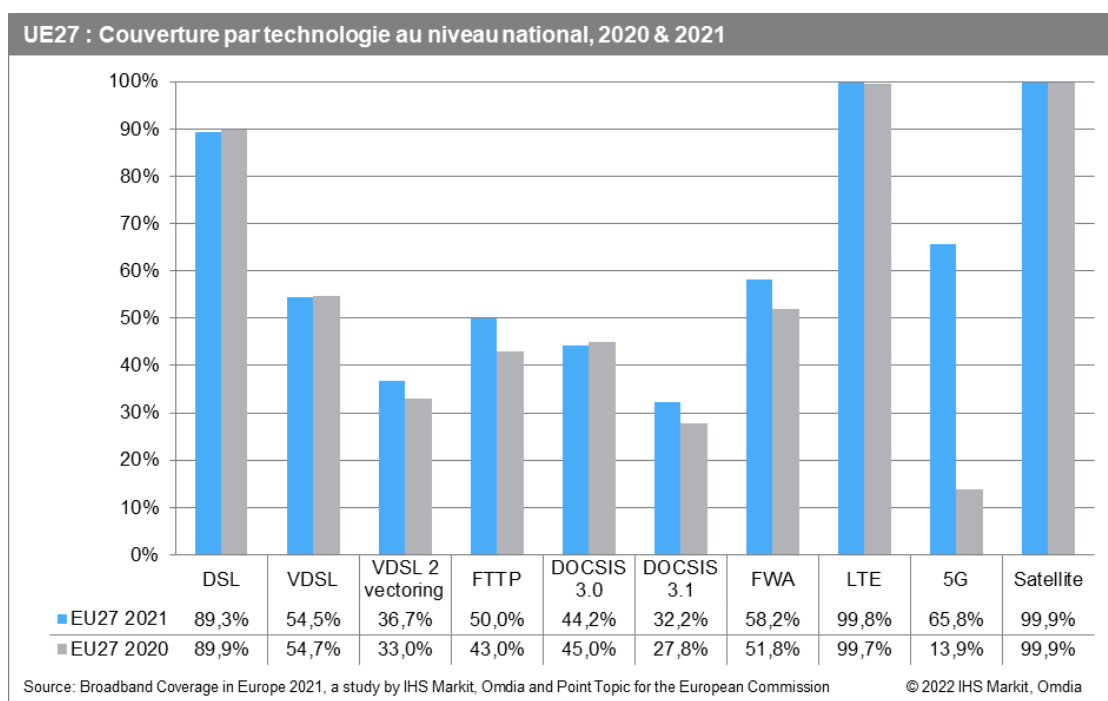
- Les résultats de l'enquête montrent que plus de 188 millions de ménages de l'UE (97,9%) avaient accès à au moins une des principales technologies haut débit fixe en juin 2021, soit 1,2 million de ménages supplémentaires par rapport à la fin juin 2020.
- A la mi-2021, la couverture en services d'accès nouvelle génération (VDSL, VDSL2 Vectoring, DOCSIS 3.0, DOCSIS 3.1 et FTTP) atteignait 90,1% des ménages européens. Cela représente une hausse de 2,9 points de pourcentage, soit 5,9 millions de ménages supplémentaires par rapport à la fin juin 2020. Au total, 173 millions de ménages avaient accès au haut débit de nouvelle génération à la mi-2021.
- A la fin juin 2021, 70,2% des foyers de l'UE étaient couverts par des réseaux modem câble DOCSIS 3.1 ou FTTP, c'est-à-dire les technologies actuellement capables d'offrir des débits atteignant le gigabit. Cette évaluation a été introduite en 2019 sous le nom de couverture des réseaux à très haute capacité (RTHC). Par rapport à la mi-2020, la couverture combinée des réseaux FTTP et DOCSIS 3.1 a considérablement augmenté, par 10,4 points de pourcentage. Cette augmentation peut être attribuée à la fois aux progrès continus des déploiements FTTP et à l'intensification des efforts des câblo-opérateurs européens pour mettre leurs réseaux au niveau de la norme DOCSIS 3.1 dans les douze mois précédant la fin juin 2021.
- La couverture en haut débit des zones rurales reste inférieure à la couverture au niveau national dans l'ensemble des Etats membres de l'UE. A la mi-2021, 91,5% des foyers ruraux étaient couverts par au moins une technologie de haut débit fixe, et plus des deux tiers (67,5%) avaient accès aux services très haut débit de nouvelle génération. La couverture des zones rurales par les ANG a continué de croître, augmentant de 7,6 points de pourcentage, soit près de 2,2 millions de foyers supplémentaires comparé à la fin juin 2020.



- 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-2021, la connexion par modem DSL continue d'être la technologie de haut débit fixe la plus répandue dans l'UE27, couvrant 89,3% des ménages européens. Cela représente une diminution de 0,5 points de pourcentage comparé à mi-2020, en raison des déploiements limités de nouveaux réseaux DSL, rattrapés par la croissance totale des ménages. De plus, dans plusieurs pays, les anciens réseaux de cuivre sont mis hors service et remplacés par des réseaux FTTP, contribuant ainsi à la diminution de la couverture DSL.
- A la fin juin 2021, la technologie VDSL couvrait 54,5% des ménages européens, soit un léger déclin de 0,2 points de pourcentage au cours de la période de douze mois. Alors que le VDSL restait la technologie ANG la plus répandue au sein de l'UE27, sa portée semble avoir atteint sa limite. La croissance de la couverture VDSL diminue depuis 2018, les opérateurs ayant

commencé à réorienter leurs investissements vers des technologies plus avancées (en particulier le FTTP) dans le cadre de l'agenda de la décennie numérique.

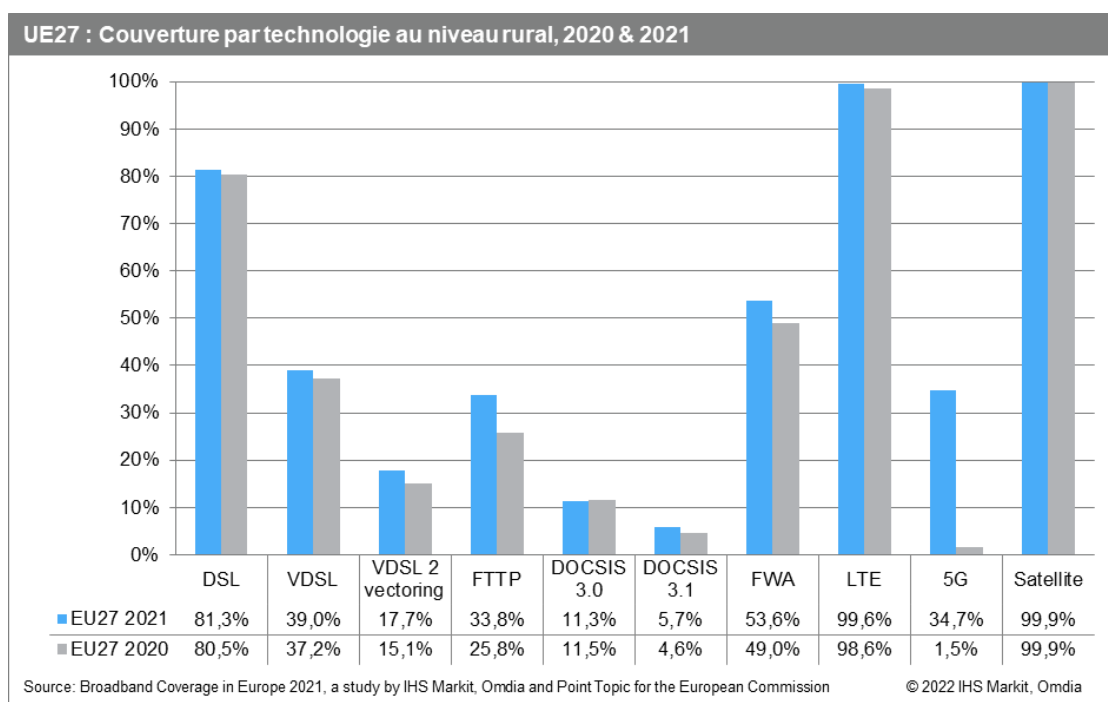
- La technologie du VDSL2 Vectoring a été disponible pour plus d'un tiers (36,7%) des foyers de l'UE fin juin 2021, soit une augmentation de 3,7 points de pourcentage par rapport l'année précédente. Cette technologie a été mesurée pour la première fois en 2019 pour indiquer la couverture des services bande passante à plus grande capacité, offerts via l'héritage réseaux cuivre et offrant généralement des vitesses de téléchargement supérieures à 100 Mb/s.
- La disponibilité des réseaux FTTP a continué de croître à un rythme similaire à celui de l'année dernière, avec une hausse de 7,0 points de pourcentage, pour atteindre 50,0% des ménages européens couverts à la fin juin 2021. La vitesse de déploiement de la fibre FTTP reste la plus élevée de l'étude et pour la première fois, le niveau de couverture FTTP a pris le pas sur celui du modem câble DOCSIS 3.0
- A la mi-2021, 44,2% des foyers de l'Union européenne avaient accès à une connexion rapide via câble modem et 32,2% des foyers de l'UE étaient couverts par des réseaux câblés ayant été mis à jour au standard DOCSIS 3.1, qui sont par ailleurs capables d'offrir des vitesses atteignant le gigabit. Alors que la couverture DOCSIS 3.0 a légèrement diminué en raison du manque de déploiements de nouveaux réseaux câblés, la couverture DOCSIS 3.1 a augmenté de 4,4 points par rapport à la mi-2020.
- A la fin juin 2021, presque tous les foyers de l'UE (99,8%) étaient couverts par les réseaux mobiles LTE. La couverture 5G s'est fortement répandue entre juin 2020 et juin 2021 et les données officielles sur la couverture 5G sont désormais disponibles dans de nombreux pays. Après une augmentation significative de 51,8 points de pourcentage par rapport à la mi-2020, les services 5G étaient disponibles pour 65,8 % des ménages de l'UE. Cette croissance peut être principalement attribuée à l'introduction du partage dynamique du spectre (DSS), qui a été déployé par les principaux opérateurs de réseaux mobiles européens.



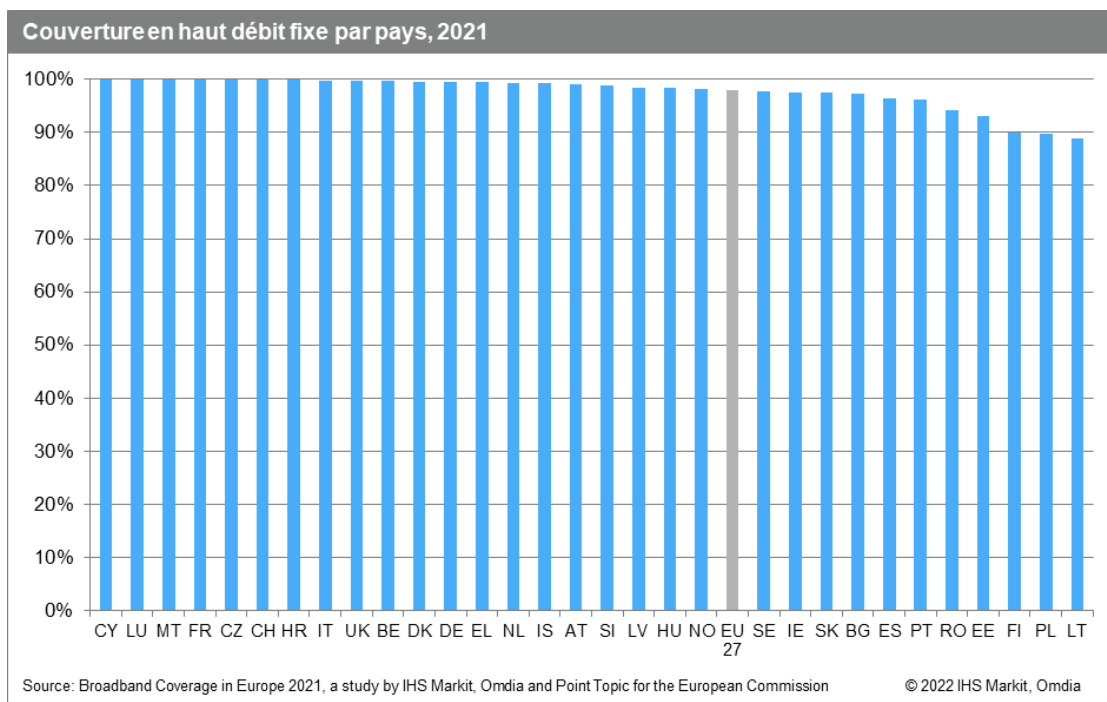
- En ce qui concerne le haut débit dans les zones rurales, il existe une différence de 6,4 points de pourcentage entre la couverture en haut débit fixe au niveau global (97,4%) et au niveau rural (91,5%). Cette différence était davantage marquée en termes de technologies ANG : ces réseaux étaient accessibles pour 67,5% des ménages ruraux, soit 22,6 points de pourcentage de moins que la couverture totale en ANG. Cependant, la différence entre couverture globale et rurale continue de se réduire par rapport aux éditions précédentes de l'étude, grâce à l'augmentation des investissements dans les réseaux en zones rurales.
- Au cours des douze mois précédant juin 2021, la couverture FTTP s'est étendue plus rapidement que les autres technologies à bande fixe dans les zones rurales. La disponibilité du FTTP en milieu rural a augmenté de 8,0 points de pourcentage, atteignant un tiers (33,8%) des ménages ruraux de l'UE. Cette forte augmentation indique que de nombreux opérateurs

européens se concentrent davantage sur le déploiement de réseaux FTTP, même dans les zones rurales traditionnellement moins rentables.

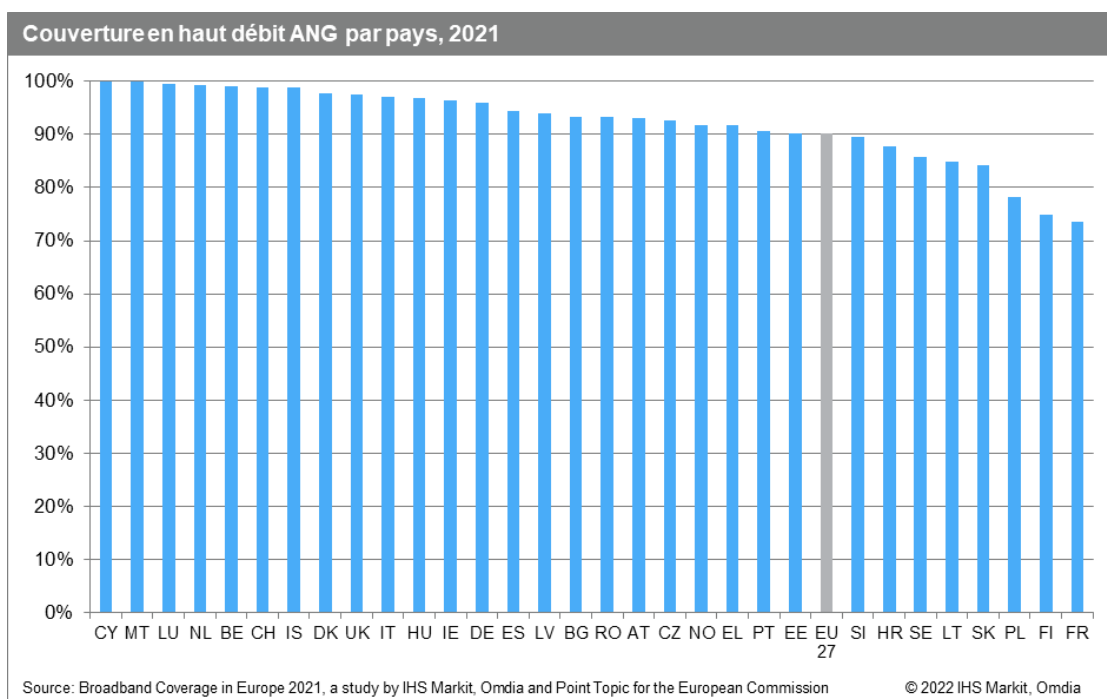
- La couverture des réseaux VDSL des zones rurales a continué d'augmenter, mais à un rythme plus lent que celui enregistré les années précédentes. L'accessibilité des réseaux VDSL a augmenté de 1,8 points de pourcentage, couvrant 39,0% des ménages ruraux de l'Union européenne. Cette croissance des réseaux VDSL en zones rurales souligne la focalisation des opérateurs, en particulier des opérateurs historiques, sur la modernisation des réseaux DSL existants.
- S'agissant de réseaux mobiles, la croissance de la couverture des réseaux LTE a continué de ralentir dû à une saturation dans les régions rurales à la mi-2021, atteignant 99,6% des foyers ruraux de l'Union européenne. Alors que les déploiements de la 5G sont principalement axés sur les zones urbaines, la disponibilité des services 5G dans les zones rurales a considérablement augmenté grâce au déploiement du partage dynamique du spectre (DSS), avec plus d'un tiers (34,7%) des ménages ruraux de l'UE couverts à la mi-2021.



- Parmi les 31 pays étudiés, 26 atteignaient une couverture en haut débit fixe supérieure à 95%, et 20 pays offraient une couverture en haut débit fixe supérieure à la moyenne des UE27 (97,9%). Plusieurs des pays étudiés offraient une couverture en haut débit fixe complète de leur territoire, notamment Chypre, le Luxembourg, et Malte. Dans trois des pays (Lituanie, Pologne et Finlande), moins de 90,0% des ménages avait accès à une connexion en haut débit fixe.



- Chypre et Malte étaient les deux seuls pays à offrir une couverture complète en réseaux ANG, tandis que le Luxembourg, les Pays-Bas, la Belgique, la Suisse et l'Islande offraient une couverture supérieure ou égale à 99,0%.
- Des 31 pays de l'étude, 23 pays démontraient des niveaux de couverture en ANG supérieurs à la moyenne de l'UE (90,1%). Avec une couverture de 73,7% des ménages, et malgré une augmentation considérable du nombre de foyers couverts en ANG, la France reste le pays le moins bien classé dans cette étude en termes de proportion de foyers passés 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. A la mi-2021, la 5G était commercialement déployée dans 29 pays de l'étude. Les deux seuls pays où les réseaux 5G n'étaient pas déployés à mi-2021 étaient la Lettonie et le Portugal.

1.0 Introduction

The growth and competitiveness of the European economy depends on investments in Information and Communication Technologies (ICTs). The European Commission estimates that half of all productivity growth derives from ICT¹, while the ITU's analysis of more than 200 studies on broadband impact notes that a 10% increase in broadband penetration yields an increase in GDP ranging between 0.25-1.5%². Moreover, OECD estimates that 10% increase in broadband penetration can raise labour productivity by 1.5%³ and an EIB study asserts that a doubling of broadband speeds can result in 0.3% GDP growth⁴.

In order to foster the development of 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 free movement of goods and services online and mean that businesses, governments and individuals cannot fully benefit from digital tools that would be available to them but that are currently locked in 27 different regulatory environments.

The European Commission estimates that once completed, 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 the 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 roll out of reliable high-speed broadband networks across Europe. In September 2016, the European Commission introduced a new set of competitive Gigabit Society connectivity targets to be achieved by 2025⁵. 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 download speed of at least 100Mbps, upgradable to Gigabit speed.

Moreover, the Digital Compass communication adopted in March 2021 set out ambitious "Digital Decade" 2030 targets, which further highlight gigabit connectivity for everyone and 5G coverage everywhere by 2030. In September 2021, the "Path to the Digital Decade" proposal then identified and confirmed the importance of investment-friendly regulatory and policy framework, which would facilitate collaboration between national and EU-level policies and foster investment to achieve the Digital Decade 2030 targets.

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 measures the deployment and quality of broadband infrastructure.

In order to monitor the progress of broadband networks' deployment across the Member States, DG CONNECT (the European Commission Directorate General for Communications Networks, Content and Technology) has commissioned the Broadband Coverage in Europe (BCE) project to examine

¹ The Digital Agenda for Europe – Driving European growth digitally, Brussels 18 December 2012, COM(2012) 784 final

² ITU (2016), "Working Together to Connect the World by 2020: Reinforcing Connectivity Initiatives for Universal and Affordable Access", <https://www.broadbandcommission.org/Documents/publications/davos-discussion-paper-jan2016.pdf>

³ OECD (2011), "National Broadband Plans", OECD Digital, Economy Papers, No. 181, OECD Publishing. <http://dx.doi.org/10.1787/5kg9sr5fmqwd-en>

⁴ Bohlin et al (2014), EIB Institute, "The economic impact of broadband speed: Comparing between higher and lower income countries", https://institute.eib.org/wp-content/uploads/2014/04/EIB_broadband-speed_120914.pdf

⁵ Connectivity for a Competitive Digital Single Market – Towards a European Gigabit Society, Brussels 14 September 2016, <https://ec.europa.eu/digital-single-market/en/news/communication-connectivity-competitive-digital-single-market-towards-european-gigabit-society>

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 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 ten main broadband technologies. The study covers 30 countries including the EU27, the UK, Norway, and Iceland. A separate study is commissioned annually 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. Following the completion of Brexit, data for the UK are excluded from the EU totals but data for the UK continues to be collected and included in the study. However, the accompanying data tool includes totals for both EU27 as well as EU28 for comparison purposes.

The ten 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
- 5G
- 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.

In 2019, the research team in agreement with DG CONNECT, reviewed the categories included in the previous iterations of 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 expects FWA to become an even more relevant access technology with the launch of 5G FWA services.

With 5G coverage of urban areas and major terrestrial transport paths being one of the Gigabit Society connectivity targets and given the fact that operators have deployed 5G networks and launched 5G services in many study countries by mid-2020, 5G was included among the technologies tracked by the study for the first time in 2020 bringing the total number of technologies tracked by the study to ten.

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 30Mbps coverage
 - Combination of VDSL (including VDSL2 Vectoring), DOCSIS 3.0 (including DOCSIS 3.1), and FTTP
- Overall FTTP & DOCSIS 3.1 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 and in the BCE 2019 report was included under the title Very High Capacity Networks (VHCN) coverage.

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 the 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, Switzerland and the UK). More specifically, NUTS 3 level areas are smaller regional units of 150,000 to 800,000 inhabitants. There are 1,380 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 2012-2019 data (with the exemption of the new 5G category introduced in the 2020 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 30Mbps download speed
- Coverage by broadband network/s capable of at least 100Mbps download speed
- Coverage by broadband network/s capable of at least 1Gbps download speed
- Coverage by broadband network/s capable of at least 1Gbps upload and 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 was a newly introduced category added in the study for the first time in 2019. And in 2021, a 1Gbps upload and download speed coverage was added while the now universally achieved at least 2Mbps download speed coverage was excluded from the list of speed categories tracked by the study.

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 also provides 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 actual user experience, as a typical user will only be able to use one mobile network at a time.

The following table details the scope of the Broadband Coverage in Europe 2021 study.

Scope	Description of Broadband Coverage Metrics
Geographical coverage	<ul style="list-style-type: none"> • EU27 + Iceland, Norway, Switzerland, and the UK • Rural and national coverage
Technologies	<p>The following technologies are included:</p> <ul style="list-style-type: none"> • 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 • 5G • Satellite <p>The study also covers the following technology combinations:</p> <ul style="list-style-type: none"> • 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 FTTP & DOCSIS 3.1 coverage
Speeds	<p>The study covers the following speed categories:</p> <ul style="list-style-type: none"> • At least 30Mbps download • At least 100Mbps download • At least 1Gbps download • At least 1Gbps upload/download
Mobile coverage	<p>An additional mobile metric is included in the study since the 2017 edition of the study:</p> <ul style="list-style-type: none"> • 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.

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 2021 edition of the Broadband Coverage in Europe study mirrors the approach used in the 2013-2020 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 National Regulatory Authorities (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 2021 (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 2012-2020. 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 2012-2020 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 30Mbps, 100Mbps and 1Gbps. An additional speed category of at least 1Gbps upload and download speed was included in the 2021 survey questionnaire as requested by DG CONNECT.

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 NUTS 3 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 2013-2021 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 2021. 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 ten 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 NUTS 3 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 FTTP & DOCSIS 3.1 coverage.

For the sake of consistency, the research applied a similar methodology in the 2021 study to the approach used in the 2012-2020 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 2020 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 2021 edition of the study. For the 2021 study an additional category was added to track coverage of broadband with gigabit speeds in both the upstream and downstream (and the previously-reported 2Mbps category was discontinued). The new category is only available for markets where the NRA was able to provide this information. Thus the following speed categories are included among the metrics:

- Coverage by broadband network/s capable of at least 30Mbps download speed
- Coverage by broadband network/s capable of at least 100Mbps download speed
- Coverage by broadband network/s capable of at least 1Gbps download speed (included since 2019)

- Coverage by broadband network/s capable of at least 1Gbps upload and download speed (included since 2021)

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 30Mbps. This category encompassed VDSL (including VDSL2 Vectoring), FTTP, FWA (4G TD LTE standard and 5G FWA) and DOCSIS 3.0 (including DOCSIS 3.1) cable broadband access technologies. However, as not all connections utilizing these technologies can achieve 30Mbps 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 100Mbps. This category encompassed VDSL2 Vectoring, FTTP, DOCSIS 3.0/3.1 cable broadband and 5G FWA (if speeds higher than 100Mbps are attainable over 5G FWA). In cases where vectoring is applied to VDSL2 technology and speeds reach 100Mbps 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 100Mbps actual download speeds (for example, in the case of FTTP (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.
- Coverage by broadband network/s capable of realistically achieving actual upload and 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 upload and 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 the relevant download/upload speed if the connection's broadband speed was capable of achieving the relevant speed for the majority of the time. 'Majority of time' is understood to mean actual 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 download speed categories. No such estimation was made for the new 1Gbps upload and download category.

For the 2019 edition of the BCE study, some changes were made to the technologies considered when estimating the coverage by speed categories, to reflect the technological advancements and improving capabilities of individual broadband access technologies that had been observed over the preceding years. For this reason, availability of FWA provided over 4G LTE-TDD was considered in the 'at least 30Mbps' speed category and VDSL2 Vectoring was included in the analysis of availability of services providing at least 100Mbps download speeds. Since the 2020 edition, we have also included 5G FWA where relevant.

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

3.7 Estimating additional mobile coverage metrics

As required in the Tender Specifications for SMART 2019/0020 and following the discussions with DG CONNECT at the inception meeting, the research team has included two additional mobile metrics as part of the Broadband Coverage in Europe 2021 study, both aimed to better reflect availability of mobile broadband services for European consumers:

- Average LTE coverage
- 5G coverage

The Average LTE coverage 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 (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.

5G coverage was included in the Broadband Coverage in Europe study for the first time in 2020, reflecting the progress of mobile operators that have deployed and launched their 5G networks in many European countries. Over the twelve months to mid-2021, a significant progress has been made in 5G coverage due to the introduction of the Dynamic Spectrum Sharing (DSS) technology, which enables parallel use of LTE and 5G in the same frequency band. Moreover, official regulatory data on 5G rollouts has become available in the past year, providing a robust view of progress in 5G deployments. This is in addition to the research team review of information published by network operators on the cities and areas where their 5G networks and services have been launched.

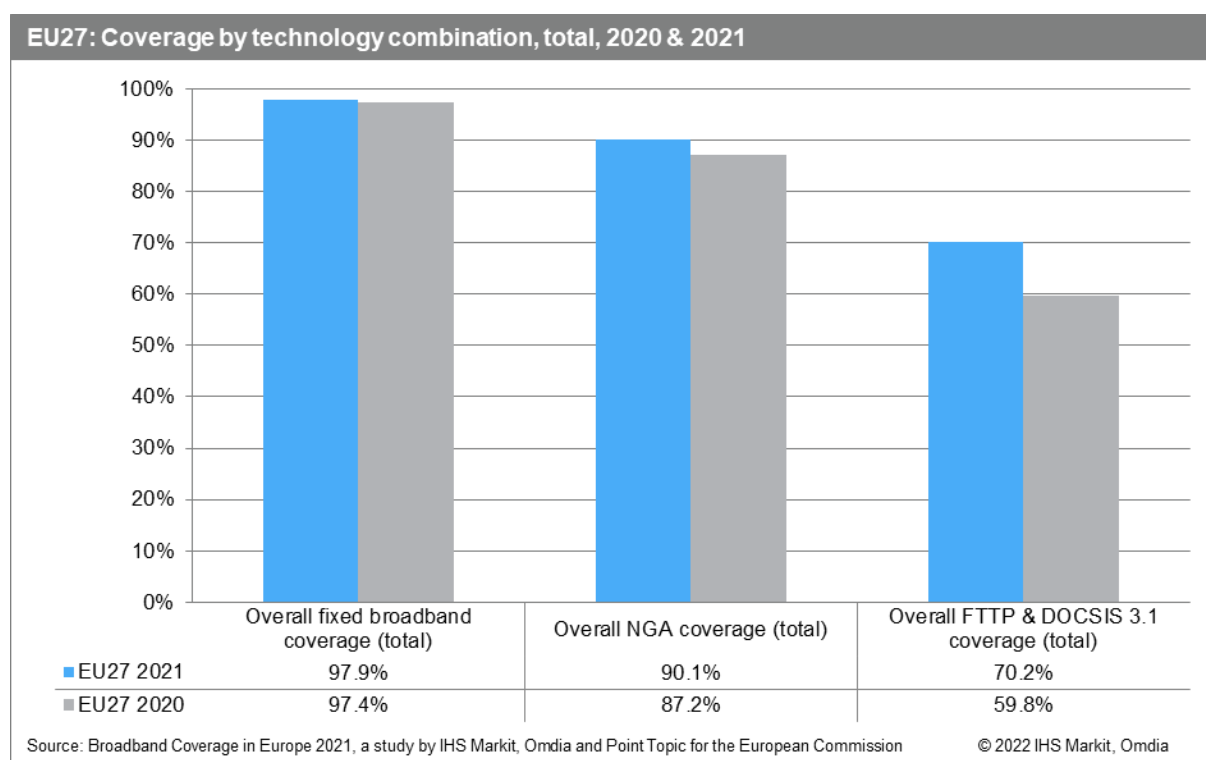
4.0 European Overview

4.1 Europe-wide coverage by technology combinations

The main objective of the Broadband Coverage in Europe 2021 study was to assess the availability of broadband services across the EU, with additional information provided for Norway, Iceland, Switzerland, and the UK.

There are ten broadband technologies examined in the 2021 edition of the BCE study: DSL, VDSL, VDSL2 Vectoring, FTTP, cable modem DOCSIS 3.0, DOCSIS 3.1, FWA (fixed wireless access), LTE, 5G, and satellite. All technologies except 5G were included in previous edition(s) of the study, thus ensuring comparability and the possibility to evaluate progress in broadband rollout across Europe.

The collected data shows that more than 188 million EU households (97.9%) had access to at least one of the main fixed broadband access technologies in mid-2021 (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-2021, growing by 0.5 percentage points (p.p.).

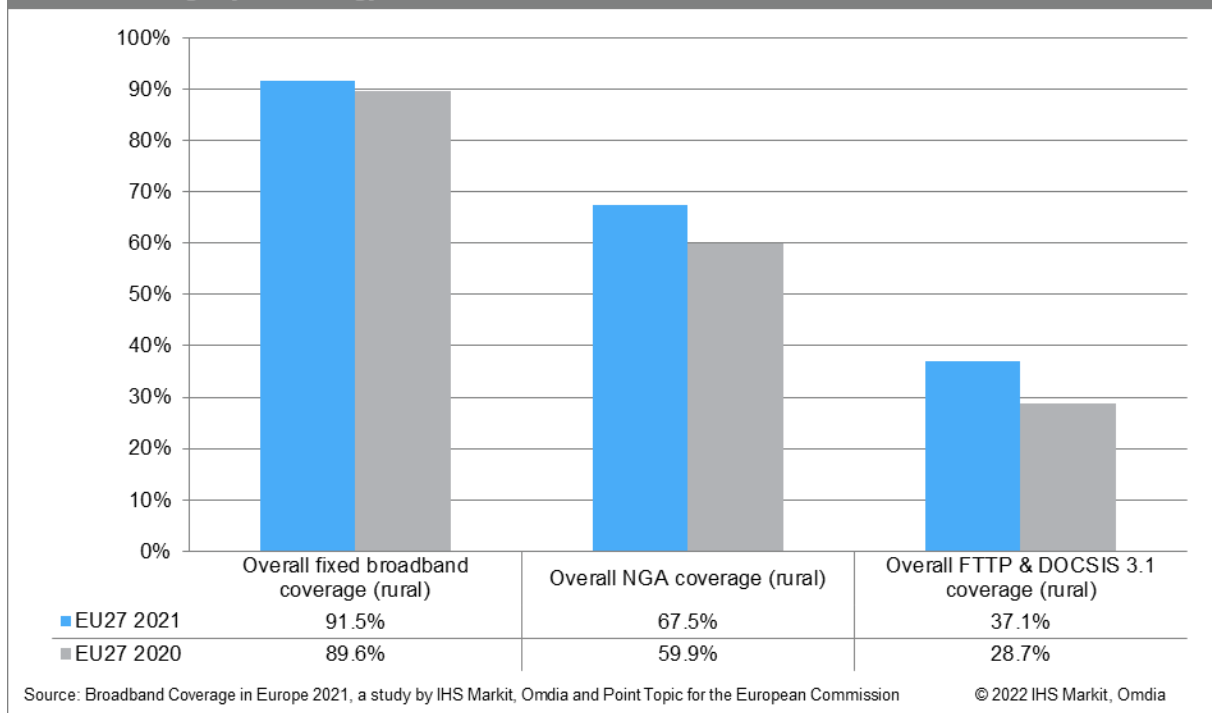


The largest growth among the combination categories was witnessed in coverage of FTTP & DOCSIS 3.1 networks. These two technologies are those primarily capable of achieving at least 1Gbps, a stretch target of the Connectivity for a European Gigabit Society policy initiative⁶. During the twelve-month period to mid-2021, overall coverage of these networks increased by 10.4 percentage points. This marked a slight acceleration in coverage growth compared to the twelve months to mid-2020 (9.7 percentage points), bringing coverage of these ultra-high speed networks to an additional 20 million EU homes, for a total of over 134 million.

Coverage of NGA broadband continued to grow steadily, reaching 90.1% of EU households in mid-2021, an increase of 2.9 percentage points. Nearly 6 million additional EU households gained access to at least one of the NGA technologies (VDSL incl. VDSL2 Vectoring, FTTP, and cable modem DOCSIS 3.0 incl. DOCSIS 3.1) and in total 173 million EU homes were passed by at least one NGA network. In the future, it can be expected that growth in NGA coverage will slow down as NGA networks approach universal coverage levels.

⁶ [Connectivity for a European Gigabit Society - Brochure | Shaping Europe's digital future \(europa.eu\)](#)

EU27: Coverage by technology combination, rural areas, 2020 & 2021



Access to fast broadband services in rural areas remains a key priority for the EU. At the end of June 2021, 91.5% of rural households across the EU27 had access to at least one fixed broadband technology, up from 89.6% in mid-2020. By contrast, only 67.5% of rural households could benefit from NGA broadband in mid-2021; in absolute terms this translated to 20.5 million rural households. Rural NGA broadband coverage grew by 7.6 percentage points since mid-2020, an acceleration in the growth pace compared to the 5.8 percentage point increase recorded in the last iteration of this study. The growth in rural NGA coverage was largely driven by an 8.4 percentage point increase in rural coverage of FTTP & DOCSIS 3.1 networks, bringing these services to an additional 2.5 million EU homes.

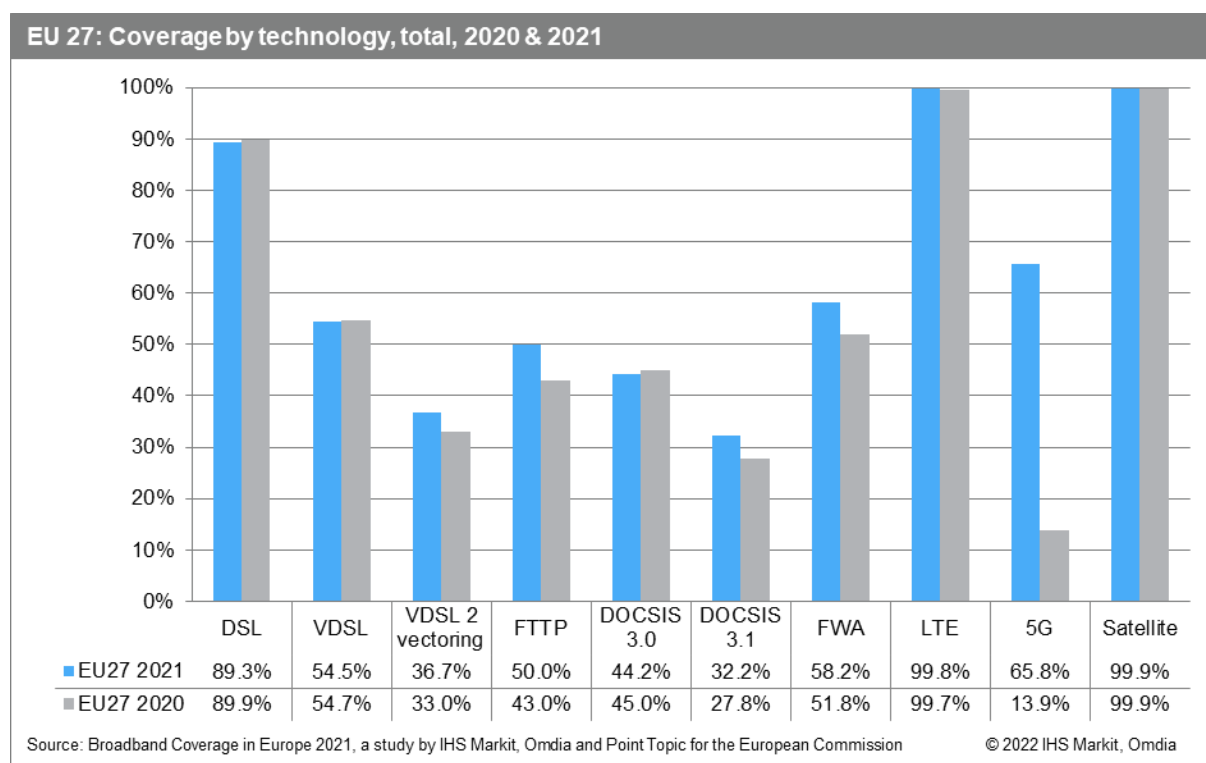
4.2 Europe-wide coverage by individual technologies

4.2.1 Coverage by technology in total

Examining the availability of fixed broadband technologies, DSL remained the most pervasive broadband technology, reaching 89.3% of EU households in mid-2021. This represents a marginal 0.3 percentage point decline compared to mid-2020, underpinned by the growing number of operators opting for disconnection of copper lines and upgrade to fibre.

Fixed Wireless Access, which includes Wi-Fi, WiMAX, 4G LTE-TDD, and 5G FWA was available to 58.2% of EU households at the end of June 2021, a 6.4 percentage point increase compared to mid-2020. This represents a significant uptick in growth versus the previous year (when coverage increased by only 0.3 percentage points). This reflects the increasing importance of 4G FWA access and the growth of 5G FWA, which the research team expects to continue growing strongly in the next few years.

Over the study period, VDSL coverage appears to have peaked, and declined marginally by 0.2 percentage points since mid-2020. As observed in previous iterations of this study, VDSL coverage growth has been decreasing as operators have diverted investments towards more advanced technologies (especially FTTP) in pursuit of the Digital Decade targets. At the end of June 2021, VDSL was available to more than half of EU households (54.5%). Availability of VDSL2 Vectoring technology has been tracked since 2019 to indicate coverage of higher-capacity bandwidth services offered via legacy copper networks, i.e. those typically providing download speeds higher than 100Mbps. Coverage of this technology continues to grow, and by mid-2021, 36.7% of EU homes were passed by VDSL2 Vectoring, a 3.7 percentage point increase compared to the end of June 2020.



Despite a 7.0 percentage point growth compared to mid-2020, FTTP coverage remained lower than VDSL – but it overtook cable modem DOCSIS 3.0 for the first time and remains ahead of VDSL2 Vectoring. At the end of June 2021, FTTP broadband services were available to half of EU households (50.0%), or nearly 96 million households in absolute terms (an increase of 13.5 million).

As nearly all cable networks in the EU had already been upgraded to DOCSIS 3.0 already in mid-2017, the research team decided in 2019 to exclude standard cable modem technology and track DOCSIS 3.0 and DOCSIS 3.1 coverage instead. By mid-2021, 44.2% 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 32.2% of EU households, which means that 72.8% of DOCSIS 3.0 networks had been upgraded to the DOCSIS 3.1 standard at the end of June 2021.

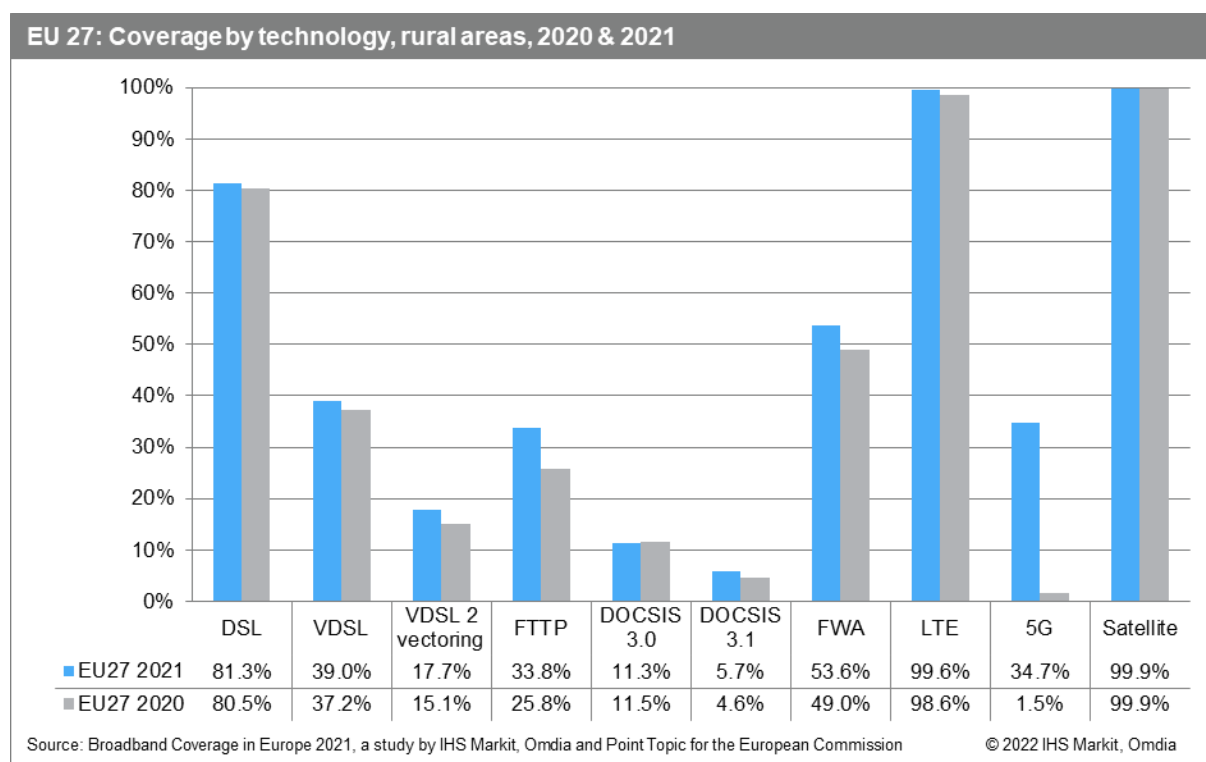
Examining mobile network coverage, LTE growth continued to slow down over the study period, and coverage increased by 0.1 percentage points, reaching 99.8% availability. With LTE coverage at an almost universal level in most of the EU, the focus has now shifted to 5G rollouts. Mobile network

operators made significant progress in 5G over the year to June 2021. Official data on 5G coverage is now available for many countries, and the research team has reviewed available information published by network operators on their 5G network deployments and service launches to complete the picture at EU level. By June 2021 almost two thirds (65.8%) of households across the EU were passed by 5G networks, a substantial increase since the previous year. Much of this growth has been driven by the use of Dynamic Spectrum Sharing technology (DSS), which has allowed operators to deploy 5G coverage rapidly using existing infrastructure.

At the end of June 2021, 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 2019. 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.

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, achievement of the Digital Decade's goal of gigabit broadband available to everyone by 2030 will present a challenge, especially in EU's rural regions.



Broadband coverage levels in rural regions remain notably lower than total national coverage, with fixed broadband networks passing 91.5% of rural EU households compared to 97.9% of total households. The gap between total NGA coverage and rural NGA coverage remained much larger, but at 22.6 percentage points, it continued to narrow during the twelve months to mid-2021. For comparison, the difference in total and rural NGA coverage was 27.3 percentage points in mid-2020, and 30.1 percentage points in mid-2019, highlighting the shift in NGA network deployments towards rural areas.

The most widespread fixed broadband technology in rural areas continued to be DSL, reaching 81.3% of rural EU households by mid-2021. During the twelve months to mid-2021, rural VDSL coverage expanded by 1.8 percentage points, reaching 39.0% 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. VDSL2 Vectoring was available to 17.7% of rural households: 19 percentage points fewer than on a national level.

Fixed Wireless Access was available to 53.6% of rural households. 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 2021, cable modem DOCSIS 3.0 networks passed only 11.3% of rural EU homes, down fractionally since mid-2020. As most DOCSIS 3.1 upgrades have so far been focused primarily on urban areas, DOCSIS 3.1 was available to just 5.7% of rural households at the end of June 2021.

In the twelve months to the end of June 2021, FTTP coverage expanded more quickly than other fixed broadband technologies in rural areas. Rural FTTP availability increased by 8.0 percentage points, reaching more than a third (33.8%) of rural EU households. This significant growth indicates the increased focus of many European operators on deploying FTTP networks even in traditionally less profitable rural areas.

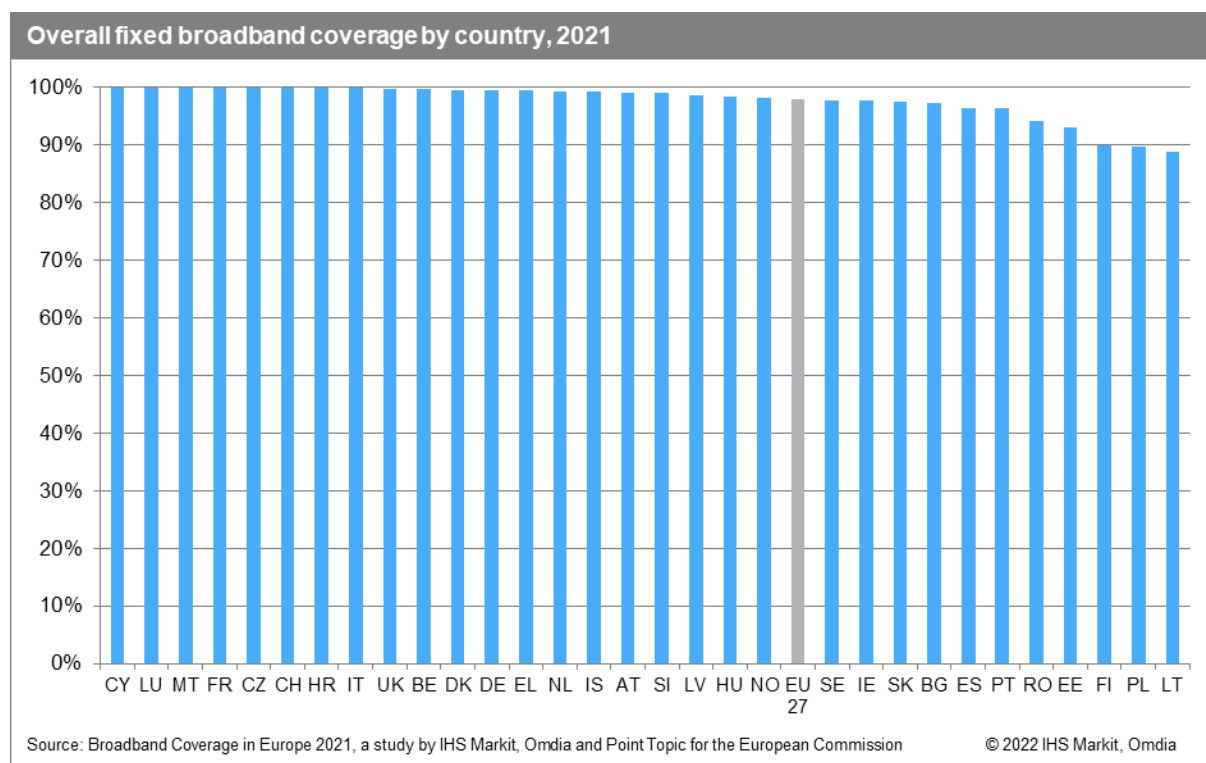
By mid-2021, rural LTE coverage approached near universal levels, with 99.6% of rural EU homes passed by at least one LTE network. As most areas become covered by LTE networks, the pace of rollouts has slowed down considerably. Over the study period, LTE coverage of rural regions increased by 1.0 percentage point. Although 5G deployments tend to focus first on urban areas, availability of 5G services in rural areas has grown substantially, with 34.7% of rural EU households covered by 5G networks at June 2021, almost all of this having been deployed over the course of the year since June 2020.

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 2Mbps download speed. Four technologies make up the overall fixed broadband coverage figure: DSL (including VDSL and VDSL2 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.



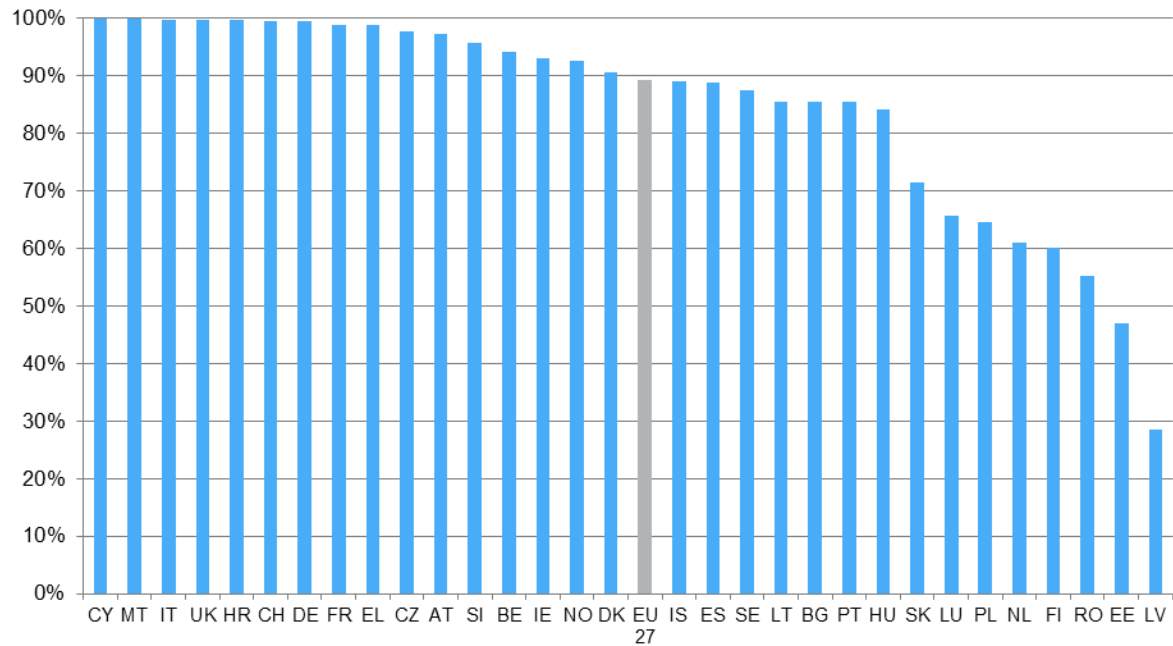
In total, 26 out of the 31 study countries registered fixed broadband coverage of above 95%, highlighting the breadth of fixed broadband coverage in most countries. As of mid-2021, three countries recorded complete fixed broadband coverage, namely: Cyprus, Luxembourg, and Malta. On the other hand, Lithuania, Poland, and Finland were the only countries with fixed broadband coverage levels below 90%.

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, 16 out of the 31 study countries recorded DSL coverage above 90%, with the EU27 average for DSL availability having marginally increased by 0.8 percentage point since mid-2020. At the end of June 2021, Cyprus and Malta reported complete coverage by DSL networks. However, it is important to note that while universal DSL coverage was registered for these countries, this is generally considered accurate to one decimal place to account for the possibility of a negligible number of remote homes failing to receive DSL coverage.

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

DSL coverage by country, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

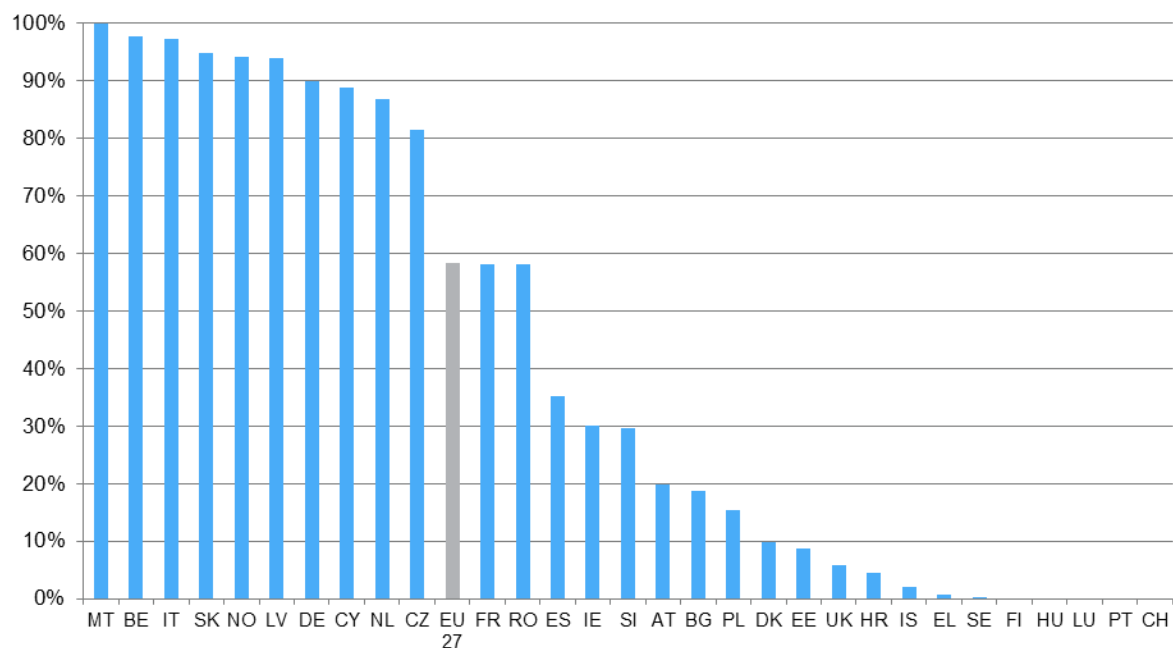
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In an increasing number of countries, DSL coverage has decreased, most often as a result of decommissioning of legacy copper lines and their replacement by fibre optic networks or FWA and mobile networks in some instances (e.g. Finland). Latvia, Estonia, Romania, Finland, the Netherlands, Poland, Luxembourg, and Slovakia all recorded DSL coverage levels below 75%.

4.3.1.2 Total Fixed Wireless Access (FWA) coverage by country

Fixed Wireless Access includes Wi-Fi, WiMAX, 4G TD LTE and 5G FWA. Those technologies generally provide a viable broadband solution for less-densely populated and harder-to-reach areas. The EU27 average for FWA coverage stood at 58.2% at the end of June 2021, with coverage ranging between 0.0% and 100.0%. In several countries, there were no FWA services available to households while only Malta recorded complete FWA coverage.

FWA coverage by country, 2021

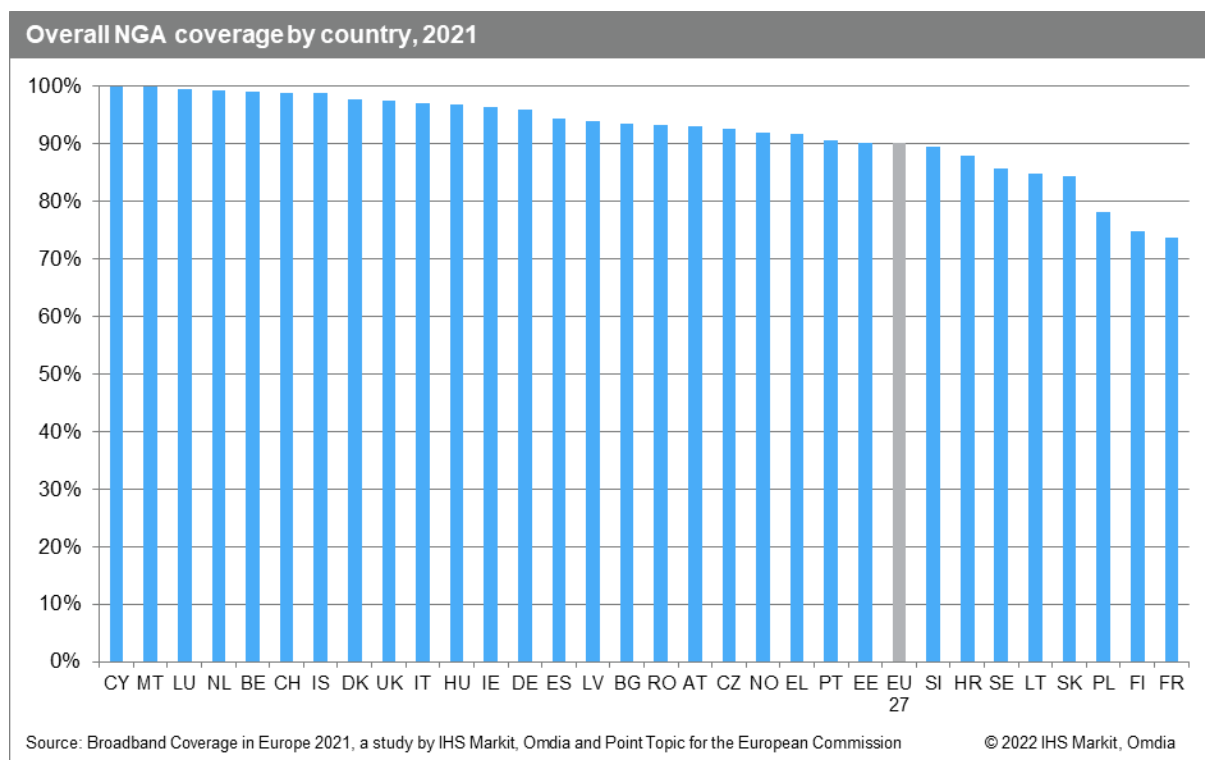


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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4.3.2 Total overall NGA coverage by country

The NGA combination category is comprised of VDSL (including VDSL2 Vectoring), FTTP, and cable modem DOCSIS 3.0 (including DOCSIS 3.1) technologies, all typically capable of delivering a service speed of at least 30Mbps (although VDSL local loop lengths mean that actual speeds do vary⁷). One of the original objectives of the Digital Agenda for Europe was to have complete coverage of European households at this speed. Since then, the goals have shifted towards gigabit coverage. Nevertheless, the analysis of this combination category still constitutes an important evaluation of the rollout of the relevant technologies and progress towards this goal.



By the end of June 2021, 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 Luxembourg, the Netherlands, Belgium, Switzerland, and Iceland continued to reach near universal NGA coverage levels.

On the other hand, eight countries reported coverage levels below the European average of 90.1%, with France remaining the country with the lowest coverage of the study, with 73.7% of homes passed by NGA networks.

4.3.2.1 Total VDSL coverage by country

VDSL broadband services were available to 54.5% of EU households by mid-2021, unchanged from mid-2020. In the last few years, the pace of growth in VDSL coverage has slowed down gradually indicating a shifting strategy of most operators to move away from upgrading existing copper infrastructure to investing in deployments of fibre optic networks all the way to customers' property.

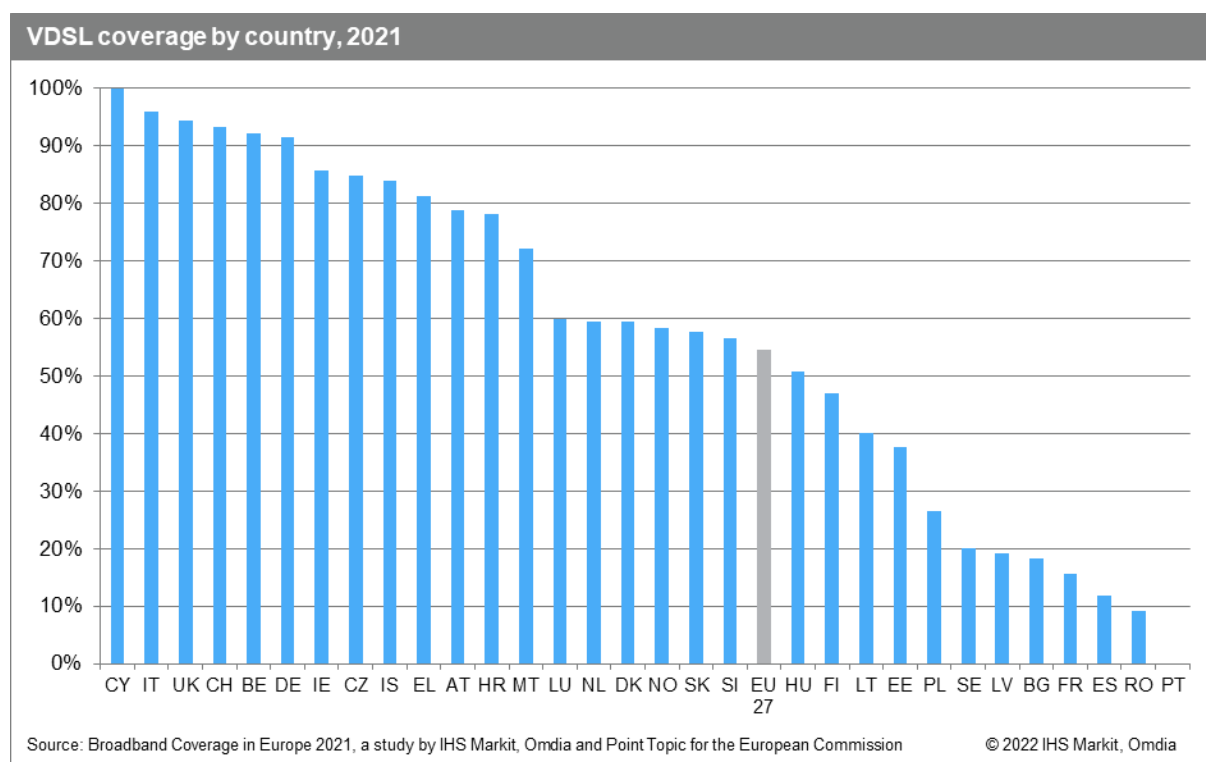
It is important to note that broadband performance on VDSL lines varies depending on the length of the copper loop from the VDSL enabled cabinet connected to the optical fibre backhaul. Formerly, households with a VDSL connection at a distance of about 500 metres from a VDSL enabled street cabinet or exchange, typically, reached download connection speeds of around 25Mbps. However, with the newest VDSL technology, these speeds can be achieved up to a distance of 1 000 metres.⁸

By mid-2021, Cyprus, Italy, the UK, Switzerland, Belgium, and Germany all recorded VDSL coverage levels that exceeded 90%, whilst VDSL networks passed more than 80% of homes in four other countries (Ireland, Czechia, Iceland, and Greece). Overall, 19 study countries recorded VDSL coverage levels that were higher than the EU average of 54.5%. Over the study period, Lithuania saw a 36.0

⁷ Please see [Chapter 4.5](#) for more information on actual download speed coverage.

⁸ For further analysis of actual download speed coverage please see [Chapter 4.5](#).

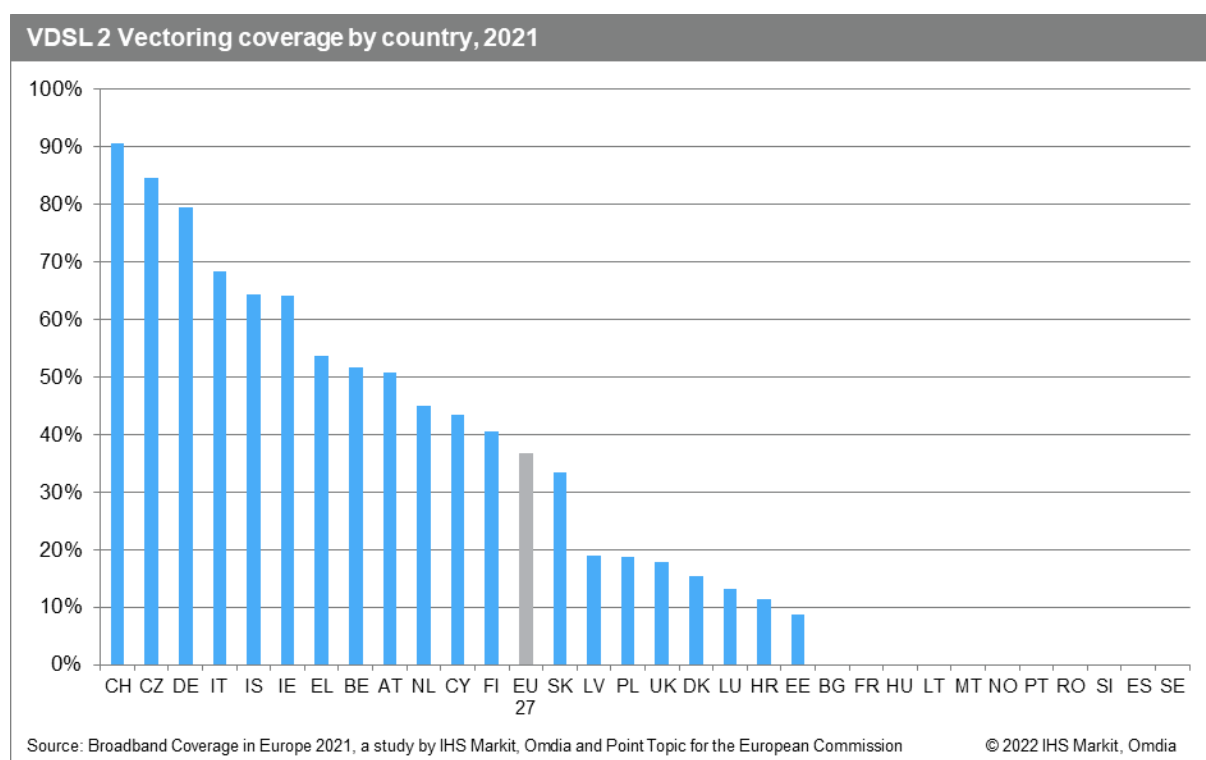
percentage point increase as the incumbent upgraded its legacy copper network in 2021. Slovakia and Austria also saw significant increase in VDSL coverage (18.4 p.p. and 15.5 p.p., respectively).



However, VDSL services remained far from widespread in a number of countries. Romania, Spain, France, Bulgaria, and Latvia all recorded VDSL coverage below 20%, 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.



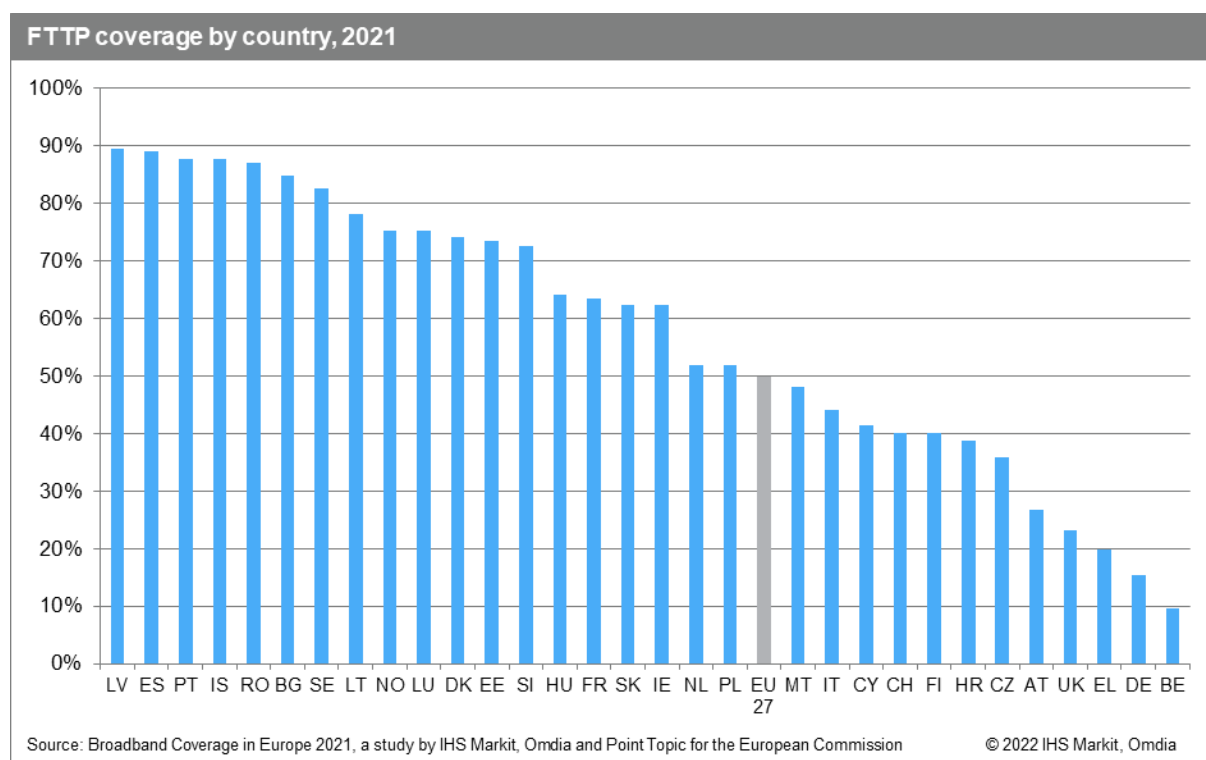
On average, VDSL2 Vectoring coverage reached over a third (36.7%) of EU households at the end of June 2021. However, availability of VDSL2 Vectoring services continued to vary widely across the EU, between 0.0% and 90.7%. The technology was absent in eleven study countries, and its coverage surpassed 50% of households in nine countries. It is worth noting though that two countries, Switzerland and Iceland, which recorded two of the five highest VDSL2 Vectoring coverage levels are not EU Member States and therefore are not included in the average EU27 VDSL2 Vectoring coverage calculation.

Switzerland recorded the highest VDSL2 Vectoring coverage of this study, with 90.7% of homes passed by VDSL2 Vectoring, followed by Czechia, where VDSL2 Vectoring services were available to 84.6% of households. Moreover, due to the focus of the Czech incumbent's infrastructure arm on deploying VDSL2 Vectoring solutions over the last couple of years, Czechia's whole VDSL network footprint has been upgraded to offer services with download speeds higher than 100Mbps.

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

FTTP coverage increased by 7.0 percentage points in the twelve months to mid-2021. On average, 50.0% of EU homes were passed by FTTP networks with thirteen countries recording FTTP coverage below the EU average.



Latvia remained the country with the highest FTTP coverage level, with 89.5% of homes passed.

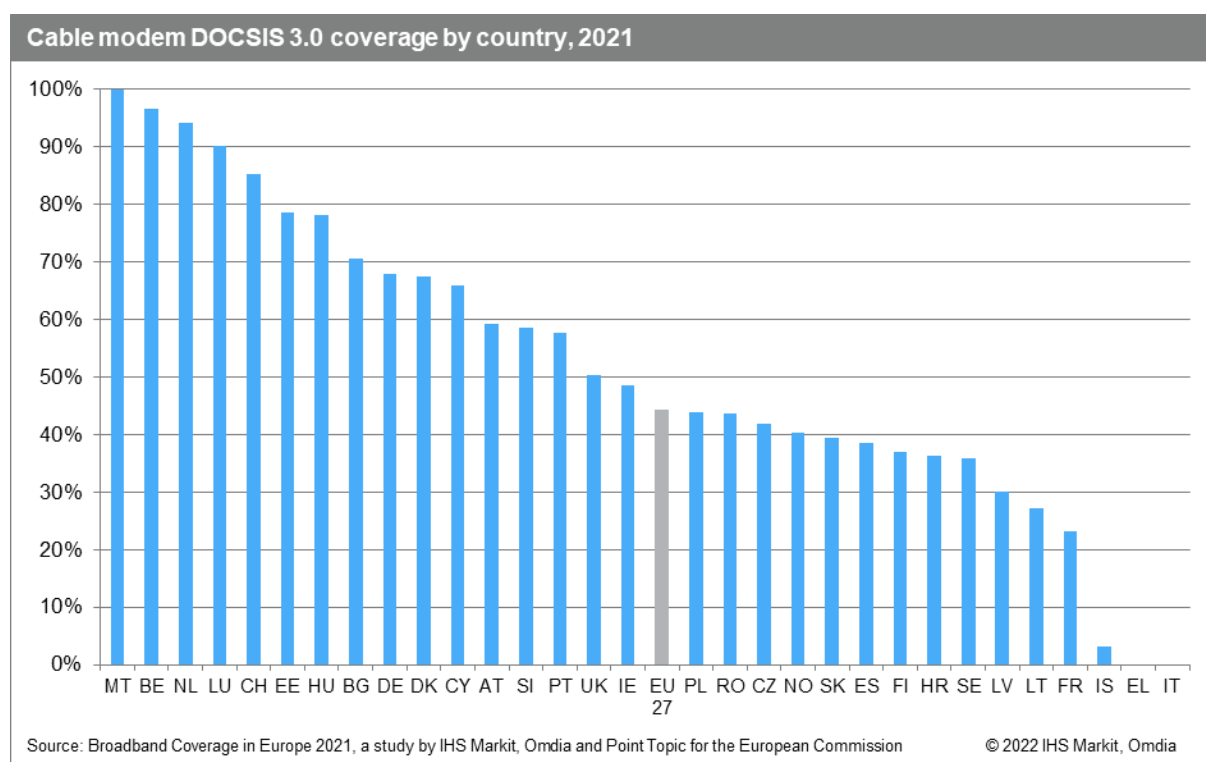
Six other countries - Spain, Portugal, Iceland, Romania, Bulgaria, and Sweden – reached FTTP coverage levels higher than 80%. As a testament to the increased FTTP deployment activity, across the EU, nine study countries recorded double-digit growth in FTTP coverage – these included Cyprus, France, Hungary, Ireland, Italy, Lithuania, the Netherlands, Romania, and Slovakia.

Whilst FTTP networks were available in all study countries, availability remained limited in some. However, this year, no country recorded FTTP coverage below 5% and only one country, Belgium, recorded FTTP coverage below 10%, with 9.7% of Belgian households having access to FTTP services. In Belgium, the incumbent has prioritised VDSL upgrades to existing DSL networks as opposed to investing in the typically more expensive FTTP technology. A similar strategy was adopted by operators in other countries such as Germany, Greece and the UK, which all recorded FTTP coverage levels

below 25% in mid-2021. 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 trialling out solutions such as G.fast to increase achievable speeds using existing copper infrastructure. It is also worth noting that some operators (such as BT/Openreach in the UK, for example) have recently revisited their network deployment strategy and started to prioritise FTTP roll-out over legacy network upgrades. Indeed, even these countries recorded increases in FTTP coverage over the twelve months to mid-2021. In Belgium, FTTP coverage grew by 3.2 p.p., Germany saw a 1.5 p.p. increase and in Greece and the UK, FTTP coverage increased by 9.6 p.p. and 8.8 p.p., respectively.

4.3.2.4 Total cable modem DOCSIS 3.0 coverage by country

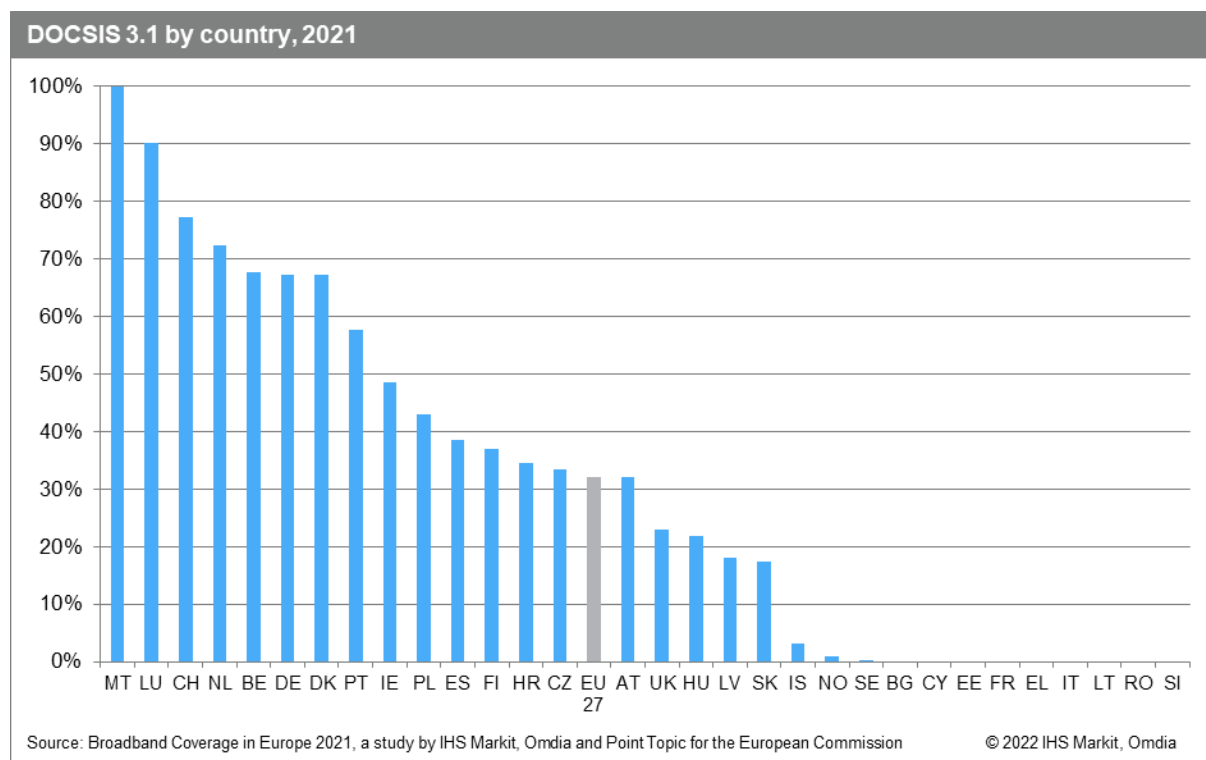
At the end of June 2021, cable modem DOCSIS 3.0 services were available to 44.2% of EU households. As was the case in previous iterations of this study, cable availability varied widely across study countries, from complete absence of coverage in Italy and Greece to universal coverage in Malta. Belgium, the Netherlands and Luxembourg were the only other countries where coverage exceeded 90%.



Overall, cable modem DOCSIS 3.0 coverage has remained relatively unchanged 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 new cable networks. Increases in cable coverage are generally limited to infill of holes in existing coverage areas, or new housing developments within existing coverage footprints. On the other hand, decommissioning of cable networks and their upgrade to FTTH has already started in several study countries, with Spain witnessing the largest decrease of 7.3 percentage points compared to mid-2020.

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 and in the twelve months to mid-2021, DOCSIS 3.1 increased by 4.4 percentage points to reach 32.2% of EU households. Moreover, nearly three-quarters (72.8%) of DOCSIS 3.0 networks have been upgraded to the DOCSIS 3.1 standard by the end of June 2021, compared to 61.8% the year prior.



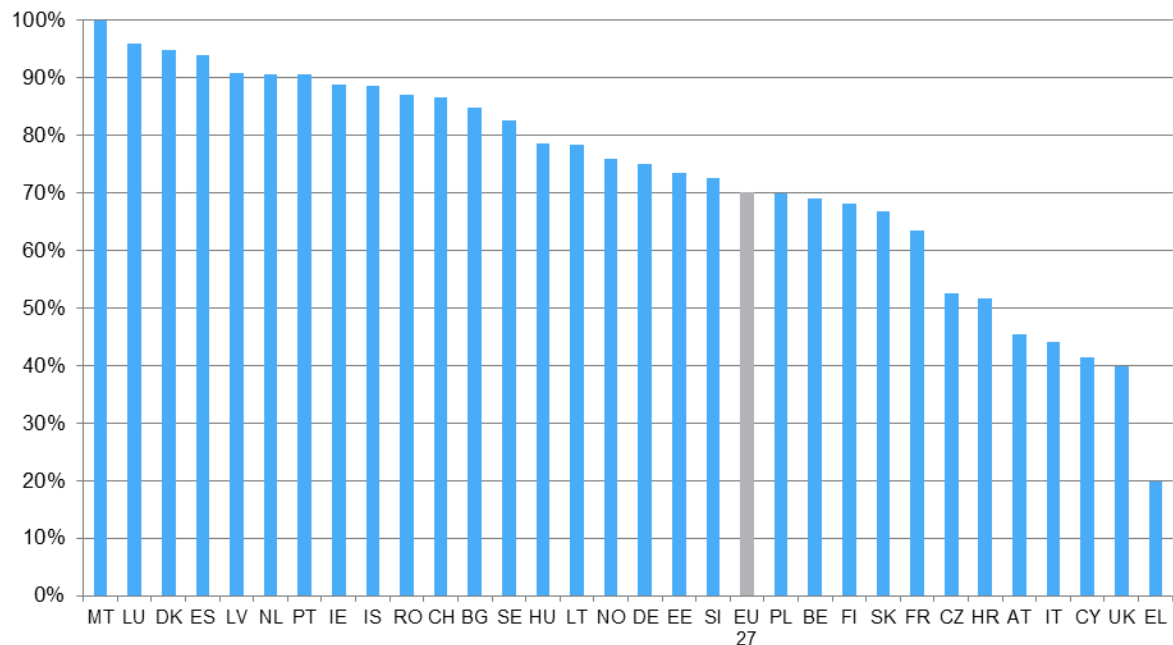
DOCSIS 3.1 coverage varied widely across study countries, between 100.0% in Malta, and 0.0% in nine study countries. It is to be noted that in Croatia, Denmark, Finland, Luxembourg, Malta, Poland, Portugal and Spain, cable networks have been upgraded almost entirely or entirely to the DOCSIS 3.1 standard. In the twelve months to mid-2021, cable operators in Czechia, Hungary and Latvia deployed DOCSIS 3.1 for the first time.

4.3.3 Total overall FTTP & DOCSIS 3.1 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 FTTP & DOCSIS 3.1 coverage, the two fixed-line broadband access technologies primarily capable of achieving gigabit download speeds.

At the end of June 2021, 70.2% of EU households were passed by at least one FTTP or DOCSIS 3.1 network, with coverage growing by 10.4 percentage points on the EU27 level. Overall FTTP & DOCSIS 3.1 coverage ranges between 19.8% in Greece and 100.0% in Malta. Among the countries registering the highest coverage were those with most widespread DOCSIS 3.1 coverage, such as Malta and Luxembourg both reaching coverage levels over 95%. Denmark and Spain were also among the leaders in this category owing to extensive FTTP coverage in both countries.

Overall FTTP & DOCSIS 3.1 coverage by country, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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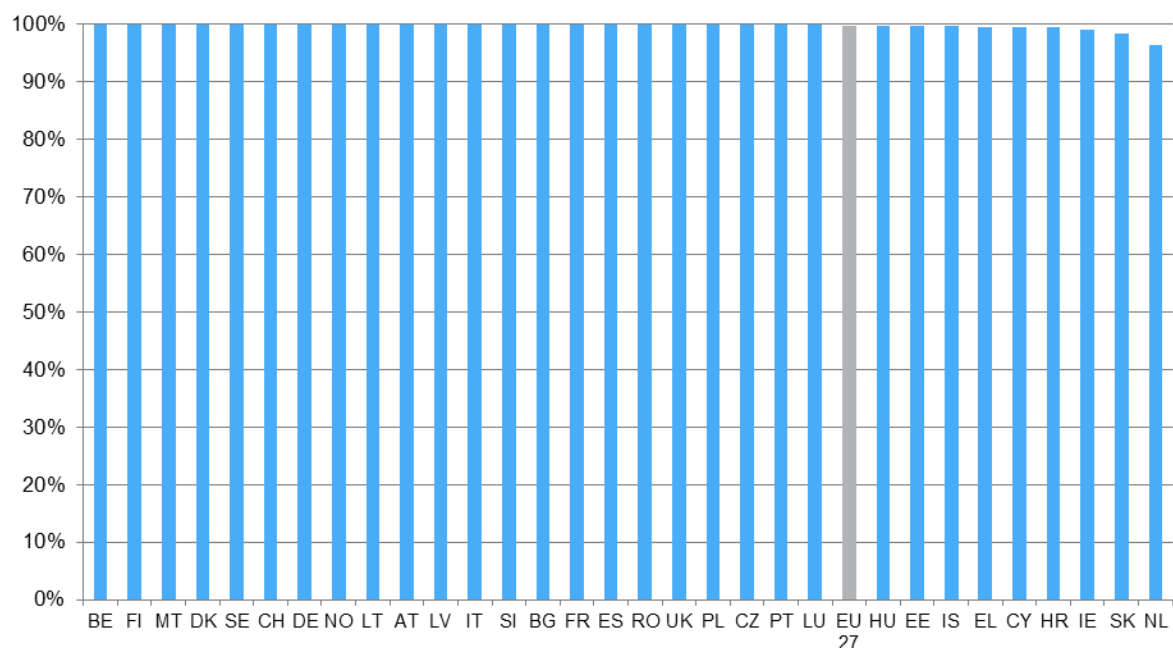
On the other hand, countries such as Greece, the UK, and Cyprus recorded the lowest levels, due to operators' past preference for VDSL upgrades over FTTP deployments, and cable operators only slowly starting with DOCSIS 3.1 upgrades.

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 a marginal 0.1 percentage point in the twelve-month period to mid-2021, reaching 99.8% of households. The Netherlands saw an actual decrease of 3.1 percentage points and was the country with the lowest LTE availability, at 96.4% of households covered, owing to prioritisation of 5G networks over LTE.

LTE coverage by country, 2021

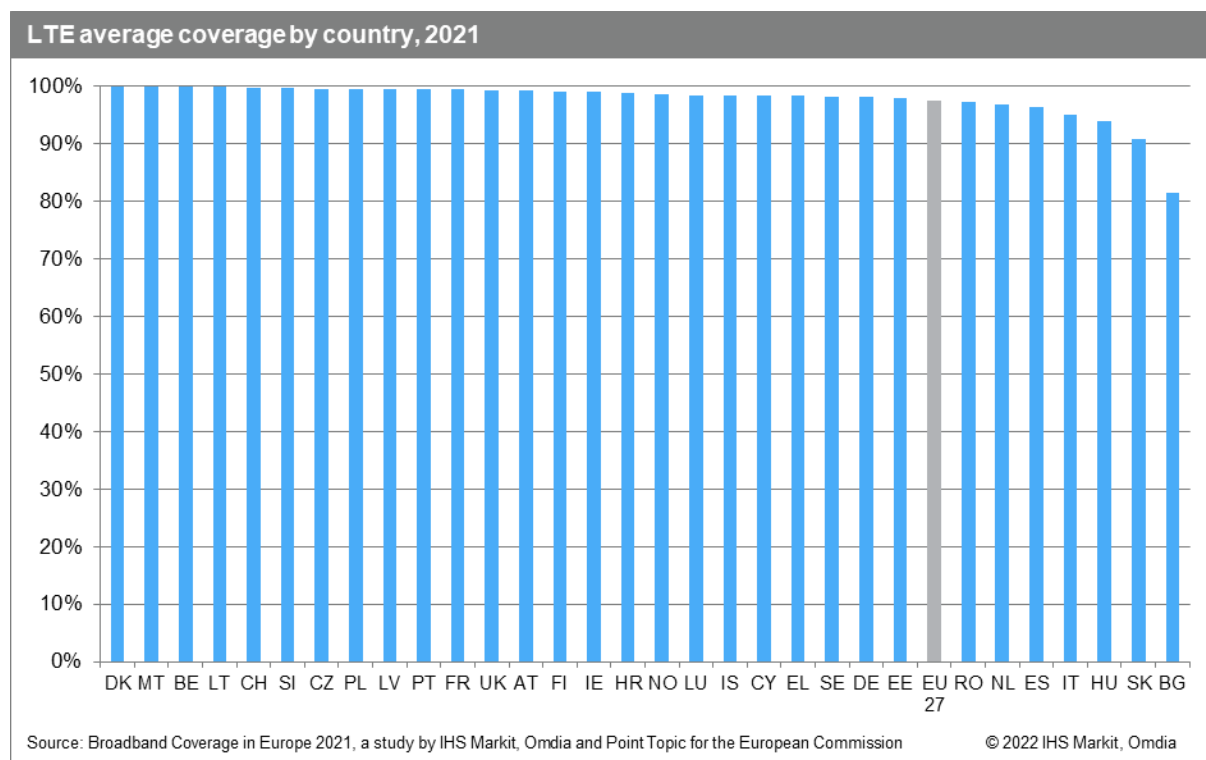


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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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 2021, operators in Denmark, Malta, and Belgium provided universal average LTE coverage, meaning that 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% in only one country: Bulgaria.

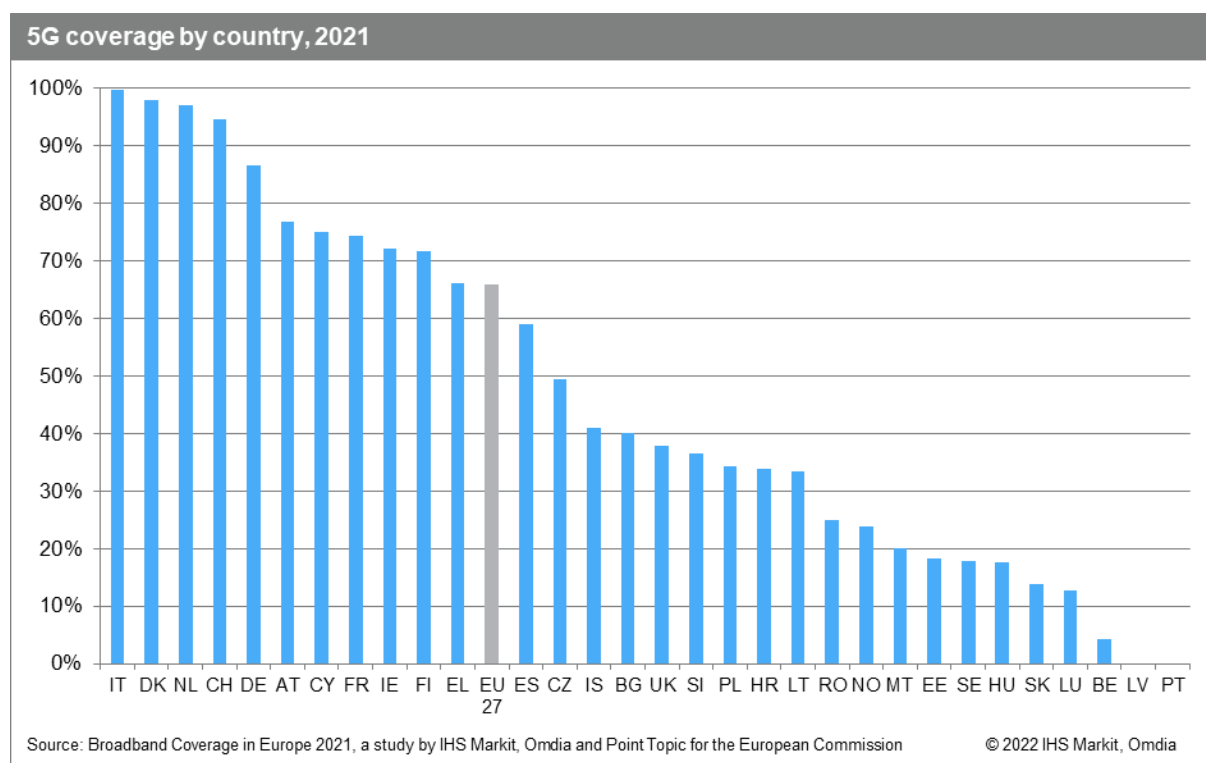


4.3.4.3 Total 5G coverage by country

5G coverage was included in the Broadband Coverage in Europe study for the first time in 2020, reflecting the progress of mobile operators that have deployed and launched their 5G networks in many European countries. Official data on 5G coverage is now available for many countries, and the research team has reviewed available information published by network operators on their 5G network deployments and service launches to complete the picture. In instances where the research team estimated 5G coverage based on information published by network operators on the cities and areas where their 5G networks and services have been launched, we have taken into consideration that not all of a given city or an area would have been covered initially.

Mobile network operators made significant progress in 5G over the year to June 2021 with 5G services being available in 29 countries compared to only 16 in mid-2020. Much of this growth has been driven by the use of Dynamic Spectrum Sharing technology (DSS), which has allowed operators to deploy 5G coverage rapidly using existing infrastructure. Such an example is Italy, where 5G coverage is now near universal at 99.7% of households. In Denmark, the Netherlands, and Switzerland, 5G coverage reached more than 90% of households by mid-2021.

At the end of June 2021, 5G was absent only in Portugal and Latvia but coverage remained limited in nine other countries – Belgium, Luxembourg, Slovakia, Hungary, Sweden, Estonia, Malta, Norway, and Romania – which all recorded 5G coverage levels lower than 25%.



Note: 5G coverage includes coverage provided using Dynamic Spectrum Sharing (DSS)

4.3.5 Total satellite coverage by country

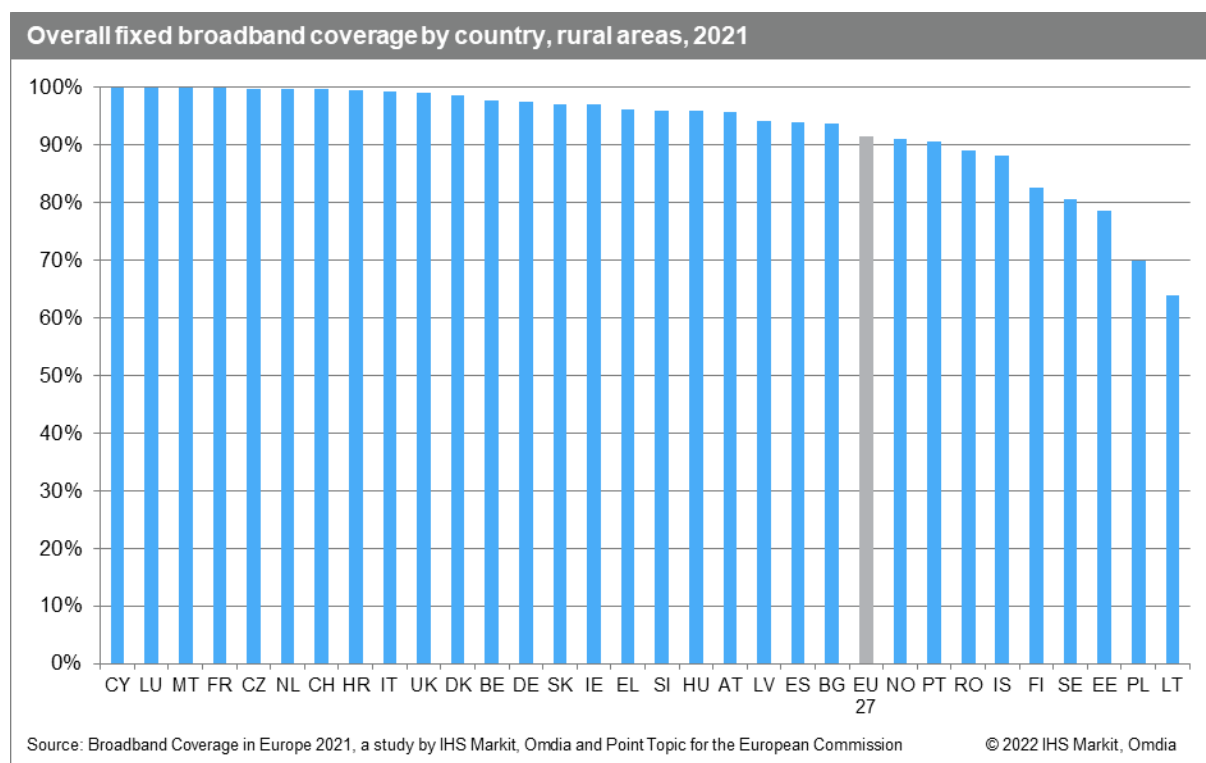
At the end of June 2021, all study countries, with the exception of Iceland, were covered by KA-band satellite, which is able to deliver a 2Mbps broadband service. However, in certain countries (Estonia and Norway) there was only partial satellite coverage. Satellite beams are capable of reaching 75.4% of Estonian households and 97.2% of Norwegian households, figures which are essentially unchanged since 2013. However, 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 the number of serviceable homes in a particular area.

As in the previous years, 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-2021, rural fixed broadband coverage reached 91.5% of rural households compared to national coverage of 97.9%. However, the gap between total fixed coverage and rural fixed coverage continues to close at 6.4 percentage points compared to 7.7 percentage points in mid-2020. Moreover, in mid-2018, the recorded gap between total and rural fixed broadband coverage at the EU level was 9.1 percentage points.



Nine countries reported rural fixed broadband coverage below the EU average (91.5%), with only three countries (Lithuania, Poland, and Estonia) recording levels below 80%. Lithuania recorded the lowest rural fixed broadband coverage of the study, with 64.0% of rural homes passed. Rural fixed broadband coverage was universal in Cyprus, Luxembourg, and Malta.

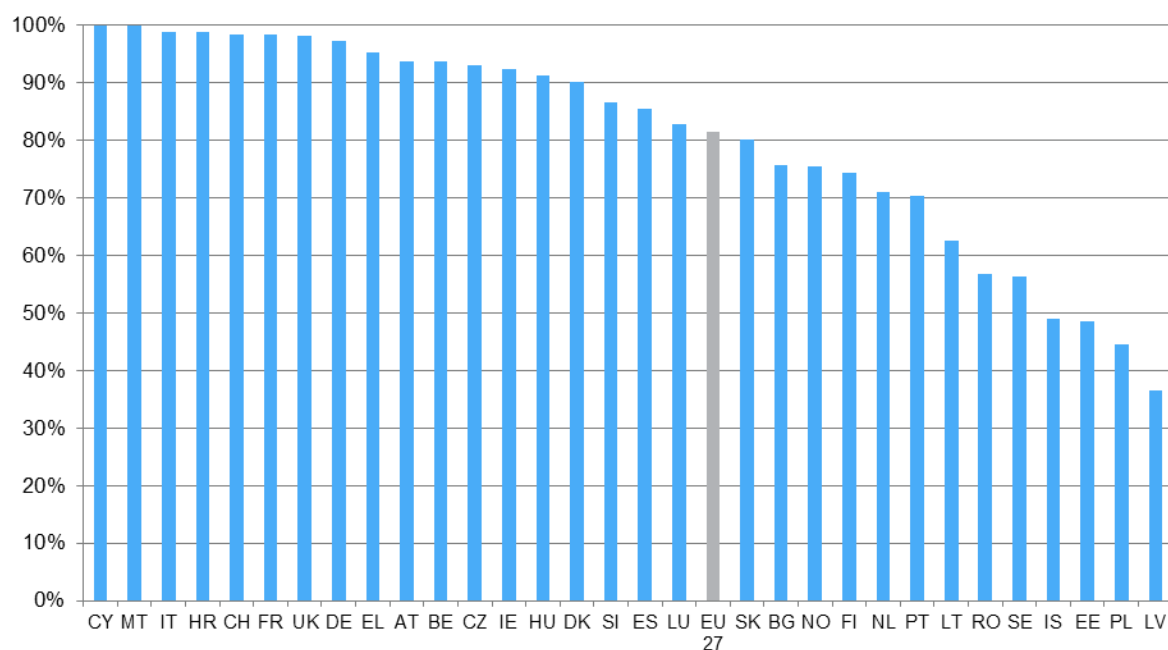
It should be noted that data on rural coverage collected from NRAs and individual operators was not always as comprehensive as total market-level data. In cases when information on rural coverage was incomplete, the research team estimated rural coverage. These estimations assume that a technology will 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 81.3% of rural EU households. When compared to the total EU27 DSL coverage, rural DSL coverage was 8.0 percentage points lower and the difference between total and rural DSL coverage remained considerable in some countries, such as Iceland (40.1 percentage points) and Sweden (31.2 percentage points).

In mid-2021, thirteen countries recorded rural DSL coverage levels below the EU average (81.3%). As was the case last year, Latvia, Poland, Estonia, and Iceland reported the lowest rural DSL coverage levels, at 36.6%, 44.5%, 48.5%, and 48.9% respectively. With the decommissioning of legacy copper lines under way in many study countries, we also start to see in several countries (e.g. Finland, Hungary, Luxembourg) that rural DSL coverage reaches higher levels than total DSL coverage. This trend is a result of the pace of legacy lines decommissioning and replacement being faster on a total level (i.e. is primarily targeted at urban areas), whereas DSL remains the key technology in rural areas.

DSL coverage by country, rural areas, 2021



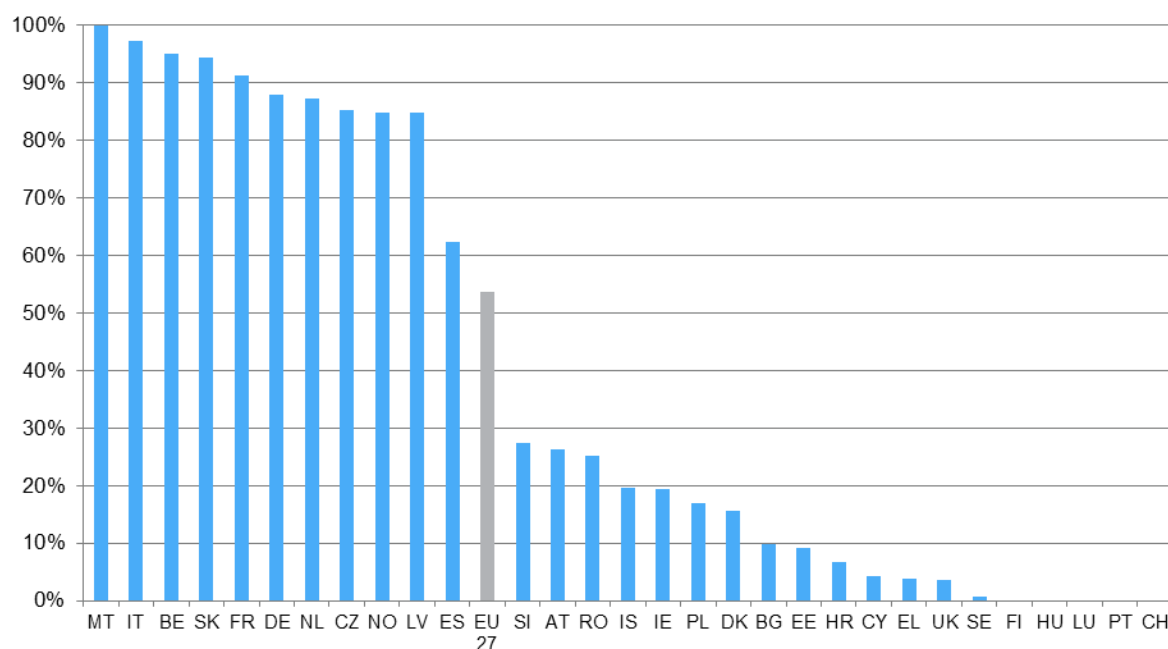
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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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 but one of the highest FTTP coverage of rural areas of all study countries, at 75.2% of rural homes 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 a technical and an economic perspective.

FWA coverage by country, rural areas, 2021



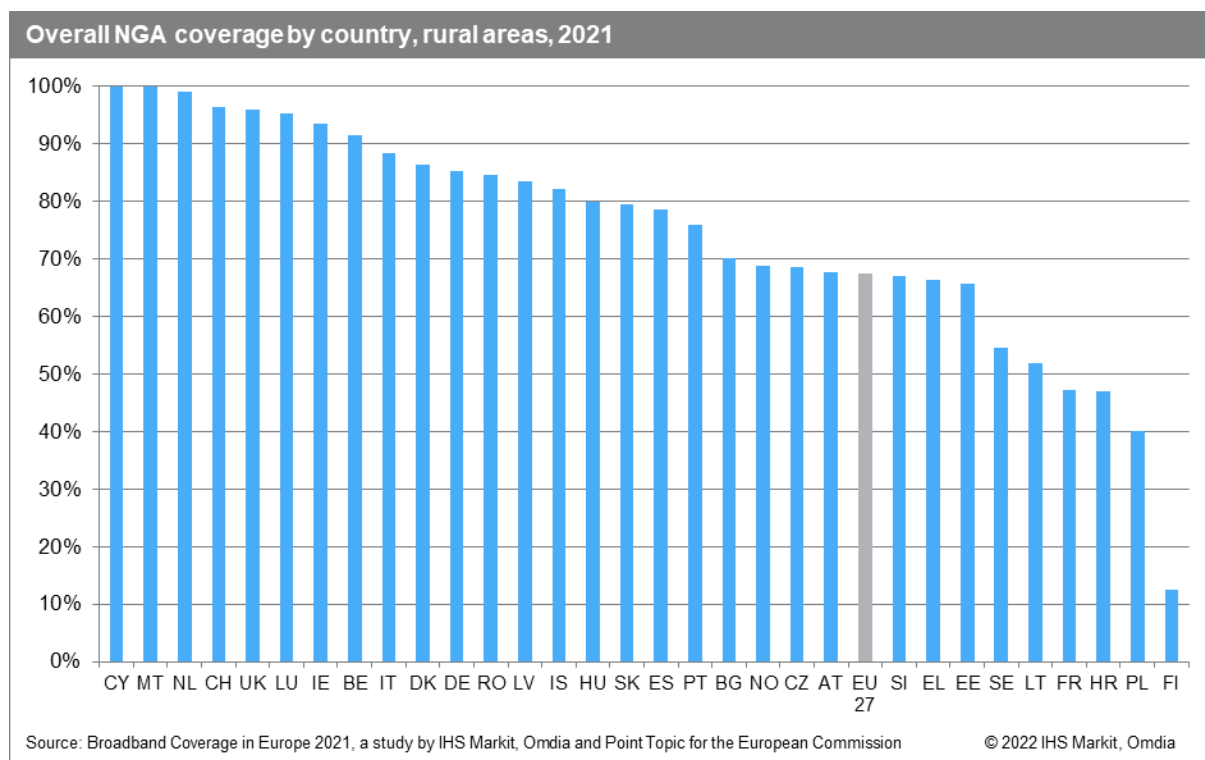
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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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 Digital Single Market and Digital Decade goals.

At the end of June 2021, the rural EU average for NGA coverage was 67.5%, an increase of 7.6 percentage points compared to mid-2020. Although rural NGA coverage was 22.6 percentage points below total NGA coverage (90.1%), 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 27.3 percentage points in mid-2020, 30.0 percentage points in mid-2019, and 34.9 percentage points in mid-2018. This indicates that network deployment is shifting towards rural areas, as urban areas start to reach saturation for NGA coverage.



By mid-2021, both Cyprus and Malta recorded universal rural NGA coverage. Six other countries recorded rural NGA coverage exceeding 90%: the Netherlands, Switzerland, the UK, Luxembourg, Ireland, and Belgium. Eight countries reported double-digit increases in rural NGA availability, with Austria recording the largest increase, at 30.1 percentage points since mid-2020.

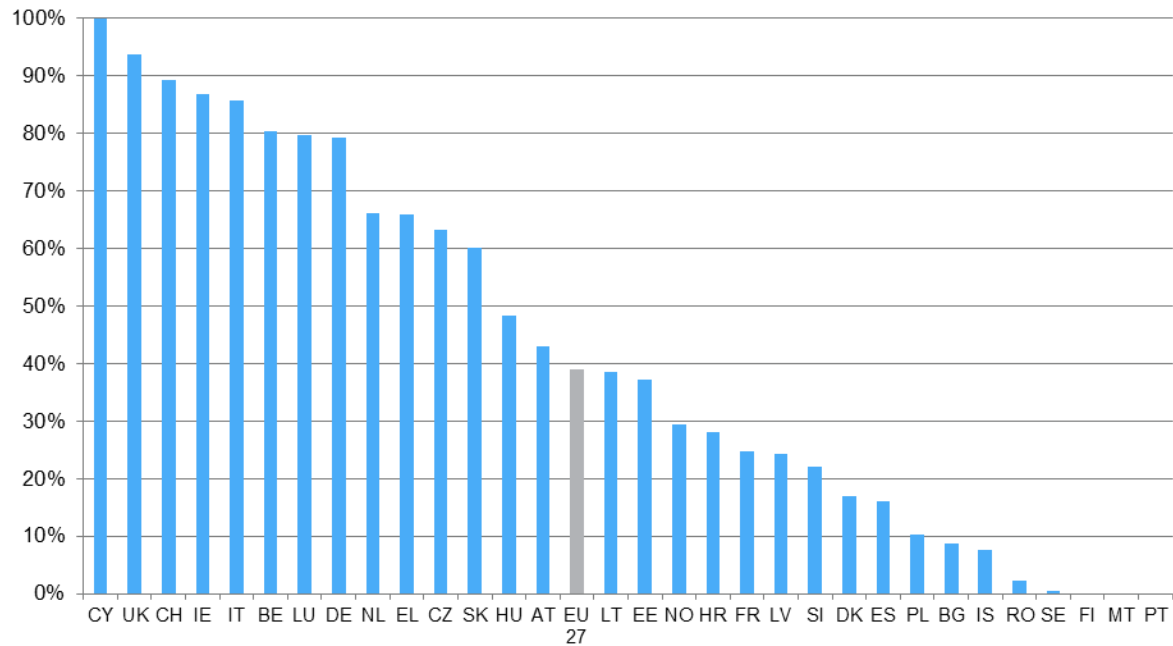
In total, nine countries recorded NGA availability below the EU average of 67.5%. Finland continued to be the country with the lowest rural NGA availability levels (12.4%), as mobile technologies are key to providing broadband coverage in rural Finland.

4.4.2.1 Rural VDSL, VDSL2 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 39.0% of rural homes in the EU, a 1.8 percentage point increase during the twelve months to mid-2021.

Cyprus was the only country to record universal rural VDSL coverage, whilst in seven other countries (the UK, Switzerland, Ireland, Italy, Belgium, Luxembourg, and Germany) 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.

VDSL coverage by country, rural areas, 2021

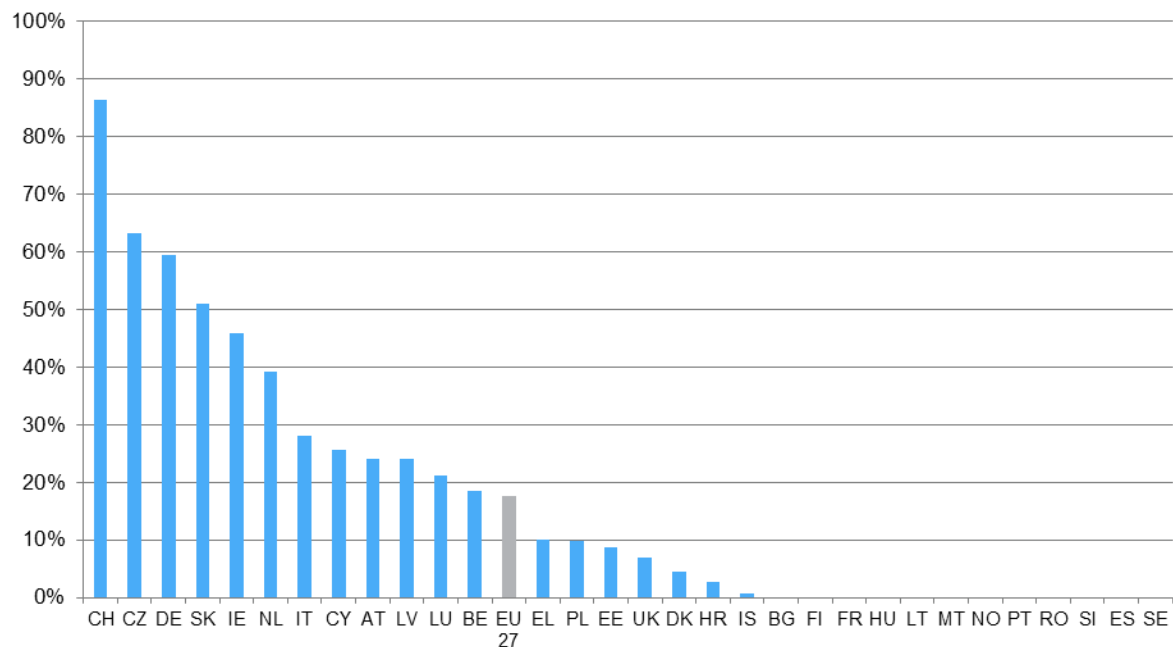


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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At the end of June 2021, VDSL2 Vectoring remained absent from rural regions of twelve study countries. The EU27 average stood at 17.7%, with Switzerland recording the highest coverage level, at 86.3%. It was followed by Czechia, where 63.2% of rural households had access to VDSL2 Vectoring services with the incumbent's infrastructure company completing the upgrade of the whole of its legacy network to the standard.

VDSL 2 Vectoring coverage by country, rural areas, 2021

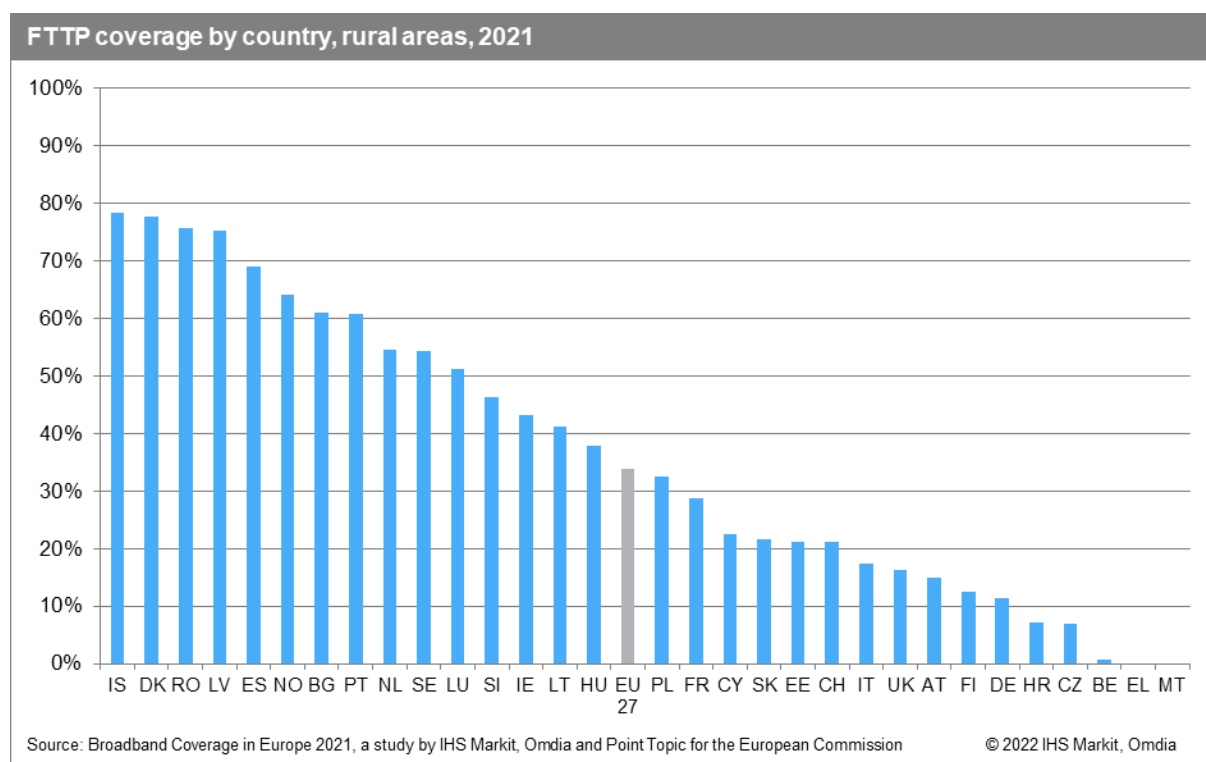


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

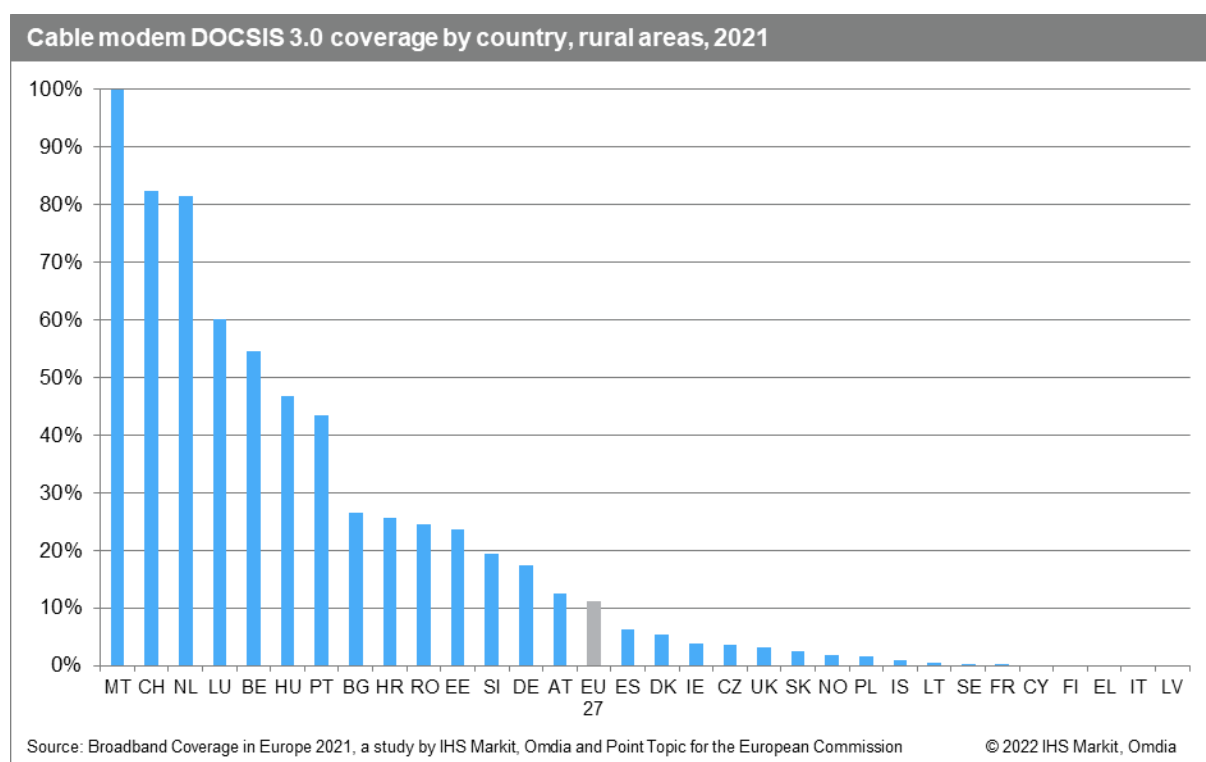
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By mid-2021, Iceland was the leader in terms of rural FTTP coverage (78.4%) followed closely by Denmark where FTTP services were available to 77.8% of rural households. In addition, FTTP networks passed more than half of rural homes in Romania, Latvia, Spain, Norway, Bulgaria, Portugal, the Netherlands, Sweden, and Luxembourg. The Netherlands also recorded the largest year-on-year increase, with rural FTTP coverage growing by 27.2 percentage points and reaching 54.5% of rural Dutch households.

Conversely, sixteen countries recorded rural FTTP coverage below the EU average of 33.8% and FTTP remained absent from rural regions of Malta and Greece.

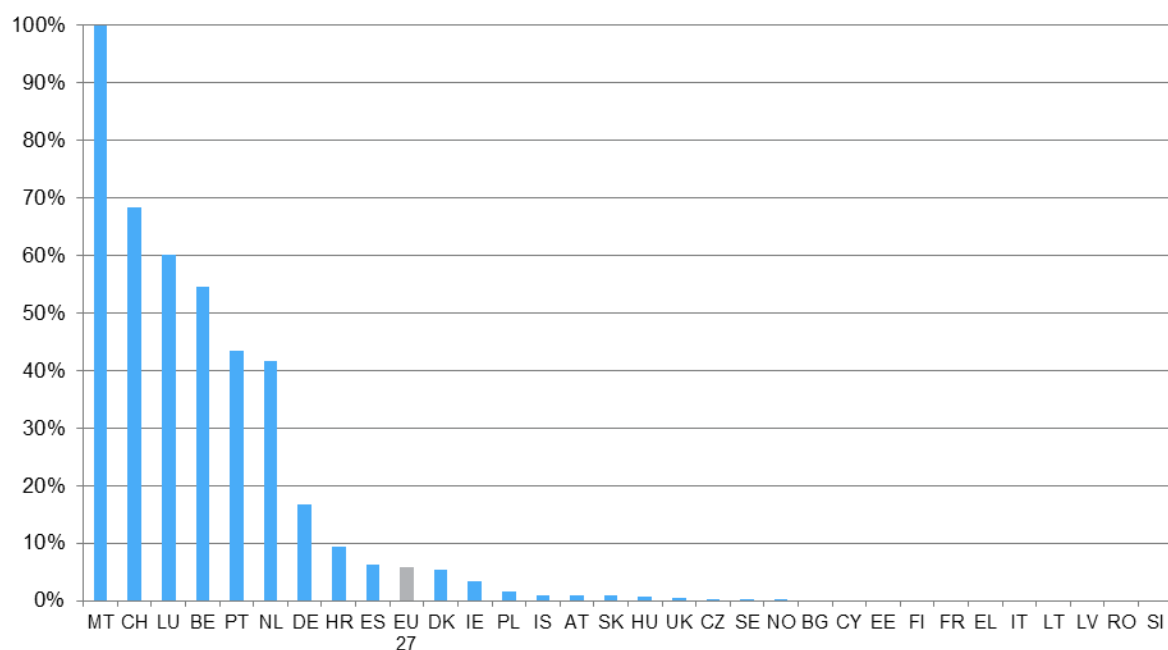


Malta remained the leader in terms of rural DOCSIS 3.0 coverage (100.0%). Apart from Malta, only Switzerland, the Netherlands, Luxembourg, and Belgium recorded rural DOCSIS 3.0 availability higher than 50%.



At the end of June 2021, DOCSIS 3.1 was absent from rural regions of eleven study countries. DOCSIS 3.1 was also the fixed broadband technology with the lowest rural EU average, at 5.7% of rural households. Malta was the only country to record complete rural DOCSIS 3.1 coverage, and only three other countries (Switzerland, Luxembourg, and Belgium) recorded coverage over 50%.

DOCSIS 3.1 coverage by country, rural areas, 2021



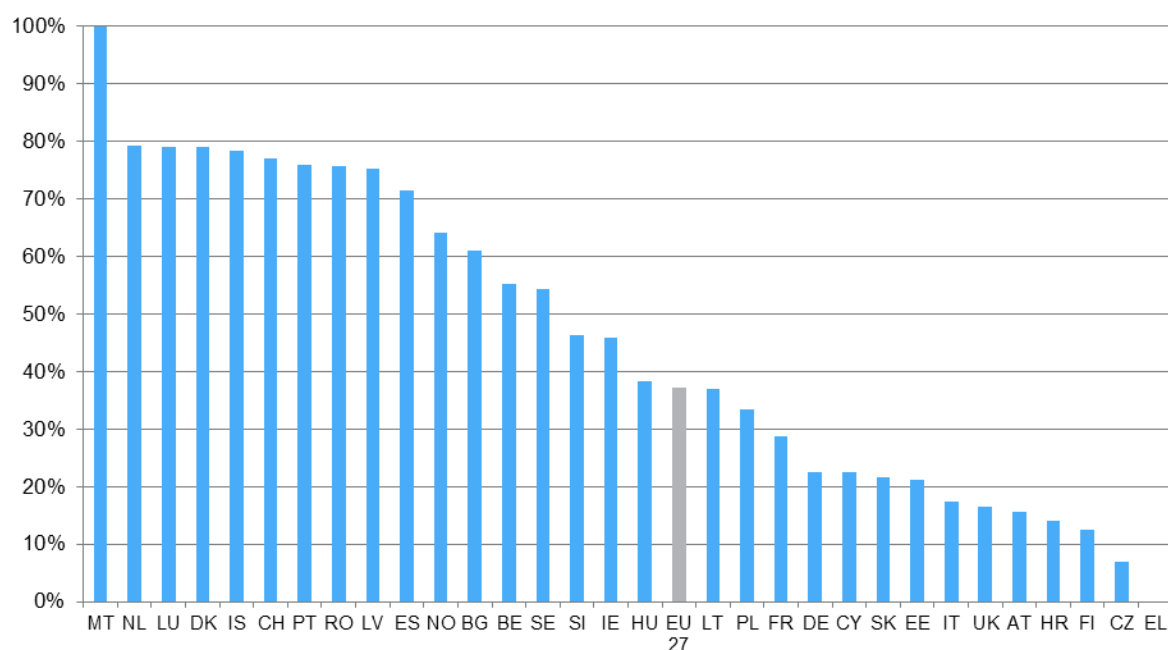
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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4.4.3 Rural overall FTTP & DOCSIS 3.1 coverage by country

By mid-2021, 37.1% of rural EU homes were passed by either FTTP or DOCSIS 3.1 networks. Despite growing by 8.4 percentage points compared to the end of June 2020, overall FTTP & DOCSIS 3.1 coverage of rural regions across the EU was 33.1 percentage points lower than on a national level with coverage levels growing faster on national level than on rural level (i.e. the gap between national and rural coverage has increased compared to mid-2020).

Overall FTTP & DOCSIS 3.1 coverage by country, rural areas, 2021



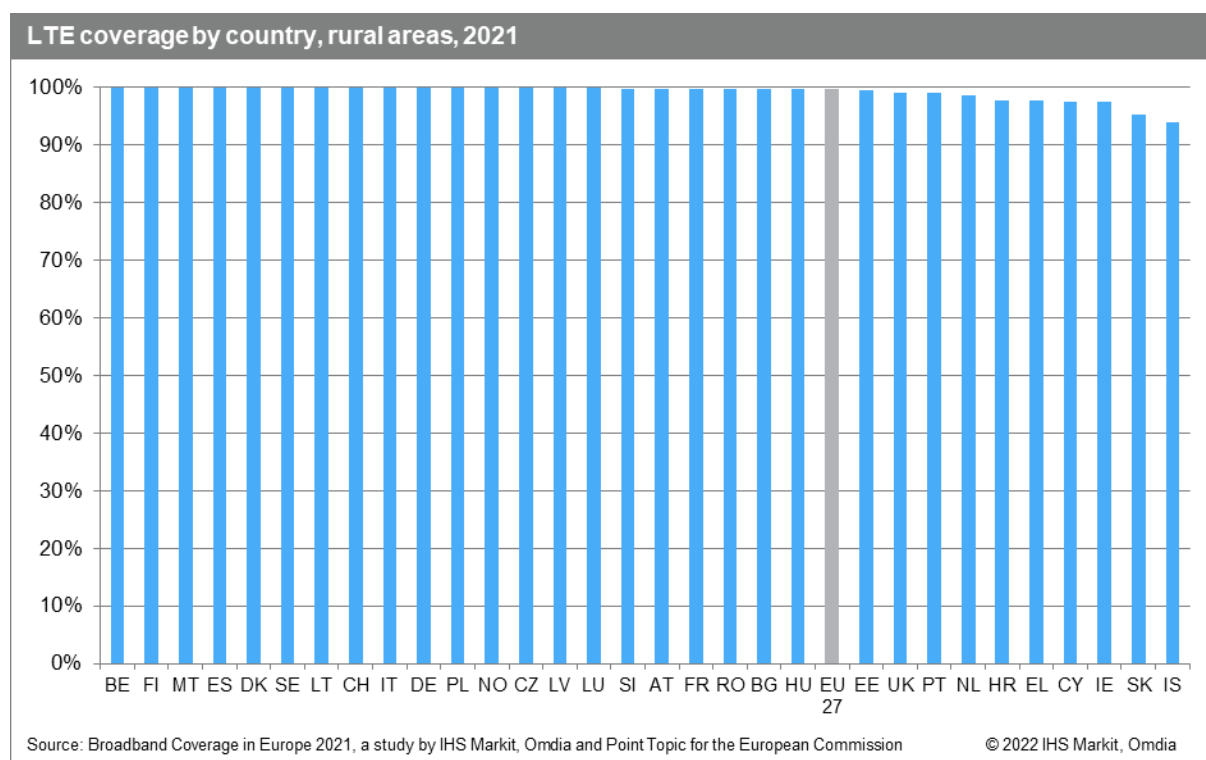
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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Greece was the only country to record complete absence of FTTP & DOCSIS 3.1 coverage, with rural regions being covered by DSL-based technologies only. Fourteen countries recorded rural FTTP & DOCSIS 3.1 coverage levels below the EU average. Malta is the only country with complete FTTP & DOCSIS 3.1 rural coverage and another eight countries (the Netherlands, Luxembourg, Denmark, Iceland, Switzerland, Portugal, Romania, and Latvia) recorded coverage above 75%.

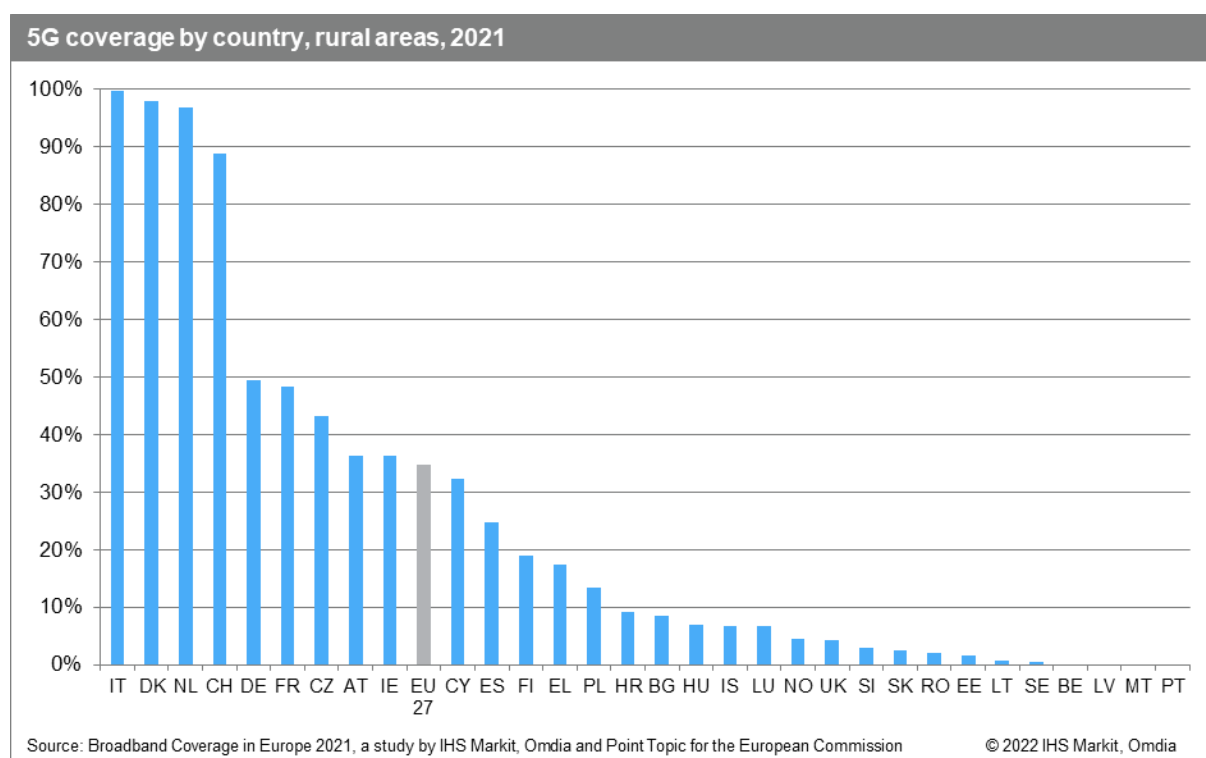
4.4.4 Rural LTE coverage by country

By mid-2021, the EU average for rural LTE coverage was 99.6%, an increase of 1.0 percentage point in the twelve-month period, a significant slowdown in growth as LTE coverage becomes near universal in nearly all study countries.



4.4.5 Rural 5G coverage by country

Thanks to the use of Dynamic Spectrum Sharing technology (DSS), operators were able to speed up deployment of 5G networks extending even into rural areas with rural 5G coverage increasing from only 1.5% in mid-2020 to 34.7% of rural EU households covered by 5G networks at the end of June 2021. In Italy, Denmark, and the Netherlands, 5G services were available to more than 90% of rural households.

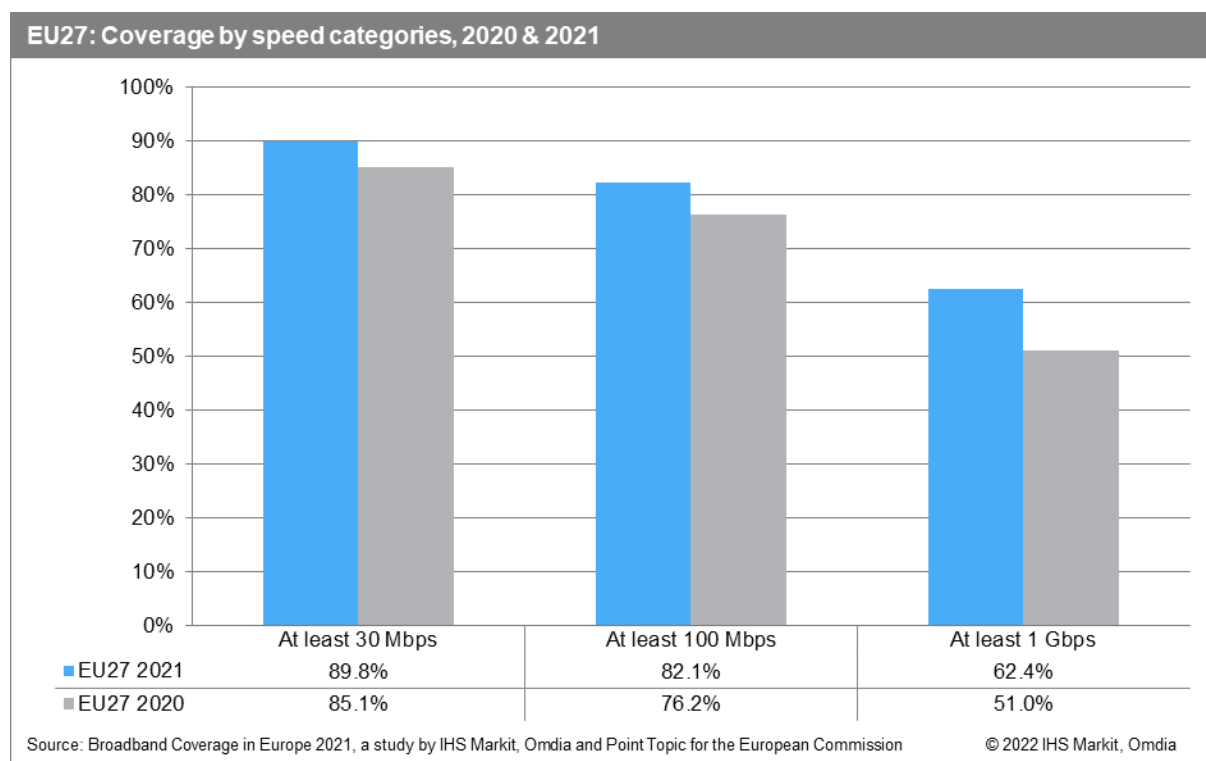


Note: 5G coverage includes coverage provided using Dynamic Spectrum Sharing (DSS)

4.5 Coverage by speed categories

4.5.1 Europe-wide coverage by speed categories

Following a discussion with DG CONNECT, the research team has decided in 2021 to exclude the 'At least 2Mbps' speed category as the vast majority of networks now offers broadband connections at this actual speed. On the other hand, a new category determining actual 1Gbps upload and download speed was added among the speed categories tracked by the BCE study. However, as data for this metric was not available for all countries, it was not possible to calculate the EU27 average coverage value and data is presented for individual countries later on in this chapter.



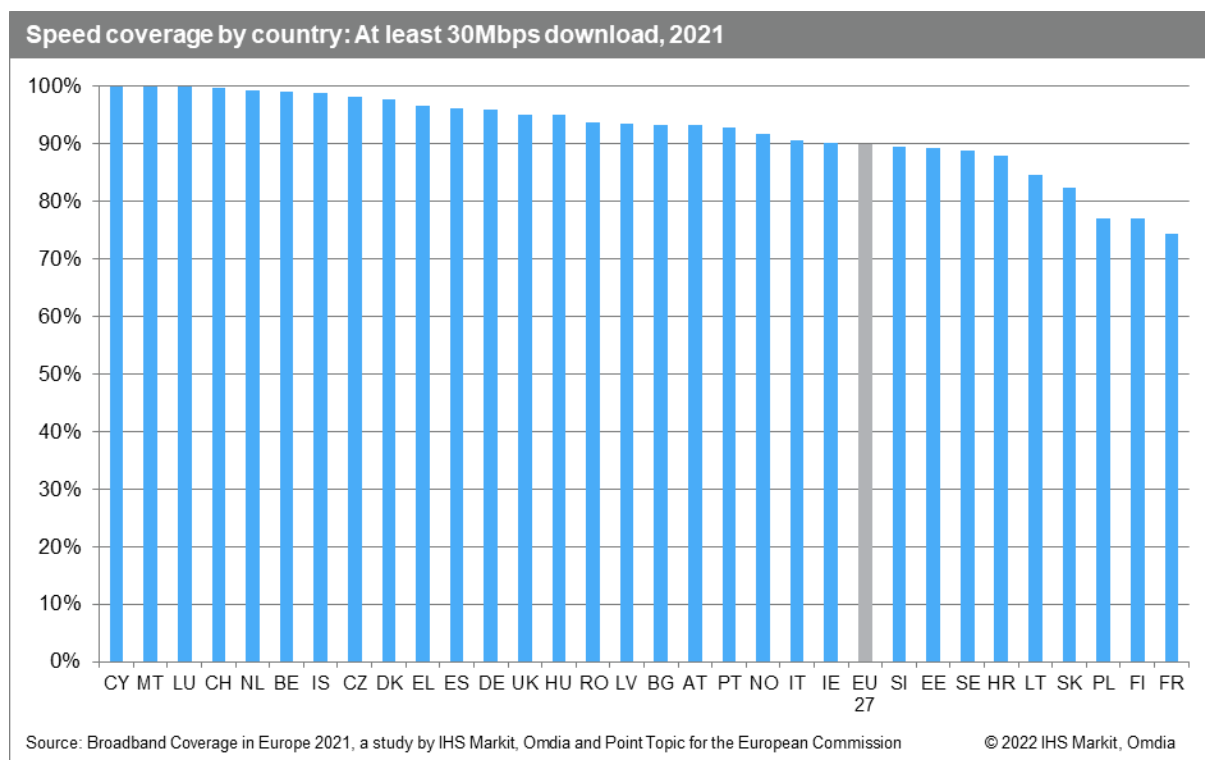
By mid-2021, 89.8% of EU households had access to at least one fixed broadband service that provided actual download speeds of at least 30Mbps, a 4.7 percentage point increase since mid-2020. This increase was driven by the overall growth in NGA coverage as well as the technological advancements that resulted in a higher number of VDSL networks being capable of supporting 30Mbps download speeds.

Coverage of networks supporting at least 100Mbps grew by 5.9 percentage points year-on-year. This is a result of growth in both VDSL2 Vectoring as well as FTTP coverage. At the end of June 2021, more than eight in ten (82.1%) of EU households had access to broadband services capable of providing at least 100Mbps actual download speeds.

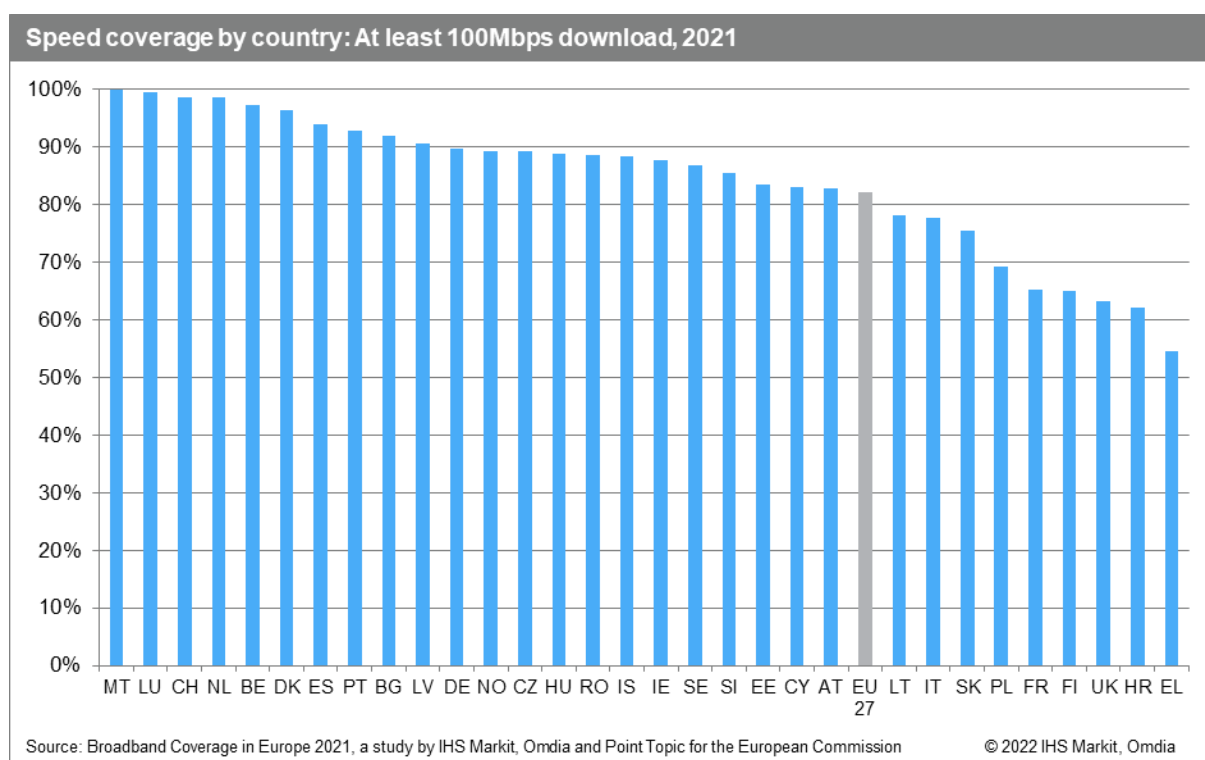
At the end of June 2021, 62.4% of EU households had access to broadband services capable of providing at least 1Gbps actual download speeds, following a significant 11.4 percentage point growth driven by progress in FTTP deployments as well as DOCSIS 3.1 upgrades.

4.5.2 Country comparison of coverage by speed categories

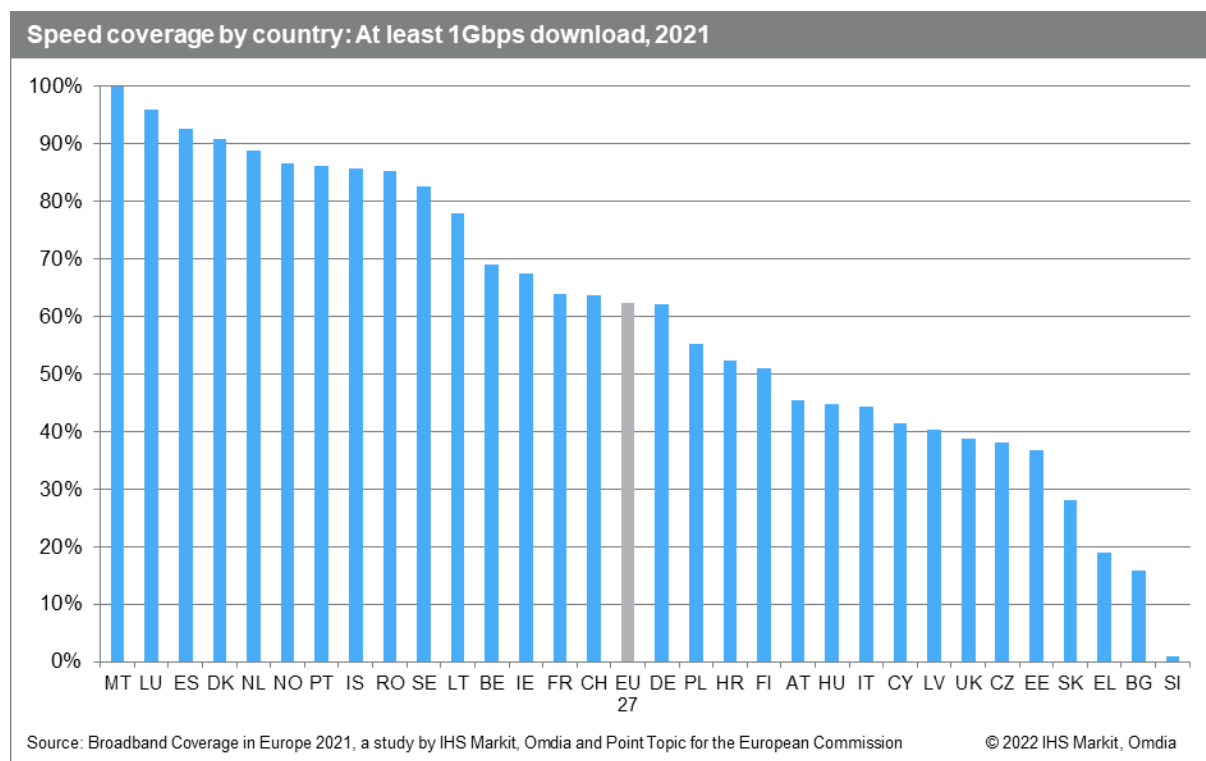
At the end of June 2021, fixed broadband services capable of at least 30Mbps download speeds passed more than 70% of households in all study countries. Malta and Cyprus recorded universal at least 30Mbps coverage and in eleven other countries (Luxembourg, Switzerland, the Netherlands, Belgium, Iceland, Czechia, Denmark, Greece, Czechia, Spain, Germany, and the UK), high-speed broadband service capable of delivering at least 30Mbps download speeds were available to more than 95% of households. Lithuania registered the highest growth with at least 30Mbps coverage expanding by 14.1 percentage points in the twelve-month period to the end of June 2021.



Whilst significant improvements have been made in high-speed broadband connectivity in recent years, examining availability of at least 100Mbps speeds shows that achieving universal coverage by 2025 will be challenging.



At the end of June 2021, 82.1% of EU households had access to broadband services capable of providing at least 100Mbps actual download speeds. Some considerable differences remain among individual countries. By mid-2021, over 95% of homes in six study countries (Malta, Luxembourg, Switzerland, the Netherlands, Belgium, and Denmark) were passed with a fixed broadband service capable of reaching at least 100Mbps actual download speeds. Moreover, Austria, Bulgaria, Croatia, Ireland, Italy, Lithuania, and Slovakia all recorded double-digit growth in availability of at least 100Mbps speed coverage by mid-2021. Conversely, only 54.6% of homes in Greece had access to broadband services capable of delivering at least 100Mbps actual download speeds.

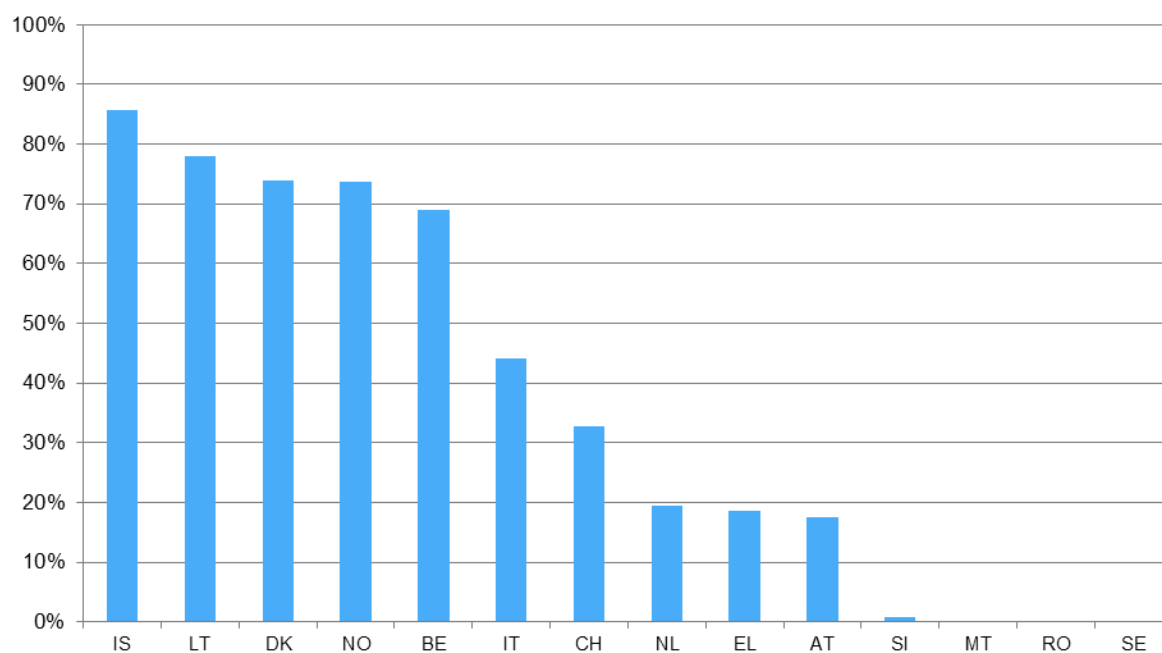


Great disparities also remain when analysing availability of services providing gigabit connectivity. At the end of June 2021, Malta was the only study country to record universal coverage by broadband services capable of providing at least 1Gbps. In Luxembourg, at least 1Gbps services were available to 95.9% of households and more than 9 in 10 of Spanish (91.7%) and Danish (90.7%) households had access to very high capacity broadband services.

Services capable of offering at least 1Gbps were available in all study countries, albeit only 0.9% of Slovenian household had access to these. In two other countries (Bulgaria, and Greece) less than 20.0% of households had access to at least 1Gbps broadband services.

Since one of the Digital Decade's objectives is universal coverage of EU households by a Gigabit network, the DG CONNECT requested a new speed metric to be included in the BCE 2021 study monitoring the progress in terms of availability of broadband services capable of delivering gigabit upload and download speeds.

Speed coverage by country: At least 1Gbps upload and download, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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For the purposes of the BCE 2021 study, the research team included the 'At least 1Gbps upload and download' speed category in the survey questionnaire and received responses from fourteen NRAs. At this time, we decided not to estimate values for this speed category for the remainder of the study countries and present the results as a best effort analysis for those countries where NRA data is available.

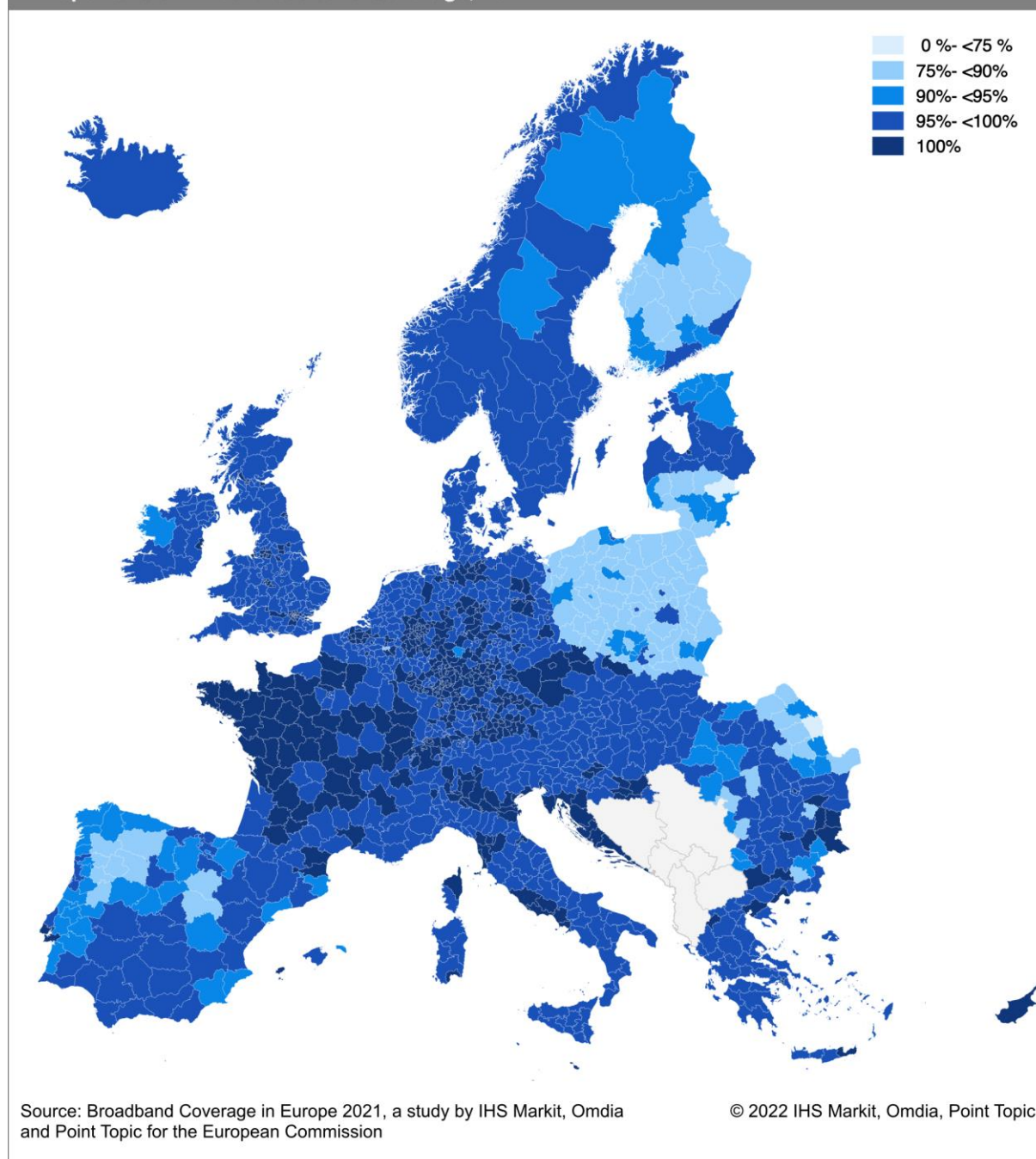
Among the fourteen countries, Iceland reported the highest number of households having access to broadband services capable of delivering actual upload and download speeds of at least 1Gbps – 85.6% of households at the end of June 2021. In Malta, Romania, and Sweden, NRAs reported no available gigabit upload and download residential coverage was available in mid-2021.

4.6 NUTS 3 level coverage

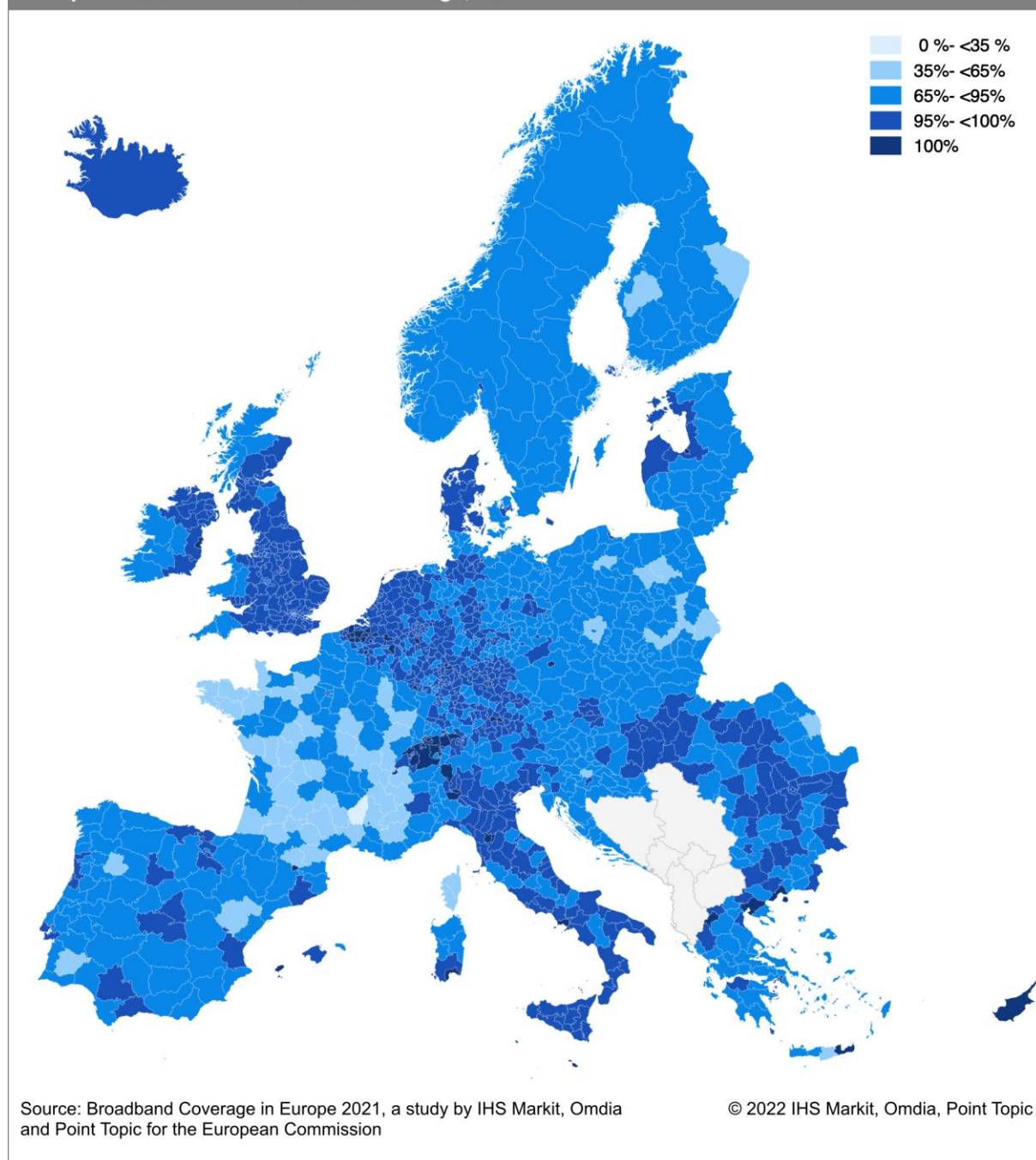
4.6.1 Total broadband coverage at NUTS 3 level

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, 2021

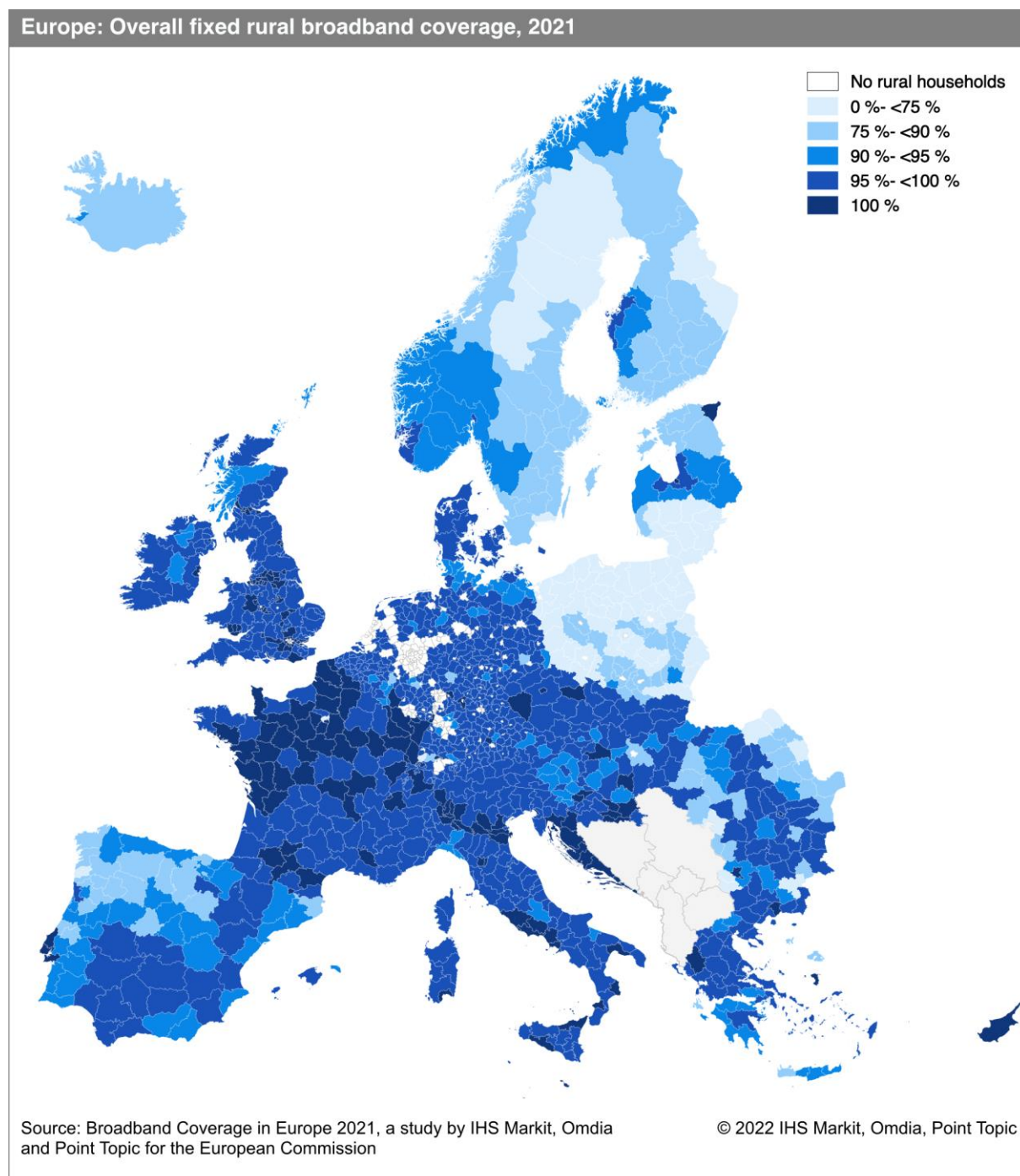


Europe: Overall NGA broadband coverage, 2021

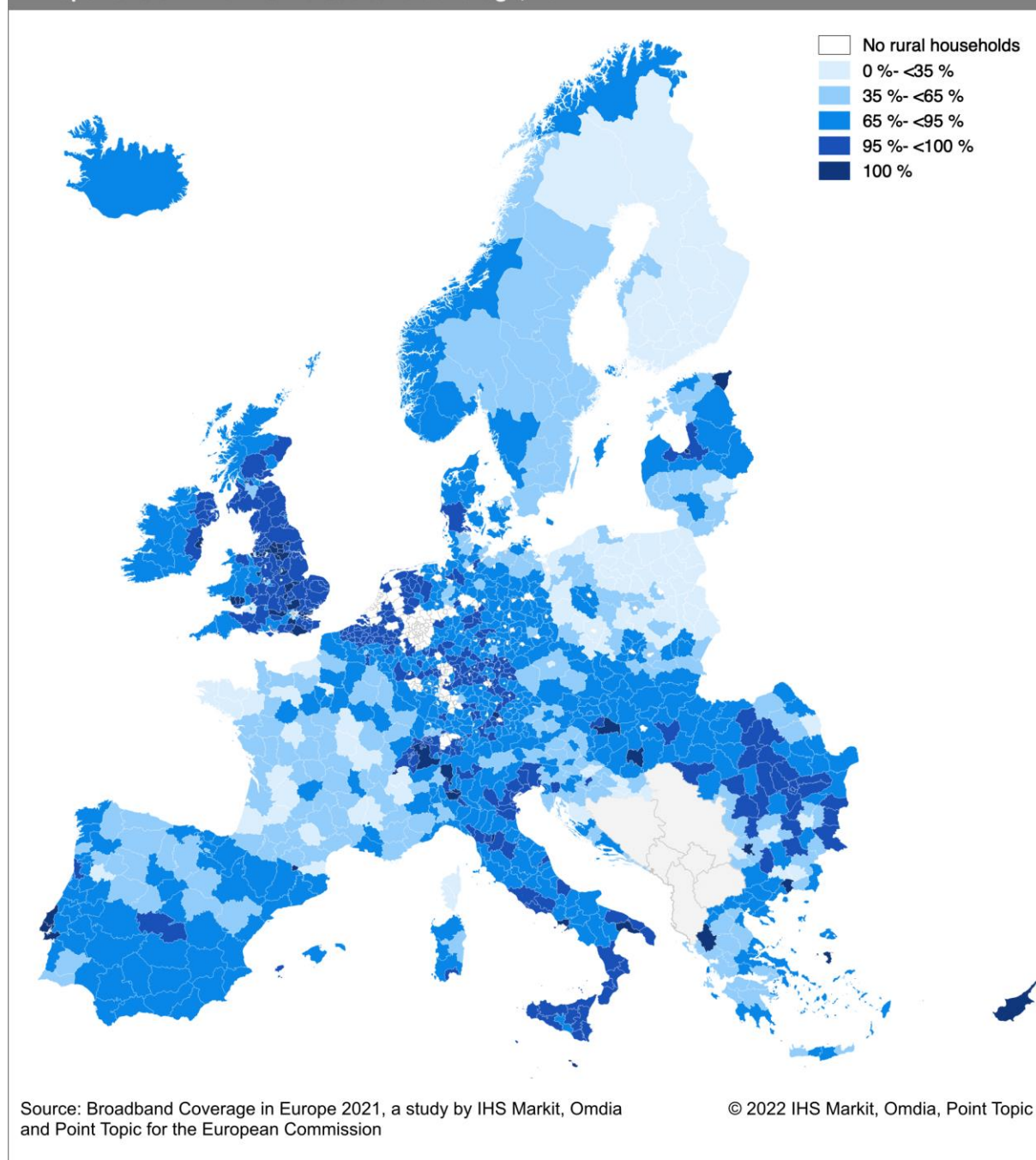


4.6.2 Rural broadband coverage at NUTS 3 level

It is important to note that Germany, Hungary, the Netherlands, Poland, Switzerland, and the UK all have some NUTS 3 regions which do not have any rural households. These NUTS 3 regions are represented by the white areas on the rural coverage maps.



Europe: Overall rural NGA broadband coverage, 2021



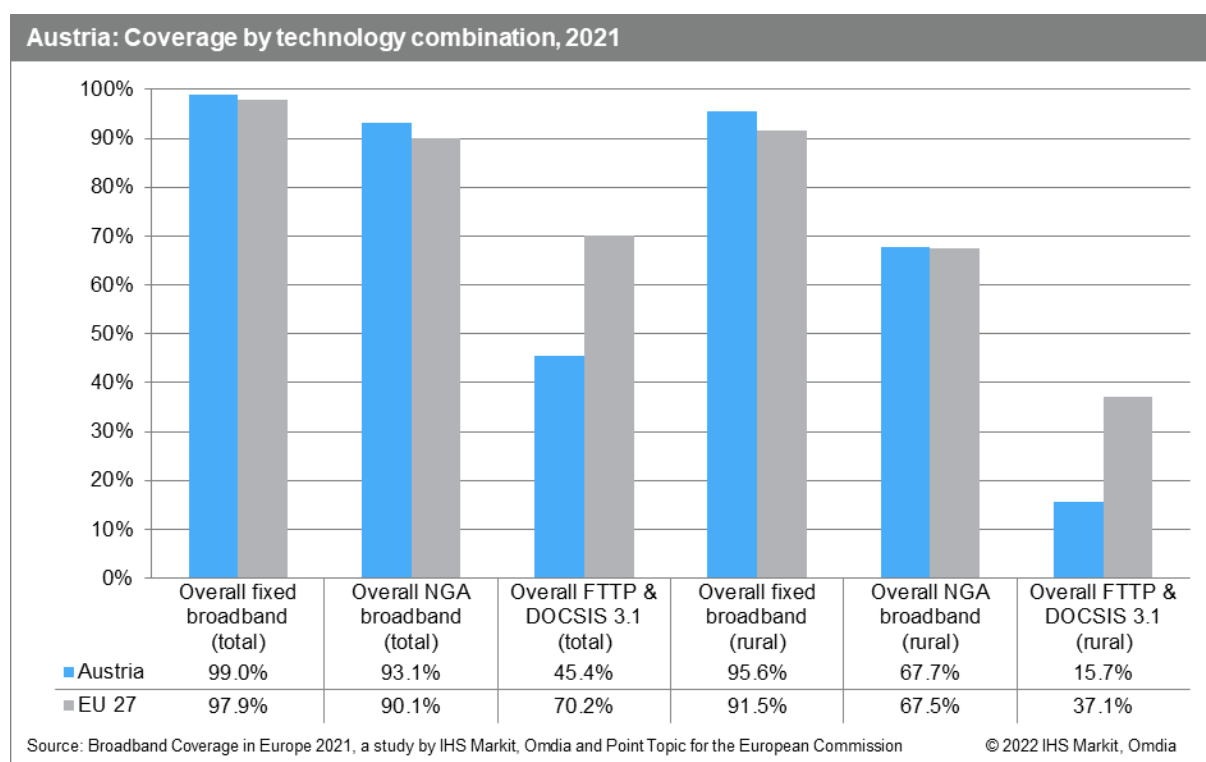
5.0 Coverage by Country

5.1 Austria

5.1.1 National coverage by broadband technology

99% of Austrian households had access to at least one broadband technology by the end of June 2021, up by 0.1 percentage points on a year-on-year comparison. Fixed broadband coverage in rural regions stood at 95.6%. Austrian operators accelerated upgrades to VDSL and VDSL2 Vectoring technologies which resulted in strong growth in the NGA coverage on both national (6.5 percentage points) and rural (30.1 percentage points) levels. Unlike previous years, Austria outperformed the EU average, passing a total of 67.7% of rural homes with NGA networks.

Although Austria provided good NGA coverage, it ranked among the bottom five countries in terms of gigabit-capable networks (FTTP & DOCSIS 3.1) on both national and rural level. FTTP & DOCSIS 3.1 networks were available to less than half of Austrian households (45.4%), despite a coverage growth of 6.1 percentage points compared to mid-2020. In rural Austria, coverage grew by 3.6 percentage points.

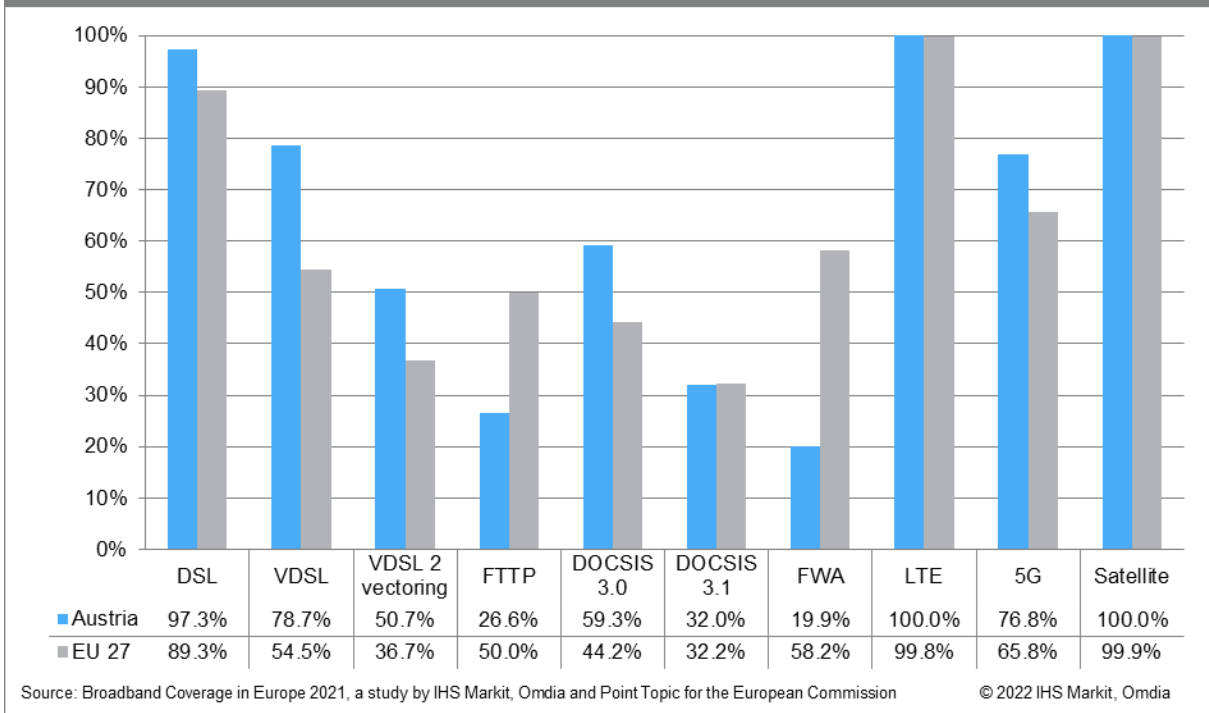


Looking at individual broadband technologies, DSL remained the most widespread, covering 97.3% of Austrian households, up by 1.9 percentage points compared to last year. The proportion of DSL networks upgraded to VDSL and VDSL2 Vectoring continued to grow and by mid-2021, 78.7% and 50.7% of the legacy copper networks had been upgraded to VDSL and VDSL2 Vectoring standards, respectively. VDSL2 Vectoring and VDSL were also the fastest growing Austrian broadband technologies, expanding coverage by 16.0 percentage points and 15.5 percentage points, respectively.

DOCSIS 3.0 networks passed 59.3% of Austrian homes while DOCSIS 3.1 was available to around a third of Austrian households (32.0%). Austrian cable operators maintained a good pace in DOCSIS 3.1 rollouts as coverage expanded by 5.3 percentage points compared to last year. Availability of FTTP networks increased by 6.1 percentage points to cover 26.6% of Austrian households. Austria still performed below the EU average in the FTTP category, holding a large gap of 23.4 percentage points.

LTE coverage remained unchanged in 2021 as the country had already reached universal coverage (100%) by mid-2020. 5G coverage expanded by 26.8 percentage points to cover 76.8% of Austrian households. Austria outperformed the EU average in 5G coverage and ranked among the top ten countries in this year's study.

Austria: Coverage by technology, total, 2021

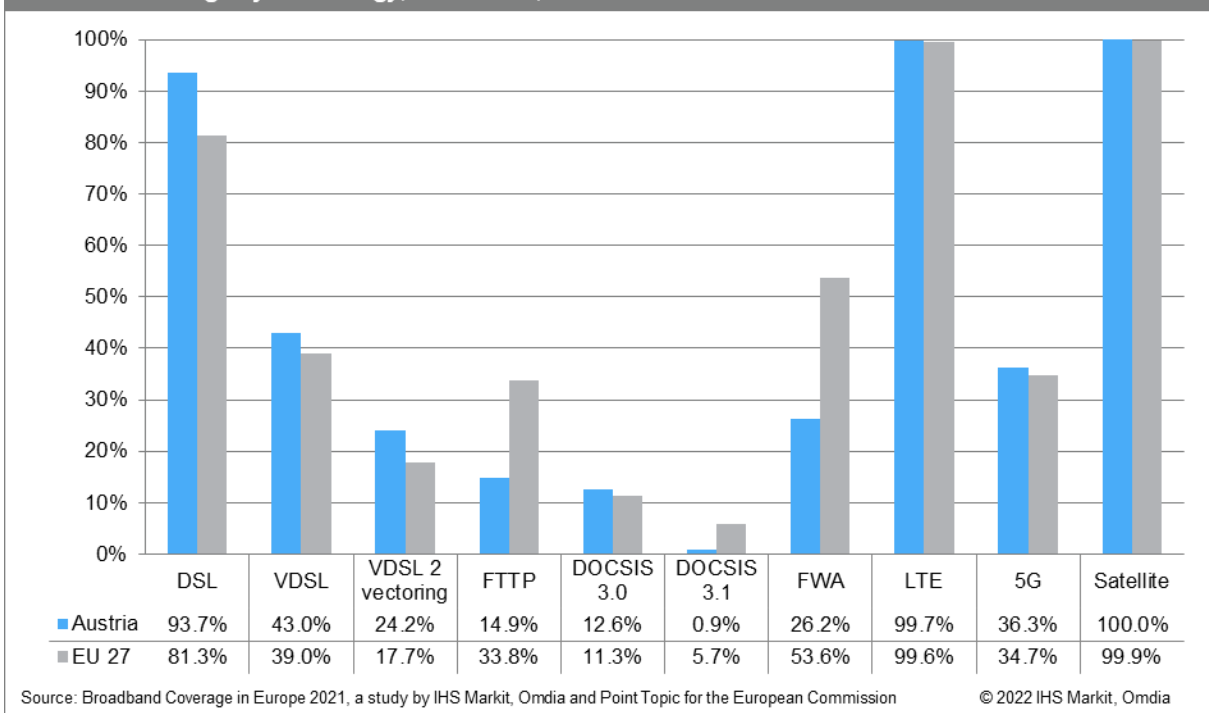


In rural regions, DSL passed 93.7% of rural homes, while 43.0% and 24.2% of Austrian households were covered by VDSL and VDSL2 Vectoring networks, respectively. As seen on national level, there was also a strong push for VDSL and VDSL2 Vectoring upgrades in rural regions, as coverage expanded by 26.7 percentage points and 20.1 percentage points, respectively.

Austria continued to lack behind other participating countries in terms of gigabit-capable networks: Only 14.9% of rural households were covered by FTTP networks by mid-2021, but the speed of rural deployments accelerated compared to the previous year. Coverage of DOCSIS 3.1 remained marginal at 0.9%, at it only grew by 0.3 percentage points in the twelve-month period.

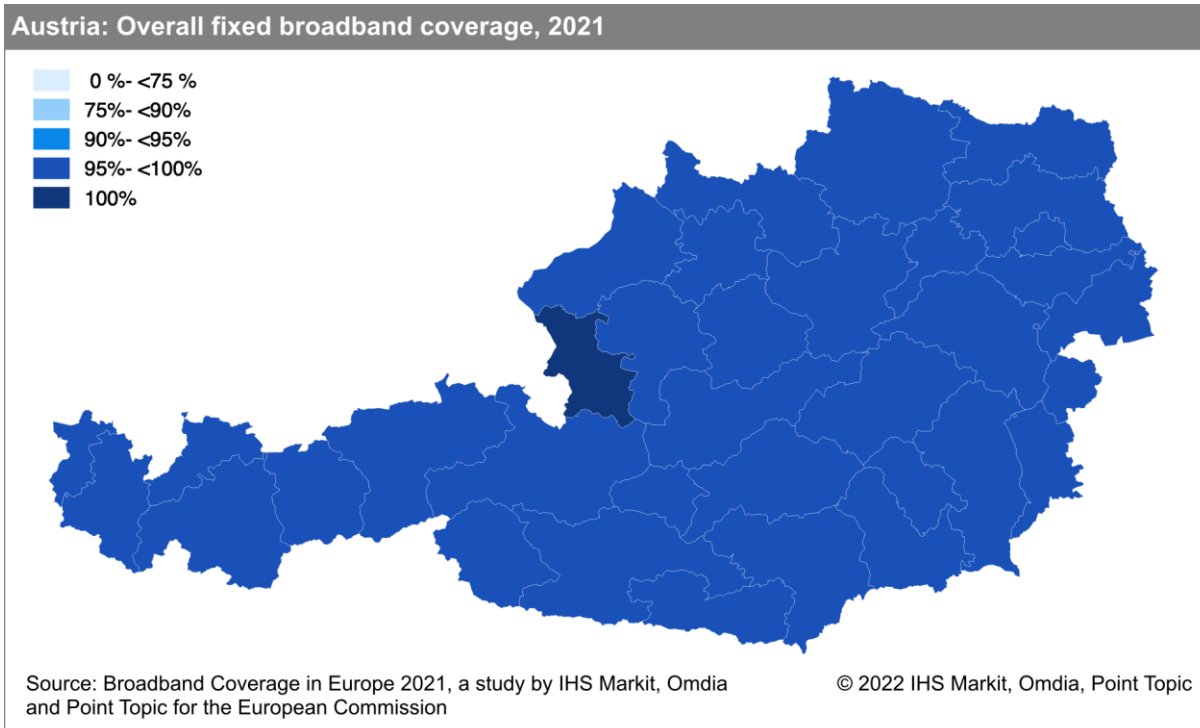
Almost all rural households (99.7%) were covered by at least one LTE network, while more than a third (36.3%) of rural households were covered by 5G services. Austrian operators accelerated deployments in rural regions as coverage expanded by 28.8 percentage points on a year-on-year comparison.

Austria: Coverage by technology, rural areas, 2021

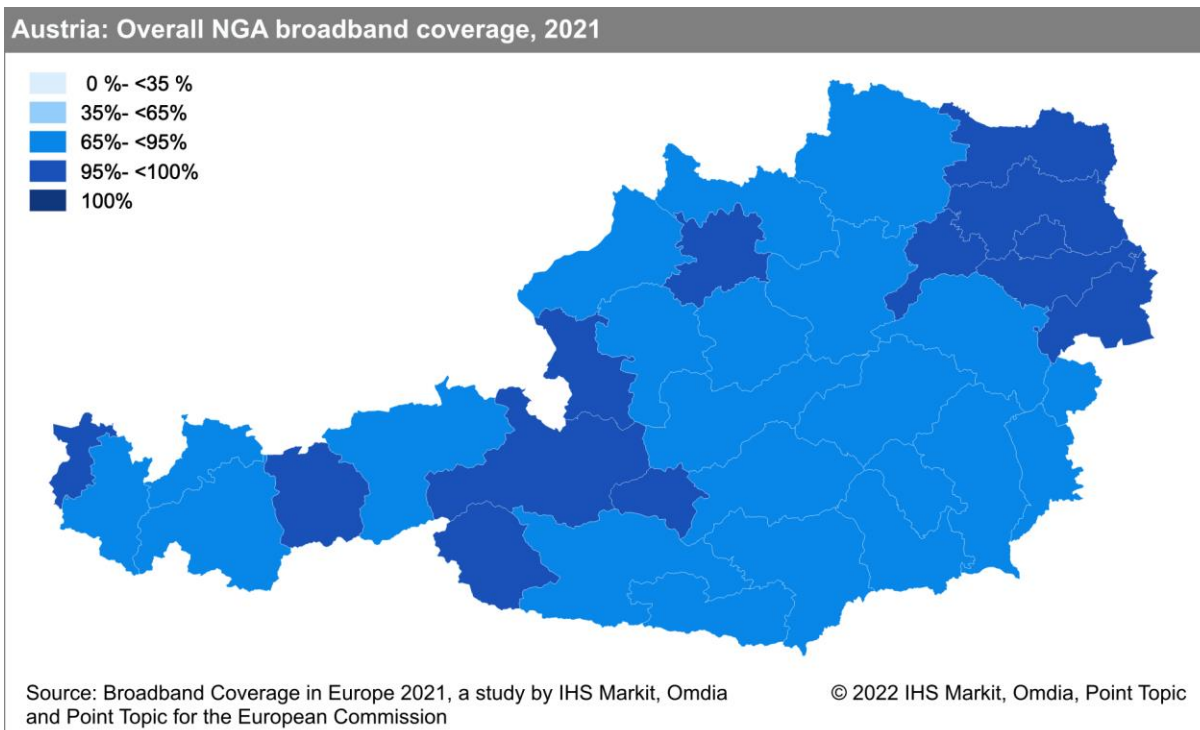


5.1.2 Regional coverage by broadband technology

Austrian fixed broadband coverage ranged from 95.3% in Oststeiermark to 100% in Salzburg und Umgebung. All regions reached the 95% threshold.



All Austrian regions performed above the 65% threshold in terms of NGA coverage. The lowest availability of NGA networks was reported in Oststeiermark (68.9%), while Nordburgenland neared universal coverage (99.4%).



5.1.3 Data tables for Austria

Statistic	National
Population	8,932,664
Persons per household	2.3
Rural proportion	14.7%

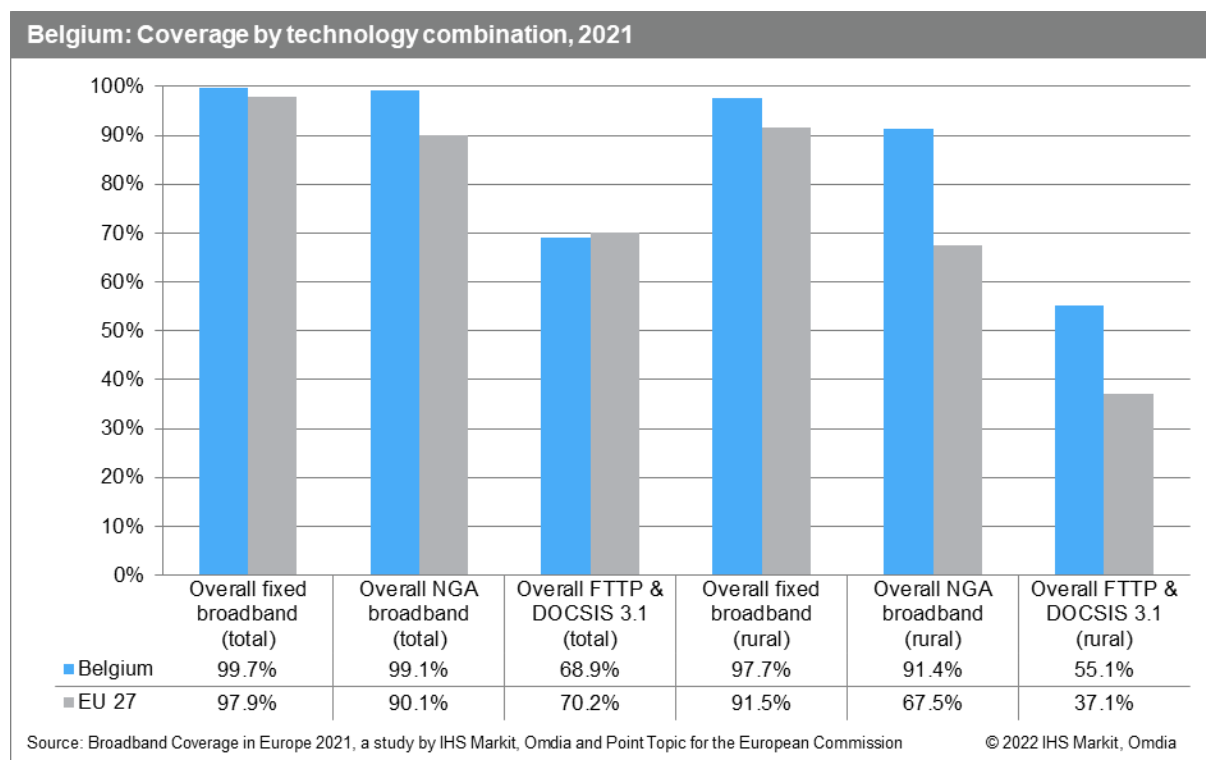
	Austria 2021		Austria 2020		Austria 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	97.3%	93.7%	95.3%	96.2%	96.9%	96.7%	89.3%	81.3%
VDSL	78.7%	43.0%	63.2%	16.3%	49.7%	13.6%	54.5%	39.0%
VDSL 2 Vectoring	50.7%	24.2%	34.7%	4.0%	21.7%	2.5%	36.7%	17.7%
FTTP	26.6%	14.9%	20.5%	10.6%	13.8%	10.0%	50.0%	33.8%
Cable modem DOCSIS 3.0	59.3%	12.6%	58.3%	21.2%	53.2%	20.4%	44.2%	11.3%
Cable modem DOCSIS 3.1	32.0%	0.9%	26.7%	0.6%	0.0%	0.1%	32.2%	5.7%
FWA	19.9%	26.2%	16.2%	25.1%	41.5%	28.9%	58.2%	53.6%
LTE	100.0%	99.7%	100.0%	99.9%	99.6%	96.6%	99.8%	99.6%
LTE average operator coverage	99.2%	-	99.3%	-	98.2%	-	97.5%	-
5G	76.8%	36.3%	50.0%	7.5%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.0%	95.6%	98.9%	98.0%	99.3%	98.0%	97.9%	91.5%
Overall NGA broadband	93.1%	67.7%	86.6%	37.7%	78.8%	34.0%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	45.4%	15.7%	39.3%	12.0%	13.8%	10.0%	70.2%	37.1%
At least 30Mbps	93.3%	-	86.6%	-	78.8%	-	89.8%	-
At least 100Mbps	82.8%	-	72.2%	-	65.2%	-	82.1%	-
At least 1Gbps	45.4%	-	36.9%	-	13.8%	-	62.4%	-
At least 1Gbps upload and download	17.5%	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.2 Belgium

5.2.1 National coverage by broadband technology

As of mid-2021, almost all Belgian households had access to at least one fixed broadband service, and NGA coverage was near-universal, reaching 99.1% of total households, compared with the EU average of 90.1%, and 91.4% of rural households – well above the EU average of 67.5%. Additionally, 68.9% of Belgian homes were passed by FTTP & DOCSIS 3.1 networks, slightly below the EU average (70.2%), although only rural coverage of these networks (55.1%) exceeded the EU figure (37.1%).



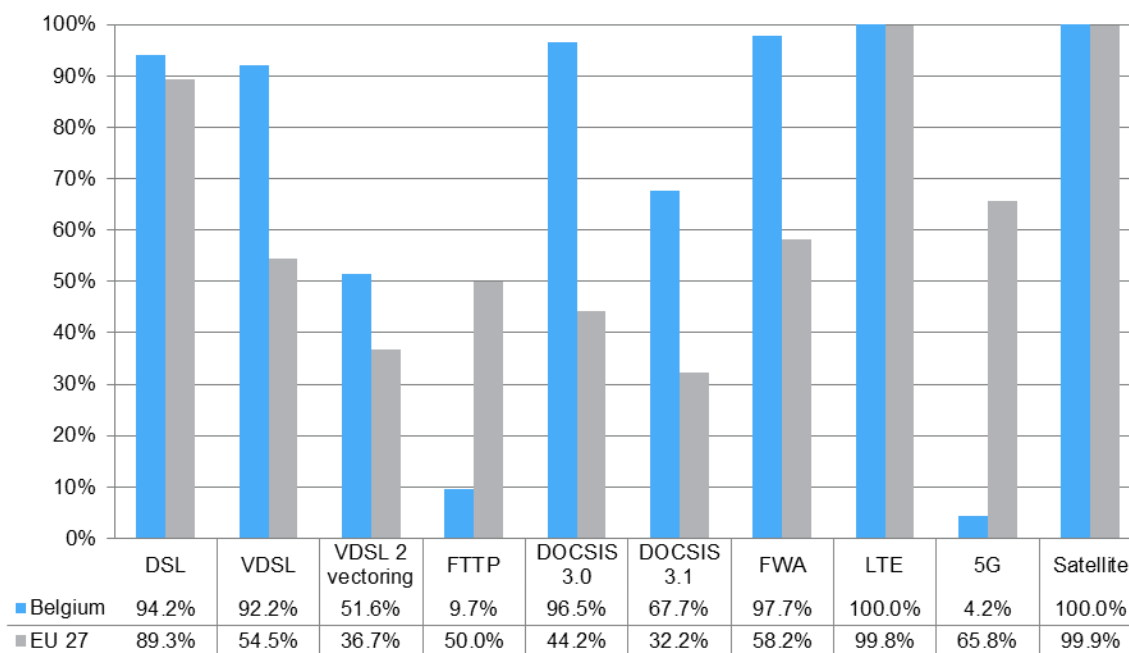
Regarding individual technology coverage at a national level, DSL availability remained high with 94.2% of homes passed by DSL networks. The Belgian incumbent operator has upgraded substantial portions of its legacy copper networks to new technology standards offering higher speeds, so that by mid-2021, VDSL and VDSL2 Vectoring technologies passed 92.2% and 51.6% of Belgian homes, respectively – representing much higher coverage levels than those observed in the EU, where VDSL services were available to 54.5% of total households while just 36.7% had access to VDSL2 Vectoring high-speed broadband services.

As of mid-2021 cable modem DOCSIS 3.0 was the most widely available fixed technology in Belgium, with services available to 96.5% of households, while Belgium was also one of the study countries where operators have made considerable progress with DOCSIS 3.1 network upgrades. By mid-2021 over two thirds (67.7%) of Belgian homes were passed by DOCSIS 3.1 networks, more than double the EU average of 32.2%.

With Belgian operators having historically focused on upgrading their legacy copper and cable networks, Belgium's FTTP coverage remains the lowest among all study countries, passing only 9.7% of homes at the end of June 2021, representing a coverage increase of 3.2 percentage points, since the previous study.

For mobile broadband coverage, Belgium has had universal LTE coverage since 2017 and by the end of June 2021, average coverage of all LTE network operators also remained at 100.0%, having achieved this milestone in 2020. The incumbent Proximus launched Belgium's first 5G services in April 2020, and remained the only 5G provider as of June 2021, with the technology reaching 4.2% coverage nationally by the end of the study period.

Belgium: Coverage by technology, total, 2021

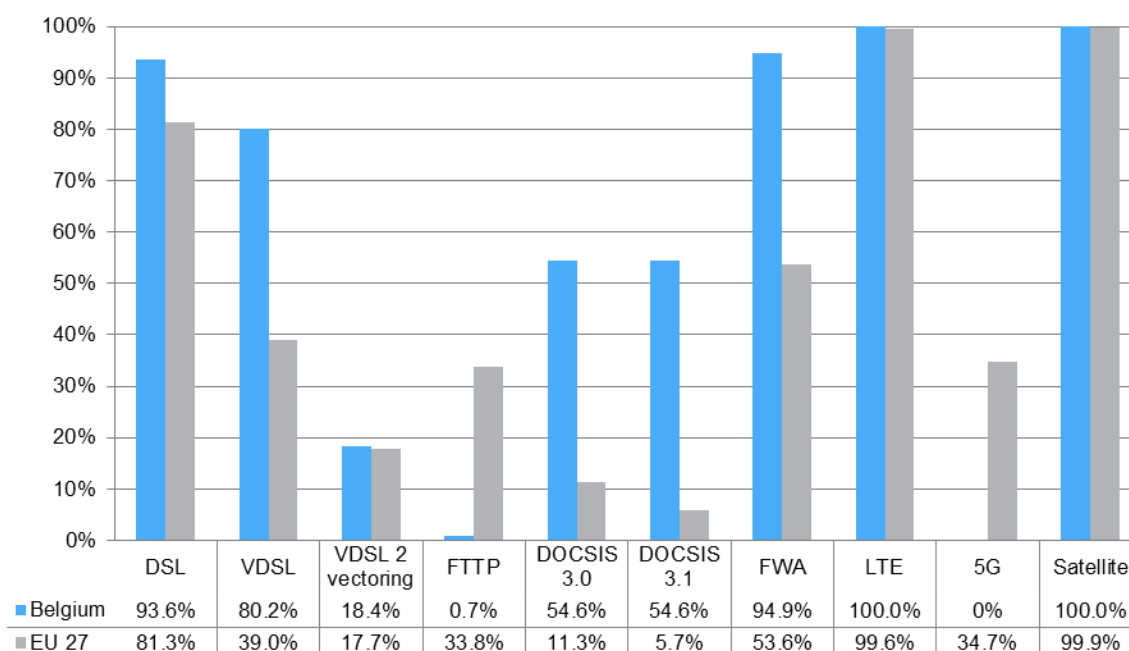


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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Within the rural regions of Belgium, DSL remained the most widely deployed fixed broadband technology, with 93.6% of rural homes passed – more than 12 percentage points above the EU average of 81.3%. Moreover, VDSL (80.2%) was more than double the average EU level (39.0%). Cable modem DOCSIS 3.0 was available to 54.6% of rural households – almost five times higher than the EU average (11.3%). Cable networks in rural areas have all been upgraded to the DOCSIS 3.1 standard, with coverage of 54.6% well ahead of the EU average for rural coverage (5.7%).

Belgium: Coverage by technology, rural areas, 2021

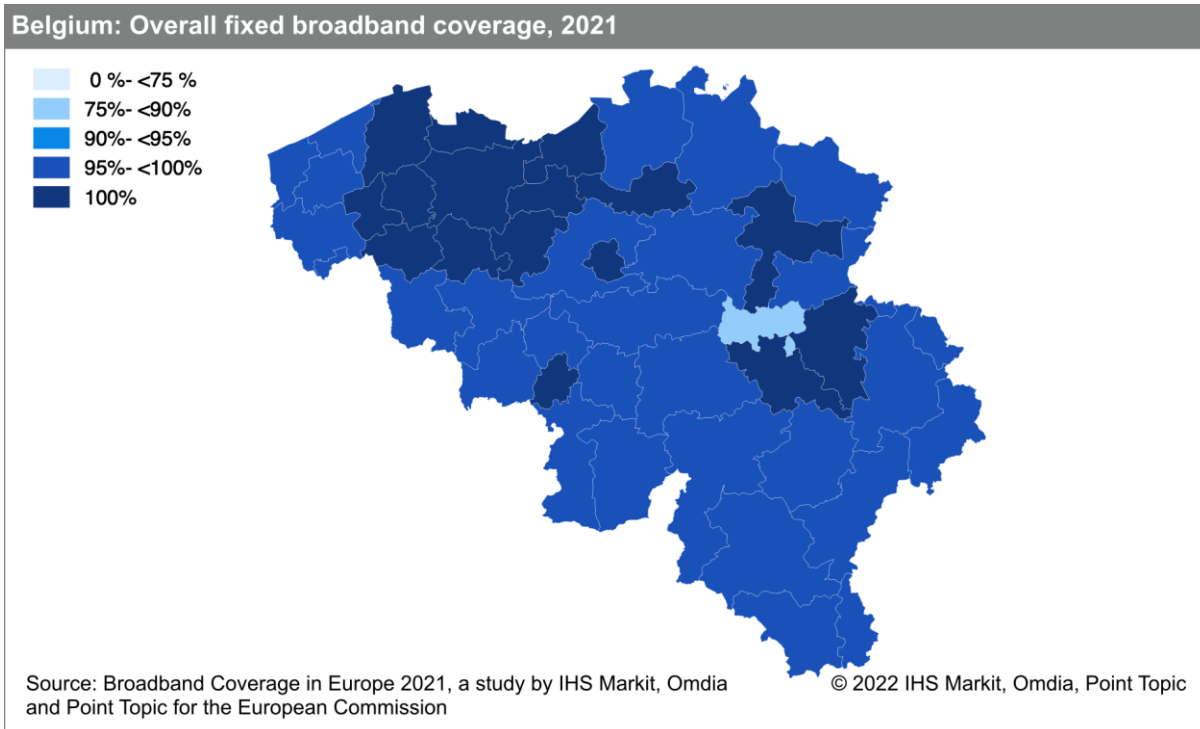


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

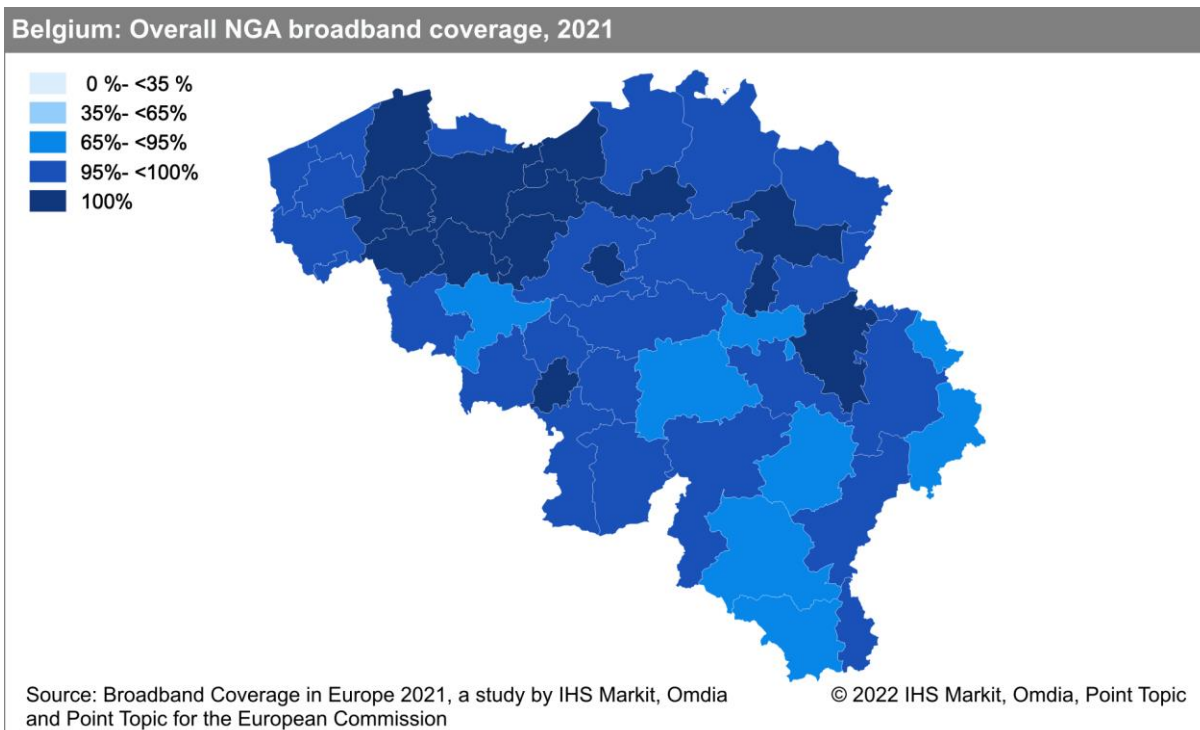
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5.2.2 Regional coverage by broadband technology

Fixed broadband was available to all households in 16 of the country's 44 regions, predominantly in Flanders. Coverage was near-universal (>96%) in the other regions, with the exception of the Walloon region of Waremmme.



Along with Brussels, all the Flemish regions of Belgium registered NGA coverage of >99%, while availability across the various Walloon regions ranged from 81.2% to 100% of households.



5.2.3 Data tables for Belgium

Statistic	National
Population	11,486,362
Persons per household	2.3
Rural proportion	5.0%

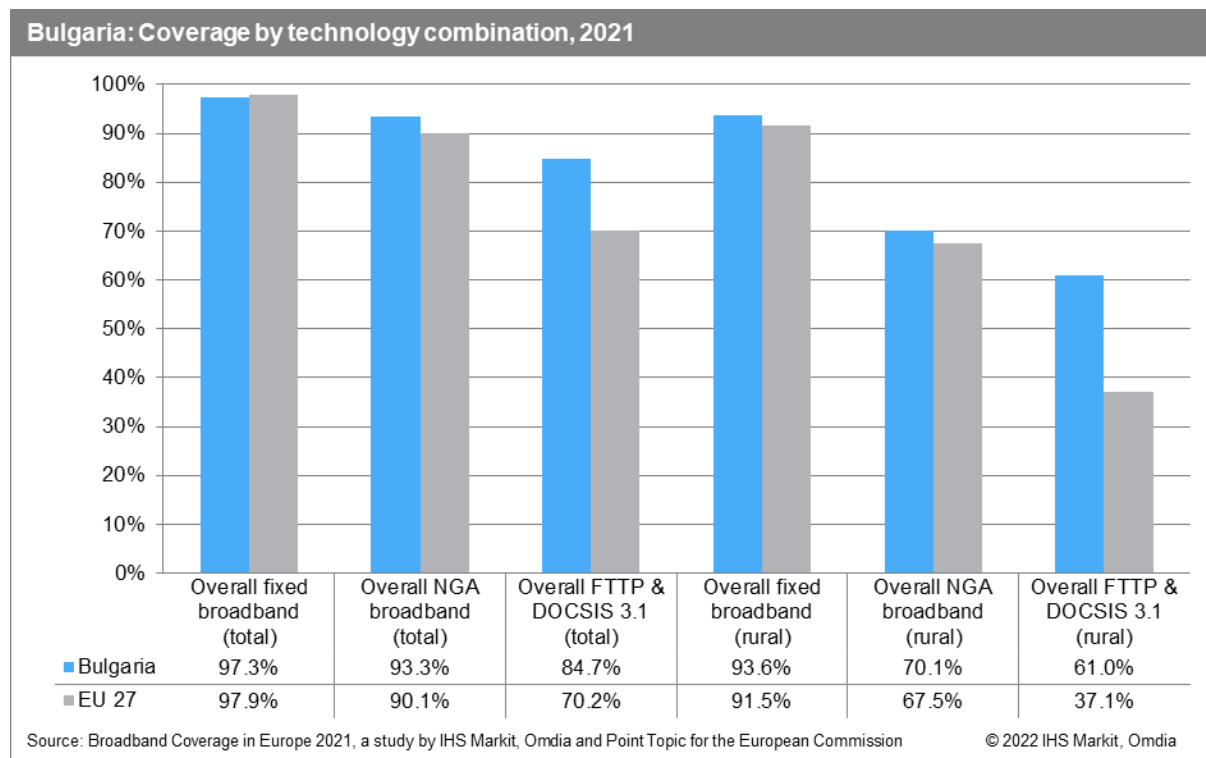
	Belgium 2021		Belgium 2020		Belgium 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	94.2%	93.6%	99.9%	97.8%	99.9%	97.8%	89.3%	81.3%
VDSL	92.2%	80.2%	96.8%	87.3%	95.5%	87.3%	54.5%	39.0%
VDSL 2 Vectoring	51.6%	18.4%	54.6%	31.3%	52.3%	31.4%	36.7%	17.7%
FTTP	9.7%	0.7%	6.5%	0.4%	3.6%	0.1%	50.0%	33.8%
Cable modem DOCSIS 3.0	96.5%	54.6%	93.6%	48.5%	93.5%	48.3%	44.2%	11.3%
Cable modem DOCSIS 3.1	67.7%	54.6%	65.8%	10.3%	65.6%	9.1%	32.2%	5.7%
FWA	97.7%	94.9%	0%	0%	0%	0%	58.2%	53.6%
LTE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.8%	99.6%
LTE average operator coverage	100.0%	-	100.0%	-	99.7%	-	97.5%	-
5G	4.2%	0%	4.4%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.7%	97.7%	99.9%	98.8%	100.0%	99.0%	97.9%	91.5%
Overall NGA broadband	99.1%	91.4%	99.3%	94.7%	99.1%	94.3%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	68.9%	55.1%	67.5%	10.6%	66.5%	9.3%	70.2%	37.1%
At least 30Mbps	99.1%	-	98.5%	-	98.3%	-	89.8%	-
At least 100Mbps	97.2%	-	96.5%	-	96.5%	-	82.1%	-
At least 1Gbps	69.0%	-	49.4%	-	49.2%	-	62.4%	-
At least 1Gbps upload and download	69.0%	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.3 Bulgaria

5.3.1 National coverage by broadband technology

Fixed broadband coverage in Bulgaria increased by 1.6pp with 97.3% of national and 93.6% of rural households covered by the end of June 2021. An increase of 5.7 percentage points was recorded in terms of NGA coverage, enabling 93.3% of households to access high speed broadband services. In rural regions, NGA coverage increased by 6.2 percentage points and passed 70.1% of homes. As there were no DOCSIS 3.1 launches by mid-2021, Bulgaria's coverage in the 1Gbps-capable network category (FTTP & DOCSIS 3.1) was identical to the FTTP coverage of 84.7%. Rural FTTP deployment continued to grow strongly, reaching 61.0% in June 2021, well ahead of the EU average (37.1%).

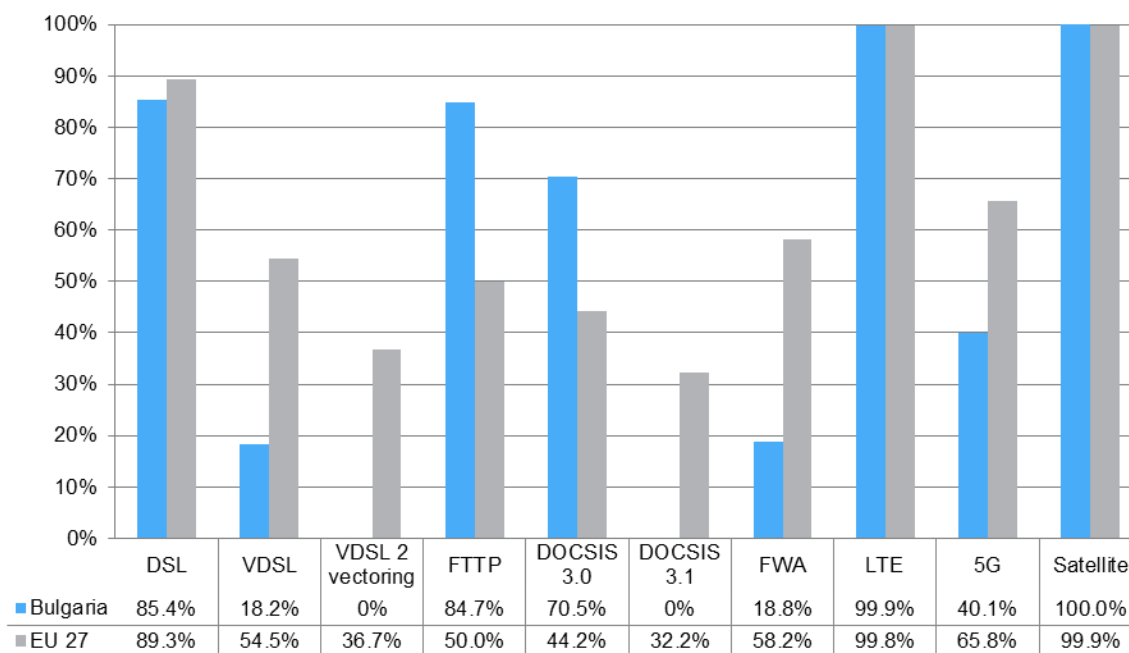


When looking at individual broadband technologies, DSL remained the most prevalent fixed broadband technology with 85.4% of households covered, fractionally ahead of FTTP. The gradual upgrade to VDSL networks continued with a total of 18.2% homes passed by mid-2021. However, VDSL2 Vectoring remained absent from the Bulgarian market.

As in previous years, cable modem DOCSIS 3.0 grew slightly, and covered 70.5% of households by June 2021, exceeding the EU average by 26 percentage points. However, no advancement in terms of DOCSIS 3.1 upgrades were made yet. FTTP coverage grew by almost 10 p.p. to reach 84.7% of households which puts Bulgaria well ahead of the EU average (50.0%).

In terms of mobile broadband technologies, nearly all (99.9%) of Bulgarian homes were covered by LTE networks. However, the average LTE coverage of the mobile network operators was only 81.4%, 0.6 p.p. higher than in 2020. The three largest providers all launched 5G services in the year to June 2021, by when coverage was estimated at 40.1%, below the EU average of 65.8%.

Bulgaria: Coverage by technology, total, 2021



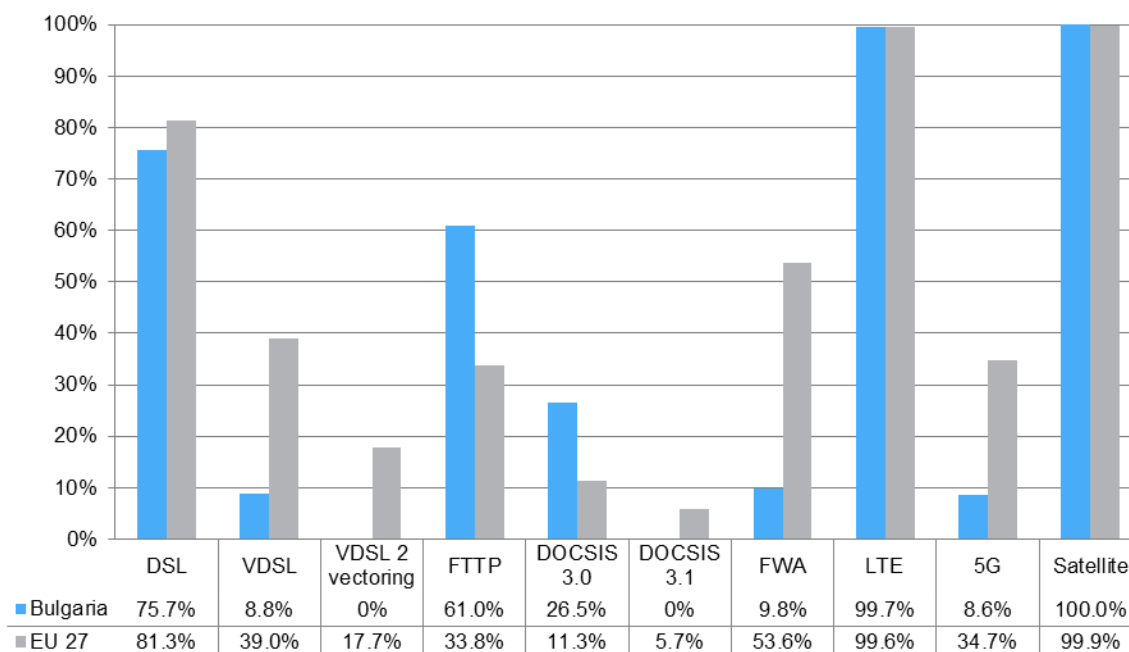
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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In rural regions, DSL remained the leading technology with 75.7% of rural homes passed, in line with the previous year. VDSL deployments progressed in rural regions, though coverage remains well below the national figure. Following an increase of 4.3 percentage points, 8.8% of rural households could access VDSL services. Meanwhile rural FTTP coverage grew by more than 12 p.p., reaching 61.0%. Bulgaria continued to sit well above the EU average in the cable DOCSIS 3.0 category, covering 26.5% of rural households.

Rural LTE coverage remained stable at 99.7% of rural homes. 5G deployments were primarily focussed on urban areas, and rural 5G coverage was estimated at 8.6%.

Bulgaria: Coverage by technology, rural areas, 2021

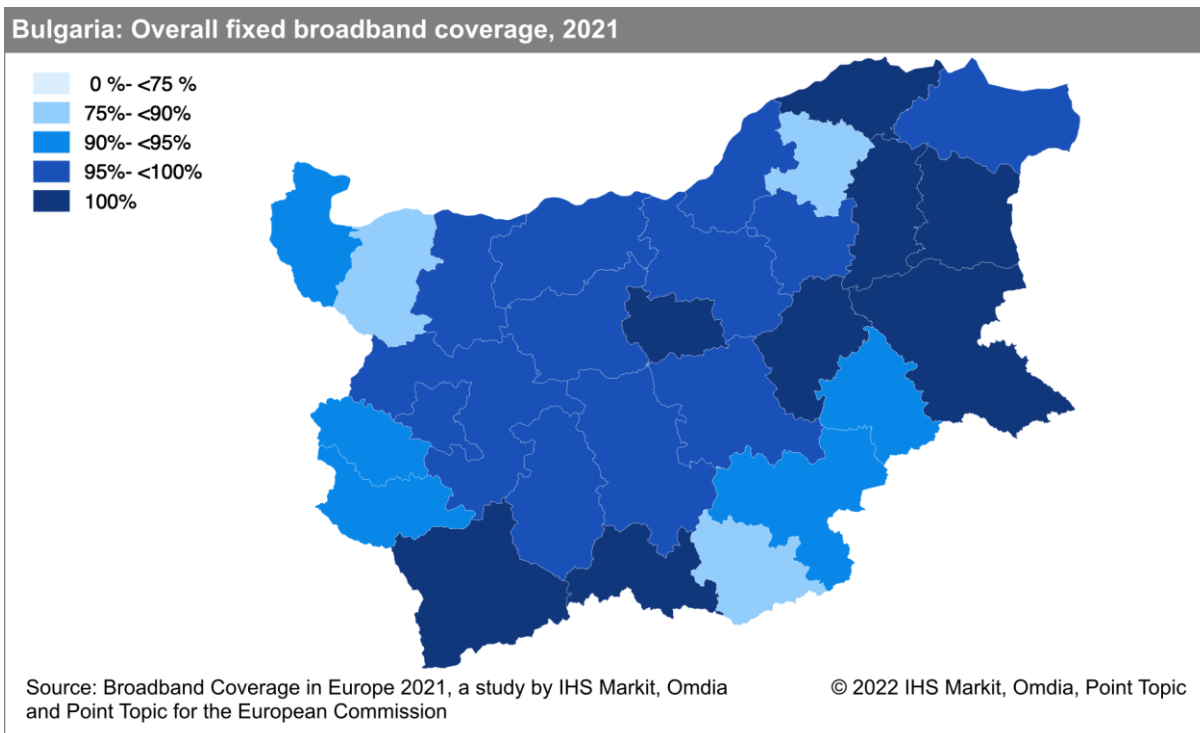


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

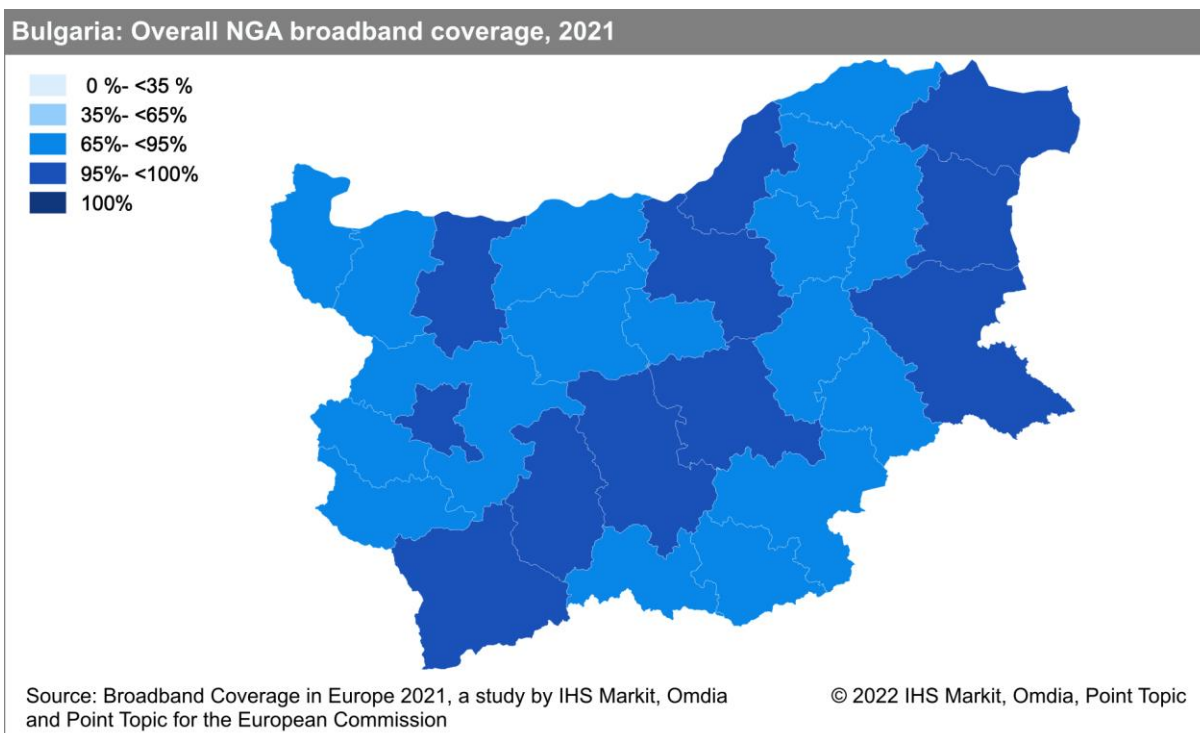
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5.3.2 Regional coverage by broadband technology

As in 2019 and 2020, there were eight Bulgarian regions which recorded universal fixed broadband coverage. Three regions passed the 90% coverage threshold in 2021, leaving only three yet to achieve this goal: Montana (87.3%), Kardzhali (88.5%), and Razgrad (89.99%). A further six regions passed the 95% threshold over the course of the year.



Coverage of NGA services exceeded 70% in all regions, ranging from 70.4% in Pernik to almost universal coverage (99.5%) in the capital city of Sofia.



5.3.3 Data tables for Bulgaria

Statistic	National
Population	6,916,548
Persons per household	2.4
Rural proportion	19.0%

	Bulgaria 2021		Bulgaria 2020		Bulgaria 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	85.4%	75.7%	85.5%	75.8%	85.5%	75.8%	89.3%	81.3%
VDSL	18.2%	8.8%	13.3%	4.5%	8.8%	3.7%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	84.7%	61.0%	75.2%	48.7%	65.2%	35.7%	50.0%	33.8%
Cable modem DOCSIS 3.0	70.5%	26.5%	70.0%	26.0%	68.7%	25.5%	44.2%	11.3%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	32.2%	5.7%
FWA	18.8%	9.8%	18.8%	9.8%	18.8%	9.8%	58.2%	53.6%
LTE	99.9%	99.7%	99.9%	99.7%	99.5%	97.3%	99.8%	99.6%
LTE average operator coverage	81.4%	-	80.8%	-	80.7%	-	97.5%	-
5G	40.1%	8.6%	0%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.3%	93.6%	95.7%	87.9%	95.6%	85.2%	97.9%	91.5%
Overall NGA broadband	93.3%	70.1%	87.6%	63.9%	84.4%	50.3%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	84.7%	61.0%	75.2%	48.7%	65.2%	35.7%	70.2%	37.1%
At least 30Mbps	93.3%	-	87.6%	-	79.8%	-	89.8%	-
At least 100Mbps	91.9%	-	80.9%	-	68.0%	-	82.1%	-
At least 1Gbps	15.9%	-	8.6%	-	6.5%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

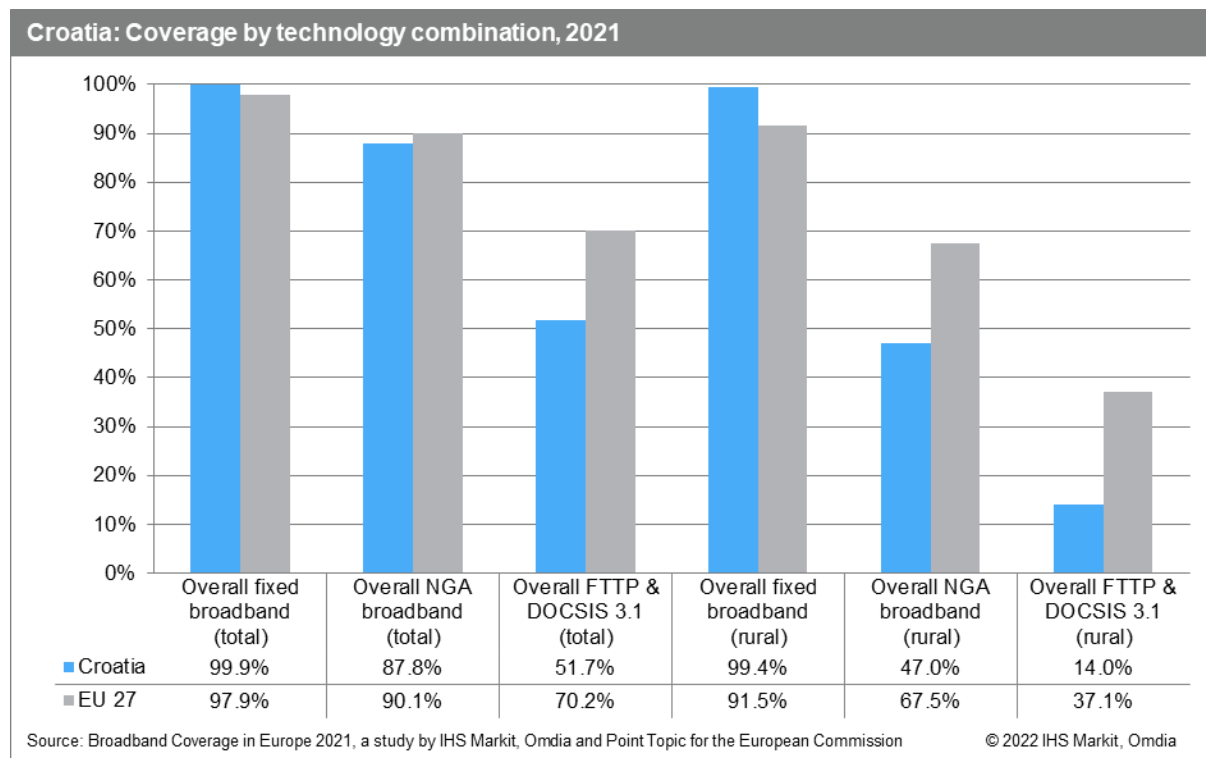
All restatements are highlighted in italics.

5.4 Croatia

5.4.1 National coverage by broadband technology

Croatia performed above the EU average in terms of fixed broadband coverage which stood at 99.9% nationally and 99.4% in rural regions, respectively. The availability of NGA networks increased by 1.5 percentage points on national level and by 7.8 percentage points in rural Croatia. More than half of Croatian households (51.7%) were covered by 1Gbps-capable networks (FTTP & DOCSIS 3.1), which represents an increase of 5.2 percentage points compared to the previous year.

Despite improvements across the NGA and FTTP & DOCSIS 3.1 categories, Croatia continued to perform below EU averages in 2021.

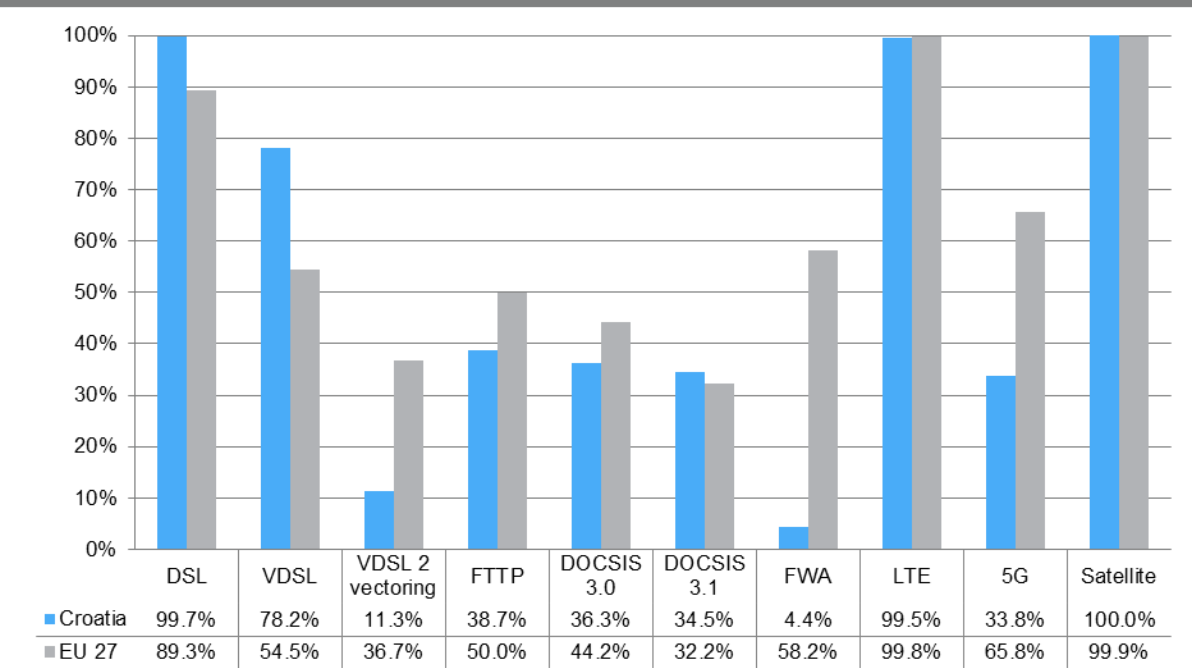


DSL was the prevalent individual broadband technology in Croatia, covering 99.7% of households by the end of June 2021. The almost universal DSL coverage remained stable in 2021, making Croatia one of the top five study countries in terms of DSL coverage. While the country also performed strongly in the VDSL category, covering 78.2% of households compared to the EU average of 54.5%, VDSL2 Vectoring upgrades were slow. Compared to mid-2020, VDSL2 Vectoring availability grew by only 1.3 percentage points and remained well below the EU average.

Availability of FTTP networks expanded by 3.2 percentage points to cover 38.7% of Croatian households by mid-2021. A similar coverage level was achieved in the cable category as DOCSIS 3.0 networks passed 36.3% of Croatian homes, up by 0.6 percentage points year-on-year. Croatia is among the EU countries with the highest proportion of cable networks upgraded to DOCSIS 3.1 standard (95.1%) which was available to 34.5% of households by mid-2021.

5G networks covered a third (33.8%) of Croatian households by mid-2021 which remained well below the EU average of 65.8%. By the end of June 2021, only one out of three MNOs had launched 5G services, while the other two operators followed after the 5G spectrum award in 2H21, which is after the cut-off date for this year's study. LTE coverage remained unchanged at 99.5%.

Croatia: Coverage by technology, total, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

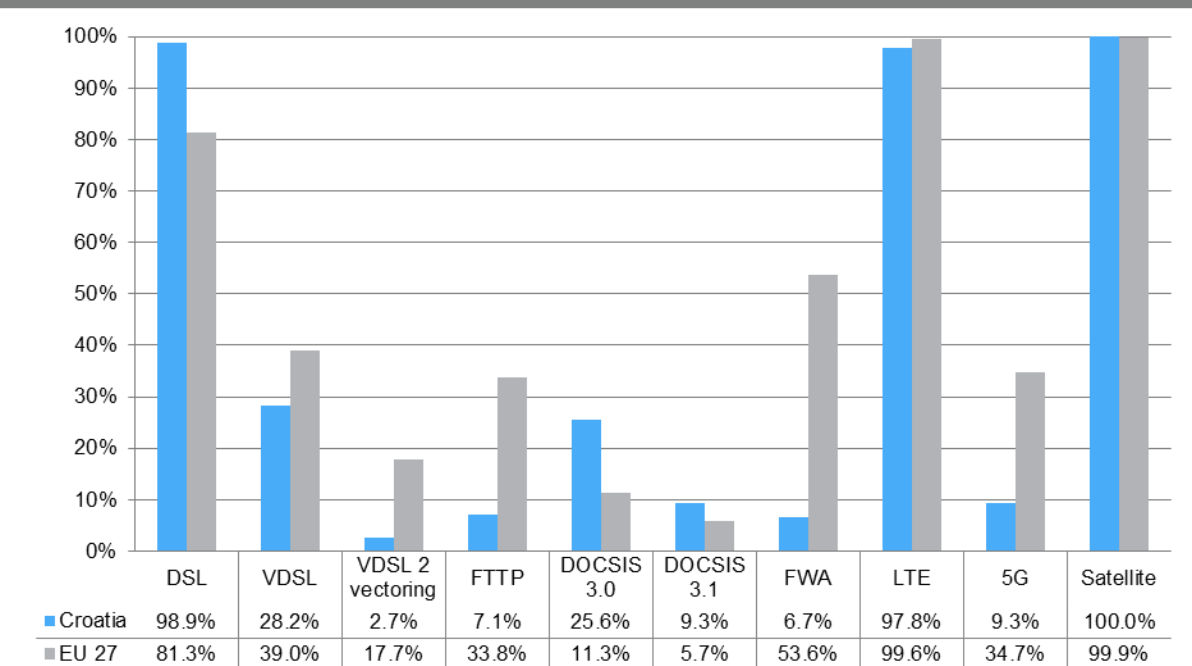
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In rural Croatia, DSL coverage remained unchanged from the previous year with 98.9% of households covered. Croatian operators made good progress on VDSL and VDSL2 Vectoring upgrades as coverage increased by 5.5 and 0.7 percentage points, respectively. Both categories remained below EU average.

The fastest growing broadband technology was DOCSIS 3.0 (4.7 percentage points) which passed 25.6% homes by mid-2021. The ultrafast DOCSIS 3.1 standard also became more accessible to rural households as coverage increased by 4.0 percentage points. FTTP rollouts remained largely focused on urban areas as rural coverage increased by only 0.3 percentage points.

5G services were available to 9.3% of rural households, while rural LTE coverage increased to 97.8%.

Croatia: Coverage by technology, rural areas, 2021

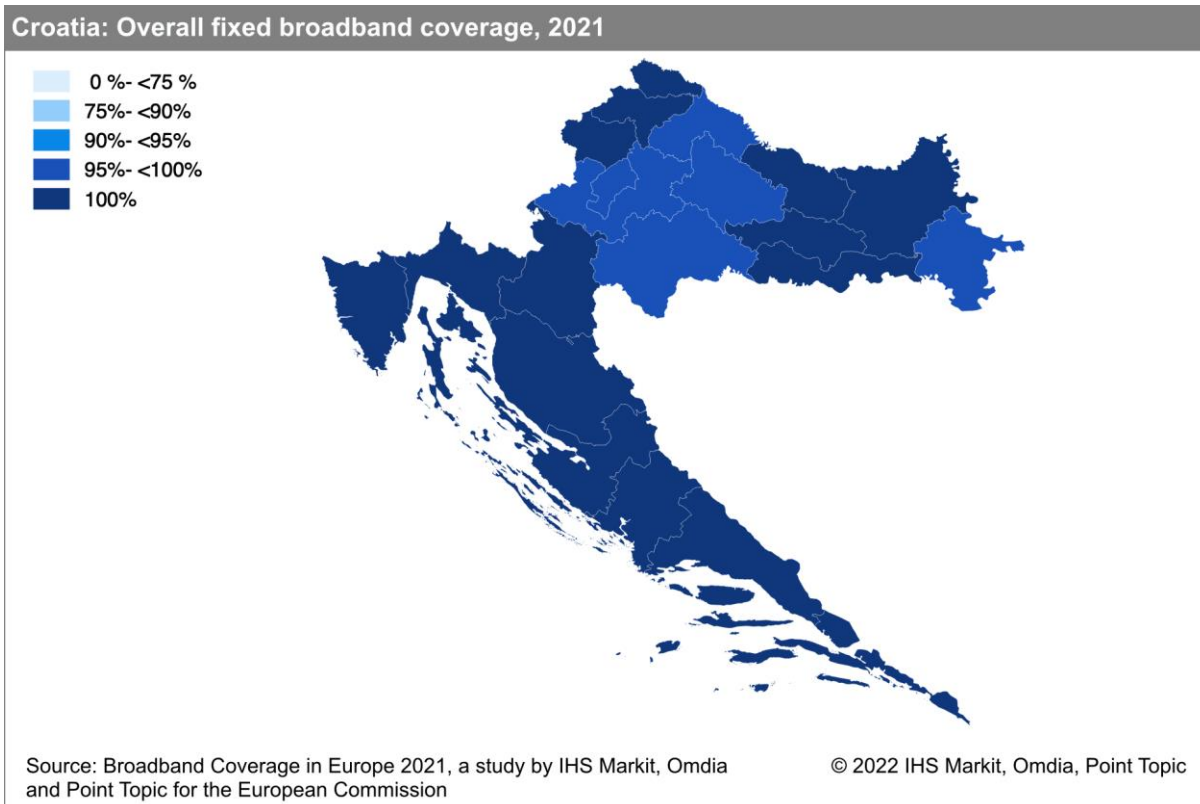


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

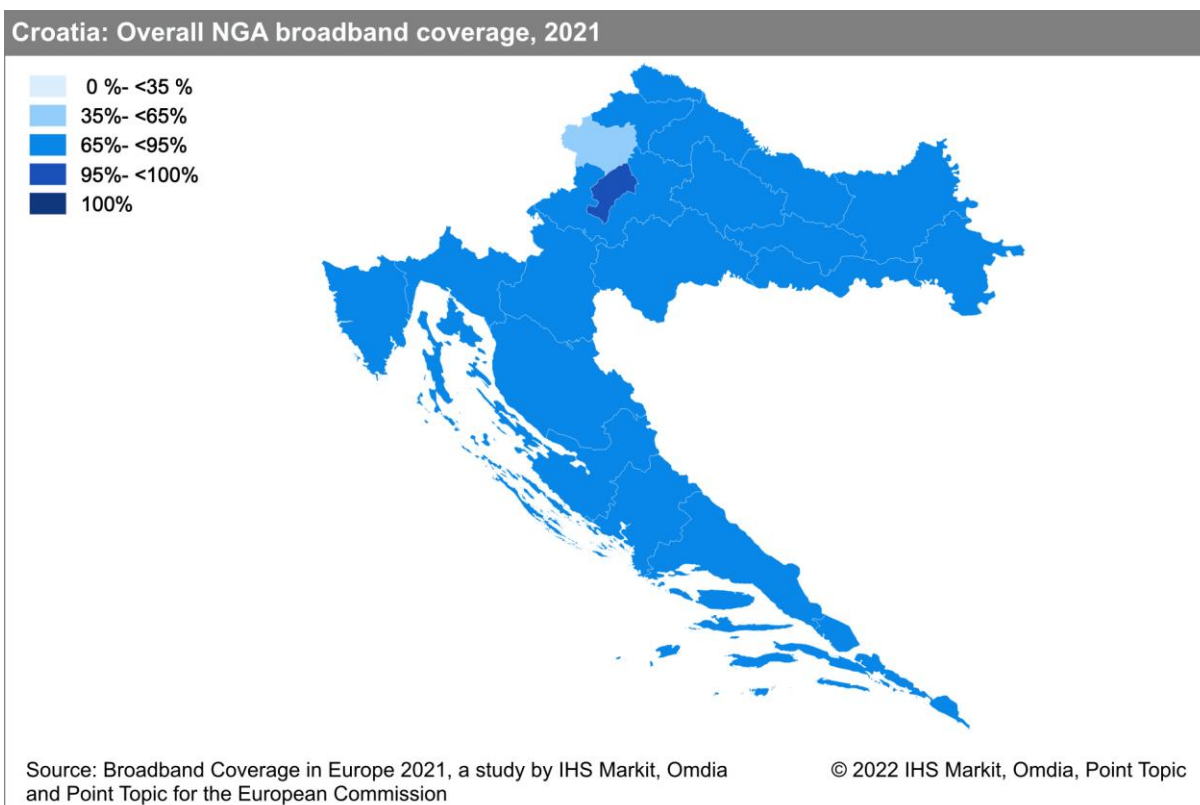
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5.4.2 Regional coverage by broadband technology

Fixed broadband coverage across Croatian regions varied between 98.5% and 100%, which remained in line with the previous iteration of this study. The lowest coverage was reported in the region of Sisačko-Moslavačka (98.5%), Vukovarsko-srijemska (99.5%) and Zagrebačka (99.6%). 15 out of 21 regions reached universal coverage.



The highest NGA coverage of 96.6% was recorded in Grad Zagreb and only Krapinsko-zagorska županija remained below the 65% threshold with 49.4% coverage.



5.4.3 Data tables for Croatia

Statistic	National
Population	4,058,165
Persons per household	2.9
Rural proportion	23.1%

	Croatia 2021		Croatia 2020		Croatia 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.7%	98.9%	99.8%	98.9%	99.7%	98.9%	89.3%	81.3%
VDSL	78.2%	28.2%	81.1%	22.7%	80.8%	20.7%	54.5%	39.0%
VDSL 2 Vectoring	11.3%	2.7%	10.0%	2.0%	9.4%	1.8%	36.7%	17.7%
FTTP	38.7%	7.1%	35.6%	6.8%	31.0%	6.3%	50.0%	33.8%
Cable modem DOCSIS 3.0	36.3%	25.6%	35.7%	20.9%	34.1%	15.5%	44.2%	11.3%
Cable modem DOCSIS 3.1	34.5%	9.3%	34.0%	5.4%	32.5%	4.8%	32.2%	5.7%
FWA	4.4%	6.7%	5.4%	6.7%	4.9%	6.0%	58.2%	53.6%
LTE	99.5%	97.8%	99.5%	97.6%	99.3%	97.0%	99.8%	99.6%
LTE average operator coverage	98.8%	-	98.3%	-	98.2%	-	97.5%	-
5G	33.8%	9.3%	0%	0%	-	-	65.8%	34.7%
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%	99.9%	99.4%	97.9%	91.5%
Overall NGA broadband	87.8%	47.0%	86.3%	39.2%	85.6%	34.0%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	51.7%	14.0%	46.5%	10.6%	43.2%	9.5%	70.2%	37.1%
At least 30Mbps	87.8%	-	86.3%	-	85.6%	-	89.8%	-
At least 100Mbps	62.1%	-	46.2%	-	43.6%	-	82.1%	-
At least 1Gbps	52.3%	-	21.8%	-	5.9%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

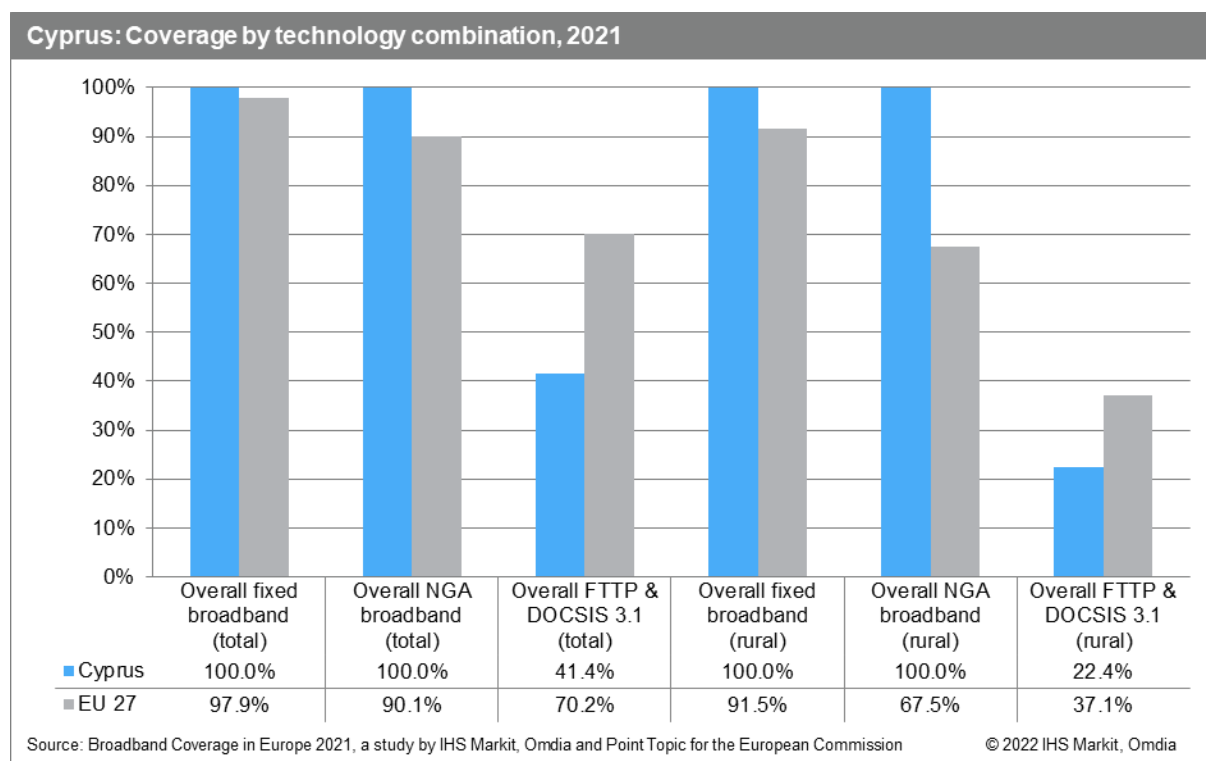
Note: The decline in VDSL coverage in 2021 was caused by a methodology change. The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

5.5 Cyprus

5.5.1 National coverage by broadband technology

Cyprus has had complete fixed broadband coverage at both national and rural levels since 2012 and in mid-2019, became the second country in the study to achieve universal NGA broadband coverage, having increased its VDSL reach to 100.0% of households in the preceding 12 months. By contrast, 1Gbps-capable networks (FTTP & DOCSIS 3.1) passed only 41.4% of homes by mid-2021, though this represented a substantial increase from the 26.2% recorded in 2020. As there were no DOCSIS 3.1 deployments by mid-2021, gigabit-capable networks were limited to FTTP.

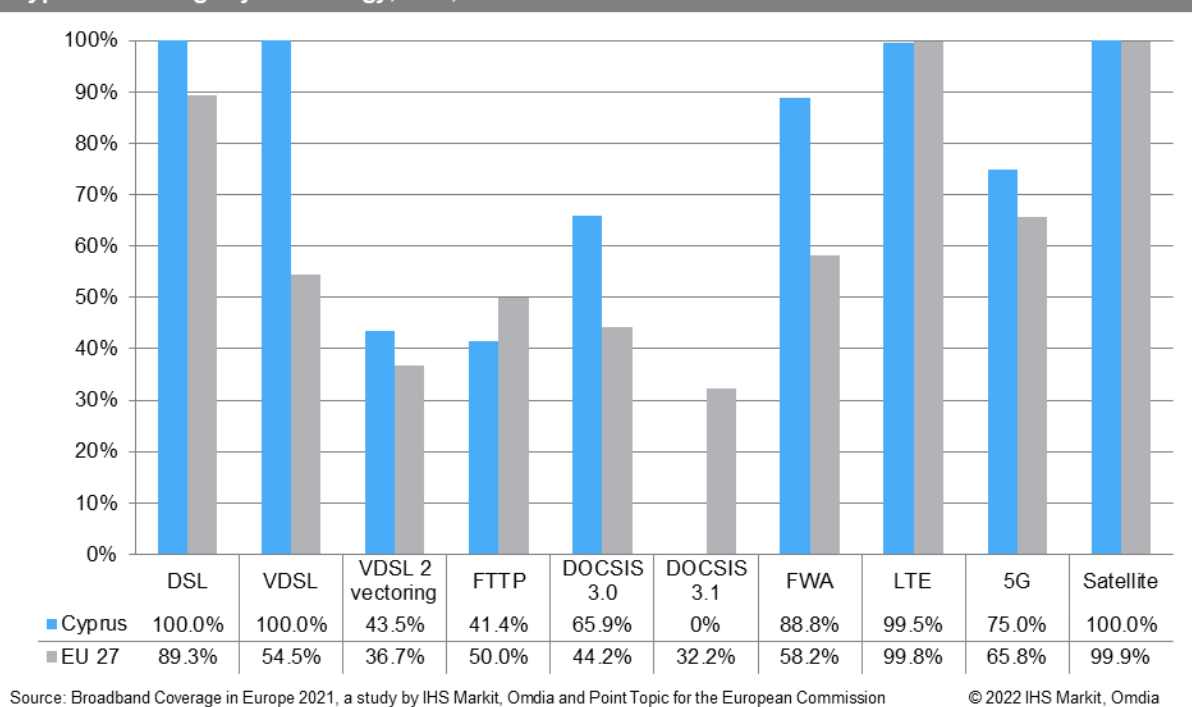


Among the individual broadband technologies, both DSL and VDSL services remained available to all households in Cyprus, with high-speed VDSL2 Vectoring services covering almost half (43.5%) of Cypriot households (down by 3.2 percentage points since mid-2020). Meanwhile Fixed Wireless Access coverage reached 88.8% of households nationally at the end of June 2021.

Cable modem DOCSIS 3.0 services are available to almost two thirds of homes (65.9%), but as of mid-2021 cable operators in Cyprus had not yet started implementing DOCSIS 3.1 upgrades. Thus, FTTP remained the only available technology capable of supporting gigabit speed services. FTTP coverage growth continued to accelerate and by the end of June 2021, FTTP networks passed 41.4% of Cypriot homes – a 15.2 percentage point increase compared to mid-2020 which ranks among the strongest growth among countries in this year's study. Despite its substantial growth however, FTTP coverage remained below the European average of 50.0%.

Considering mobile broadband technologies, LTE coverage remained stable at 99.5% of households in mid-2021 while the average coverage of all LTE network operators was 98.3%, unchanged from the previous year. Cyprus saw its first 5G services in early 2021; by June 2021 coverage had reached 75.0% of households.

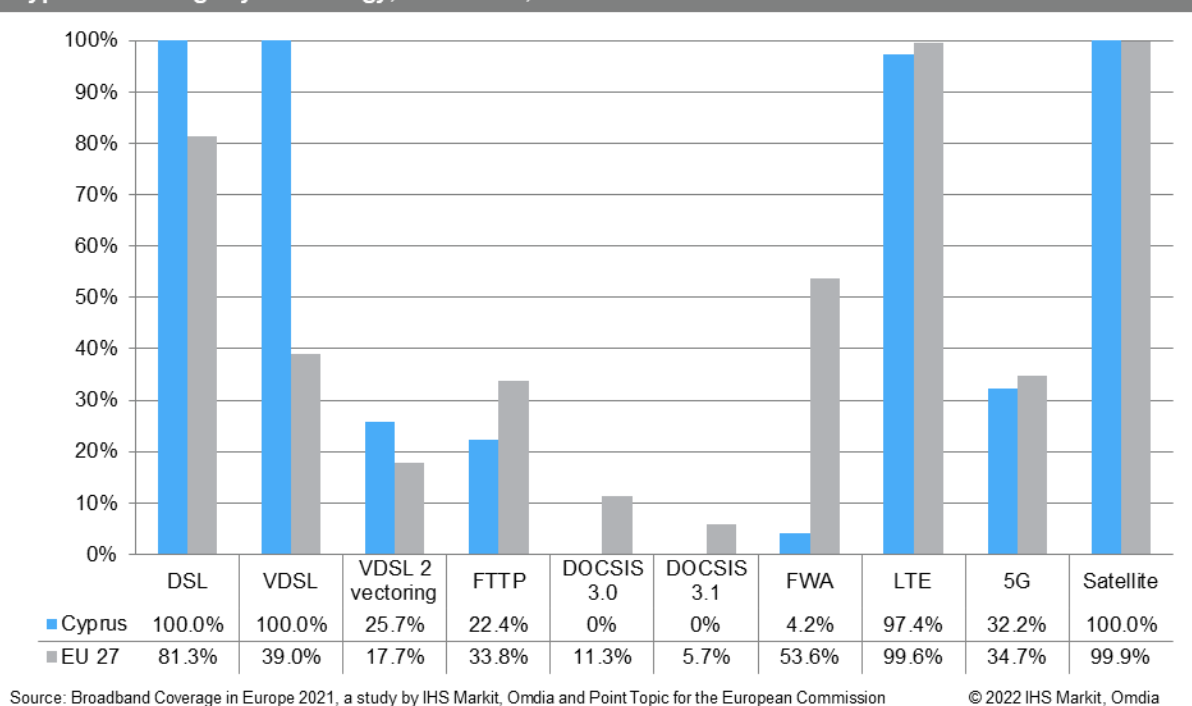
Cyprus: Coverage by technology, total, 2021



Looking at rural coverage, DSL and VDSL broadband continued to provide universal rural coverage in Cyprus. With DOCSIS 3.0 networks absent from rural areas and FTTP limited to 22.4% of Cypriot rural households, VDSL2 Vectoring remained the third most prevalent fixed technology, passing 25.7% of rural homes. Rural FWA coverage is modest, with the technology reaching just 4.2% of households.

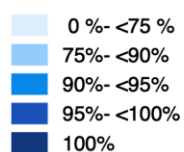
Considering mobile broadband availability, rural LTE coverage grew by 0.1 percentage point to reach 97.4% by the end of June 2021. Rural 5G coverage reached 32.2% of households.

Cyprus: Coverage by technology, rural areas, 2021



5.5.2 Regional coverage by broadband technology⁹

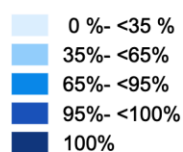
Cyprus: Overall fixed broadband coverage, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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Cyprus: Overall NGA broadband coverage, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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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	888,005
Persons per household	2.8
Rural proportion	11.4%

	Cyprus 2021		Cyprus 2020		Cyprus 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	89.3%	81.3%
VDSL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	54.5%	39.0%
VDSL 2 Vectoring	43.5%	25.7%	46.7%	19.8%	38.6%	15.0%	36.7%	17.7%
FTTP	41.4%	22.4%	26.2%	19.5%	10.1%	16.6%	50.0%	33.8%
Cable modem DOCSIS 3.0	65.9%	0%	57.8%	0%	55.5%	0%	44.2%	11.3%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	32.2%	5.7%
FWA	88.8%	4.2%	88.8%	4.0%	0%	0%	58.2%	53.6%
LTE	99.5%	97.4%	99.6%	97.3%	99.6%	96.6%	99.8%	99.6%
LTE average operator coverage	98.3%	-	98.3%	-	98.0%	-	97.5%	-
5G	75.0%	32.2%	0%	0%	-	-	65.8%	34.7%
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%	97.9%	91.5%
Overall NGA broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	41.4%	22.4%	26.2%	19.5%	10.1%	16.6%	70.2%	37.1%
At least 30Mbps	100.0%	-	100.0%	-	100.0%	-	89.8%	-
At least 100Mbps	82.9%	-	78.9%	-	71.0%	-	82.1%	-
At least 1Gbps	41.4%	-	26.2%	-	10.1%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

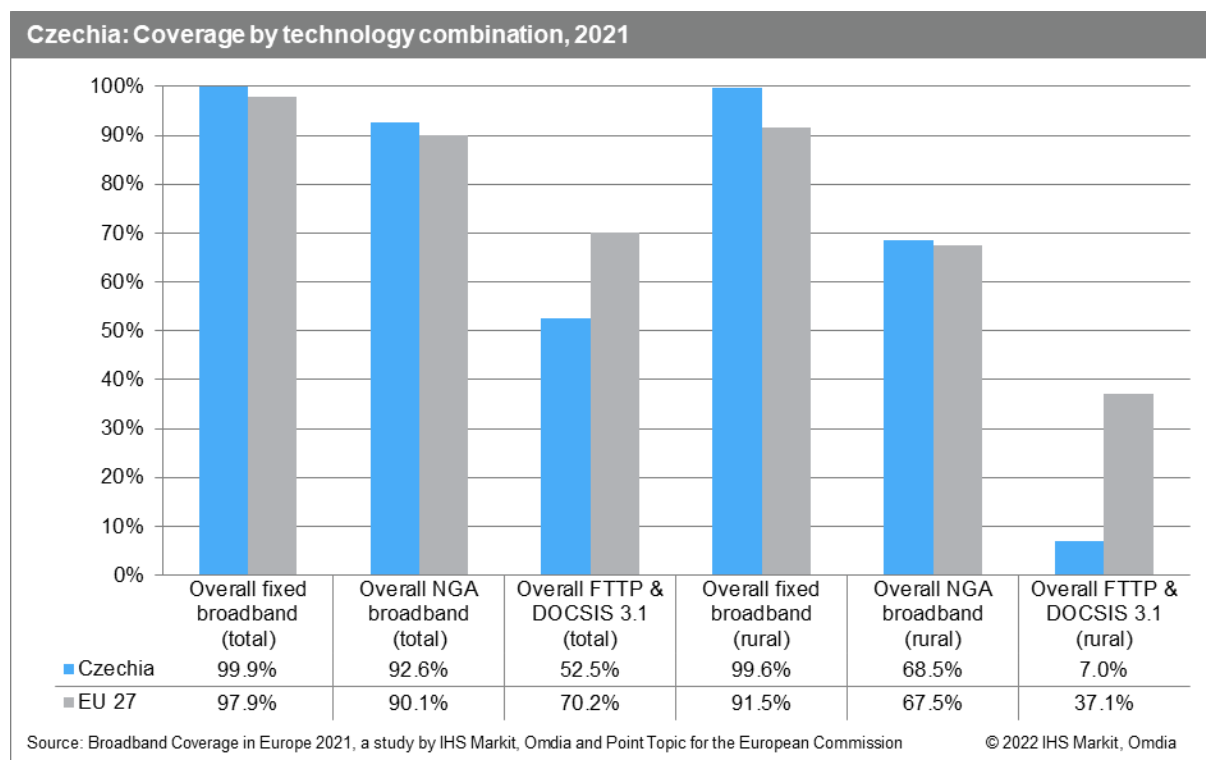
All restatements are highlighted in italics.

5.6 Czechia

5.6.1 National coverage by broadband technology

Almost all (99.9%) Czech households had access to at least one fixed broadband technology by mid-2021, while fixed broadband coverage also neared universal coverage (99.6%) in rural regions. NGA broadband services were available to 92.6% of households and 68.5% of rural households.

While Czechia outperformed the EU figure in fixed broadband and NGA categories, availability of 1Gbps-capable networks (FTTP & DOCSIS 3.1) remained below the EU average, with around half of Czech homes (52.5%) passed. Compared to mid-2020, FTTP & DOCSIS 3.1 coverage improved by 19.2 percentage points which was driven by the introduction of DOCSIS 3.1 technology which significantly expanded in the second half of 2020.



In terms of individual technologies, DSL remained the most widespread technology, passing a total of 97.6% of Czech homes. The infrastructure arm of the Czech incumbent operator, CETIN, has upgraded most of its legacy copper networks to new technology standards offering higher speeds in previous years, so that by mid-2021, VDSL and VDSL2 Vectoring networks passed 84.7% and 84.6% of Czech homes, respectively. Czechia outperformed the EU average in both categories and was the country with the second highest VDSL2 Vectoring coverage in this year's study.

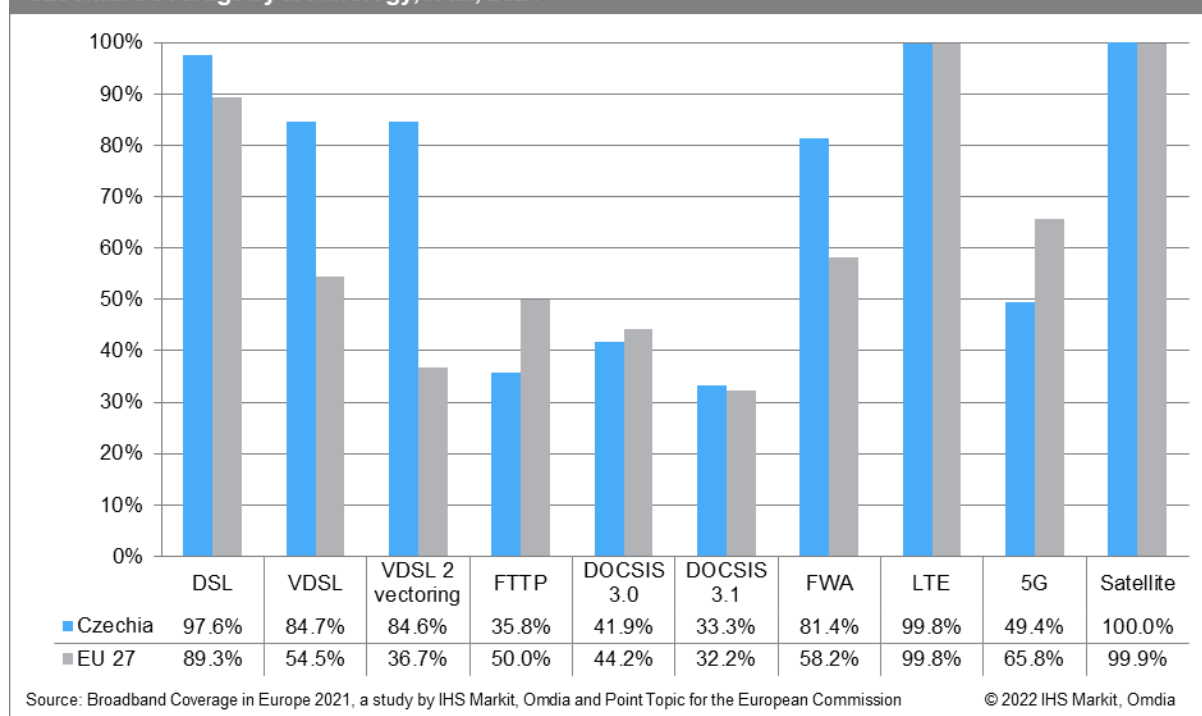
The Czech broadband market is characterized by a large number of small local fixed wireless providers, which is reflected in the high FWA coverage of 81.4%, compared to the EU average of 58.2%. Compared to mid-2020, coverage improved by 12.0 percentage points.

Cable modem DOCSIS 3.0 coverage reached 41.9% of Czech households at the end of June 2021. As cable companies have traditionally limited their presence to big cities across Czechia, the majority of households covered by cable networks were located in urban areas. DOCSIS 3.1 network rollout commenced in the second half of 2020 and was available to a third (33.3%) of Czech households by mid-2021.

FTTP coverage grew by 2.5 percentage points over the study period and passed 35.8% of Czech homes by the end of June 2021. Most of the FTTP rollouts attributed to smaller and local operators deploying these networks.

With an almost universal LTE coverage (99.8%), availability of LTE services remained unchanged on a year-on-year comparison. LTE operator average coverage stood at 99.5% meaning that mobile network operators in Czechia offer nearly equal coverage of their respective networks. Czech operators launched commercial 5G services in the second half of 2020 and covered half of Czech households (49.4%) by mid-2021.

Czechia: Coverage by technology, total, 2021

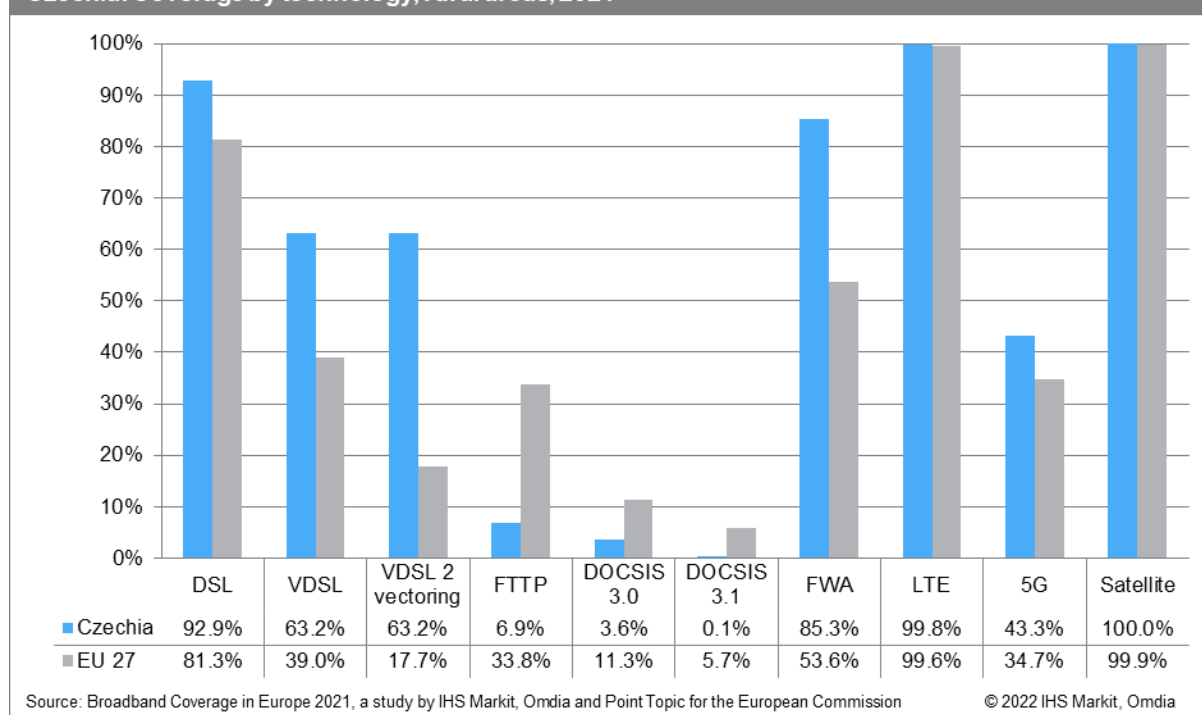


In rural regions, DSL coverage grew by 4.7 percentage points and remained the prevalent technology with 92.9% of rural homes passed. Similar to national level, large proportion of the legacy networks have been upgraded to VDSL and VDSL 2 Vectoring standards, covering 63.2% and 63.2% of Czech households, respectively. Czechia reported the second highest VDSL2 Vectoring coverage in rural regions in this year's study.

DOCSIS 3.1 upgrades were focused on urban regions as only 0.1% of rural households were covered by mid-2021. FTTP services were available to 6.9% of rural households, while DOCSIS 3.0 passed 3.6% of rural homes. Czechia performed below the EU average across all three categories.

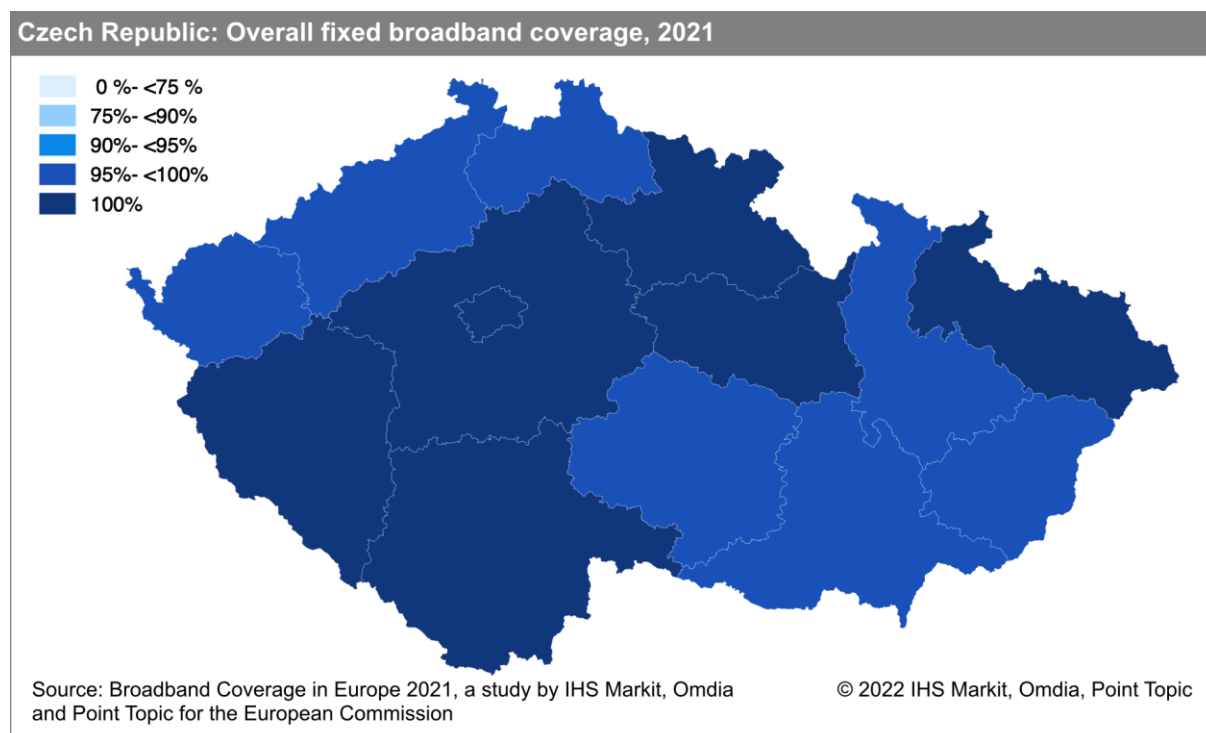
Fixed Wireless Access (FWA) networks passed 85.3% of rural Czech homes – well above the EU average (53.6%). LTE coverage remained unchanged at 99.8%, while 5G networks covered 43.3% of Czech households.

Czechia: Coverage by technology, rural areas, 2021

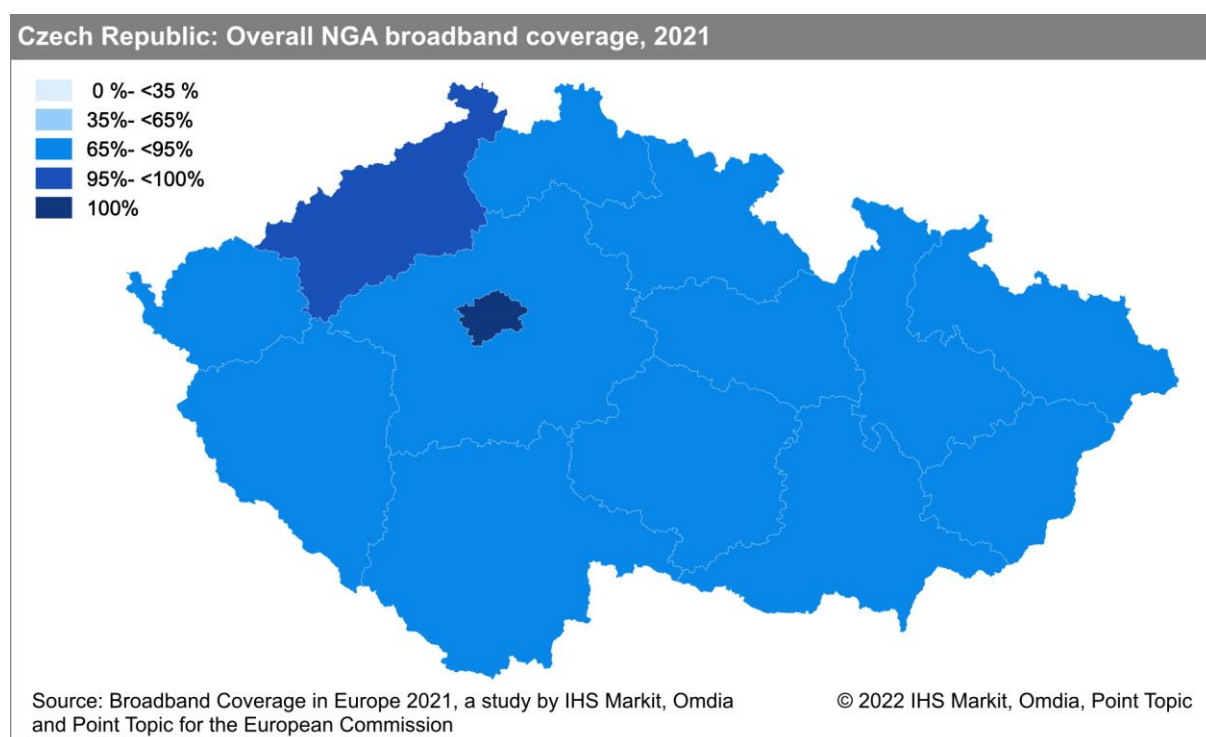


5.6.2 Regional coverage by broadband technology

Overall fixed broadband coverage in all regions of Czechia exceeded 99%, with seven regions (Hlavní město Praha, Středočeský kraj, Jihočeský kraj, Plzeňský kraj, Královéhradecký kraj, Pardubický kraj, and Moravskoslezský kraj) recording universal fixed broadband coverage levels.



Regional NGA coverage continued to record more varied levels, ranging from 87.6% in the Kraj Vysočina region, to universal coverage in Prague. Ústecký kraj was the only other region that passed the 95% threshold. NGA results were influenced by a data correction that excluded FWA technology from the indicator.



5.6.3 Data tables for Czechia

Statistic	National
Population	10,693,939
Persons per household	2.5
Rural proportion	14.6%

	Czechia 2021		Czechia 2020		Czechia 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	97.6%	92.9%	96.1%	88.2%	94.9%	87.7%	89.3%	81.3%
VDSL	84.7%	63.2%	83.7%	61.1%	83.7%	59.9%	54.5%	39.0%
VDSL 2 Vectoring	84.6%	63.2%	83.7%	61.1%	82.9%	59.3%	36.7%	17.7%
FTTP	35.8%	6.9%	33.3%	6.4%	29.3%	5.9%	50.0%	33.8%
Cable modem DOCSIS 3.0	41.9%	3.6%	41.6%	3.5%	41.1%	3.4%	44.2%	11.3%
Cable modem DOCSIS 3.1	33.3%	0.1%	0%	0%	0%	0%	32.2%	5.7%
FWA	81.4%	85.3%	69.5%	82.0%	62.1%	74.6%	58.2%	53.6%
LTE	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%	99.6%
LTE average operator coverage	99.5%	-	99.7%	-	99.6%	-	97.5%	-
5G	49.4%	43.3%	0%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.9%	99.6%	99.8%	99.2%	97.4%	98.2%	97.9%	91.5%
Overall NGA broadband	92.6%	68.5%	91.8%	66.0%	91.9%	64.2%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	52.5%	7.0%	33.3%	6.4%	29.3%	5.9%	70.2%	37.1%
At least 30Mbps	98.1%	-	96.9%	-	91.9%	-	89.8%	-
At least 100Mbps	89.2%	-	86.4%	-	75.0%	-	82.1%	-
At least 1Gbps	38.1%	-	7.6%	-	2.4%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: FWA technology and development therein is newly not reflected in the NGA coverage for Czechia, as NGA is defined to include only VDSL, DOCSIS cable 3.0/3.1 and FTTP technologies. It is to be noted that in the previous reports, FWA was erroneously taken into account in the NGA coverage calculation for Czechia. Figures for years 2020 and 2019 have been restated. As the FWA technology provided at a fixed location represents about 1/3 of the market in Czechia, the correction lead to a noticeable decline in the indicator value. The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

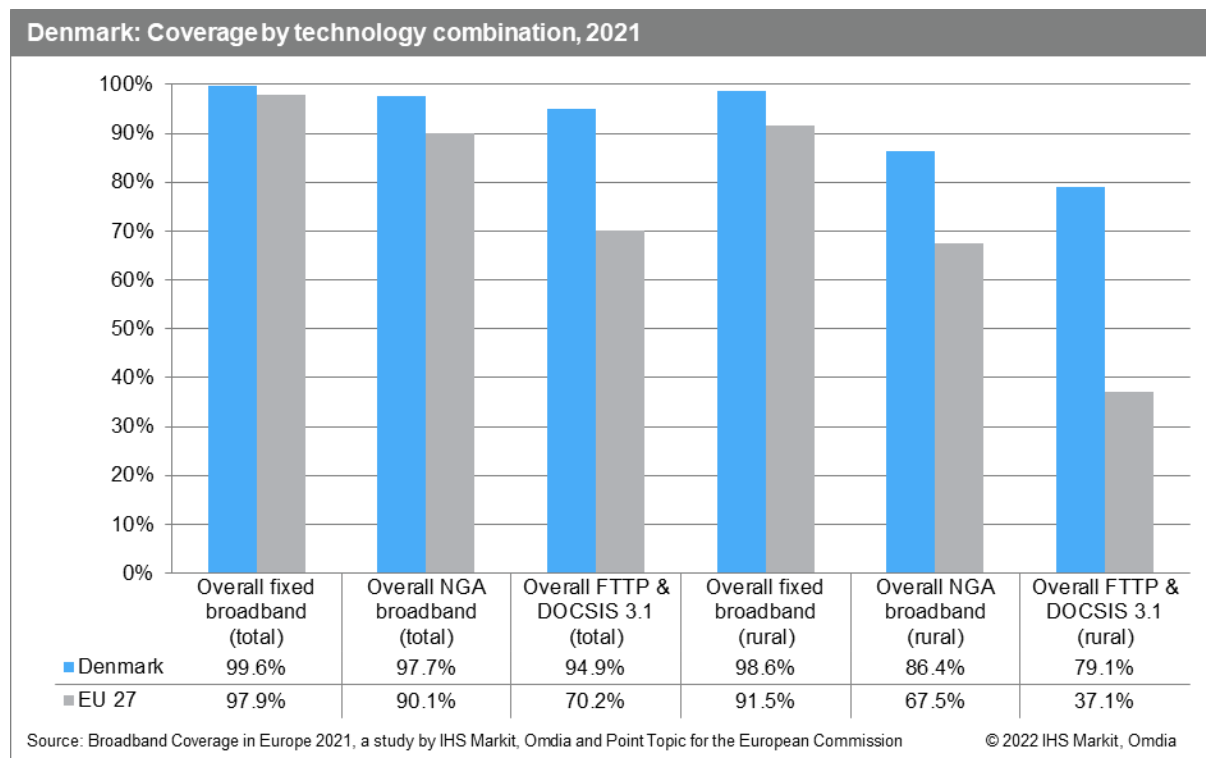
All restatements are highlighted in italics.

5.7 Denmark

5.7.1 National coverage by broadband technology

Denmark continues to exceed the EU average for all combination categories (fixed, NGA, and overall FTTP & DOCSIS 3.1). Nationally, fixed broadband and NGA coverage remained relatively stable, having already achieved high levels (above 95%) in previous years. Meanwhile rural fixed broadband grew marginally, by 0.2 percentage points, whereas rural NGA coverage grew by more than 10 p.p. to reach 86.4% of households.

Combined coverage of FTTP & DOCSIS 3.1 reached almost 95.0% of Danish households, exceeded only by Malta and Luxembourg in this study.

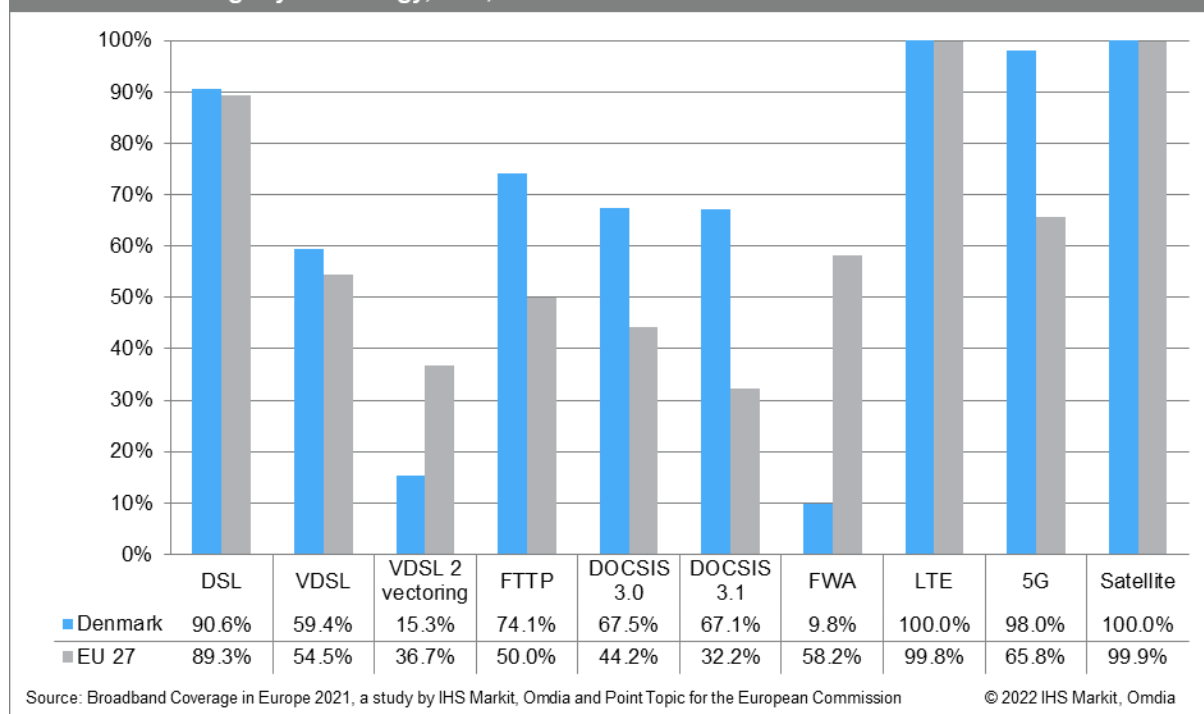


Among the individual broadband technologies, DSL recorded a reduction in coverage (of 2.7 percentage points), continuing the trend seen since 2015. Despite continuing year-on-year decreases – mainly due to the gradual replacement of copper networks with FTTP – DSL remained the most prevalent broadband technology, covering 90.6% of households. Meanwhile Fixed Wireless Access (FWA) was available to 9.8% of Danish households, up from 5.6% in 2020.

Looking at NGA technologies, FTTP coverage increased by 4.0 percentage points against mid-2020, reaching 74.1% of Danish households in mid-2021. Cable modem coverage remained stable at 67.5% of households, and by the end of June 2021, almost all of the country's cable network footprint had been updated to the DOCSIS 3.1 standard. Finally, VDSL coverage continued to decline slowly, reaching 59.4% of households after peaking at 61.5% at mid-2019, with VDSL2 Vectoring still available to 15.3% of Danish households.

Regarding mobile broadband coverage, Denmark achieved universal LTE coverage in 2016 and the country's 100% LTE coverage level remained in place during 2021. As well as being an LTE pioneer, Denmark is also among Europe's leaders in the provision of 5G infrastructure, having reached 98% coverage at national and rural level by mid-2021, second only to Italy. Denmark's 5G coverage is provided by the country's incumbent telco TDC as well as the shared network of Telia and Telenor.

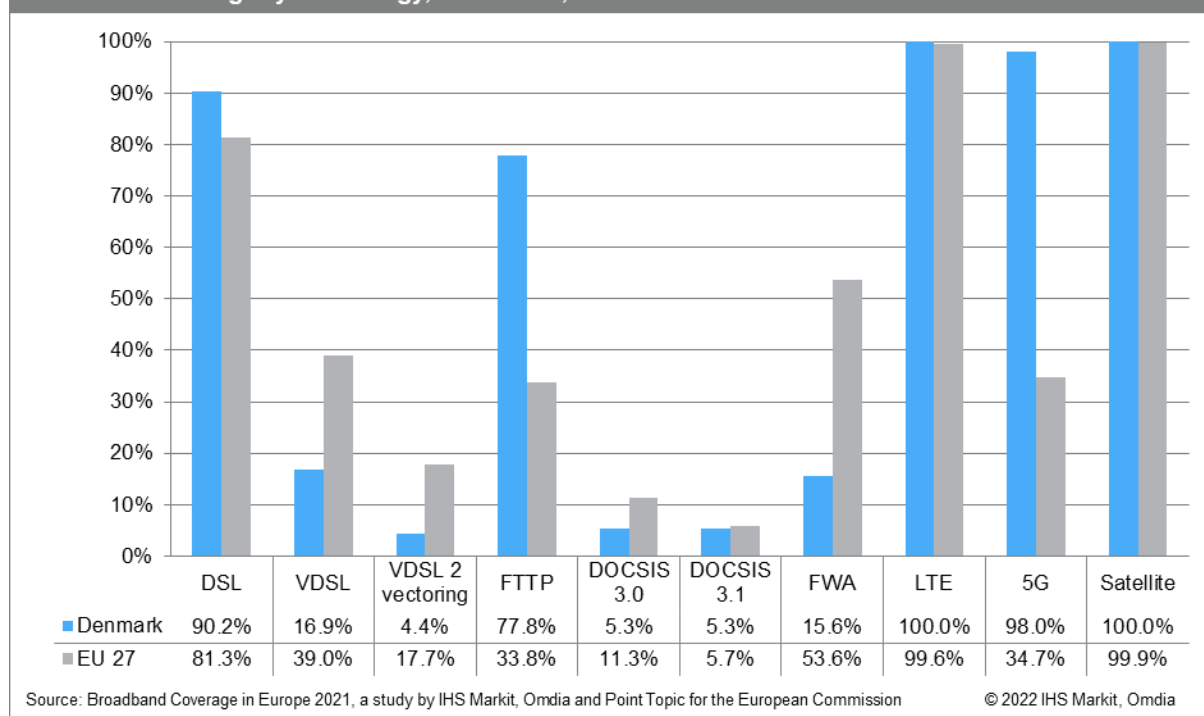
Denmark: Coverage by technology, total, 2021



Within the rural areas of Denmark, DSL remained the most prevalent technology, with 90.2% of homes passed. Remaining slightly more stable than at the national level, rural DSL recorded a slight decrease in coverage, down 1.9 percentage points from 92.1% in mid-2020. Meanwhile there was continued slight growth in Fixed Wireless Access, which was accessible to 15.6% of rural Danish homes, compared with 15.3% in mid-2020.

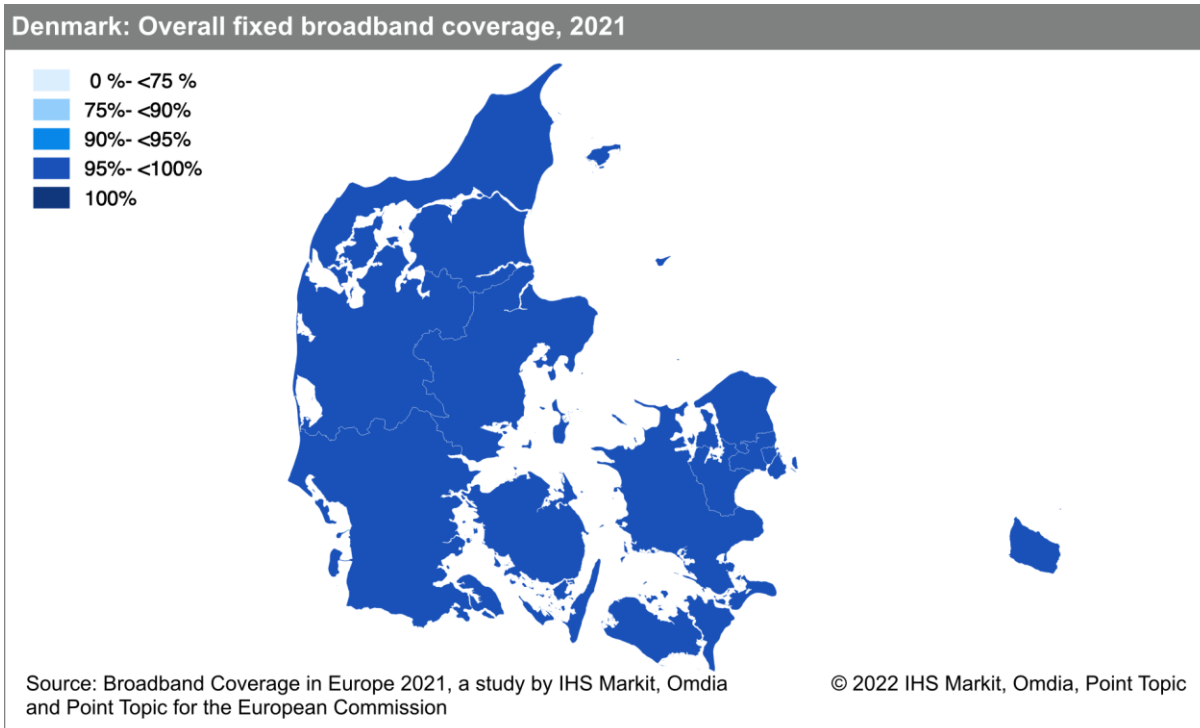
With 77.8% coverage (up from 70.9% in mid-2020) FTTP remains by far the most prevalent NGA technology available to rural households in Denmark, which has the second highest rural FTTP coverage recorded among the studied countries (after Iceland). Rural VDSL availability peaked in 2019, and continued to decrease slightly in 2021, reaching 16.9% of rural households, while VDSL2 Vectoring availability remained flat at just 4.4% of homes covered. Cable modem DOCSIS 3.0 and DOCSIS 3.1 coverage fell slightly, to 5.3% of rural households.

Denmark: Coverage by technology, rural areas, 2021

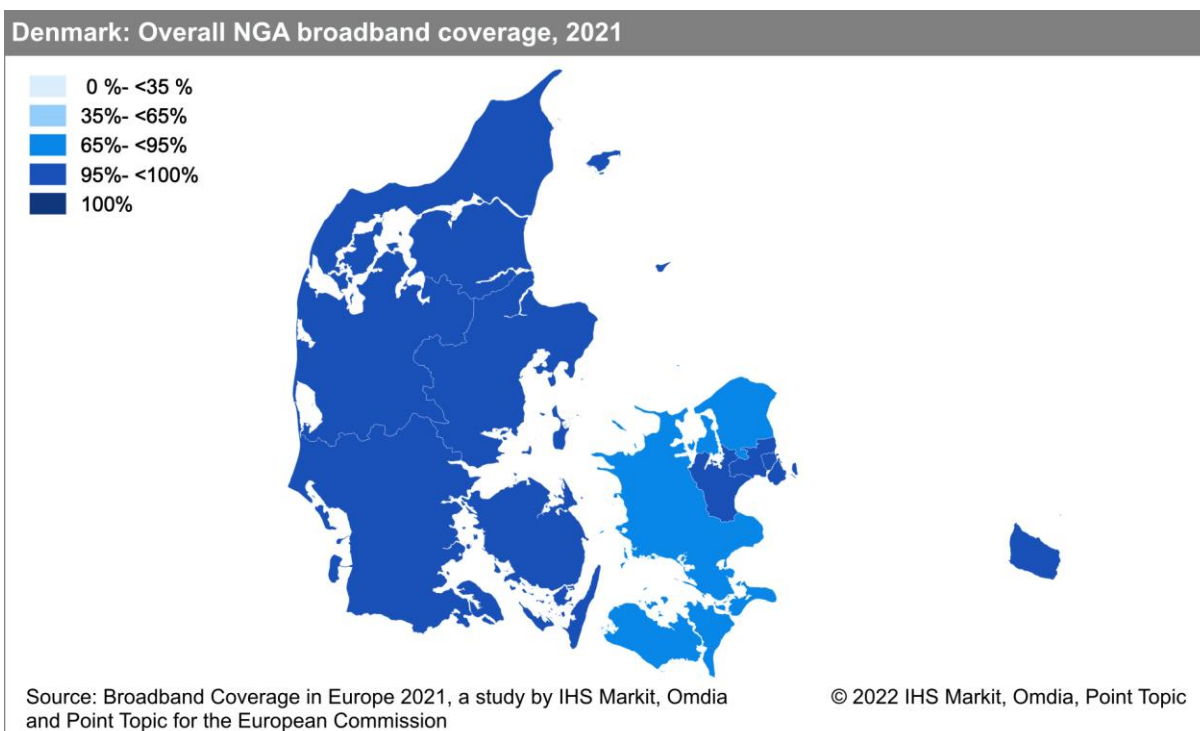


5.7.2 Regional coverage by broadband technology

Overall fixed broadband coverage exceeded 99.2% in all Danish regions at the end of June 2021. Sydjylland recorded the highest coverage, reaching 99.9%.



In this iteration of the study, NGA coverage exceeded 93% across all the Danish regions, with all but two (Nordsjælland and Vest- og Sydsjælland) recording NGA coverage greater than 96%.



5.7.3 Data tables for Denmark

Statistic	National
Population	5,822,763
Persons per household	2.1
Rural proportion	10.4%

	Denmark 2021		Denmark 2020		Denmark 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	90.6%	90.2%	93.3%	92.1%	94.2%	92.4%	89.3%	81.3%
VDSL	59.4%	16.9%	60.9%	17.1%	61.5%	17.4%	54.5%	39.0%
VDSL 2 Vectoring	15.3%	4.4%	15.7%	4.4%	15.7%	4.4%	36.7%	17.7%
FTTP	74.1%	77.8%	70.1%	70.9%	66.9%	65.8%	50.0%	33.8%
Cable modem DOCSIS 3.0	67.5%	5.3%	68.1%	5.5%	68.4%	5.9%	44.2%	11.3%
Cable modem DOCSIS 3.1	67.1%	5.3%	68.1%	5.5%	68.3%	5.8%	32.2%	5.7%
FWA	9.8%	15.6%	5.6%	15.3%	7.9%	12.0%	58.2%	53.6%
LTE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.8%	99.6%
LTE average operator coverage	100.0%	-	100.0%	-	100.0%	-	97.5%	-
5G	98.0%	98.0%	80.0%	75.0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.6%	98.6%	99.6%	98.4%	99.0%	98.0%	97.9%	91.5%
Overall NGA broadband	97.7%	86.4%	96.4%	76.3%	96.0%	76.7%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	94.9%	79.1%	93.8%	72.6%	93.0%	69.2%	70.2%	37.1%
At least 30Mbps	97.7%	-	97.1%	-	96.4%	-	89.8%	-
At least 100Mbps	96.3%	-	95.3%	-	94.3%	-	82.1%	-
At least 1Gbps	90.7%	-	86.5%	-	80.3%	-	62.4%	-
At least 1Gbps upload and download	73.9%	-	-	-	-	-	-	-

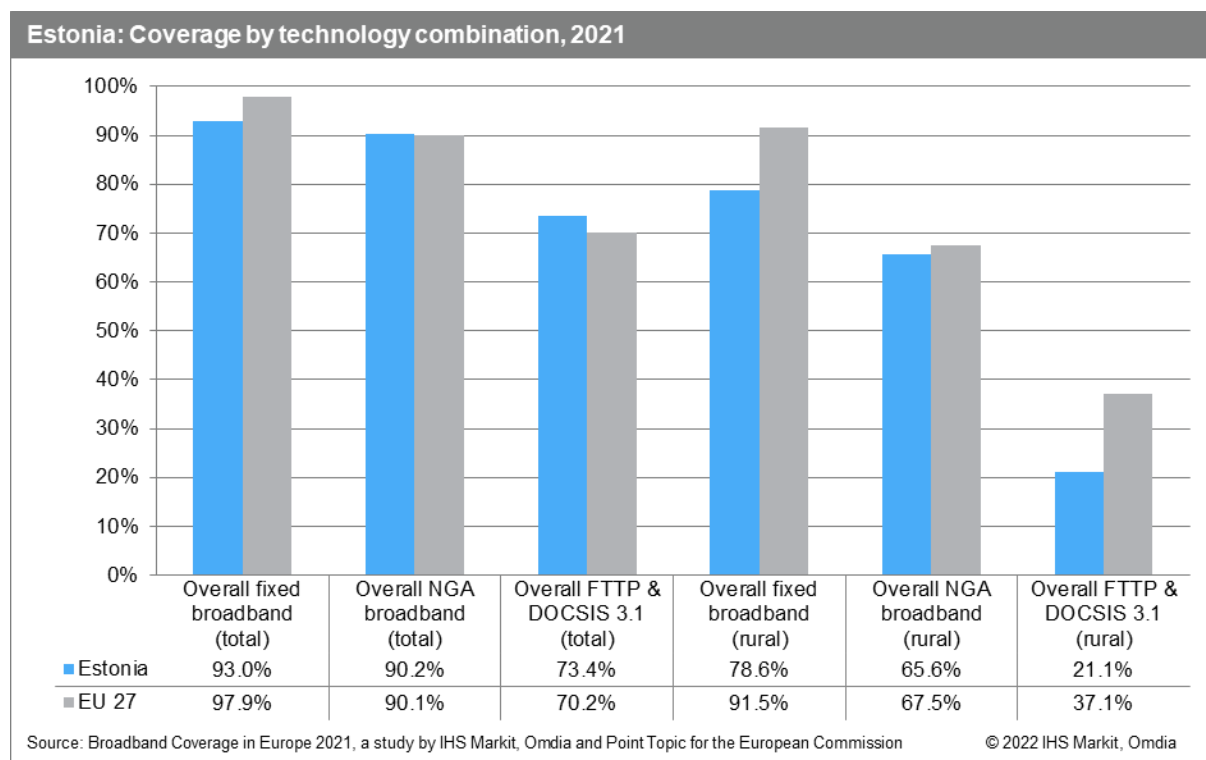
Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.8 Estonia

5.8.1 National coverage by broadband technology

93.0% of Estonian households had access to at least one fixed broadband service by the end of June 2021. With an unchanged coverage compared to mid-2020, Estonia continued to perform below the EU average with a slightly larger gap than last year. In rural Estonia, fixed broadband coverage improved by 1.4 percentage points, but also remained below the EU average. National NGA broadband coverage improved by 1.4 percentage points and 2.2 percentage points on national and rural level, respectively.

Estonia performed strongly in the FTTP & DOCSIS 3.1 category given its widespread availability of FTTP networks. As there were no DOCSIS 3.1 deployments by mid-2021, gigabit-capable networks were limited to FTTP. Coverage on national level grew by 2.5 percentage points compared to mid-2020.



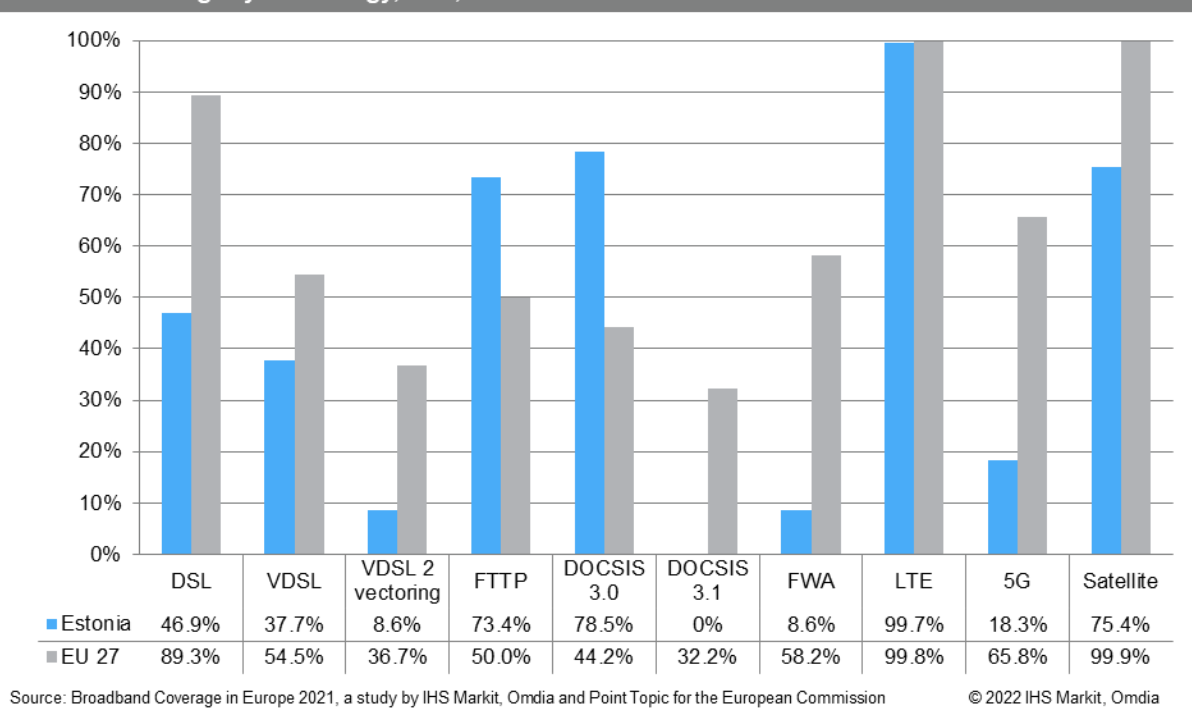
On an individual technology level, DOCSIS 3.0 remained the prevalent technology, covering 78.5% of Estonian households. DOCSIS 3.1 was still absent as operators invest into FTTP network rollouts instead. FTTP was the fastest growing technology (2.5 percentage points) and provided the second largest coverage in the country. Estonia performed well above the EU averages in DOCSIS 3.0 and FTTP categories.

Estonian operators continued to decommission legacy copper networks and to replace them with fibre optic networks which caused DSL coverage to decline by 4.2 percentage points. Less than half of Croatian households (46.9%) were still within DSL reach, which makes Estonia the country with the second lowest DSL coverage in this year's study. Similar to DSL, VDSL coverage declined by 2.5 percentage points.

5G coverage remained limited (18.3%) as only one out of three Estonian operators had launched commercial 5G services by the end of June 2021. LTE coverage stood at 99.7%.

Satellite broadband coverage remained unchanged in 2021, reaching 75.4% of Estonia, due to technical requirements for larger dishes to receive the satellite signal in some areas.

Estonia: Coverage by technology, total, 2021

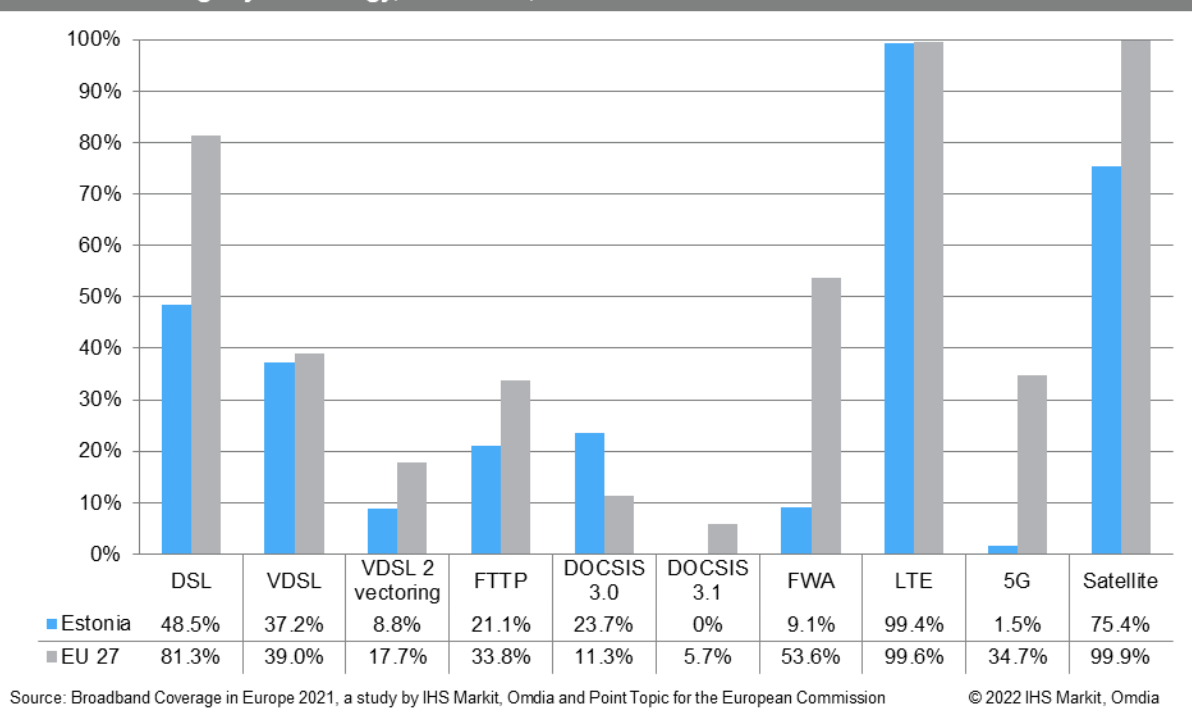


Estonia's FTTP rollouts remained largely focused on urban areas, with less than one quarter (21.1%) of rural households covered. DSL remained the prevalent technology in rural Estonia, covering 48.5% of households. VDSL and VDSL 2 Vectoring upgrades progressed as coverage expanded by 1.9 percentage points and 1.8 percentage points, respectively.

As seen on national level, DOCSIS 3.0 also scored well above the EU average (11.3%) in rural areas, providing coverage for almost a quarter of rural households (23.7%).

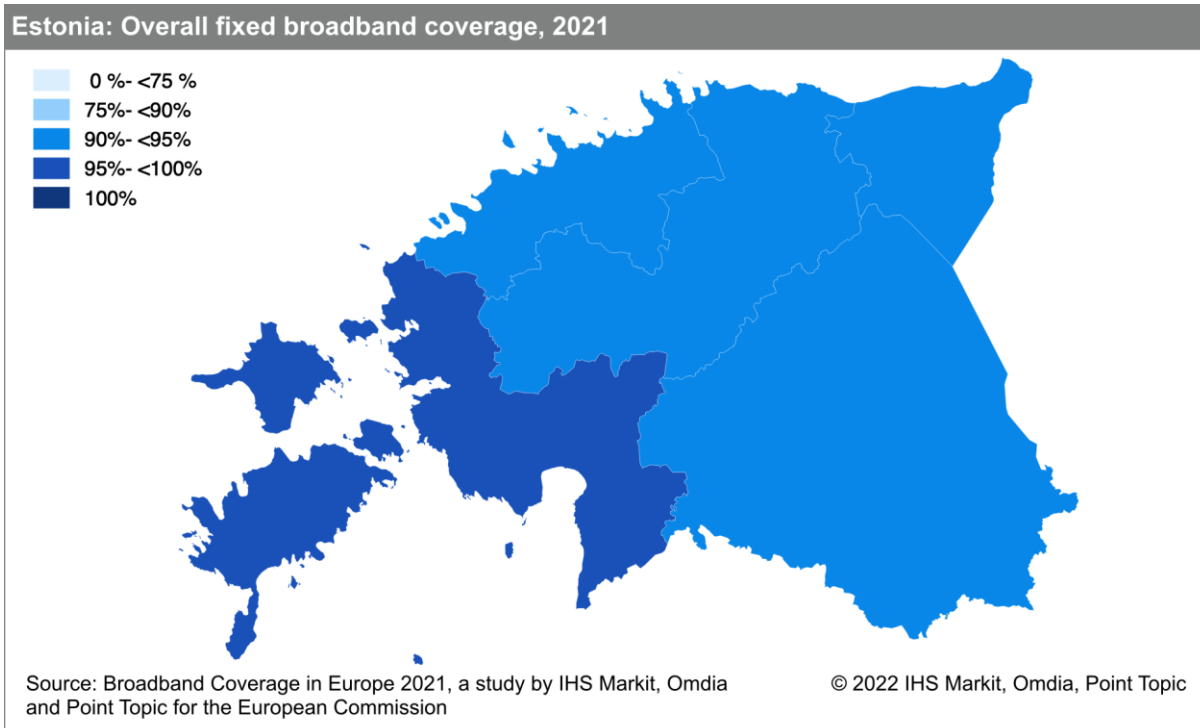
As 5G services were mainly focused on urban areas by mid-2021, only 1.5% of Estonian households in rural regions were covered by this mobile technology. LTE coverage stood at 99.4%.

Estonia: Coverage by technology, rural areas, 2021

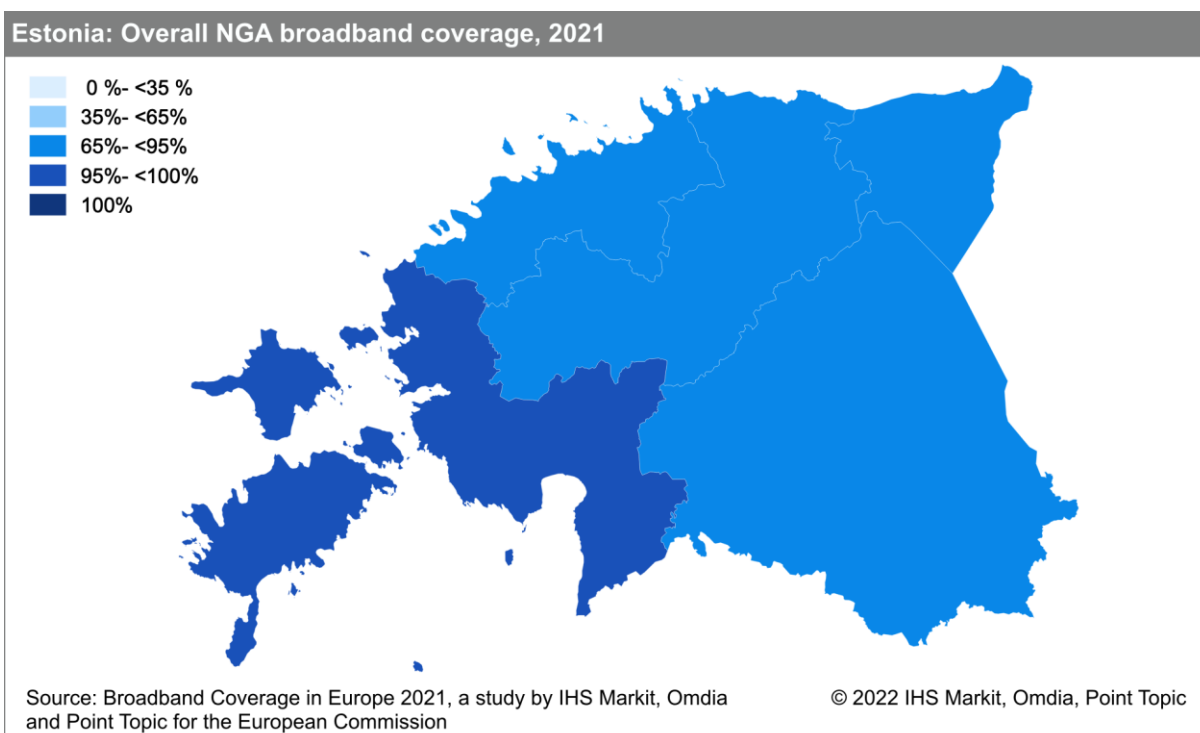


5.8.2 Regional coverage by broadband technology

Overall fixed broadband coverage ranged from 90.1% in Lõuna-Eesti to almost universal coverage (99.9%) in Lääne-Eesti. There was no region with a fixed broadband coverage smaller than 90%.



NGA coverage ranged from 87.4% in Lõuna-Eesti to 96.9% in Lääne-Eesti. The latter passed the 95% threshold over the course of the year but remained the only region to do so.



5.8.3 Data tables for Estonia

Statistic	National
Population	1,348,094
Persons per household	2.4
Rural proportion	23.7%

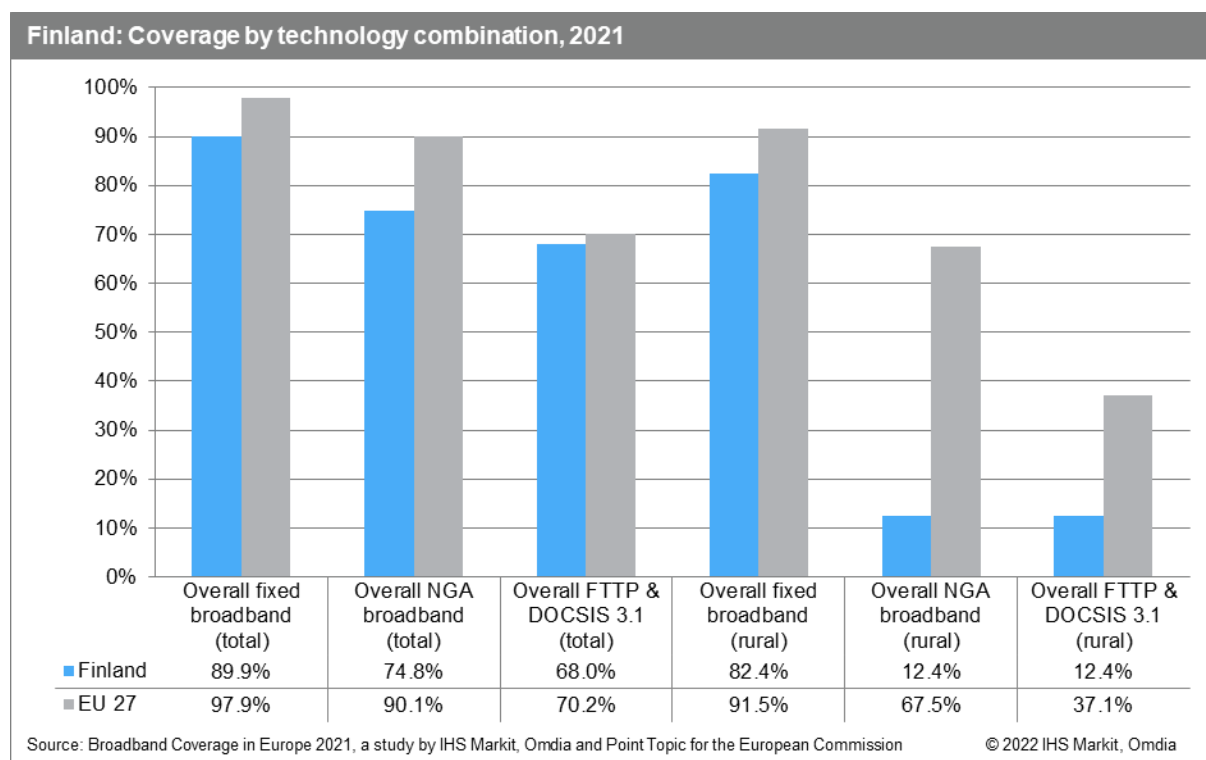
	Estonia 2021		Estonia 2020		Estonia 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	46.9%	48.5%	51.1%	47.0%	69.2%	47.0%	89.3%	81.3%
VDSL	37.7%	37.2%	40.2%	35.3%	56.1%	35.3%	54.5%	39.0%
VDSL 2 Vectoring	8.6%	8.8%	7.0%	7.0%	5.3%	5.3%	36.7%	17.7%
FTTP	73.4%	21.1%	70.9%	20.5%	57.4%	19.8%	50.0%	33.8%
Cable modem DOCSIS 3.0	78.5%	23.7%	76.7%	23.6%	67.4%	23.5%	44.2%	11.3%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	32.2%	5.7%
FWA	8.6%	9.1%	7.9%	6.1%	5.8%	5.9%	58.2%	53.6%
LTE	99.7%	99.4%	100.0%	100.0%	99.4%	99.5%	99.8%	99.6%
LTE average operator coverage	97.9%	-	98.2%	-	97.9%	-	97.5%	-
5G	18.3%	1.5%	0%	0%	-	-	65.8%	34.7%
Satellite	75.4%	75.4%	75.4%	75.4%	75.4%	75.4%	99.9%	99.9%
Overall fixed broadband	93.0%	78.6%	93.0%	77.3%	90.9%	77.0%	97.9%	91.5%
Overall NGA broadband	90.2%	65.6%	88.8%	63.4%	83.7%	62.4%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	73.4%	21.1%	70.9%	20.5%	57.4%	19.8%	70.2%	37.1%
At least 30Mbps	89.2%	-	88.3%	-	83.7%	-	89.8%	-
At least 100Mbps	83.5%	-	81.9%	-	74.3%	-	82.1%	-
At least 1Gbps	36.7%	-	35.4%	-	28.7%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.9 Finland

5.9.1 National coverage by broadband technology

Overall fixed broadband coverage in Finland resumed its decline in 2021 (after a flat trend in 2020), which is largely the result of continued DSL decommissioning. This iteration of the study sees a decrease in fixed broadband coverage of 3.6 percentage points at a national level to reach 89.9% of households. At a rural level 82.4 % of home were passed by at least one fixed broadband network. NGA coverage remained stable nationally, with high-speed broadband services being available to three-quarters (74.8%) of Finnish households overall, but reaching only 12.4% of rural households – the lowest rural NGA coverage level in this study by some margin. This is however a 3.0 p.p. increase since 2020. Combined, DOCSIS 3.1 and FTTP coverage grew by 1.3 percentage points, passing 68.0% of homes, meaning that Finland this year drops below the EU average (70.2%).



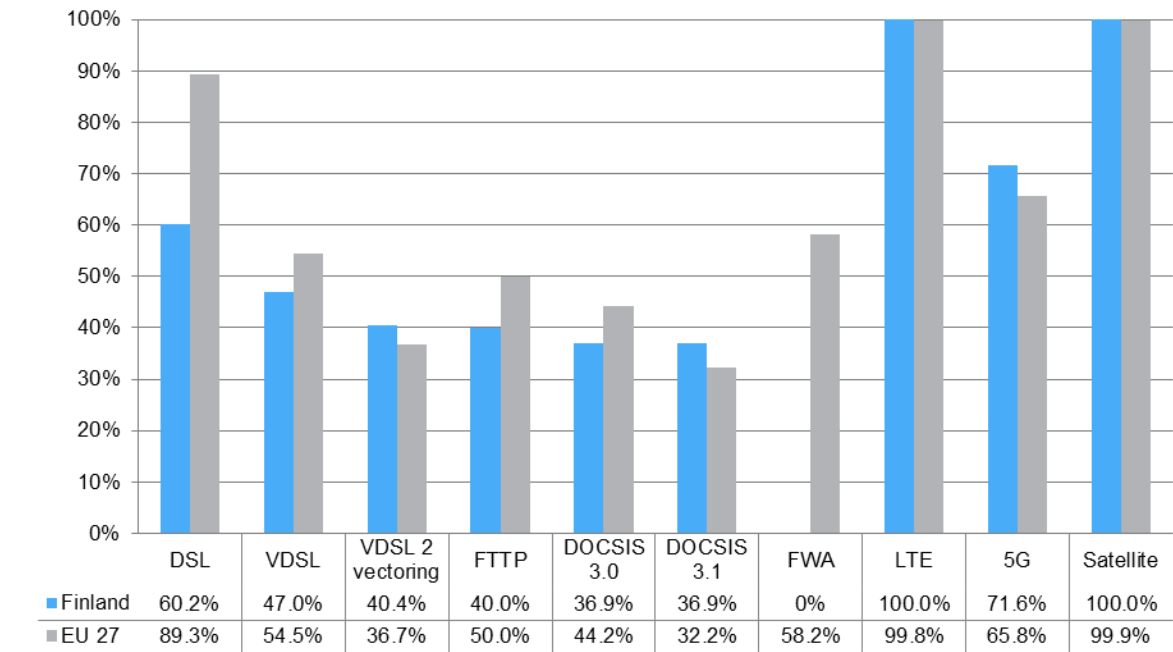
DSL remained the most prevalent of the individual fixed broadband technologies in Finland, despite a continuous decrease over the last three years associated with the gradual disconnection of copper lines, which are replaced by fibre optic networks. As of mid-2021, DSL coverage had fallen by 10.8 percentage points year-on-year, reaching 60.2% of Finnish households.

As of the end of June 2021, VDSL remained the NGA technology with the highest coverage in Finland, passing 47.0% of homes (a 1.7 p.p. decrease on the previous year). VDSL2 Vectoring services were available to 40.4% of Finnish households.

Availability of Cable DOCSIS 3.1 technology fell by 0.9 percentage points during the twelve months to the end of June 2021, covering 36.9% of all households. Finnish cable operators were among early adopters of NGA technologies and all cable networks in the country had been upgraded to the DOCSIS 3.1 standard by the end of June 2019. A 2.3 percentage points increase compared to mid-2020 meant that FTTP broadband services were available to 40.0% of Finnish households by the end of June 2021.

Regarding mobile broadband coverage, as mentioned in previous iterations of the study, Finland was an early LTE adopter, achieving nationwide coverage in 2017. At the end of June 2021, LTE coverage remained stable at 100.00% and 5G coverage reached 71.6%.

Finland: Coverage by technology, total, 2021

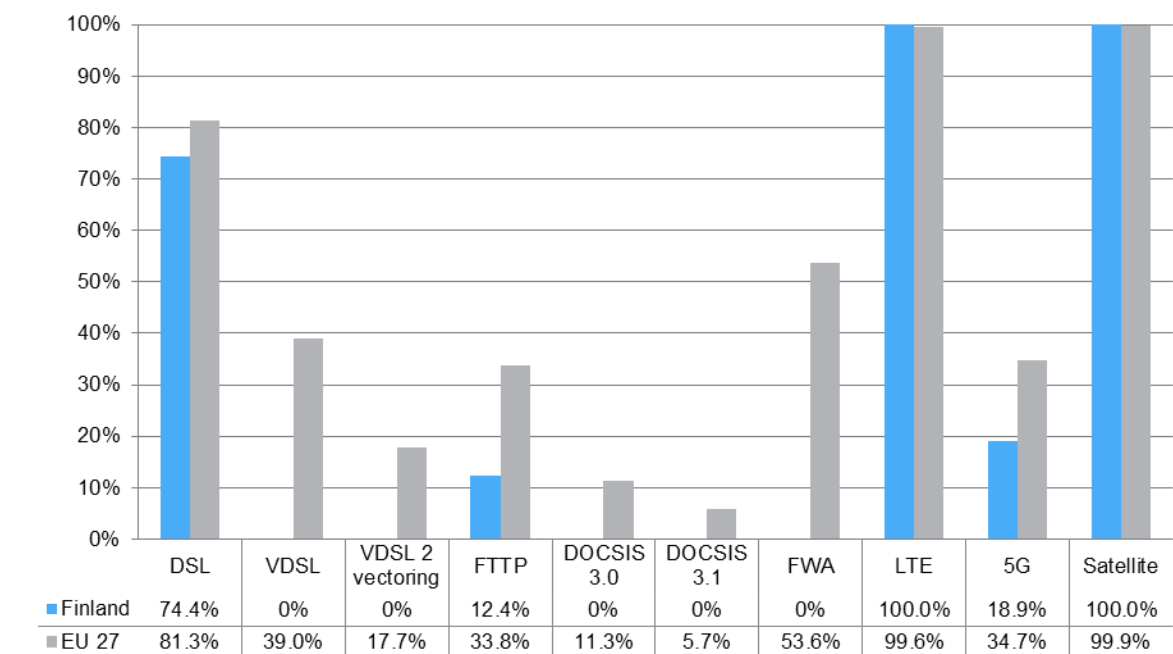


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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Rural broadband coverage in Finland saw a continued transition from DSL to FTTP during the twelve months to mid-2021. DSL covered 74.4% of households, down by 3.9 p.p., with VDSL and DOCSIS 3.0 technologies remaining absent in rural areas. FTTP networks passed 12.4% of rural homes, with coverage increasing noticeably (by 3.0 percentage points) year-on-year. Meanwhile 5G rollouts reached rural areas during the year, with coverage of 18.9% by June 2021.

Finland: Coverage by technology, rural areas, 2021

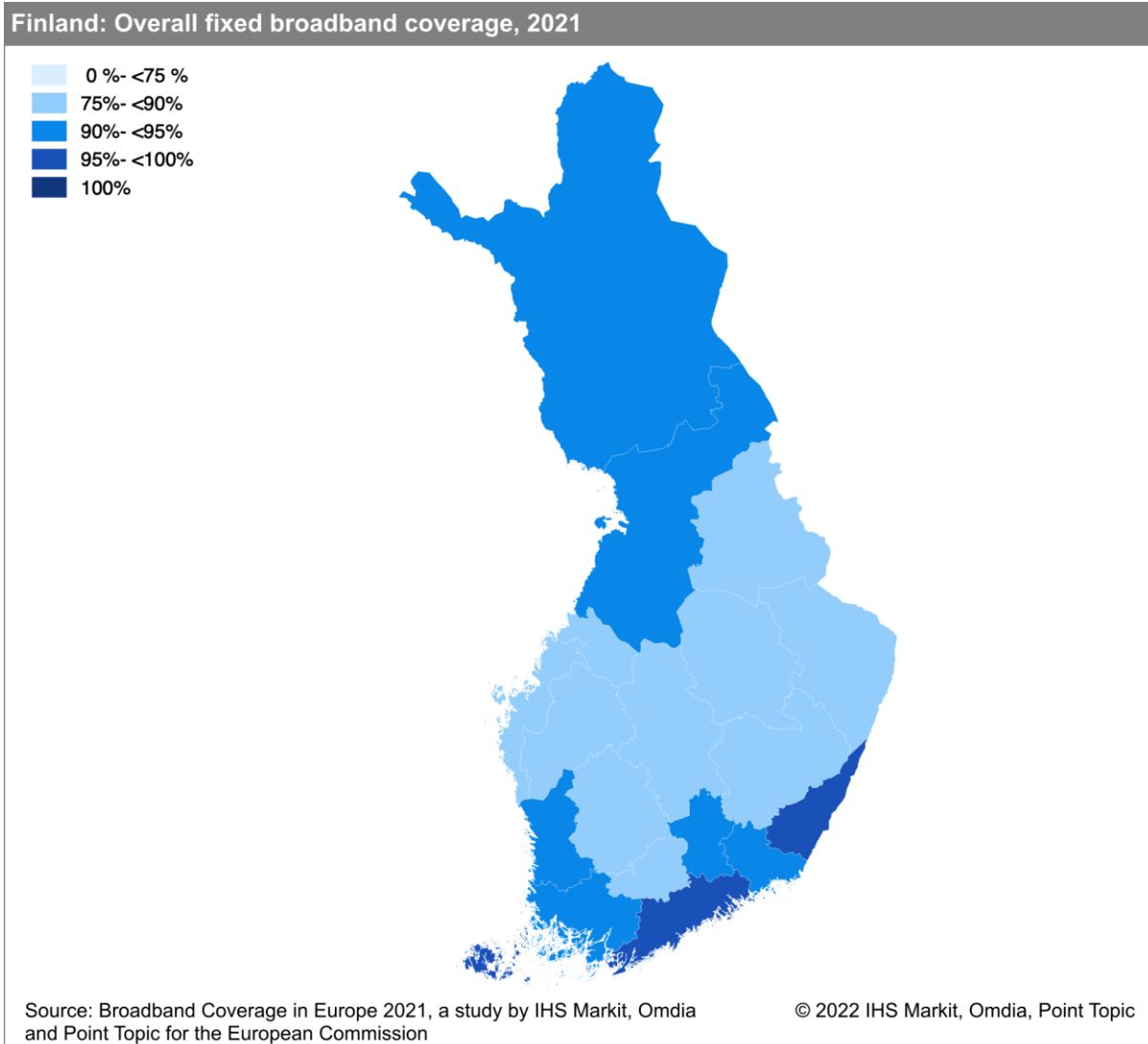


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

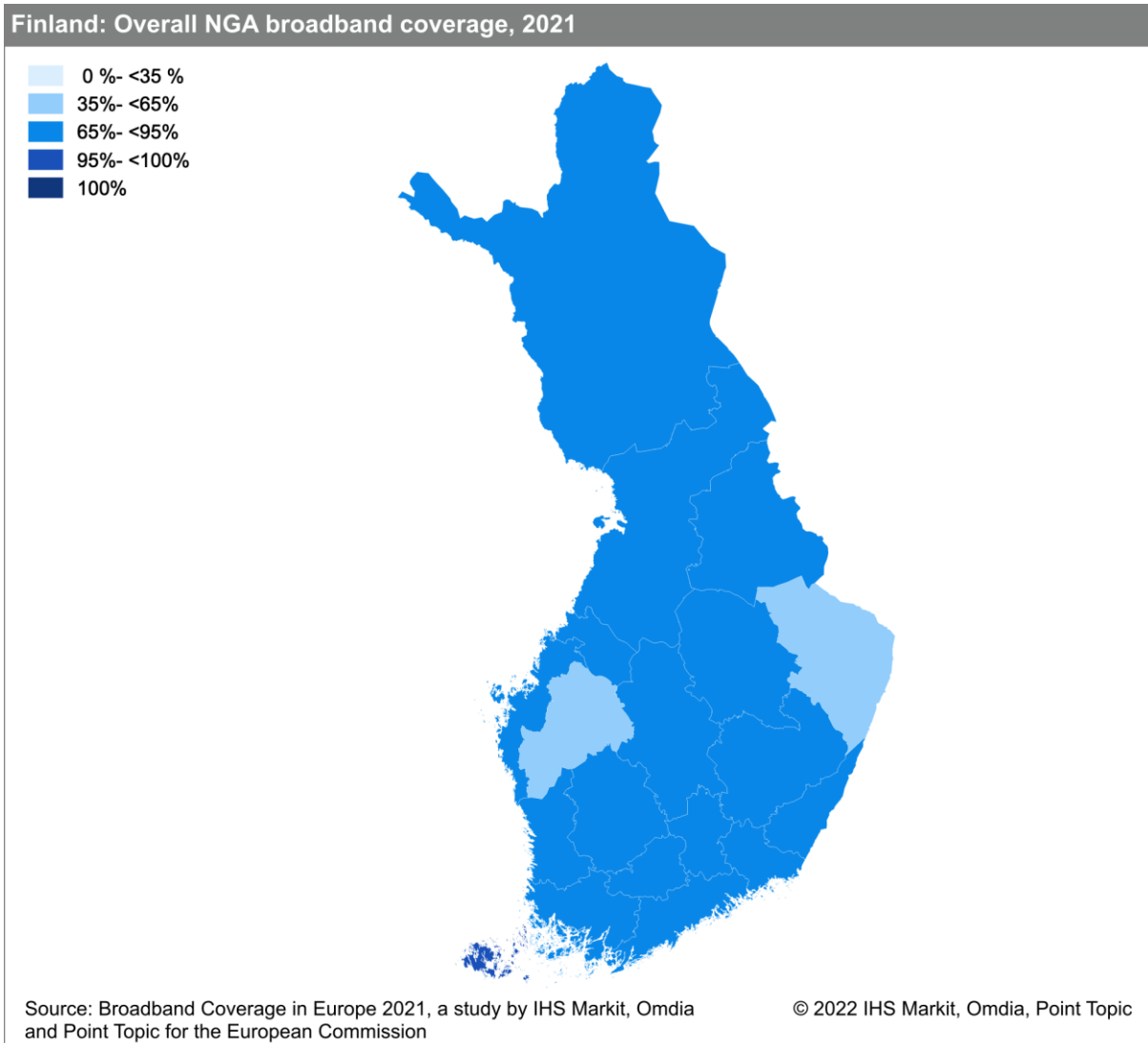
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5.9.2 Regional coverage by broadband technology

In this iteration of the study, a total of 3 Finnish regions recorded fixed broadband coverage levels below 80% – Etelä-Savo, (75%) Pohjois-Karjala (77%) and Etelä-Savo (79%). Åland retained its position as the region with the highest fixed broadband coverage, with 96% of households passed, joined this year by Etelä-Karjala. As mentioned in previous iterations of this study, Finland is atypical in the sense that broadband coverage levels are not strongly correlated to the degree of urbanisation. None of the three regions with the most rural households is among those with the lowest fixed broadband coverage.



Regarding NGA coverage levels, there is a high degree of variance between regions. Coverage generally ranges between 60% and 80%, with only three exceptions – Etelä-Pohjanmaa (51.9%) Päijät-Häme (83.0%) and Åland (96.0%), indicating that all fixed broadband in the latter region was NGA-based.



5.9.3 Data tables for Finland

Statistic	National
Population	5,525,292
Persons per household	2.0
Rural proportion	17.6%

	Finland 2021		Finland 2020		Finland 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	60.2%	74.4%	71.0%	78.3%	78.9%	81.7%	89.3%	81.3%
VDSL	47.0%	0%	48.7%	0%	48.6%	0%	54.5%	39.0%
VDSL 2 Vectoring	40.4%	0%	41.9%	0%	41.8%	0%	36.7%	17.7%
FTTP	40.0%	12.4%	37.7%	9.4%	35.2%	9.1%	50.0%	33.8%
Cable modem DOCSIS 3.0	36.9%	0%	37.8%	0%	36.9%	0%	44.2%	11.3%
Cable modem DOCSIS 3.1	36.9%	0%	37.8%	0%	36.9%	0%	32.2%	5.7%
FWA	0%	0%	0%	0%	0%	0%	58.2%	53.6%
LTE	100.0%	100.0%	100.0%	99.9%	100.0%	99.9%	99.8%	99.6%
LTE average operator coverage	99.1%	-	99.1%	-	99.1%	-	97.5%	-
5G	71.6%	18.9%	12.4%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	89.9%	82.4%	93.5%	83.1%	93.5%	84.1%	97.9%	91.5%
Overall NGA broadband	74.8%	12.4%	75.0%	9.4%	75.3%	9.1%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	68.0%	12.4%	66.7%	9.4%	61.8%	9.1%	70.2%	37.1%
At least 30Mbps	77.0%	-	75.0%	-	73.0%	-	89.8%	-
At least 100Mbps	65.0%	-	64.0%	-	62.0%	-	82.1%	-
At least 1Gbps	51.0%	-	47.0%	-	40.0%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

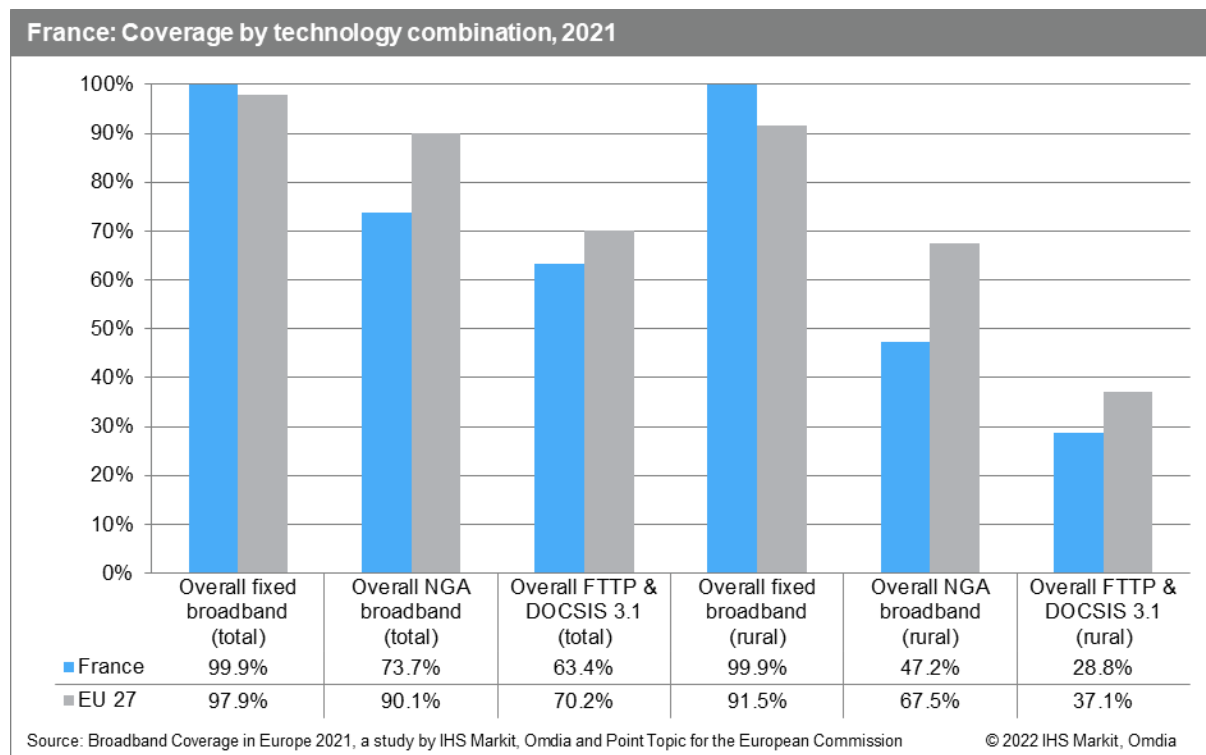
All restatements are highlighted in italics.

5.10 France

5.10.1 National coverage by broadband technology

Since France already achieved universal fixed broadband coverage at national and rural level in 2017, operators have focused on improving the availability of NGA networks. By the end of June 2021, NGA broadband services were available to almost three quarters (73.7%) of French households, following an increase of 4.7 percentage points year-on-year. Despite this progress, France again recorded the lowest NGA coverage in this year's study. In rural regions, NGA coverage improved by 9.8 percentage points and passed 47.2% of rural homes but remained well below the EU average of 67.5%.

When considering networks which have a potential to deliver gigabit speeds (FTTP & DOCSIS 3.1), coverage grew by 10.8 percentage points at a national level and 10.3 percentage points on rural level. France remains below the EU average for this metric, but the gap has narrowed since 2020 at both national and rural level.



On an individual technology level, DSL remained the most widespread service in France, with 98.8% of homes passed. FTTP remained the most prevalent NGA broadband technology and recorded the strongest increase among technologies within the 12-month period of the study. By mid-2021, FTTP services were available to almost two thirds (63.4%) of French households, following an increase of 10.8 percentage points. Cable modem DOCSIS 3.0 remained the second most widespread NGA technology, with 23.1% of homes passed. VDSL is the third NGA technology in the country, covering 15.7% of French households. As French operators have focused on the deployment of fibre rather than upgrading existing networks, DOCSIS 3.1 and VDSL2 Vectoring both remain absent from the French market as of mid-2021. Use of FWA technology is encouraged by the French government and offered by all four main French operators¹⁰. Coverage at mid-2021 was 58.1%, in line with the EU average.

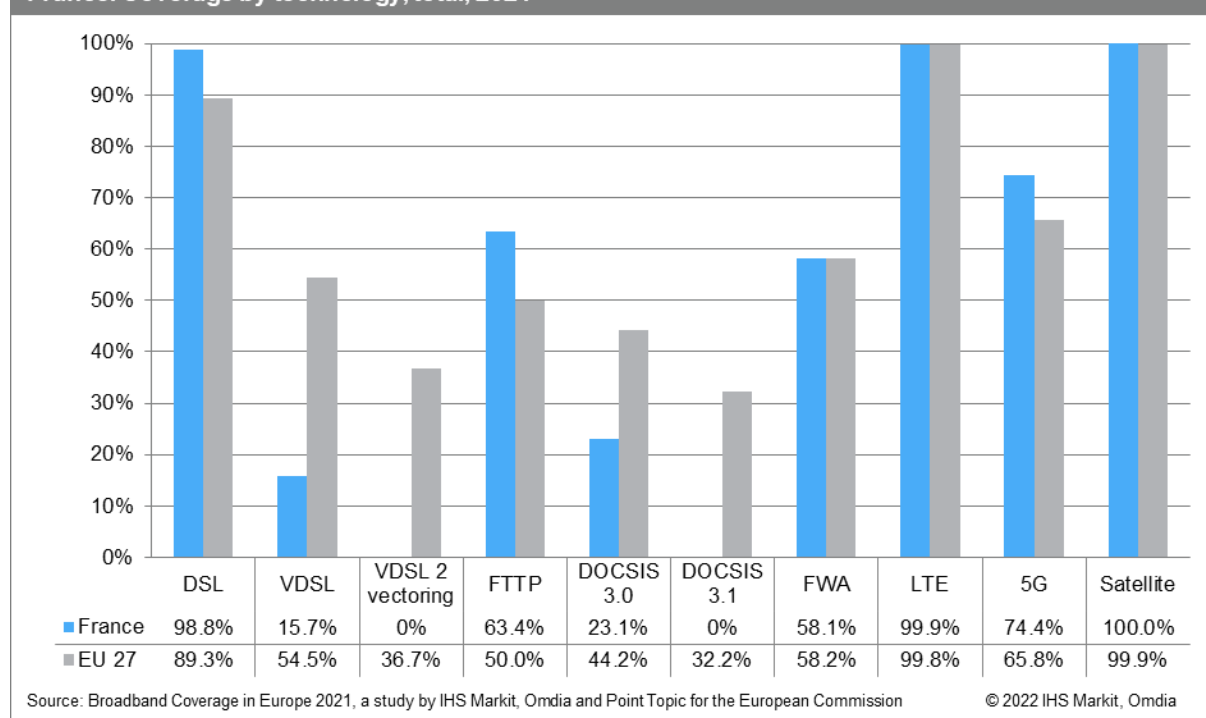
Almost all French households (99.9%) had access to LTE services by the end of June 2021. The availability is slightly lower when considering the average coverage of all LTE network operators: On average, 99.3% of French people could access LTE services, an increase of 0.2 percentage points. The major mobile operators all launched 5G services in the fourth quarter of 2020, and by June 2021 coverage had reached 74.4% of households nationwide.

In rural areas, despite a small decline of 0.7 percentage points, DSL remained the most widespread fixed broadband technology. Compared to other European countries, France recorded one of the highest rural DSL coverages and performed 17.0 percentage points above the EU average. Rural areas are the

¹⁰ <https://www.aménagement-numérique.gouv.fr/fr/bonhautdebit-aidefinanciere>

main beneficiaries of the French state initiative promoting FWA, and coverage is thus much higher in rural areas than in urban areas, reaching 91.2% of households, well above the national coverage figure.

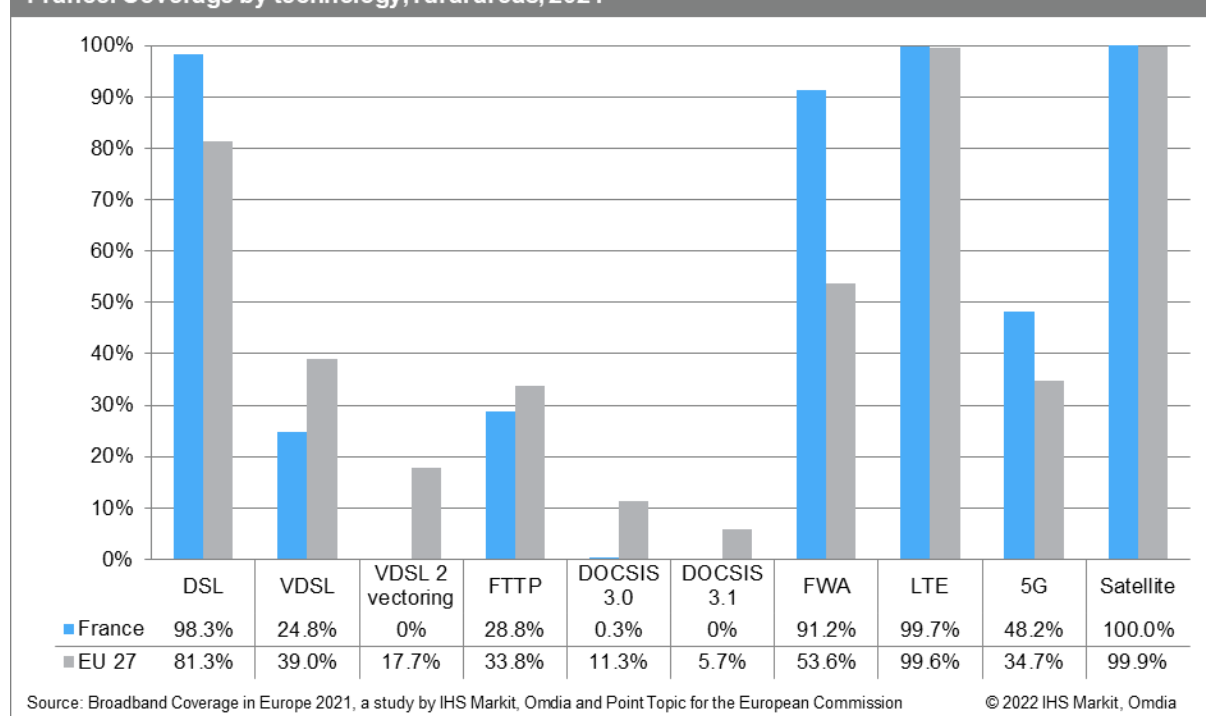
France: Coverage by technology, total, 2021



FTTP coverage in rural areas grew significantly over the year (+10.8 p.p.), and FTTP is now the leading rural NGA technology, reaching 28.8% of households. Despite the progress, France stayed below the EU average of 33.8%. VDSL also remains an important technology, passing 24.8% of rural homes, up slightly from the previous year. Cable modem DOCSIS 3.0 coverage in rural areas is minimal, at only 0.3% of households.

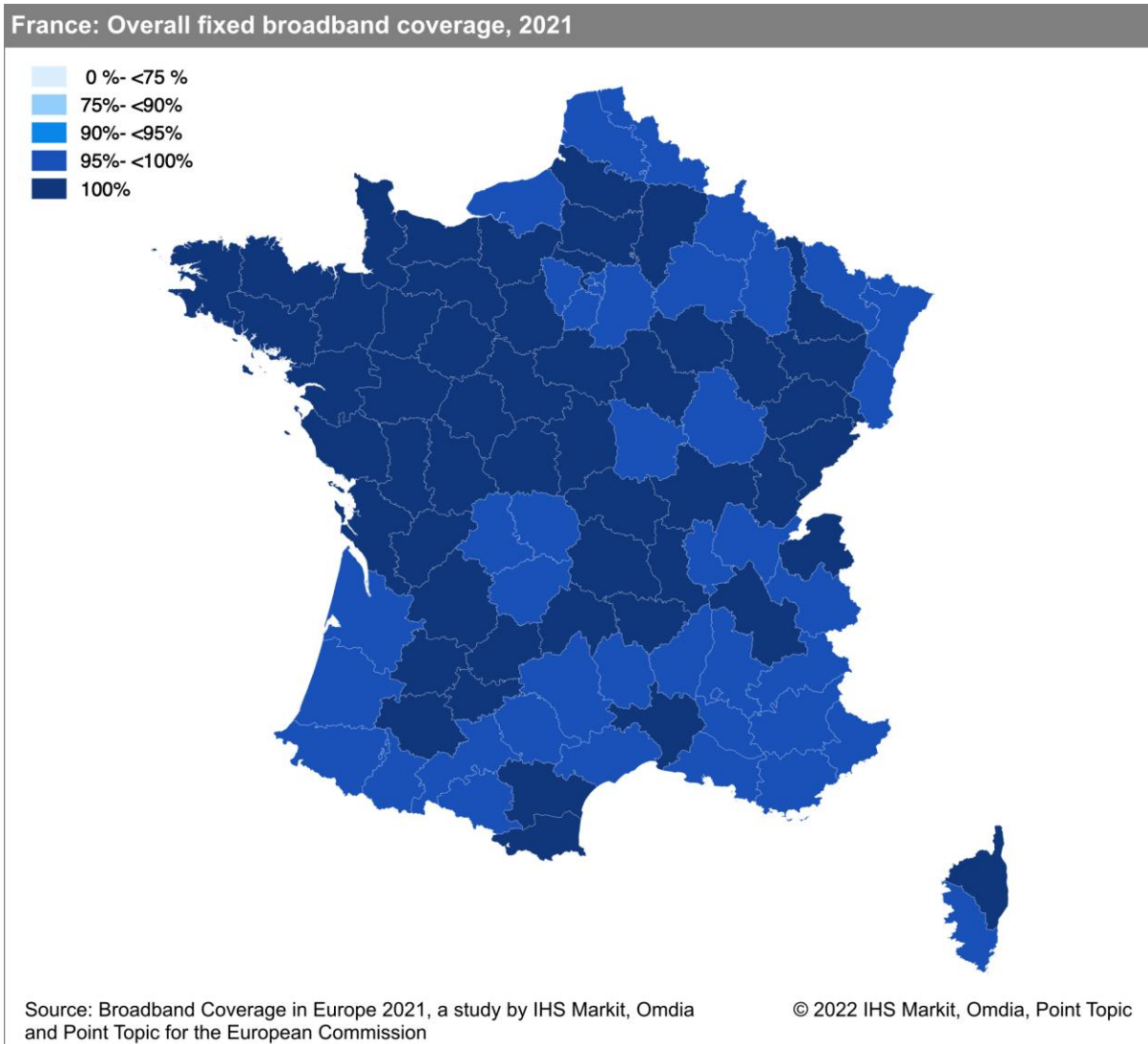
Rural LTE coverage is near-universal at 99.7%, marginally above the EU average. Since launch in 2020, 5G coverage has grown to reach almost half (48.2%) of rural households, 13.5 p.p. ahead of the EU average.

France: Coverage by technology, rural areas, 2021

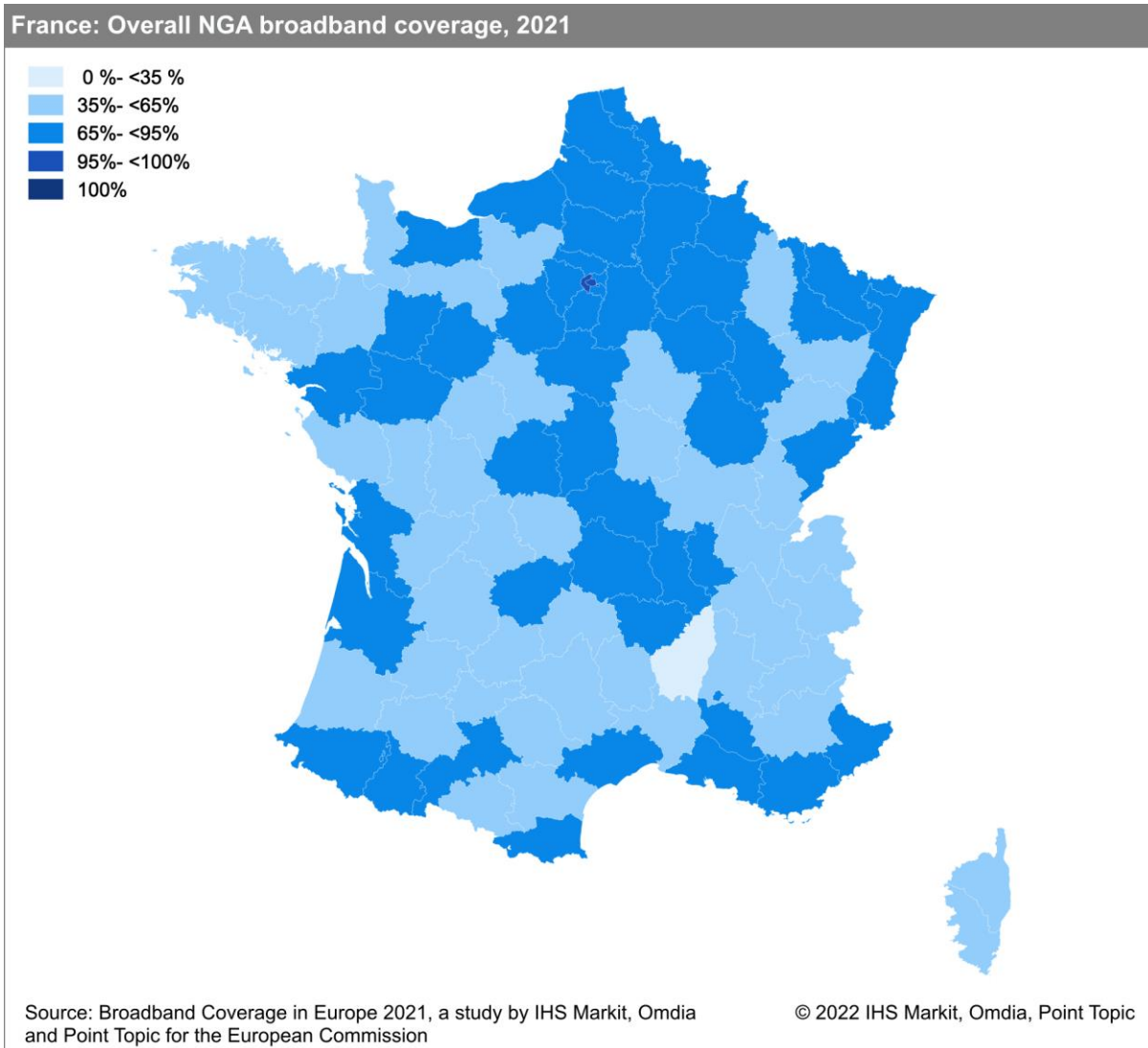


5.10.2 Regional coverage by broadband technology

Apart from the overseas department of Guyane, fixed broadband coverage across French regions is near-universal, at 99.7% or higher. 58 regions achieved 100% fixed broadband coverage by June 2021.



Unlike overall fixed broadband coverage, there was a high degree of variance between French regions in terms of NGA coverage. Ardèche recorded the lowest NGA coverage (33.8%), while Paris recorded the highest (99.5%).



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%	53.8%
FRA20	Martinique	100.0%	50.8%
FRA30	Guyane	95.4%	43.6%
FRA40	La Réunion	100.0%	88.7%
FRA50	Mayotte	100.0%	38.5%

5.10.3 Data tables for France

Statistic	National
Population	67,320,216
Persons per household	2.3
Rural proportion	16.4%

	France 2021		France 2020		France 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	98.8%	98.3%	99.2%	99.0%	100.0%	99.9%	89.3%	81.3%
VDSL	15.7%	24.8%	20.4%	24.5%	19.7%	24.4%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	63.4%	28.8%	52.6%	18.4%	43.8%	12.4%	50.0%	33.8%
Cable modem DOCSIS 3.0	23.1%	0.3%	27.0%	0.7%	27.0%	0.7%	44.2%	11.3%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	32.2%	5.7%
FWA	58.1%	91.2%	56.5%	88.4%	55.0%	87.1%	58.2%	53.6%
LTE	99.9%	99.7%	99.8%	99.1%	99.5%	99.8%	99.8%	99.6%
LTE average operator coverage	99.3%	-	99.1%	-	98.6%	-	97.5%	-
5G	74.4%	48.2%	0%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.9%	99.9%	100.0%	100.0%	100.0%	100.0%	97.9%	91.5%
Overall NGA broadband	73.7%	47.2%	69.0%	37.5%	62.1%	33.4%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	63.4%	28.8%	52.6%	18.4%	43.8%	12.4%	70.2%	37.1%
At least 30Mbps	74.4%	-	64.8%	-	62.0%	-	89.8%	-
At least 100Mbps	65.3%	-	55.8%	-	50.3%	-	82.1%	-
At least 1Gbps	63.8%	-	52.2%	-	43.8%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

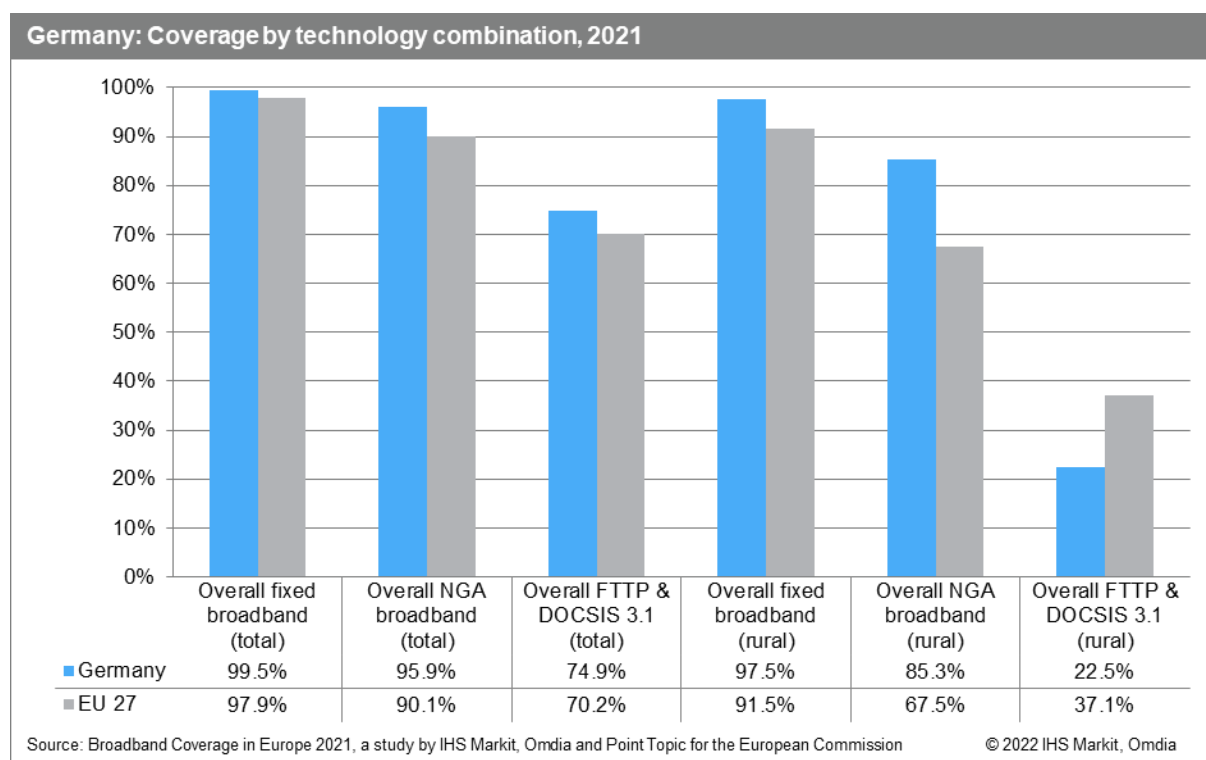
All restatements are highlighted in italics.

5.11 Germany

5.11.1 National coverage by broadband technology

Germany provided almost universal broadband coverage (99.5%) by the end of June 2021, and covered 97.5% of rural households, an improvement of 0.5 percentage points and 2.6 percentage points, respectively. The number of homes passed by NGA networks grew by 1.2 percentage points nationally and by 4.1 percentage points in rural regions. Like in previous years, Germany exceeded the EU average in the fixed broadband and NGA categories on both national and rural levels.

When looking at networks which have a potential to offer gigabit speeds (FTTP & DOCSIS 3.1), Germany reported strong growth in this year's study as coverage expanded by 19.1 percentage points since mid-2020. While FTTP deployments progressed, this growth was primarily driven by German operators upgrading cable networks to the DOCSIS 3.1 standard. Three quarters (74.9%) of German households were covered by 1Gbps-capable networks by mid-2021. Unlike last year, Germany exceeded the EU average of 70.2%, but still lacked behind gigabit coverage in rural regions, holding a gap of almost 15 percentage points to the EU average.

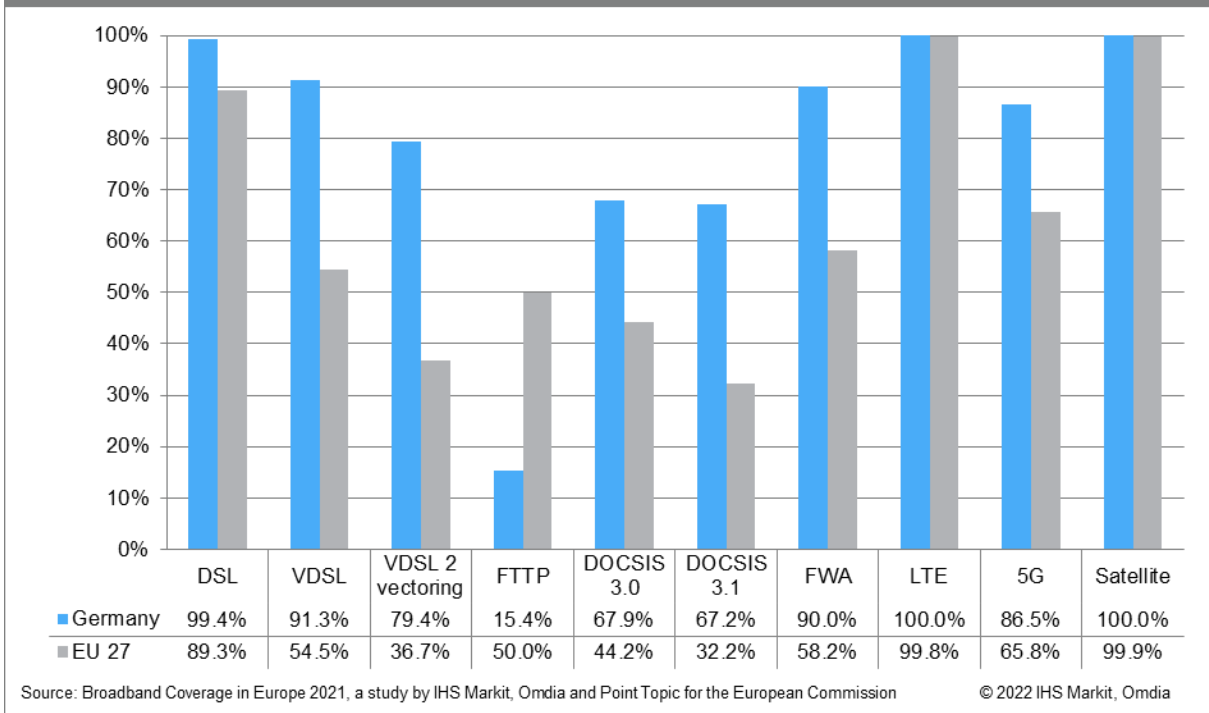


DSL remained the most prevalent individual fixed broadband technology in Germany and reached almost universal access (99.4%) as coverage grew by 0.6 percentage points over the study period. Like in previous years, Germany performed among the top countries across all copper categories, with 91.3% and 79.4% of households covered by VDSL and VDSL2 Vectoring networks, respectively. Germany was the country with the third highest VDSL2 Vectoring coverage in this year's study, as coverage increased by 6.7 percentage points compared to mid-2020. Cable DOCSIS 3.0 networks passed 67.9% of German homes, and 96% of the entire cable footprint had been upgraded to the DOCSIS 3.1 standard, covering 67.2% of households.

As German operators have historically focused on upgrading their legacy copper and cable networks, its FTTP coverage was the second lowest in this year's study. Despite an improvement of 1.6 percentage points, Germany's FTTP coverage of 15.4% remained far below the EU average of 50%.

LTE coverage grew by 0.3 percentage points over the study period and reached universal coverage levels (100%) by mid-2021. Germany performed among the top five countries in terms of 5G availability, with 86.5% homes passed.

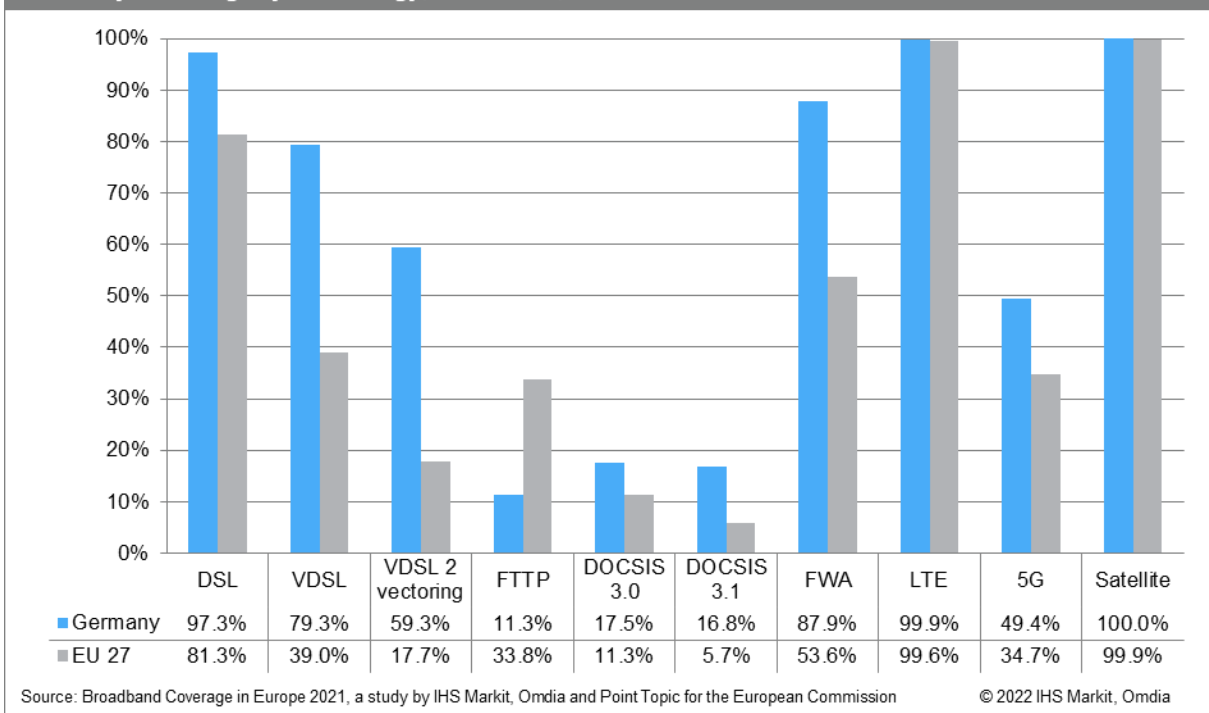
Germany: Coverage by technology, total, 2021



In rural regions, DSL covered 97.3% of households, while 79.3% of households had access to VDSL networks. Coverage of both technologies grew by 2.7 percentage points compared to mid-2020. German operators also continued to upgrade to VDSL2 Vectoring technology which was available to 59.3% of rural households. DOCSIS 3.0 and DOCSIS 3.1 networks passed 17.5% and 16.8% of rural homes, respectively. While last year, most DOCSIS 3.1 upgrades were still focused on urban areas, operators upgraded large parts of their cable networks in rural regions over the last twelve months as DOCSIS 3.1 coverage increased by 9.8 percentage points compared to mid-2020. FTTP coverage remained limited to only 11.3% of rural households which was well below the EU average of 33.8%.

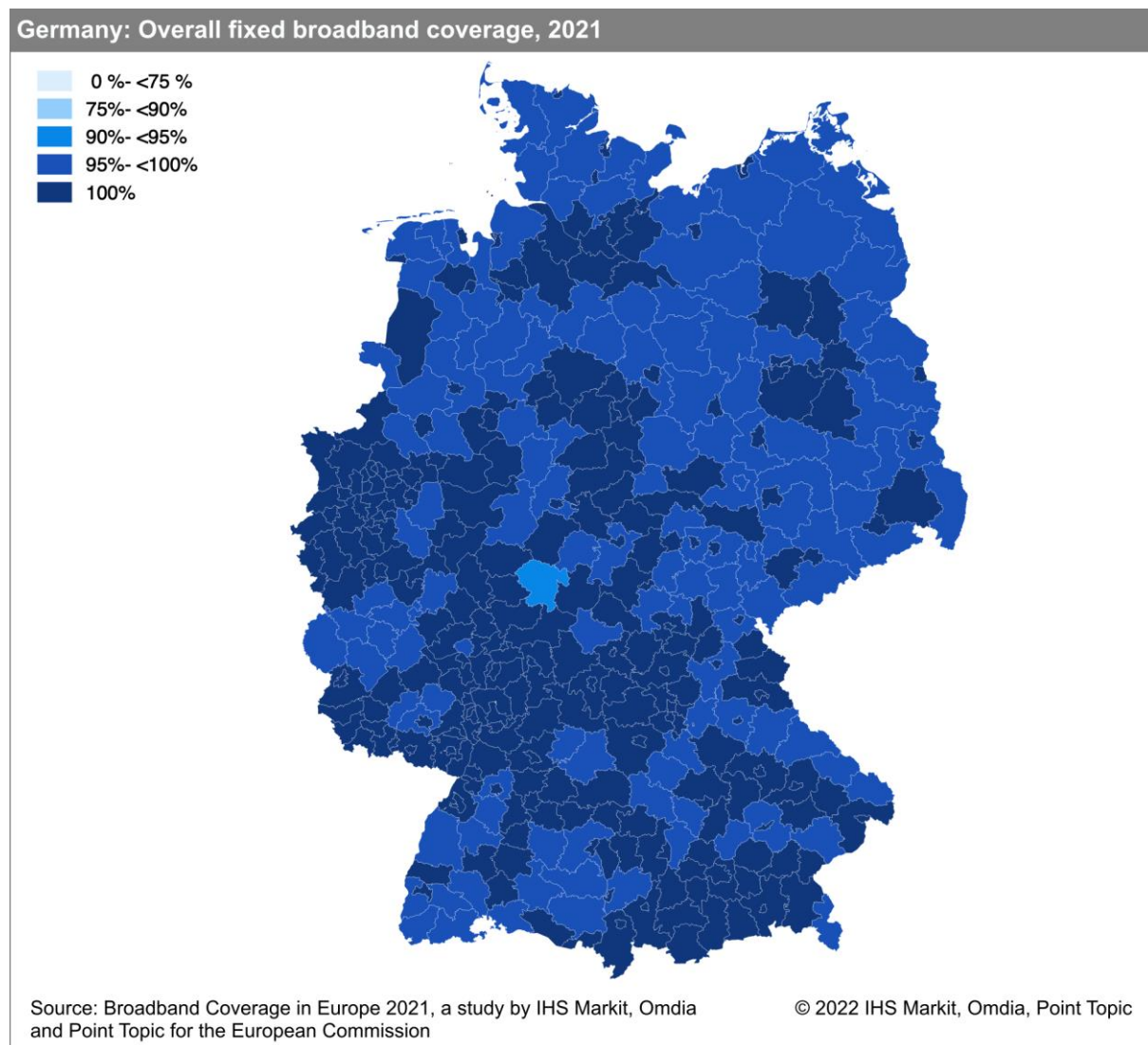
Rural LTE coverage improved by 1.4 percentage points and passed 99.9% of rural homes. German operators also made good progress in rural 5G deployments as the technology was available to half (49.4%) of all rural households.

Germany: Coverage by technology, rural areas, 2021

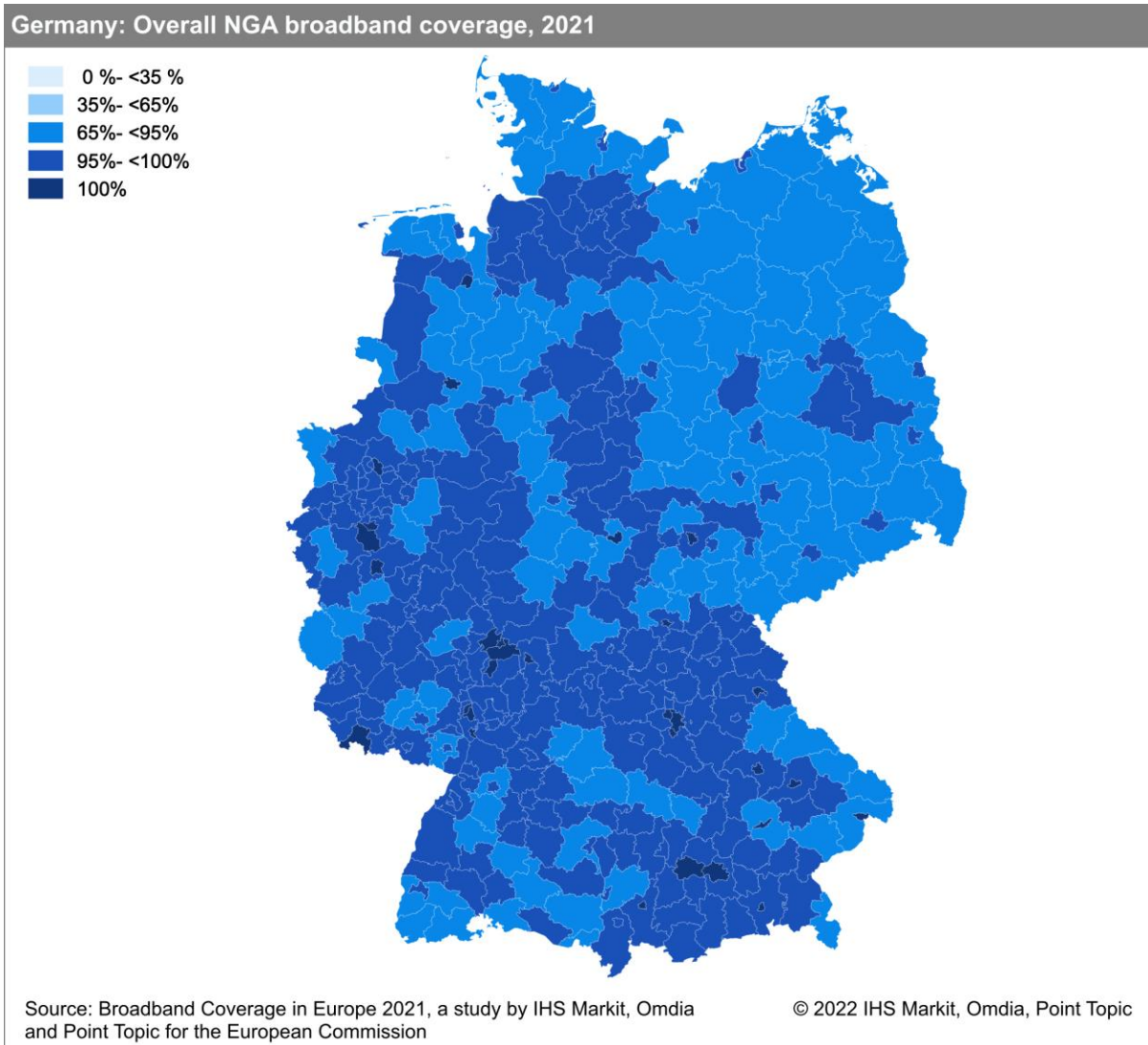


5.11.2 Regional coverage by broadband technology

Almost all German regions reached fixed broadband coverage levels above 95%, with only one region (Vogelsbergkreis) reporting 90.6% household coverage. Two thirds of German regions (265 out of 401) reached universal coverage (100.0%), which included large cities such as Frankfurt am Main, Hamburg, Berlin, and Munich, but also several rural regions.



NGA coverage differences are traditionally large across German regions, which remained true in this year's study. While 30 out of 401 regions reported universal coverage (100.0%), Landkreis Rostock did not reach the 70% threshold (67.9%).



5.11.3 Data tables for Germany

Statistic	National
Population	82,175,684
Persons per household	2.0
Rural proportion	10.5%

	Germany 2021		Germany 2020		Germany 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.4%	97.3%	98.7%	94.6%	97.9%	91.3%	89.3%	81.3%
VDSL	91.3%	79.3%	89.2%	76.6%	85.6%	69.3%	54.5%	39.0%
VDSL 2 Vectoring	79.4%	59.3%	72.7%	51.3%	65.4%	41.0%	36.7%	17.7%
FTTP	15.4%	11.3%	13.8%	10.6%	10.5%	5.6%	50.0%	33.8%
Cable modem DOCSIS 3.0	67.9%	17.5%	66.9%	16.9%	66.3%	16.9%	44.2%	11.3%
Cable modem DOCSIS 3.1	67.2%	16.8%	50.3%	7.0%	29.3%	4.7%	32.2%	5.7%
FWA	90.0%	87.9%	89.7%	86.7%	88.7%	85.1%	58.2%	53.6%
LTE	100.0%	99.9%	99.7%	98.6%	98.6%	96.7%	99.8%	99.6%
LTE average operator coverage	98.0%	-	94.3%	-	93.7%	-	97.5%	-
5G	86.5%	49.4%	17.8%	0.8%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.5%	97.5%	99.0%	94.9%	98.6%	92.8%	97.9%	91.5%
Overall NGA broadband	95.9%	85.3%	94.7%	81.2%	92.2%	74.6%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	74.9%	22.5%	55.9%	16.4%	32.7%	10.3%	70.2%	37.1%
At least 30Mbps	95.9%	-	94.7%	-	92.2%	-	89.8%	-
At least 100Mbps	89.6%	-	85.7%	-	81.8%	-	82.1%	-
At least 1Gbps	62.1%	-	55.9%	-	34.1%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. Please note that the 2021 5G figure refers to October 2021 not June as this was the first time the regulator collected data on 5G coverage. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

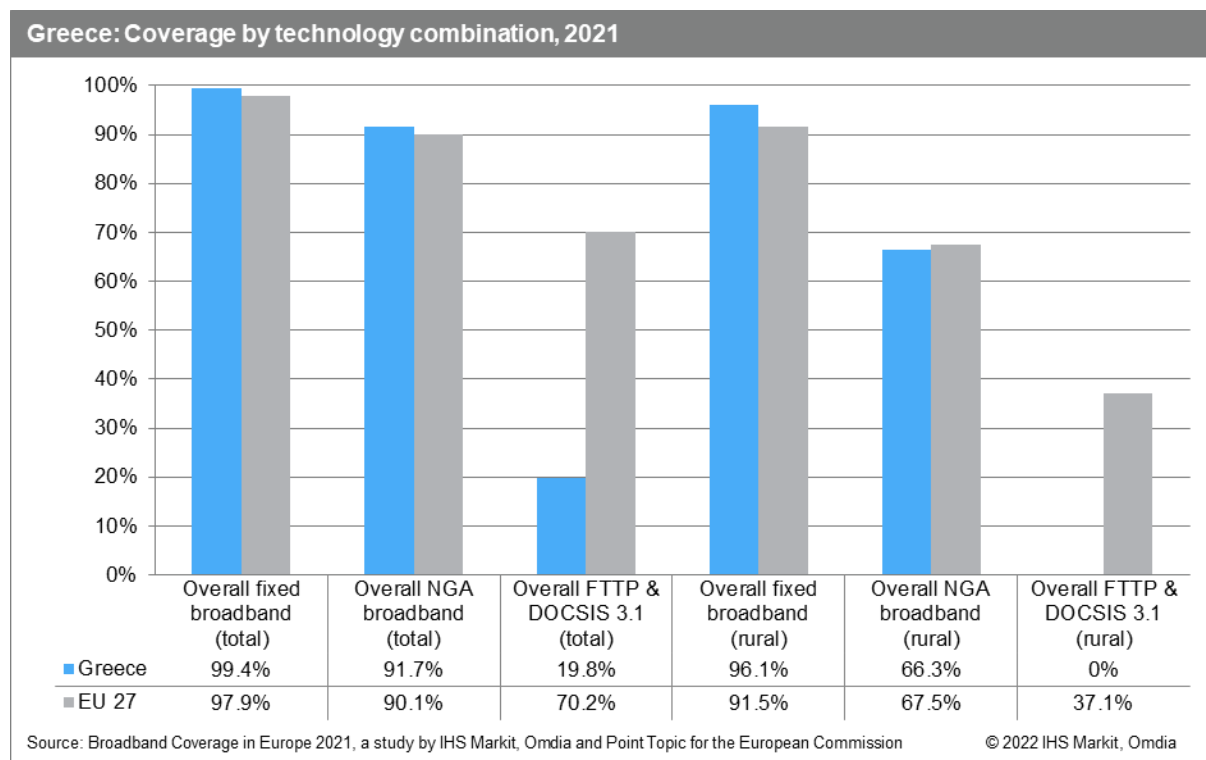
All restatements are highlighted in italics.

5.12 Greece

5.12.1 National coverage by broadband technology

Greece outperformed the EU average on both national and rural levels in terms of fixed broadband coverage, with 99.4% and 96.1% of households covered, respectively. The country also continued to make strong progress in the NGA category: by mid-2021, 91.7% of Greek households had access to high speed broadband services, up by 5.0 percentage points year-on-year. In rural regions, Greece again recorded strong growth (+10.9 p.p.) and passed almost two thirds (66.3%) of rural homes.

However, Greece again recorded the lowest coverage among member states in the combined FTTP & DOCSIS 3.1 category. With no cable networks in the country, high-speed broadband services relied on FTTP deployment which remained slow and concentrated solely on urban areas. By mid-2021, 19.8% of Greek households had access to FTTP services while rural coverage remained at 0.0%.

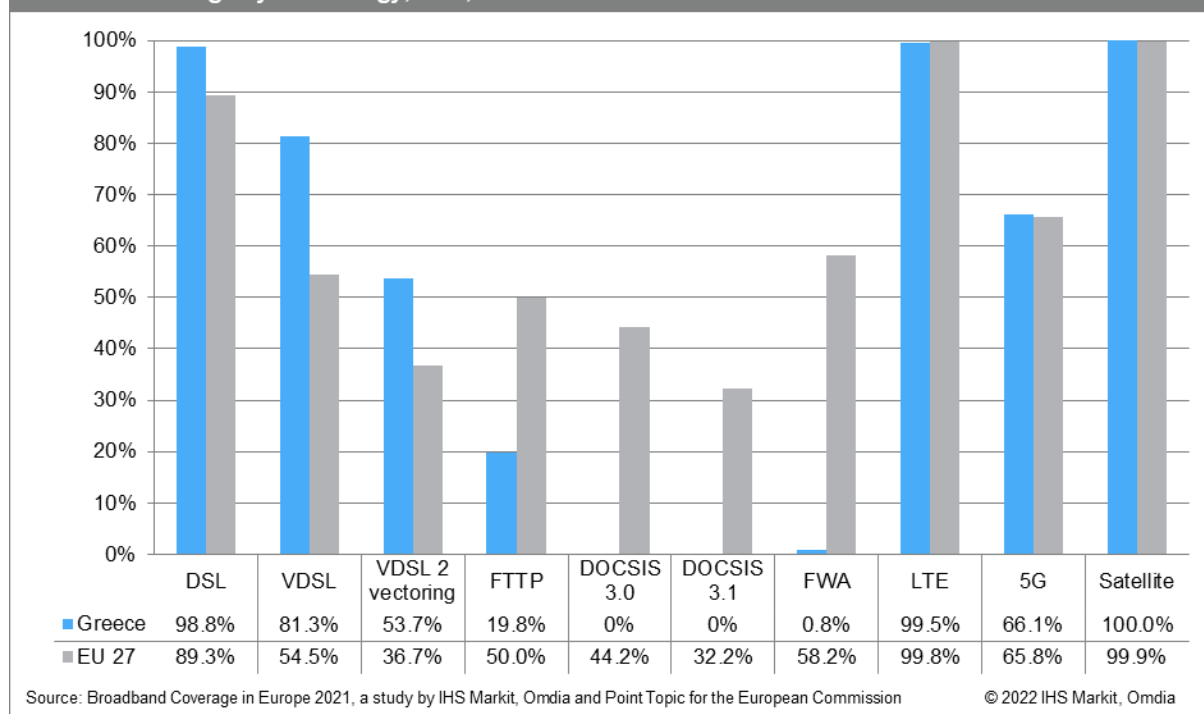


DSL remained the most prevalent fixed broadband technology in Greece, with 98.8% of households covered by the end of June 2021. As in the previous year, FWA is a niche technology with 0.8% of households covered.

In terms of NGA technologies, VDSL and VDSL2 Vectoring remained the most widely accessible services in Greece, with 81.3% and 53.7% of homes passes, respectively. Since mid-2020, coverage of VDSL and VDSL2 Vectoring increased only slightly, by 1.0 percentage points, as operators turned their focus to FTTP rollout. Coverage of FTTP almost doubled over the year, from 10.2% to 19.8%.

LTE coverage improved slightly and reached 99.5% of households by mid-2021. When considering the average LTE coverage of all Greek operators, 98.3% of Greeks had access to LTE services, up by 0.3 percentage points year-on-year. Greece's three mobile network operators all launched commercial 5G services over the course of the year, and overall coverage reached 66.1% by June 2021.

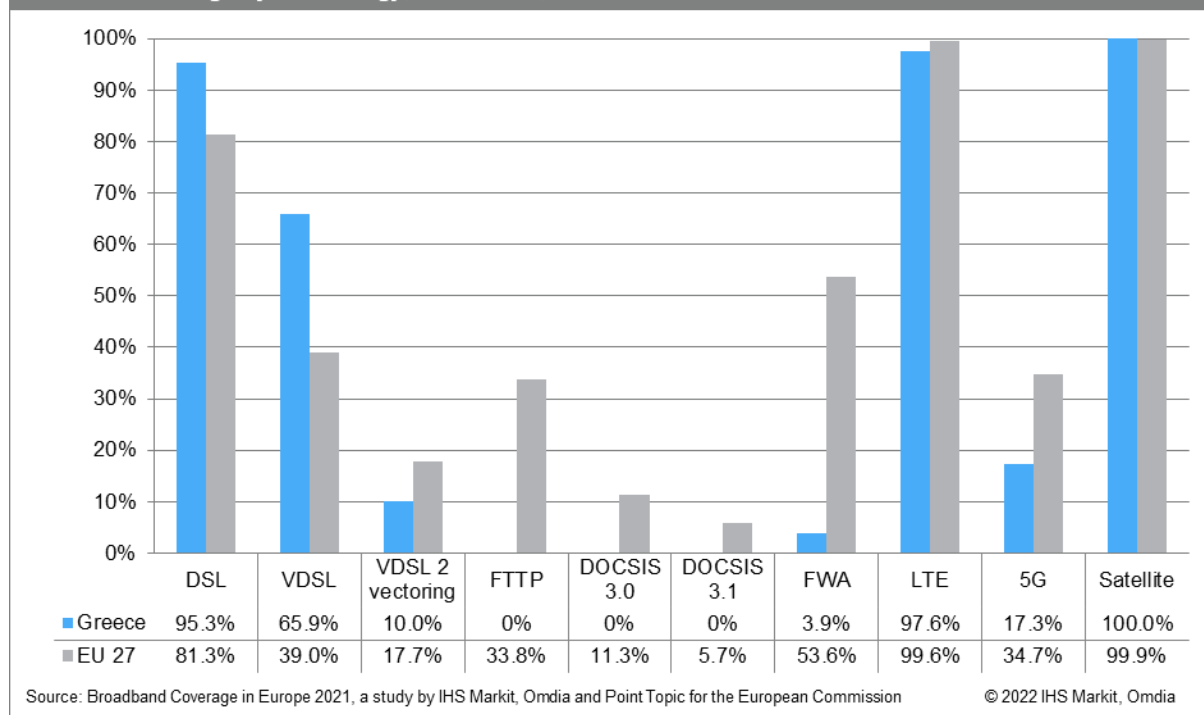
Greece: Coverage by technology, total, 2021



In rural areas of Greece, DSL remained the most prevalent technology, with 95.3% of rural homes passed. The number of networks upgraded to VDSL increased by a noteworthy 10.5 percentage points and almost two thirds (55.9%) of rural households were able to access VDSL services by mid-2021. VDSL2 Vectoring coverage grew fractionally and covered one tenth (10.0%) of rural households. FTTP and cable (DOCSIS 3.0 and 3.1) remained absent from rural Greek regions.

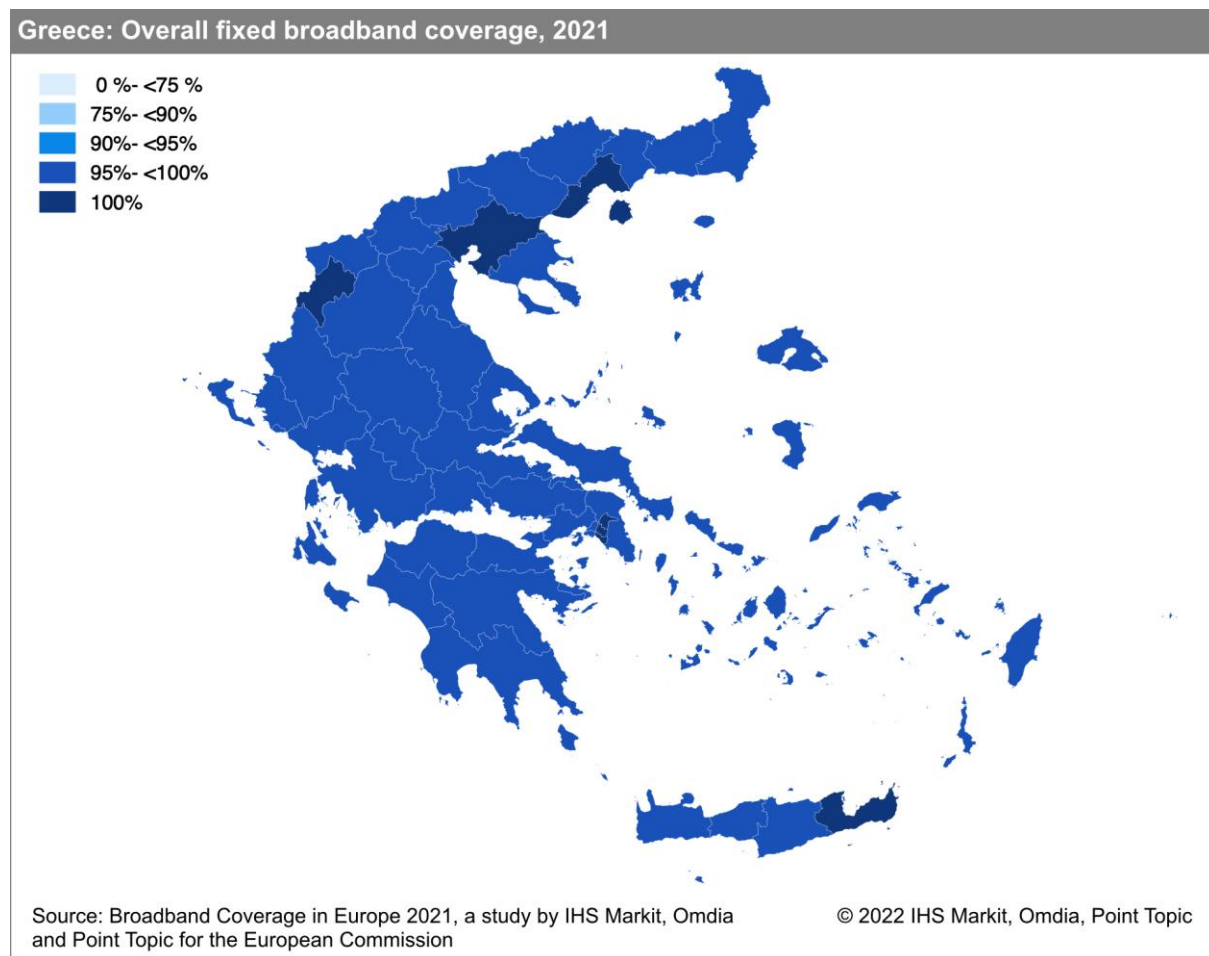
LTE coverage increased by 1.5 percentage points to pass 97.6% of rural homes by mid-2021. As in previous years, Greek rural LTE coverage remained below the EU average of 99.6%. By June 2021 one in six rural households (17.3%) had access to 5G networks, half the EU average figure.

Greece: Coverage by technology, rural areas, 2021

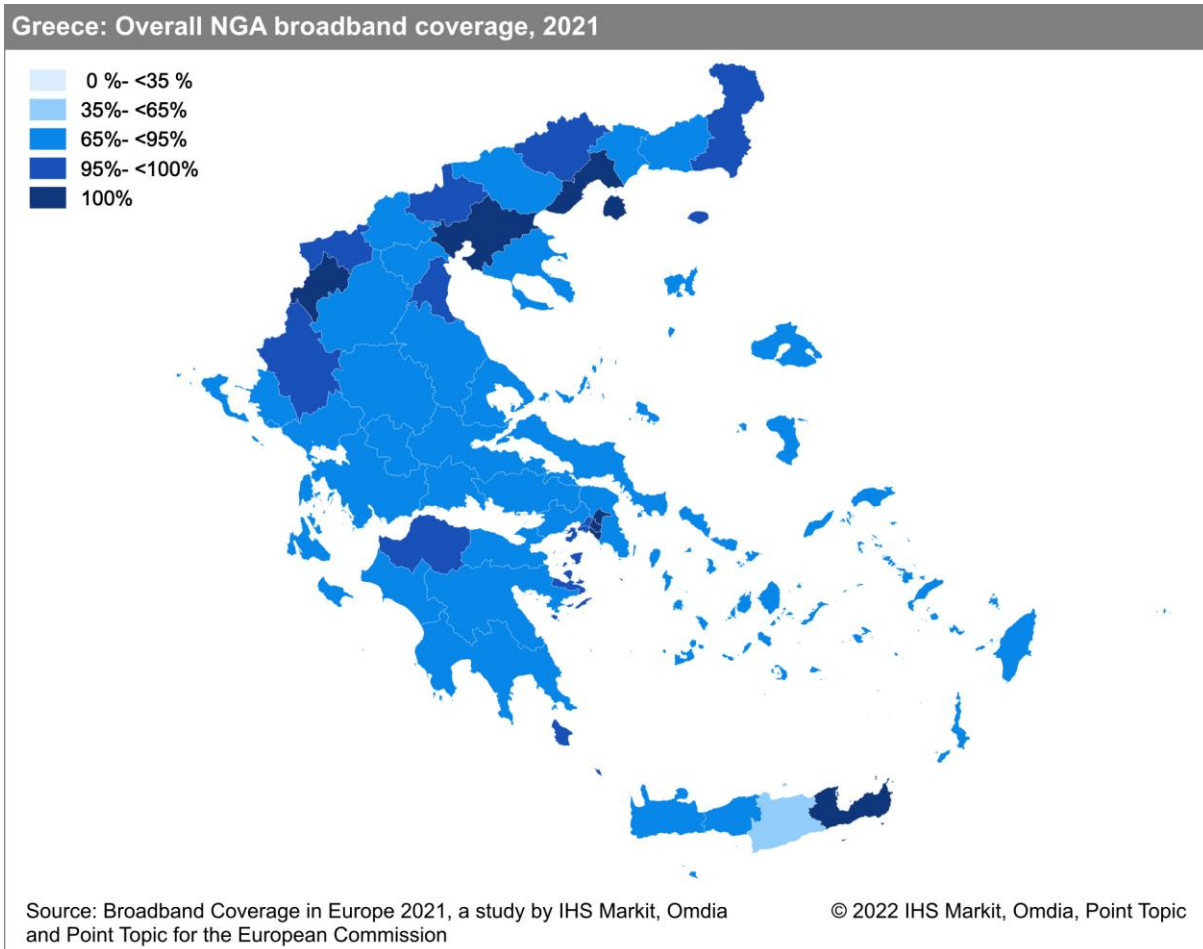


5.12.2 Regional coverage by broadband technology

Looking at Greek regions, 7 areas recorded 100% fixed broadband coverage in 2021, including most of Athens, and Thessaloniki. Elsewhere all regions surpassed 97% coverage apart from Ithaki & Kefallinia which reached 95.4%.



Greek regions continued to vary more strongly in terms of NGA coverage. As in the previous year, the lowest coverage (51.1%) was recorded in Irakleio, but in all other regions NGA coverage surpassed 72%. Seven regions recorded 100% NGA coverage, up from two in 2020.



5.12.3 Data tables for Greece

Statistic	National
Population	10,718,565
Persons per household	2.5
Rural proportion	20.5%

	Greece 2021		Greece 2020		Greece 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	98.8%	95.3%	98.8%	95.2%	98.9%	96.4%	89.3%	81.3%
VDSL	81.3%	65.9%	80.3%	55.4%	74.2%	40.1%	54.5%	39.0%
VDSL 2 Vectoring	53.7%	10.0%	52.7%	9.9%	48.7%	7.7%	36.7%	17.7%
FTTP	19.8%	0%	10.2%	0.0%	7.1%	0%	50.0%	33.8%
Cable modem DOCSIS 3.0	0%	0%	0.6%	0%	0.5%	0%	44.2%	11.3%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	32.2%	5.7%
FWA	0.8%	3.9%	0.9%	4.3%	0.9%	4.5%	58.2%	53.6%
LTE	99.5%	97.6%	99.2%	96.1%	99.1%	95.8%	99.8%	99.6%
LTE average operator coverage	98.3%	-	98.0%	-	97.0%	-	97.5%	-
5G	66.1%	17.3%	0%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.4%	96.1%	99.2%	96.5%	99.5%	98.1%	97.9%	91.5%
Overall NGA broadband	91.7%	66.3%	86.7%	55.4%	80.6%	40.1%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	19.8%	0%	10.2%	0.0%	7.1%	0%	70.2%	37.1%
At least 30Mbps	96.6%	-	86.8%	-	79.7%	-	89.8%	-
At least 100Mbps	54.6%	-	48.9%	-	41.6%	-	82.1%	-
At least 1Gbps	19.0%	-	10.2%	-	7.0%	-	62.4%	-
At least 1Gbps upload and download	18.6%	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

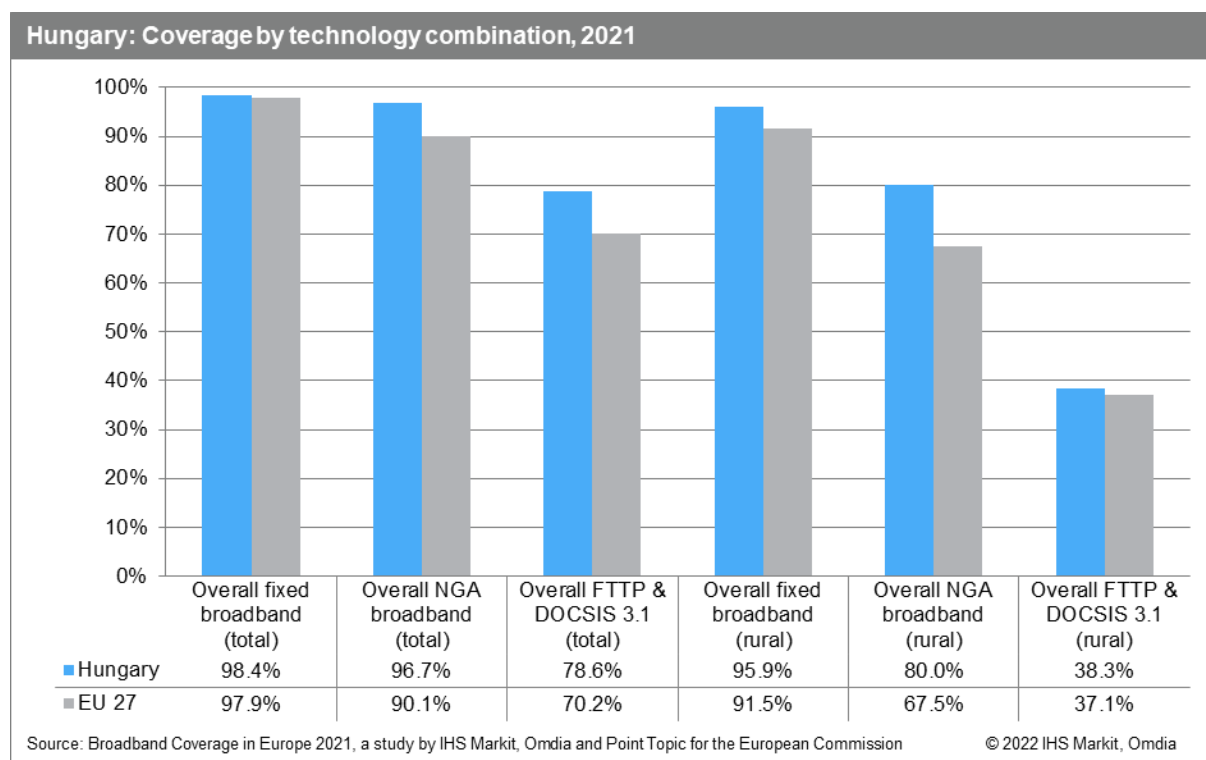
5.13 Hungary

5.13.1 National coverage by broadband technology

Fixed broadband coverage in Hungary improved by 0.9 percentage points, with a total of 98.4% of households passed by at least one fixed broadband network by the end of June 2021. In rural regions, broadband coverage improved by 0.5 percentage points and networks passed a total of 95.9% rural homes. NGA coverage grew by 7.3 percentage points to 96.7%.

Hungary reported strong growth in the 1Gbps-capable network category (FTTP & DOCSIS 3.1) as Hungarian operators started to upgrade to DOCSIS 3.1 technology and continued to deploy FTTP networks at a fast pace. FTTP & DOCSIS 3.1 coverage increase by 30.1 percentage points and 2.7 percentage points on national and rural level, respectively.

Hungary outperformed the EU averages across all technology combination categories, holding a large gap of 12.5 percentage points in the rural NGA category.

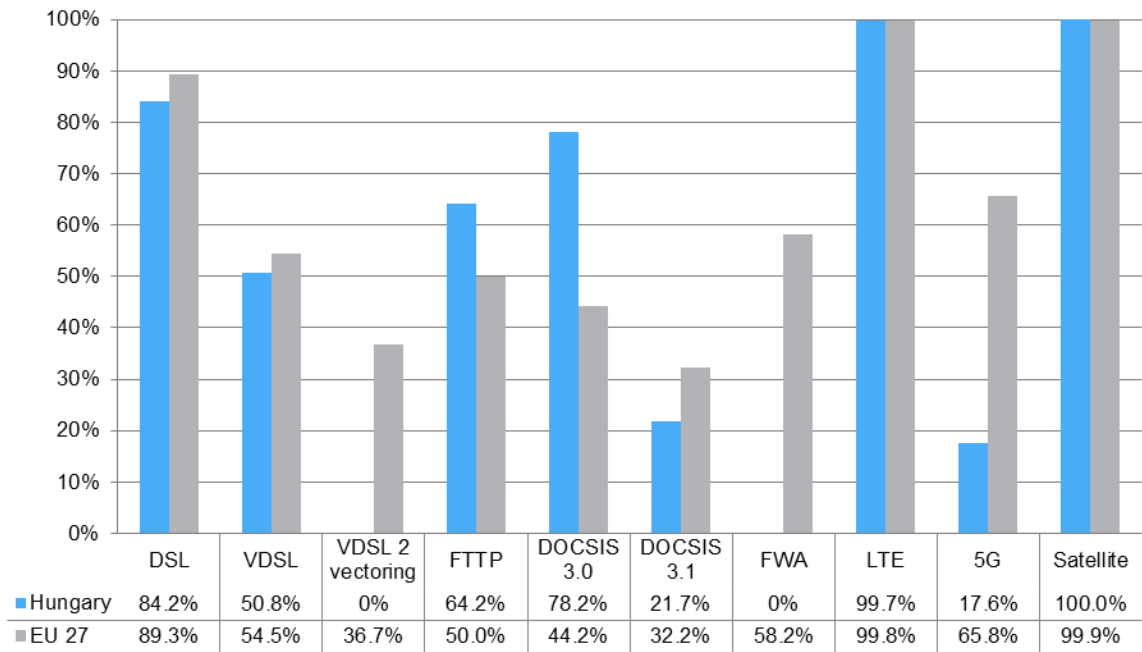


DSL remained the most prevalent individual technology, despite a decrease of 0.4 percentage points compared to mid-2020. Around half of Hungarian households (50.8%) were covered by VDSL networks, while VDSL2 Vectoring upgrades has not started at the end June 2021.

DOCSIS 3.0 was the second most accessible broadband technology in the country, with 78.2% of homes passed. Hungary outperformed the EU average by 34.0 percentage points and ranked among the top ten countries in the DOCSIS 3.0 category. DOCSIS 3.1 coverage which stood at 0% by mid-2020 grew to cover a fifth (21.7%) of Hungarian households by mid-2021 as Hungarian operators launched a rapid deployment of DOCSIS 3.1 technology. FTTP coverage expanded by 15.6 percentage points and passed a total of 64.2% of households.

LTE neared universal coverage, as it grew by 0.4 percentage points to cover 99.7% of Hungarian households. 5G coverage expanded to 17.6%, up by 10.3 percentage points on a year-on-year comparison. Despite steady progress, Hungary's 5G coverage remained small compared to other study countries, with a gap of 48.2 percentage points to the EU average.

Hungary: Coverage by technology, total, 2021



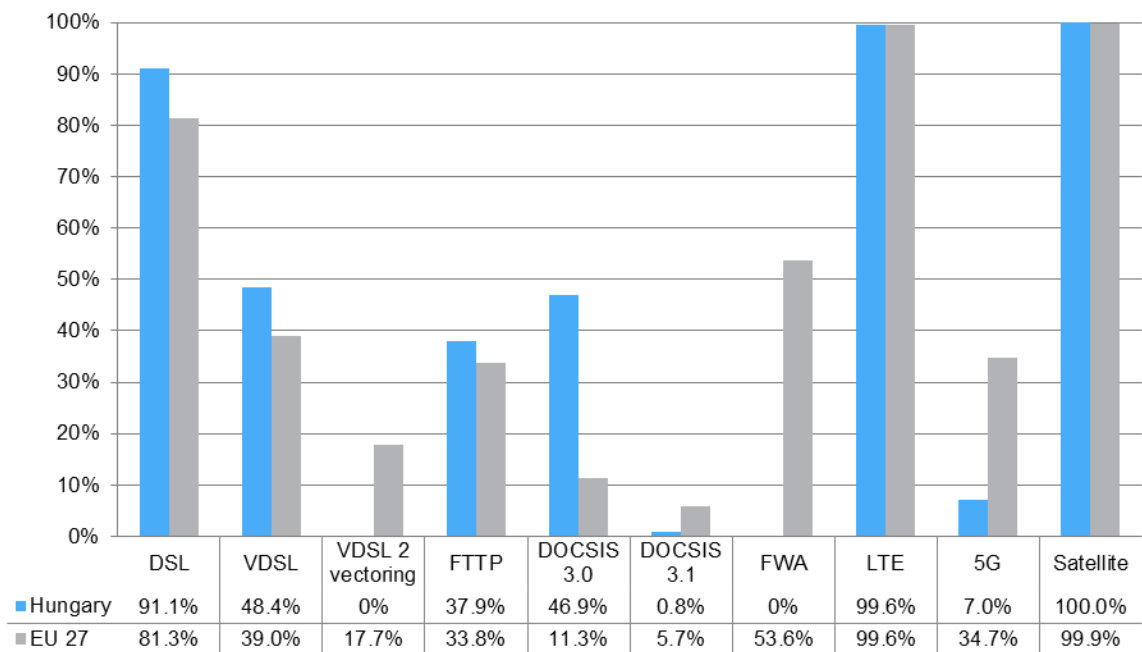
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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In rural Hungary, DSL coverage reached 91.1%, while 48.4% of rural households were covered by VDSL networks. Cable DOCSIS 3.0 passed 46.9% of rural homes and Hungary ranked among the top ten countries in the rural DOCSIS 3.0 category, holding a gap of 35.6 percentage points to the EU average. FTTP continued to grow in rural regions, albeit at a slower rate than seen in previous year. A total of 37.9% of rural homes were passed by FTTP networks by mid-2021.

LTE coverage grew by 1.4 percentage points and neared universal coverage, with a total of 99.6% of rural households covered. While 5G deployment was largely focused on urban areas in its first months, Hungarian operators launched deployments in rural regions, covering 7.0% of rural households by mid-2021.

Hungary: Coverage by technology, rural areas, 2021

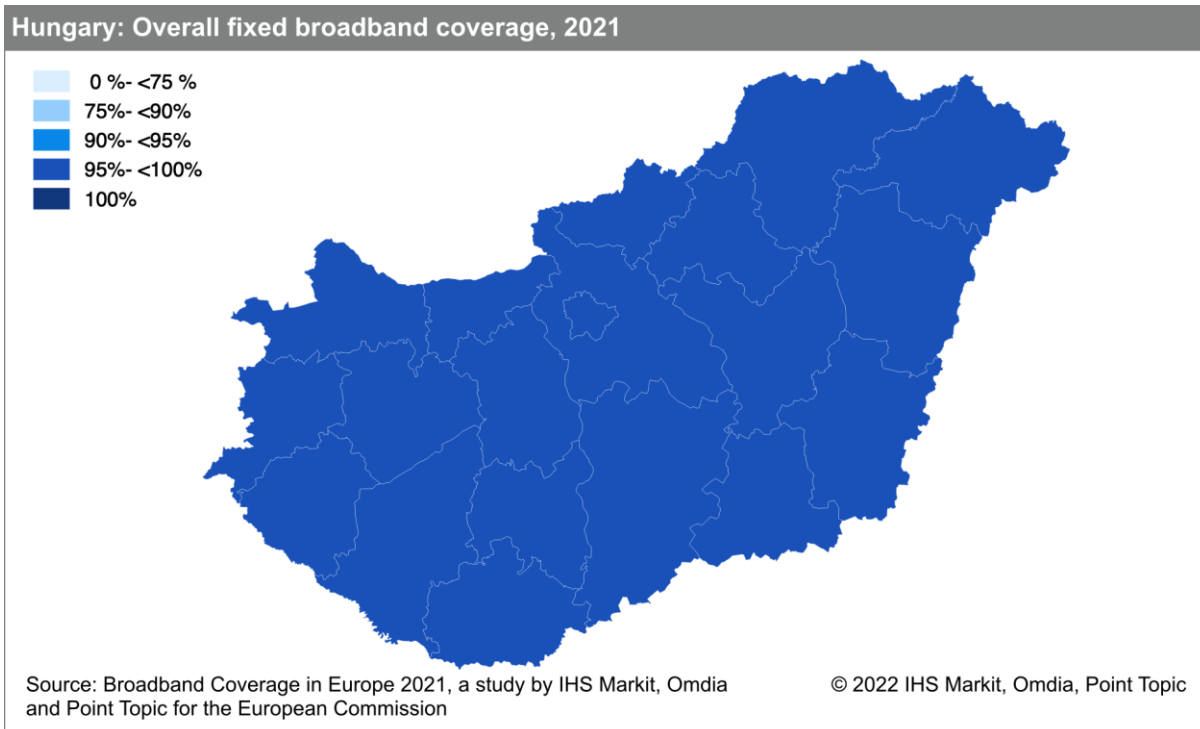


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

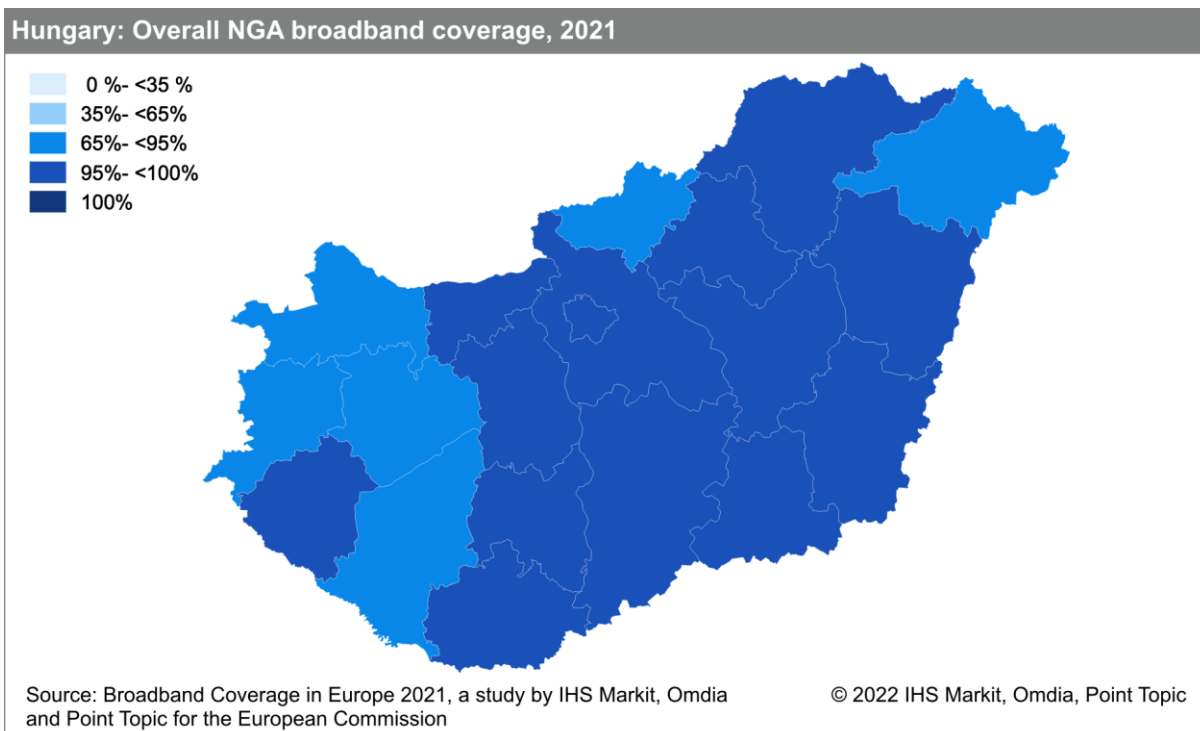
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5.13.2 Regional coverage by broadband technology

All Hungarian regions reached the 95% coverage threshold over the course of year. The lowest coverage (95.0%) was recorded in Győr-Moson-Sopron. There were several regions that reached almost universal coverage: Nógrád (99.9%), Jász-Nagykun-Szolnok (99.8%), Borsod-Abaúj-Zemplén (99.7%).



Variance in NGA coverage declined over the course of the year and ranged from 88.1% in Vas to 99.6% in Tolna. 14 out of 20 regions passed the 95% coverage threshold.



5.13.3 Data tables for Hungary

Statistic	National
Population	9,769,526
Persons per household	2.2
Rural proportion	31.6%

	Hungary 2021		Hungary 2020		Hungary 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	84.2%	91.1%	84.6%	89.6%	87.4%	87.9%	89.3%	81.3%
VDSL	50.8%	48.4%	50.1%	46.5%	50.7%	43.6%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	64.2%	37.9%	48.6%	35.6%	42.6%	28.9%	50.0%	33.8%
Cable modem DOCSIS 3.0	78.2%	46.9%	76.0%	47.1%	74.5%	47.1%	44.2%	11.3%
Cable modem DOCSIS 3.1	21.7%	0.8%	0%	0%	0%	0%	32.2%	5.7%
FWA	0%	0%	0%	0%	0%	0%	58.2%	53.6%
LTE	99.7%	99.6%	99.3%	98.2%	99.2%	97.7%	99.8%	99.6%
LTE average operator coverage	94.0%	-	98.5%	-	96.8%	-	97.5%	-
5G	17.6%	7.0%	7.3%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	98.4%	95.9%	97.5%	95.4%	95.5%	94.6%	97.9%	91.5%
Overall NGA broadband	96.7%	80.0%	89.5%	79.4%	89.6%	77.7%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	78.6%	38.3%	48.6%	35.6%	42.6%	28.9%	70.2%	37.1%
At least 30Mbps	94.9%	-	87.6%	-	86.2%	-	89.8%	-
At least 100Mbps	88.7%	-	85.5%	-	79.0%	-	82.1%	-
At least 1Gbps	44.8%	-	35.9%	-	33.1%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

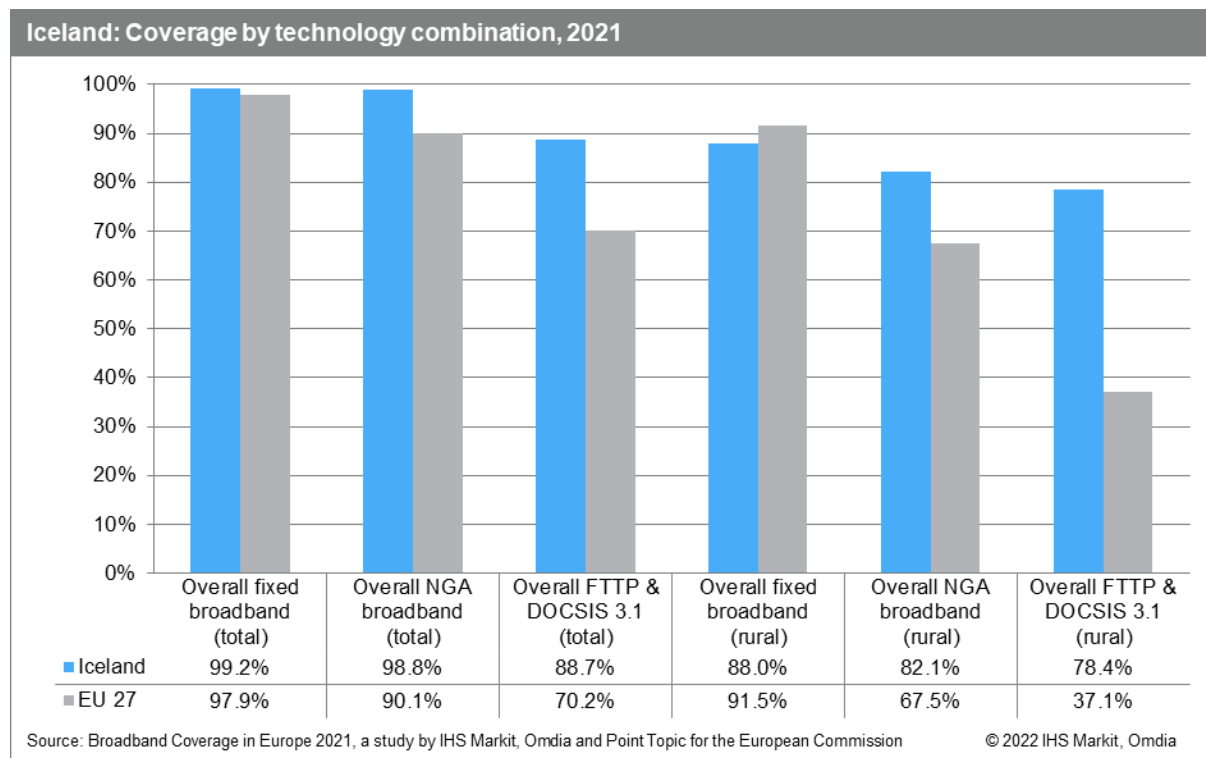
Note: The LTE average in 2021 declined due to the entrance of a new mobile network operator. The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.14 Iceland

5.14.1 National coverage by broadband technology

Overall fixed broadband coverage in Iceland remained stable and nearing universal coverage with 99.2% of Icelandic homes passed by at least one fixed broadband network. At a rural level, fixed broadband coverage reached 88.0% of rural homes. High-speed NGA broadband services were available to 98.8% of Icelandic households, and to 82.1% of rural households.

Due to the high proliferation of FTTP networks, Iceland ranked as one of the leaders in terms of overall FTTP & DOCSIS 3.1 coverage. At the end of June 2021, 88.7% of all households and 78.4% of rural households were passed by fixed networks capable of delivering gigabit speed connectivity.



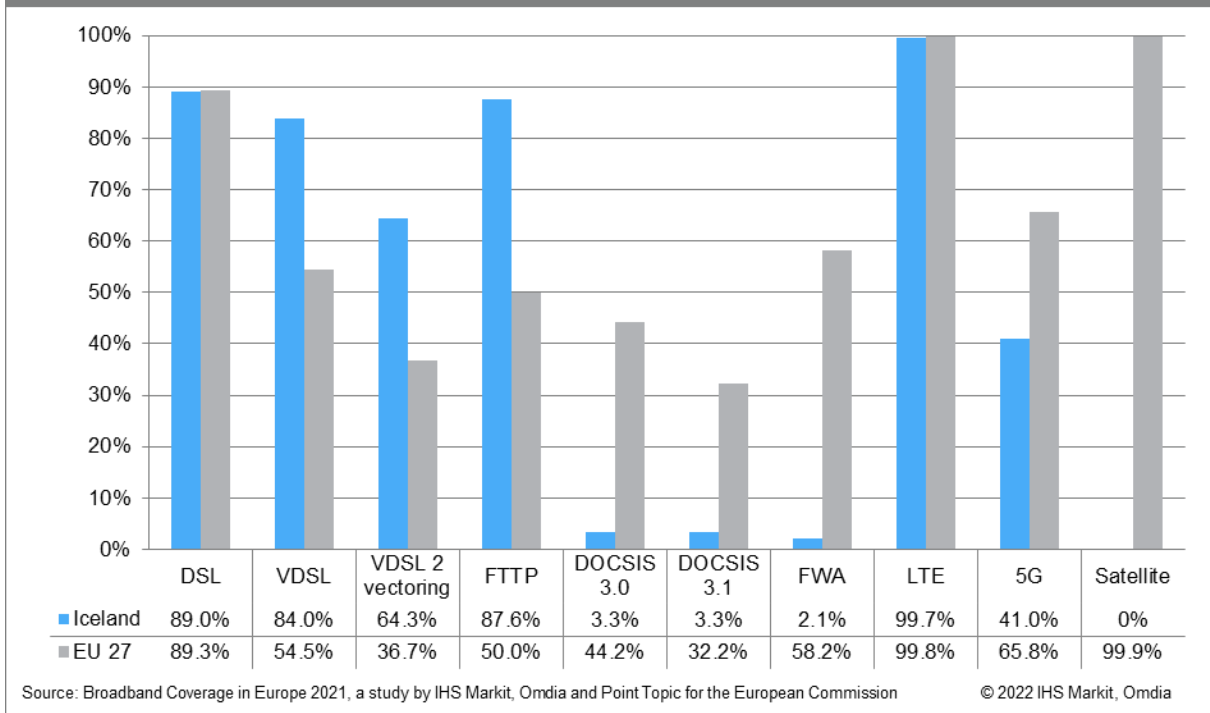
Looking at individual broadband technologies in Iceland, DSL remained the most common fixed broadband technology available to Icelandic households, accessible to 89.0% of households. FTTP coverage grew by 5.0 p.p. over the year to reach 87.6% of households, well ahead of the EU average (50.0%).

VDSL coverage continued to decline in 2021, as operators upgraded their networks to FTTP. But coverage remained high, with 84.0% of households having access to VDSL services at the end of June 2021. VDSL2 Vectoring was available to 64.3% of households, down by 1.0 p.p. from 2020.

Only a small number of homes (3.3%) 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. Fixed Wireless Access is also a niche technology in Iceland, available to 2.1% of households.

In terms of mobile broadband, LTE coverage remained almost universal, at 99.7% of households covered. Commercial 5G services were launched over the course of the year, and by June 2021 coverage reached 41.0% of households.

Iceland: Coverage by technology, total, 2021

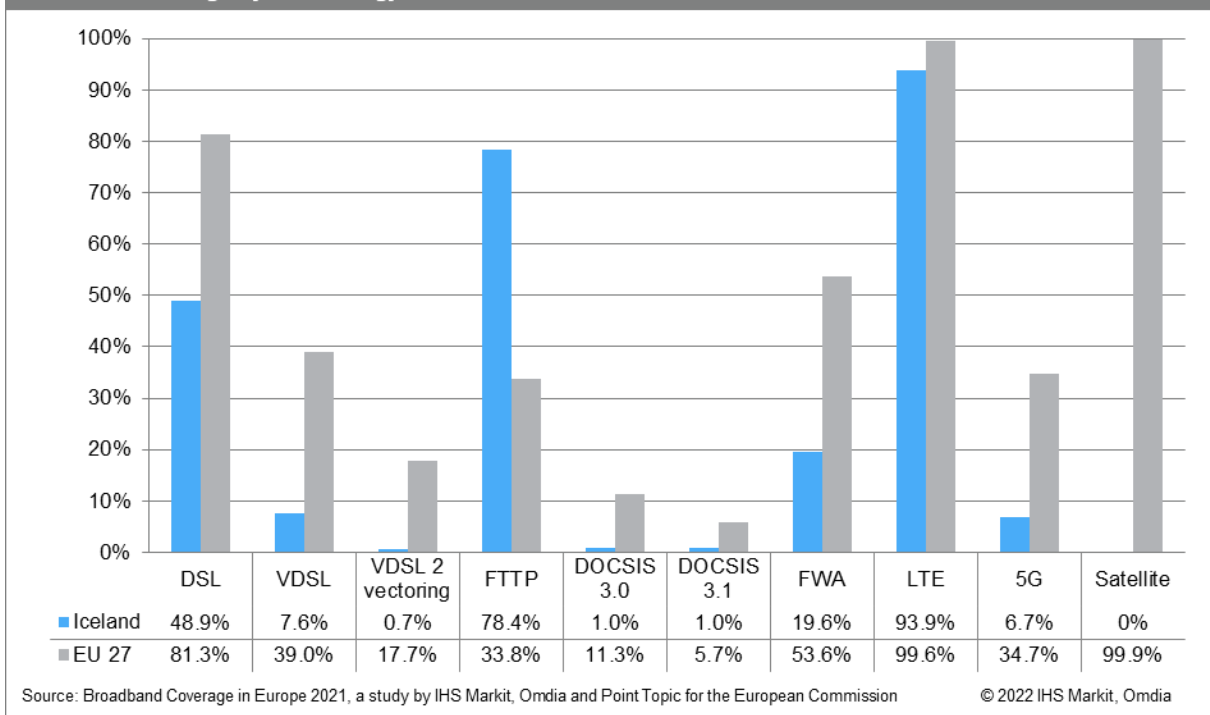


FTTP is the leading technology in rural areas, with 78.4% of households passed, up from 66.3% in mid-2020, more than double the EU average. FTTP rollout has been accompanied by a reduction in availability of DSL services, which fell by 8.7 p.p. to reach less than half of rural households (48.9%).

VDSL services were available to 7.6% of rural households, whilst only 0.7% of rural households had access to VDSL2 Vectoring services. Cable modem DOCSIS 3.0 and DOCSIS 3.1 remained negligible in rural areas with only 1.0% coverage.

FWA was accessible to 19.6% 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.

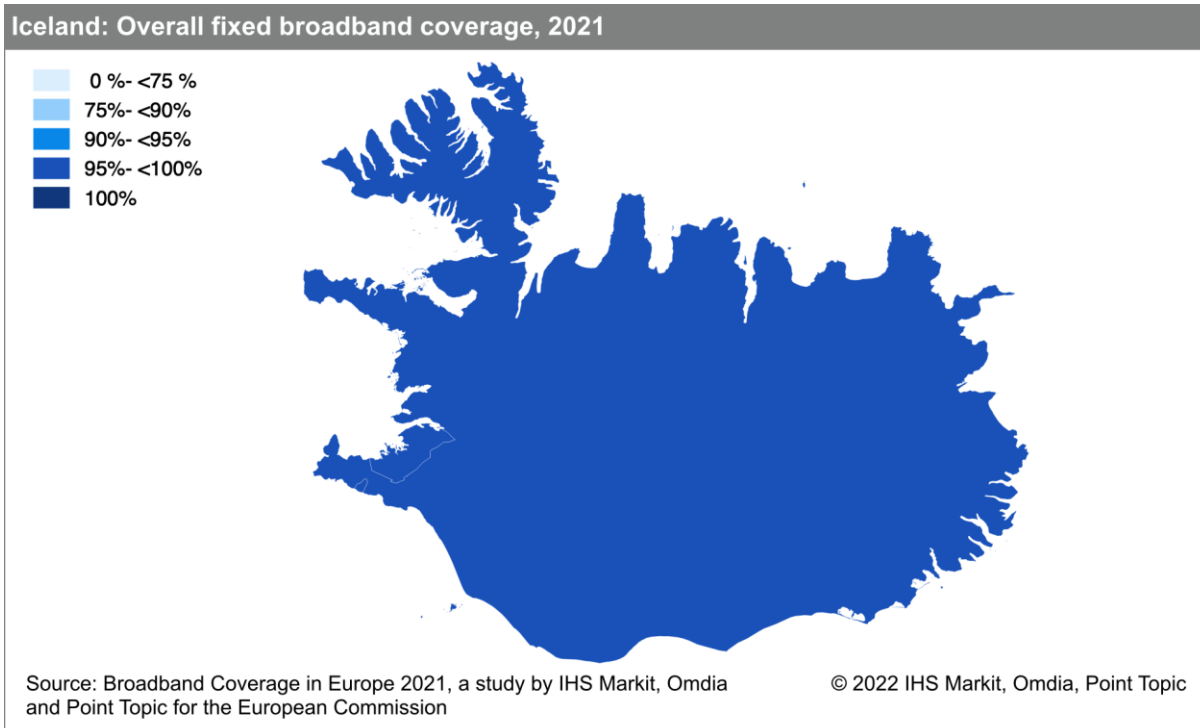
Iceland: Coverage by technology, rural areas, 2021



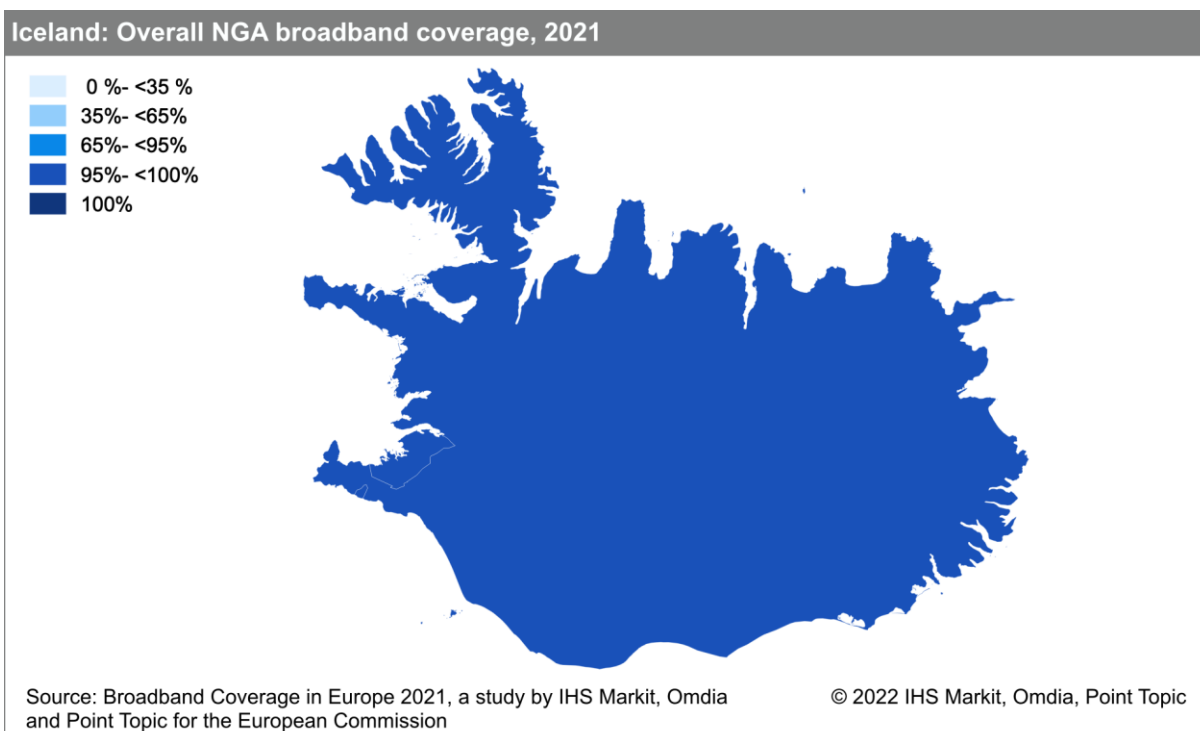
Over the study period, LTE coverage remained nearly universally available to 99.1% of rural Icelandic homes, while 5G reached 6.7% of households.

5.14.2 Regional coverage by broadband technology

In this iteration of the study, fixed broadband was nearly universally available in both regions, Höfudborgarsvæði and Landsbyggd.



NGA coverage remained near-universal in Höfudborgarsvæði, with 99.9% of households passed. In the Landsbyggd region, 97.9% of households were covered by NGA networks.



5.14.3 Data tables for Iceland

Statistic	National
Population	365,990
Persons per household	2.6
Rural proportion	5.0%

	Iceland 2021		Iceland 2020		Iceland 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	89.0%	48.9%	93.2%	57.5%	97.4%	64.6%	89.3%	81.3%
VDSL	84.0%	7.6%	87.2%	14.8%	90.5%	22.0%	54.5%	39.0%
VDSL 2 Vectoring	64.3%	0.7%	65.3%	1.0%	67.6%	1.6%	36.7%	17.7%
FTTP	87.6%	78.4%	83.5%	66.3%	80.4%	54.7%	50.0%	33.8%
Cable modem DOCSIS 3.0	3.3%	1.0%	0.3%	0%	0.3%	0%	44.2%	11.3%
Cable modem DOCSIS 3.1	3.3%	1.0%	0.3%	0%	0.3%	0%	32.2%	5.7%
FWA	2.1%	19.6%	2.2%	20.6%	2.2%	20.6%	58.2%	53.6%
LTE	99.7%	93.9%	99.9%	99.1%	99.9%	99.1%	99.8%	99.6%
LTE average operator coverage	98.4%	-	99.6%	-	99.6%	-	97.5%	-
5G	41.0%	6.7%	0%	0%	-	-	65.8%	34.7%
Satellite	0%	0%	0%	0%	0%	0%	99.9%	99.9%
Overall fixed broadband	99.2%	88.0%	99.7%	93.5%	99.5%	91.8%	97.9%	91.5%
Overall NGA broadband	98.8%	82.1%	97.6%	60.4%	96.9%	51.3%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	88.7%	78.4%	83.6%	66.3%	82.0%	54.7%	70.2%	37.1%
At least 30Mbps	98.8%	-	96.3%	-	95.6%	-	89.8%	-
At least 100Mbps	88.3%	-	83.9%	-	83.3%	-	82.1%	-
At least 1Gbps	85.6%	-	78.5%	-	77.0%	-	62.4%	-
At least 1Gbps upload and download	85.6%	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

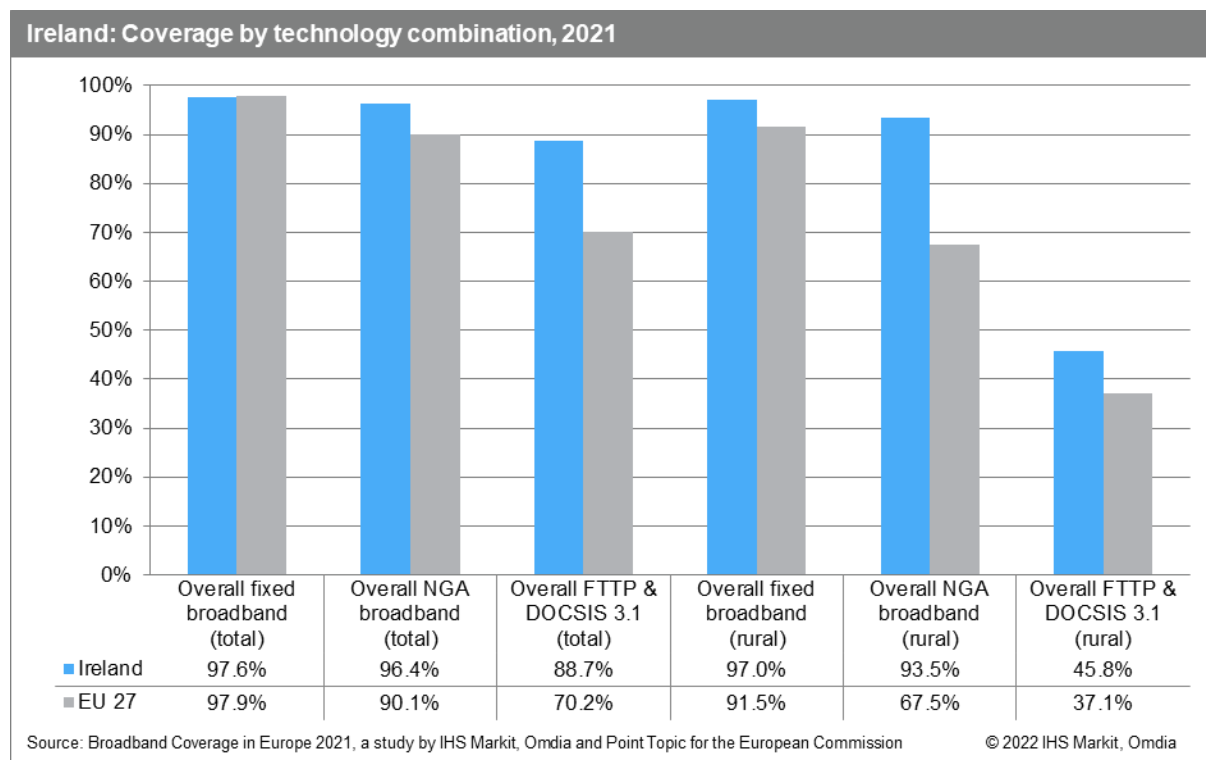
All restatements are highlighted in italics.

5.15 Ireland

5.15.1 National coverage by broadband technology

Overall fixed broadband coverage in Ireland remained stable over the study period, with 97.6% of Irish households having access to at least one fixed broadband network at the end of June 2021. Rural fixed broadband coverage grew slightly, reaching 97.0% of rural households. NGA services were available to 96.4% of all Irish households and 93.5% of rural homes were passed by NGA networks, a 2.2 percentage point increase compared to mid-2021.

Overall FTTP & DOCSIS 3.1 coverage continued to increase over the study period, growing by 5.5 percentage points to reach 88.7% at a national level, owing to continued steady progress in FTTP rollouts. Despite a 21.9 percentage point increase compared to mid-2020, FTTP & DOCSIS 3.1 coverage is more limited at a rural level, reaching 45.8% of rural households.

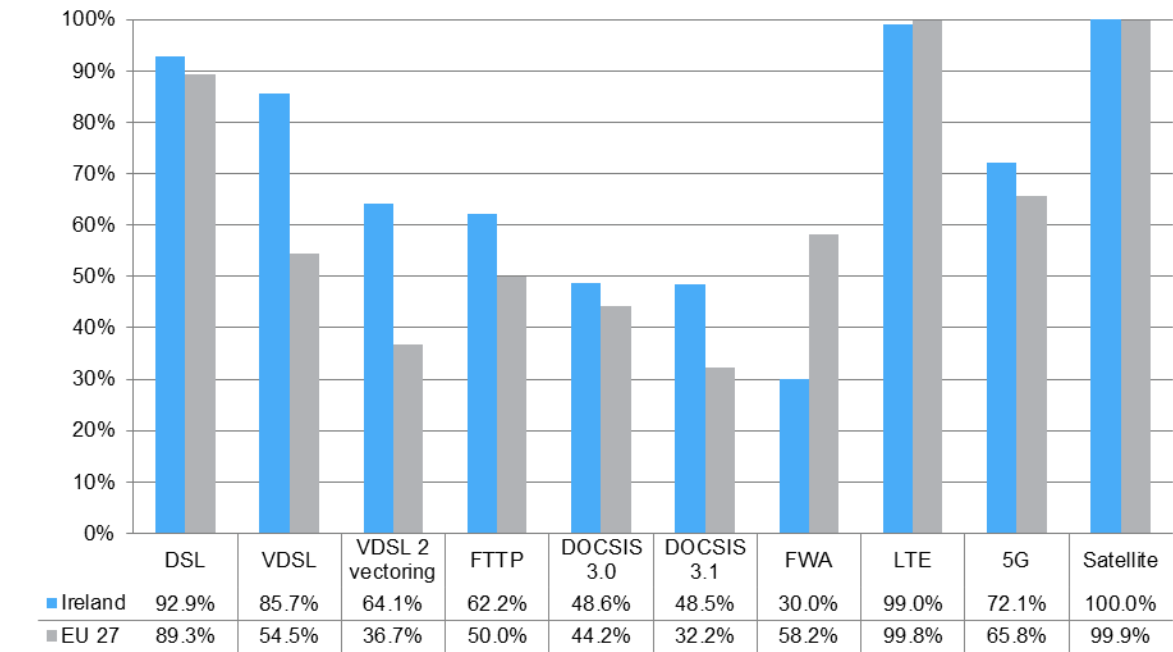


DSL remained the most prevalent fixed broadband technology, reaching 92.9% of households, while FWA was available to just under a third (30.0%) of Irish households. VDSL remains the most common NGA technology, with 85.7% of households covered, down somewhat from mid-2020. VDSL2 Vectoring was available to almost two-thirds (64.1%) of Irish households, growing by 1.1 percentage points from the end of June 2020.

Cable modem DOCSIS 3.0 coverage remained steady at just under a half (48.6%) of households, almost all of which supported DOCSIS 3.1. FTTP again recorded a significant increase in coverage (+14.6 p.p.), to reach 62.2% of homes at the end of June 2021. Moreover, as many FTTP rollouts have been focused in areas with limited cable network presence, coverage of both networks is more complementary than overlapping.

In terms of mobile broadband, LTE services were available to 99.0% of Irish households and all operators provided similar level of coverage, putting average LTE coverage also at 99.0%. 5G coverage more than doubled over the year, hitting 72.1% in June 2021, more than double the previous year.

Ireland: Coverage by technology, total, 2021

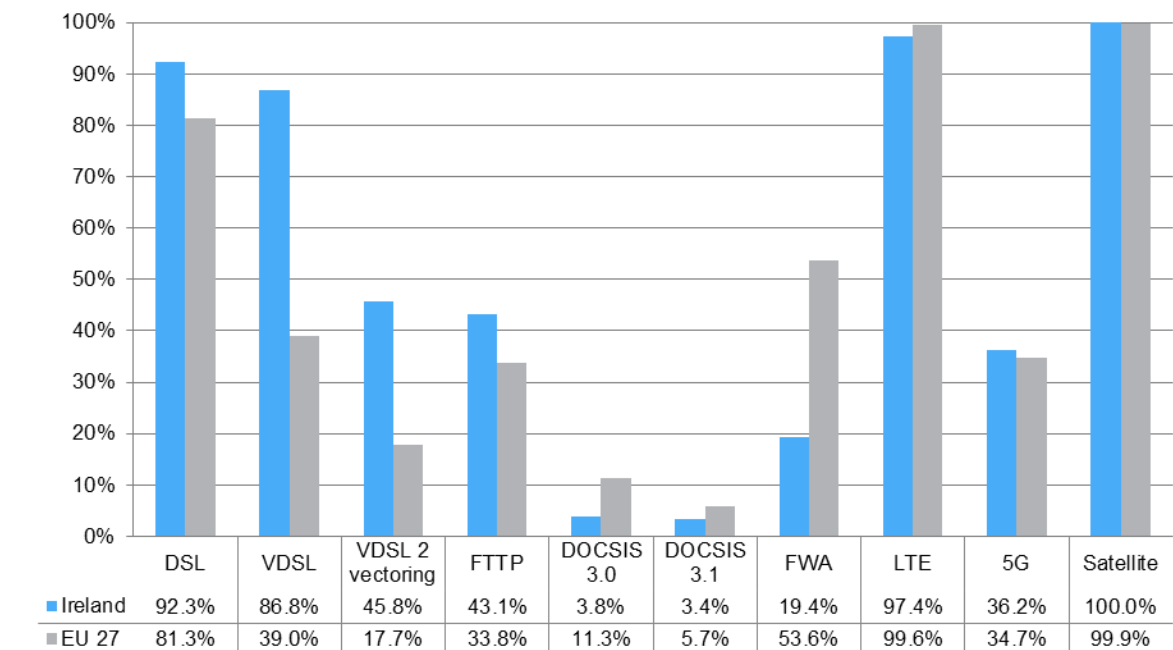


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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In rural areas, DSL coverage increased by 3.2% to reach 92.3% of households. Almost all of the DSL network supported VDSL services, which were available to 86.8% of households. The Irish government's National Broadband Plan led to significant growth in rural FTTP coverage over the year, which more than doubled to reach 43.1% of rural households at the end of June 2021. Rural cable DOCSIS 3.0 coverage remained limited at 3.8%. Rural LTE reached 97.4% of rural households, below the EU average of 99.6%, whereas rural 5G coverage was ahead of the EU figure, at 36.2%.

Ireland: Coverage by technology, rural areas, 2021

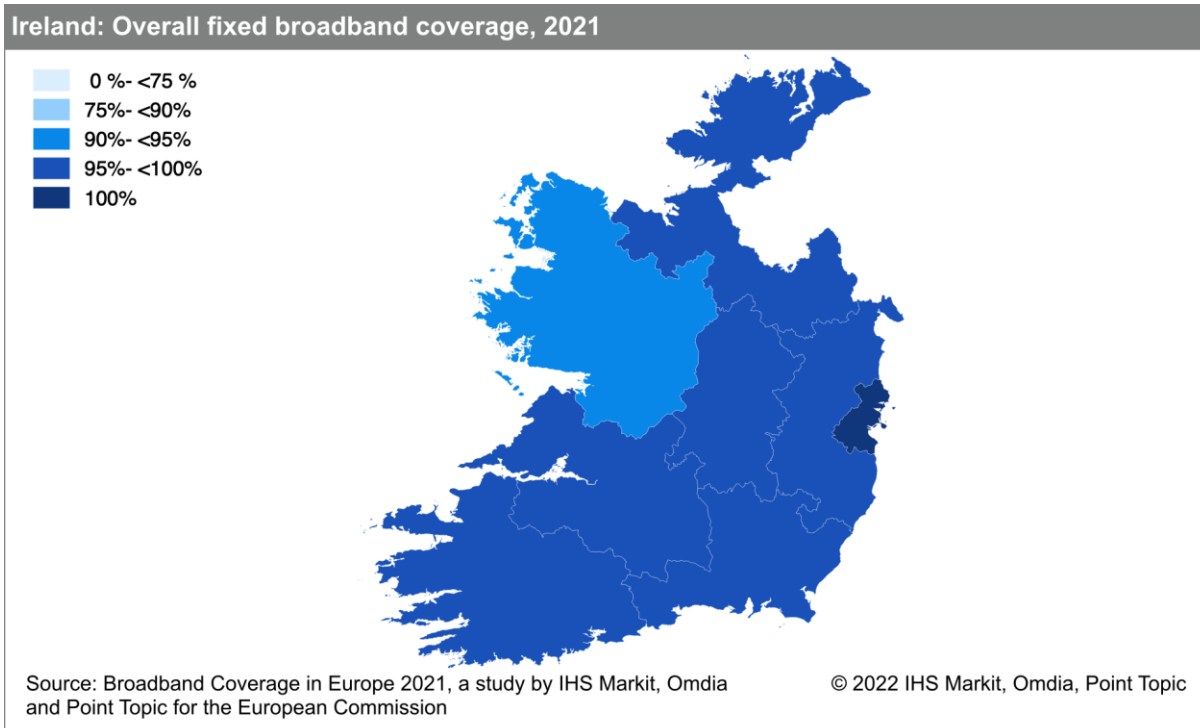


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

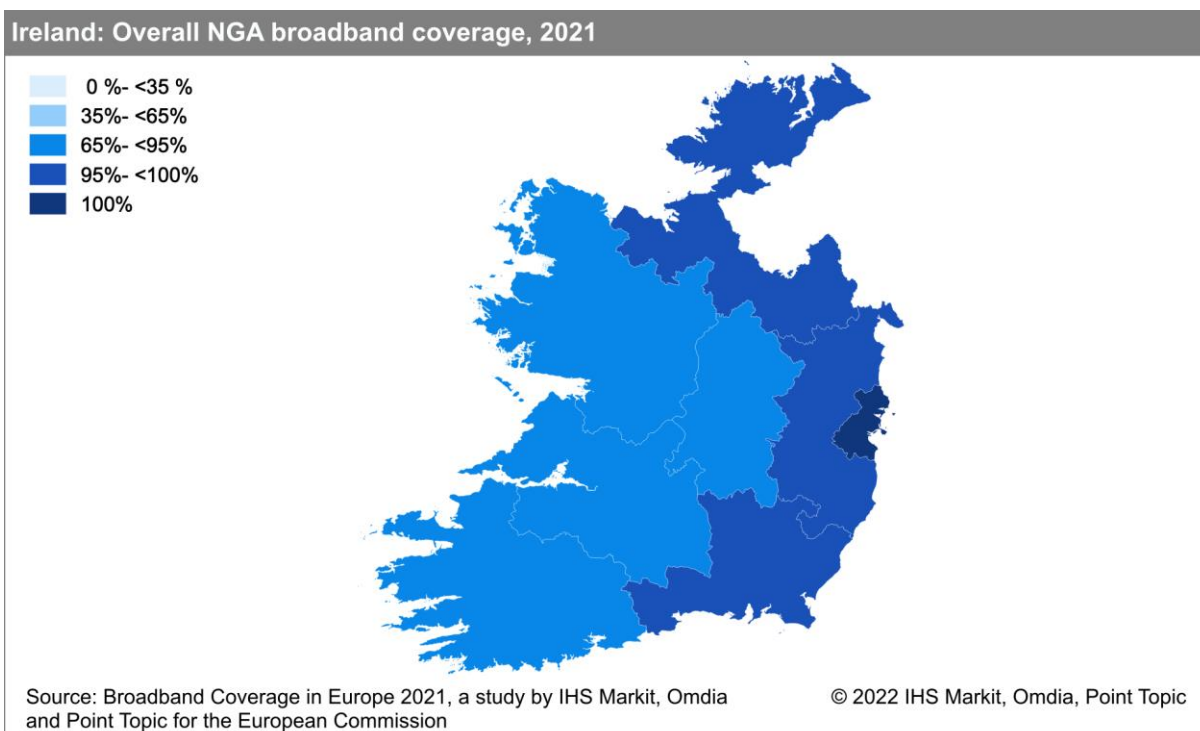
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5.15.2 Regional coverage by broadband technology

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 93.0%.



NGA coverage was above 90% in all Irish regions. Dublin recorded universal NGA coverage (100.0%), and West Ireland recorded the lowest, with 91.9% of households covered.



5.15.3 Data tables for Ireland

Statistic	National
Population	4,964,440
Persons per household	2.8
Rural proportion	37.9%

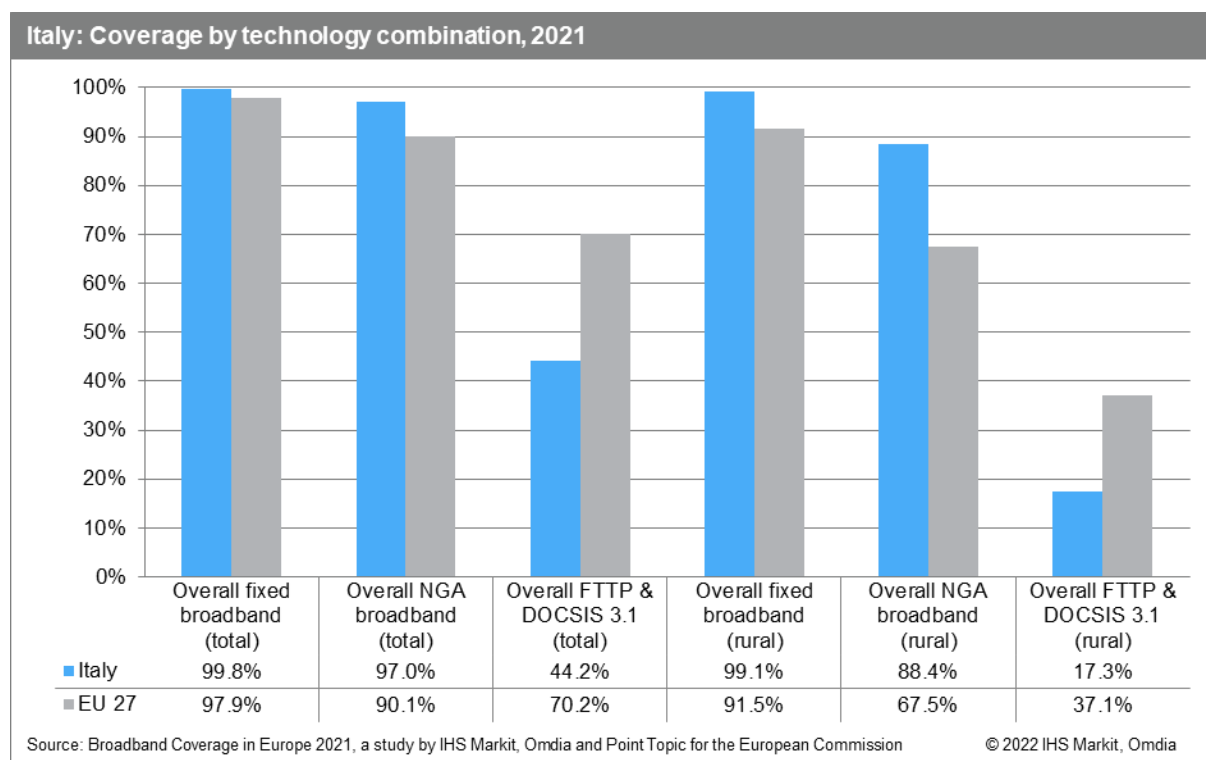
	Ireland 2021		Ireland 2020		Ireland 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	92.9%	92.3%	93.3%	89.0%	93.3%	89.0%	89.3%	81.3%
VDSL	85.7%	86.8%	92.5%	86.2%	92.1%	86.3%	54.5%	39.0%
VDSL 2 Vectoring	64.1%	45.8%	62.9%	24.9%	55.8%	7.3%	36.7%	17.7%
FTTP	62.2%	43.1%	47.7%	20.6%	35.4%	13.5%	50.0%	33.8%
Cable modem DOCSIS 3.0	48.6%	3.8%	49.8%	3.7%	49.2%	3.7%	44.2%	11.3%
Cable modem DOCSIS 3.1	48.5%	3.4%	48.6%	3.6%	0%	0%	32.2%	5.7%
FWA	30.0%	19.4%	29.8%	17.8%	29.7%	17.6%	58.2%	53.6%
LTE	99.0%	97.4%	99.0%	97.4%	99.0%	97.0%	99.8%	99.6%
LTE average operator coverage	99.0%	-	99.0%	-	98.7%	-	97.5%	-
5G	72.1%	36.2%	30.5%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.6%	97.0%	97.9%	96.2%	97.8%	96.1%	97.9%	91.5%
Overall NGA broadband	96.4%	93.5%	96.2%	91.2%	96.0%	90.3%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	88.7%	45.8%	83.3%	24.0%	35.4%	13.5%	70.2%	37.1%
At least 30Mbps	90.1%	-	87.7%	-	89.7%	-	89.8%	-
At least 100Mbps	87.7%	-	72.8%	-	69.1%	-	82.1%	-
At least 1Gbps	67.4%	-	58.1%	-	15.9%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.16 Italy

5.16.1 National coverage by broadband technology

At the end of June 2021, nearly all (99.8%) of Italian households were coverage by at least one fixed broadband network. At a rural level, fixed broadband was available to 99.1% of rural households. In terms of NGA broadband, high speed broadband services based on NGA technologies were available to 97.0% of Italian households, and to 88.4 % of rural Italian households. Since mid-2020, NGA coverage improved both at a national level (by 4.3 percentage points) as well as a rural level, increasing by 12.2 percentage points. In both categories (fixed broadband and NGA), Italy recorded coverage levels above the EU average. Combined FTTP & DOCSIS 3.1 networks passed 44.2% of Italian households at a national level, and 17.3% of rural households. In the absence of cable networks in Italy, this coverage equals FTTP coverage.



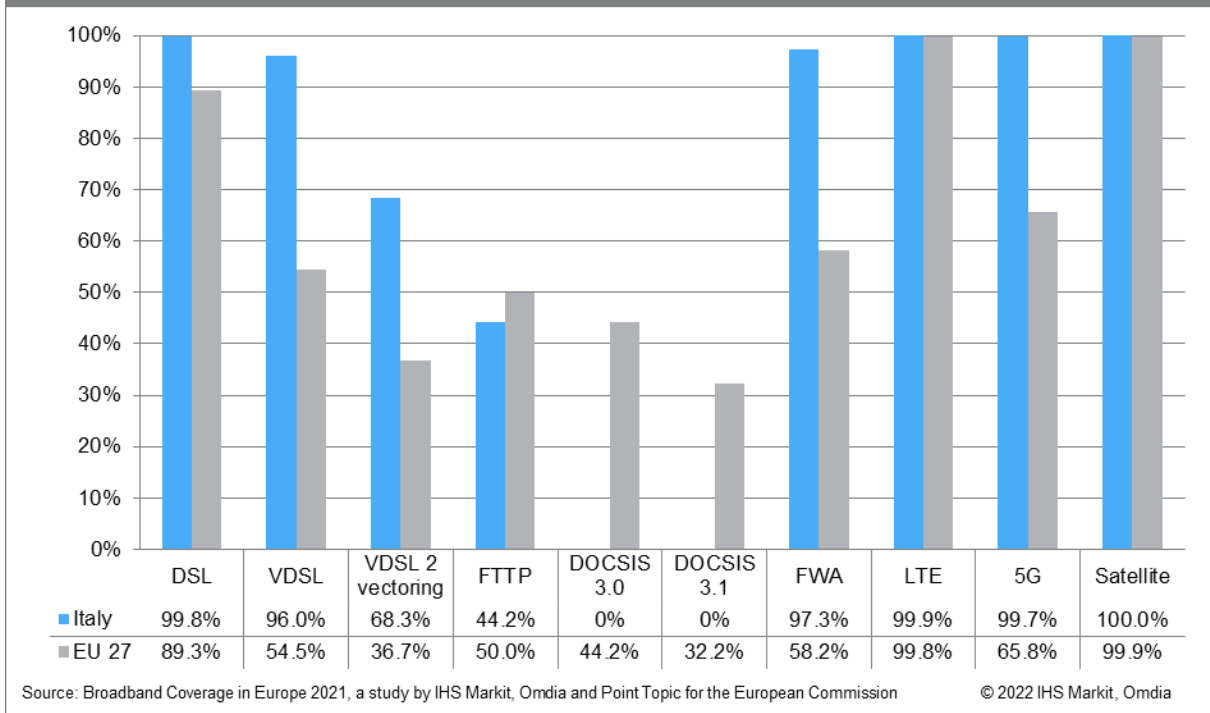
Looking at individual technologies, DSL remained the most widespread broadband technology in Italy, with an almost-universal coverage level (99.8% of households passed). Fixed Wireless Access (FWA) was available to 97.3% of households.

In terms of NGA broadband technologies, the Italian market remained largely dominated by VDSL, which was available to 96.0% of households, up by 3.3 percentage points since mid-2020. Whilst VDSL2 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 2021, these services were available to 68.3% of Italian households, recording an 8.4 percentage point increase year-on-year.

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 by 10.4 percentage points over the study period, reaching 44.2% of households. Despite this increase, FTTP coverage in Italy remained below the EU average of 50.0%.

In terms of mobile broadband coverage, LTE services were available to 99.9% of households. When considering average coverage of all mobile network operators, 94.9% of Italians had access to LTE services. Italy recorded the highest 5G coverage in this year's study, at 99.7% of households, driven by the rapid deployment of Dynamic Spectrum Sharing technology.

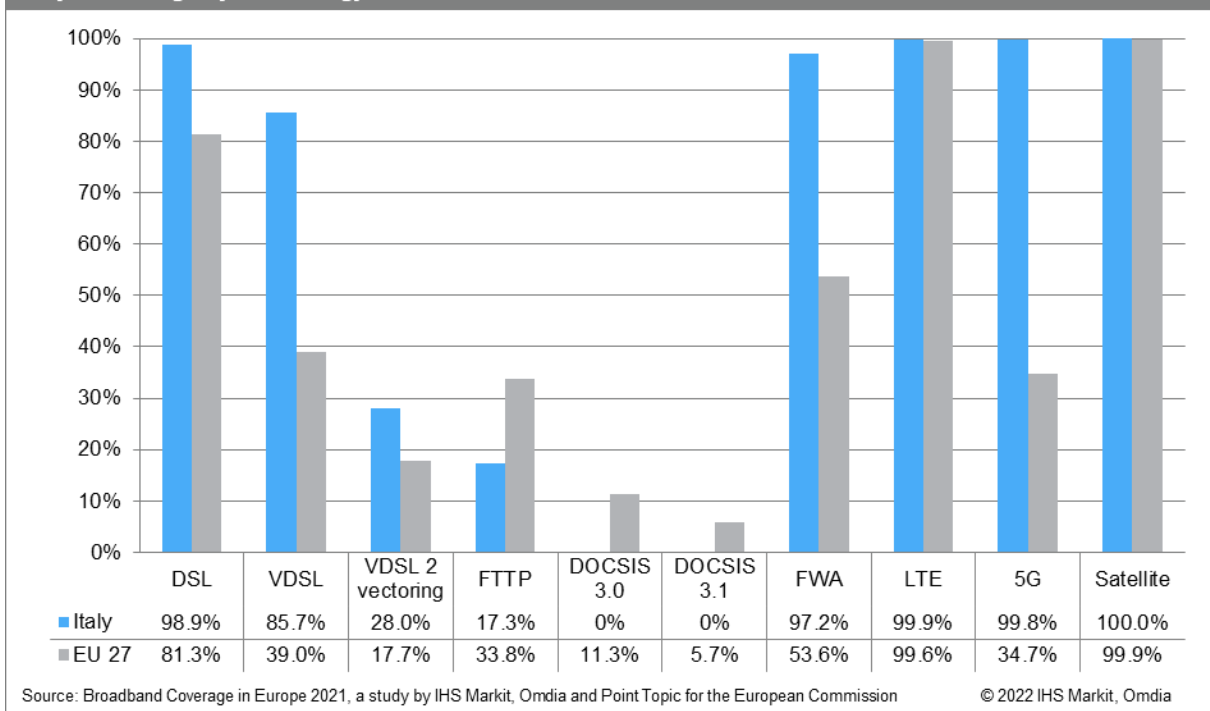
Italy: Coverage by technology, total, 2021



In rural areas, DSL remained the key technology providing fixed broadband access. At the end of June 2021, DSL was available to 98.9% of rural households, whereas FWA was accessible to 97.2% of rural households. VDSL remains the leading rural NGA technology, increasing by 8.8 percentage points, to reach 85.7% of rural households at the end of June 2021. 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 28.0% of rural households. Rural FTTP coverage increased by 9.0 percentage points over the study period. Yet, despite this increase rural FTTP coverage remained well below the EU average, with 17.3% of rural Italian homes passed.

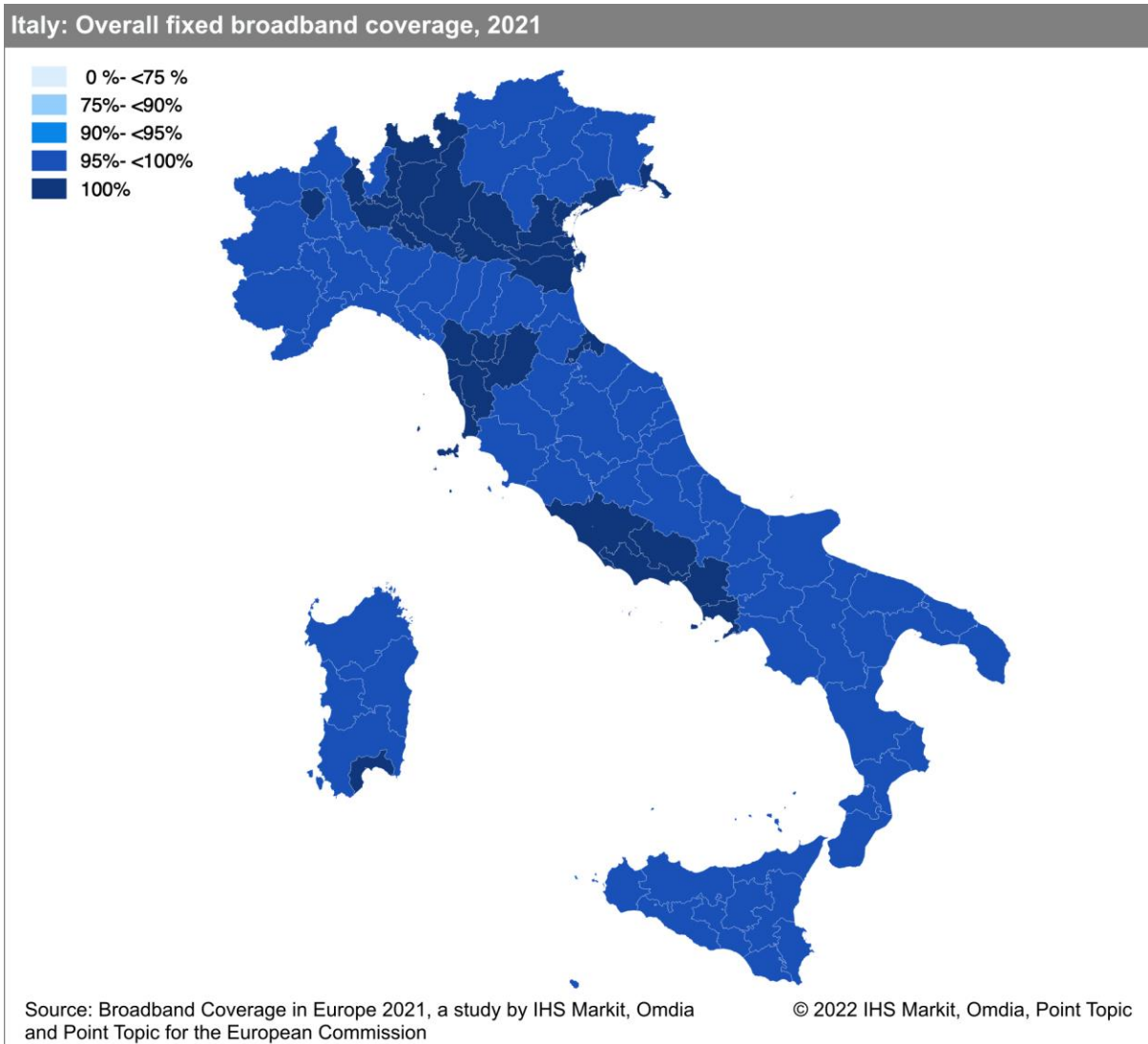
Rural LTE coverage reached 99.9% of rural homes, closely matched by 5G at 99.8%, driven by the use of DSS technology.

Italy: Coverage by technology, rural areas, 2021



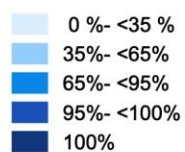
5.16.2 Regional coverage by broadband technology

All regions of Italy have very high fixed broadband coverage, with the majority >99.5%. This year, coverage ranged between 97.0% in Campo Basso and universal coverage (100%) in 31 Italian regions.



As is the case in most countries of this study, NGA coverage disparities across regions were higher than fixed broadband coverage variations. At the end of June 2021, only four regions had NGA coverage below 80%, the lowest being Bolzano-Bozen at 70.8%, while six regions achieved 100% coverage.

Italy: Overall NGA broadband coverage, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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5.16.3 Data tables for Italy

Statistic	National
Population	59,655,613
Persons per household	2.4
Rural proportion	10.7%

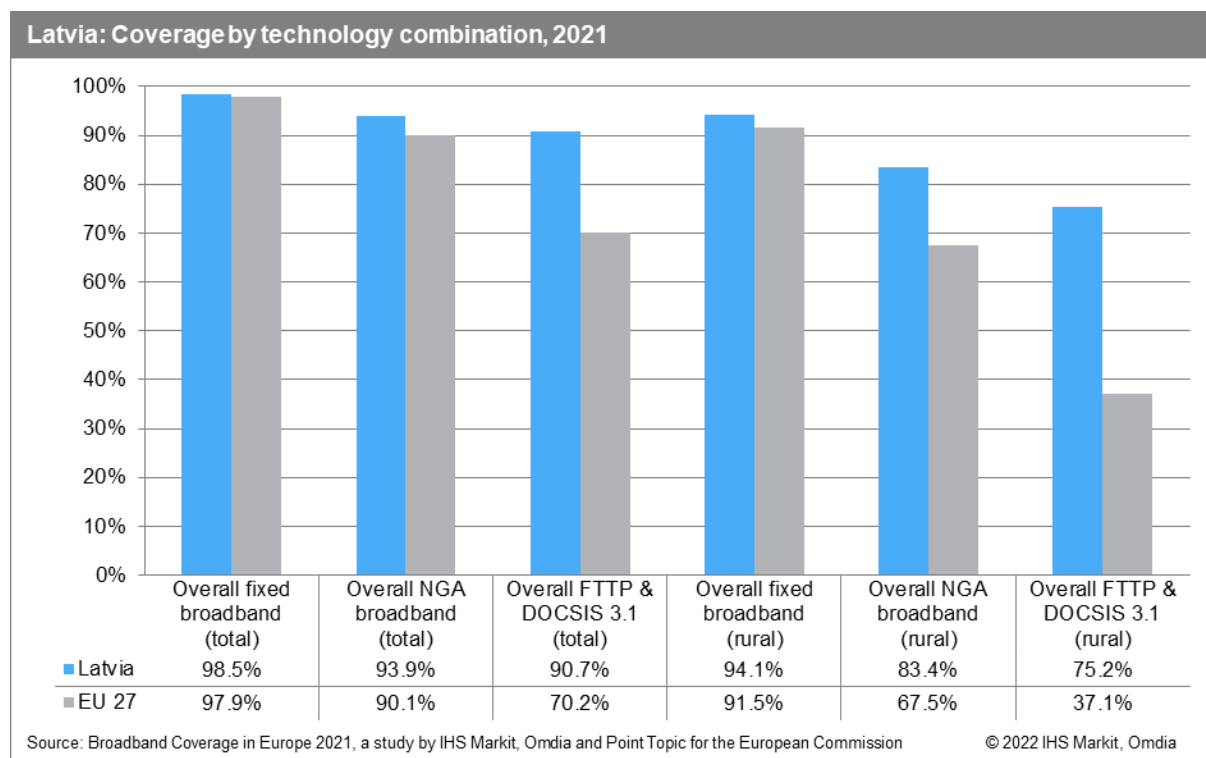
	Italy 2021		Italy 2020		Italy 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.8%	98.9%	99.6%	98.2%	99.6%	97.3%	89.3%	81.3%
VDSL	96.0%	85.7%	92.7%	76.9%	88.9%	68.4%	54.5%	39.0%
VDSL 2 Vectoring	68.3%	28.0%	59.9%	16.7%	55.8%	11.6%	36.7%	17.7%
FTTP	44.2%	17.3%	33.7%	8.4%	30.0%	2.1%	50.0%	33.8%
Cable modem DOCSIS 3.0	0%	0%	0%	0%	0%	0%	44.2%	11.3%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	32.2%	5.7%
FWA	97.3%	97.2%	72.3%	57.9%	72.9%	41.0%	58.2%	53.6%
LTE	99.9%	99.9%	99.3%	94.7%	98.9%	95.0%	99.8%	99.6%
LTE average operator coverage	94.9%	-	98.0%	-	97.1%	-	97.5%	-
5G	99.7%	99.8%	8.1%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.8%	99.1%	99.6%	98.2%	99.6%	97.3%	97.9%	91.5%
Overall NGA broadband	97.0%	88.4%	92.7%	76.2%	88.9%	68.4%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	44.2%	17.3%	33.7%	8.4%	30.0%	2.1%	70.2%	37.1%
At least 30Mbps	90.6%	-	82.0%	-	77.5%	-	89.8%	-
At least 100Mbps	77.6%	-	67.0%	-	61.0%	-	82.1%	-
At least 1Gbps	44.2%	-	33.7%	-	30.0%	-	62.4%	-
At least 1Gbps upload and download	44.2%	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.17 Latvia

5.17.1 National coverage by broadband technology

By the end of June 2021, overall fixed broadband coverage in Latvia had reached 98.5% at a national level, and at 94.1% at a rural level, both exceeding the EU average. The country also continued to fare well compared with the EU average in terms of NGA broadband availability. NGA broadband was accessible to 93.9% of households at a national level, compared with the EU average of 90.1%, and 83.4% of rural households, well above the EU average of 67.5%. Overall FTTP & DOCSIS 3.1 availability at national level grew by 2.6 p.p., reaching 90.7% of Latvian households, still substantially higher than the EU average of 70.2%. Meanwhile rural coverage grew by 1.4 p.p., passing 75.2% of rural Latvian households – more than double the EU average for rural FTTP & DOCSIS 3.1 availability.

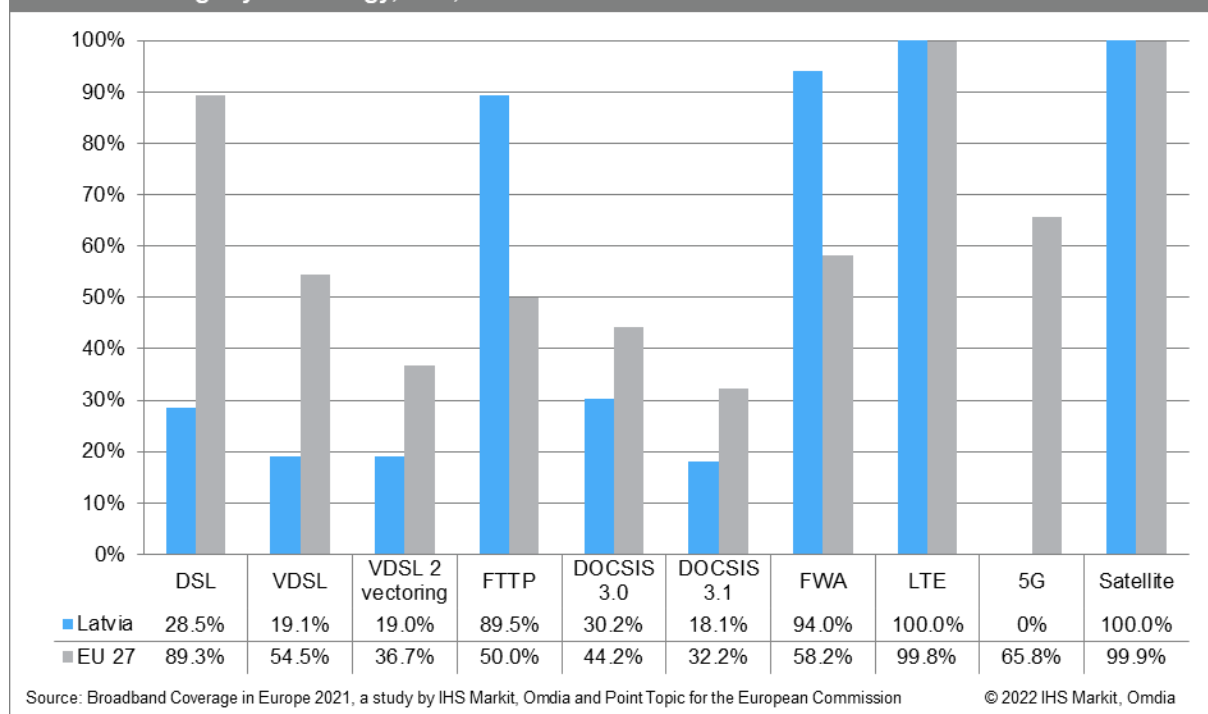


Looking at individual technologies, the twelve months to the end of June 2021 saw DSL coverage fall by 2.8 percentage points. With only 28.5% of households having access, Latvia remained the study country having the lowest DSL availability. During the same period however, VDSL coverage recorded a fractional increase, from 19.0% in mid-2020 to 19.1% at the end of June 2021. Coverage of VDSL2 Vectoring also increased fractionally, covering 19.0% of households nationally by mid-2021. FWA coverage remained stable during the twelve-month study period, covering 94.0 percent of households – well above the EU average.

Widespread availability of FTTP remained the key distinguishing feature of the Latvian market, with coverage increasing by 1.4 p.p. during the year, with services available to 89.5% of all households. This remains the highest level of national FTTP coverage in the study, well ahead of the EU average, which stood at 50.0%. As discussed in previous iterations of the study, the structure of Latvia's broadband market is largely shaped by Tet, which has been developing the country's FTTP-dominant infrastructure since 2009. The rapid development of FTTP availability has been at the expense of the remaining NGA technologies, whose coverage is lower than the EU average, so that just 19.1% of Latvian households had access to VDSL, while DOCSIS 3.0 was available to 30.2% as of mid-2021.

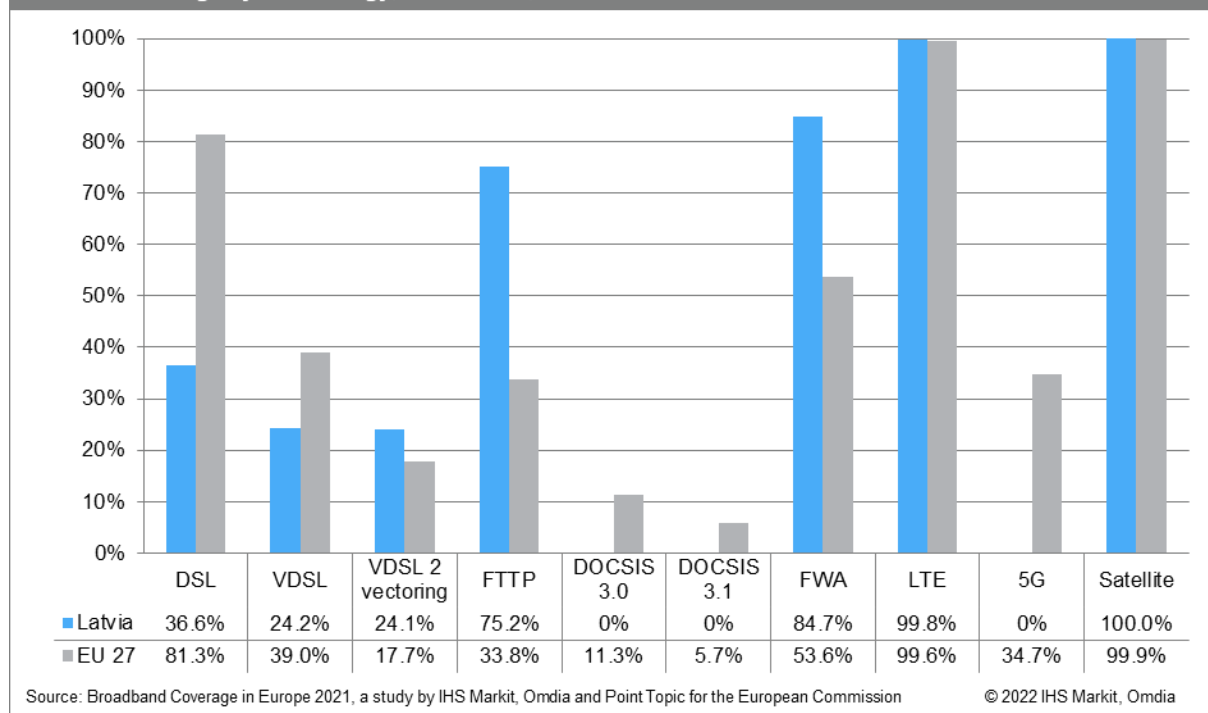
Within the mobile broadband category, national LTE coverage stood at 100.0%, with universal coverage for Latvian homes having been guaranteed for the first time during the year to June 2019. Meanwhile average LTE coverage among all mobile network operators meant that 99.5% of Latvians had access to LTE services by the end of June 2021. Along with Portugal, Latvia was one of two countries in the study not to have launched commercial 5G services as of June 2021.

Latvia: Coverage by technology, total, 2021



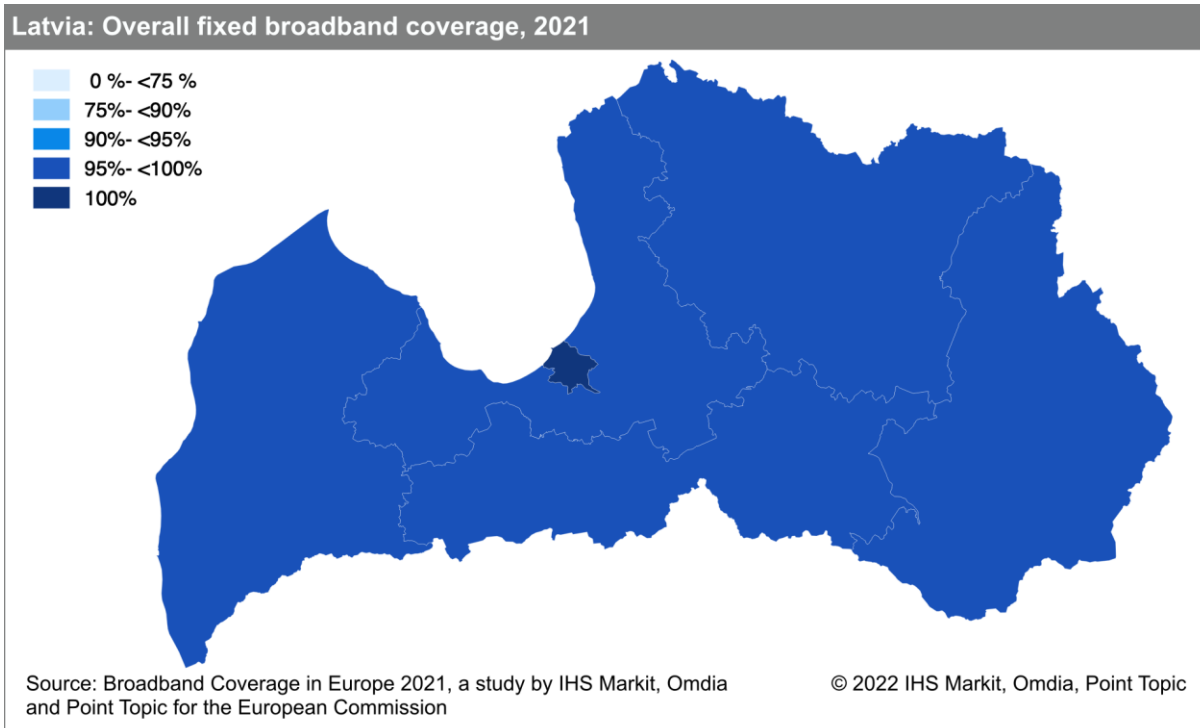
Rural DSL coverage grew fractionally over the study period, with 36.6% of rural homes covered at the end of June 2021, including 24.1% covered by VDSL2 Vectoring. Meanwhile FWA was available to 84.7% of rural households, a slight increase since the previous study. FTTP remained the most widespread NGA technology across the rural regions of Latvia, covering 75.2% of households, substantially higher than the EU average of 33.8%. VDSL availability increased by 1.3 percentage points, reaching 24.2% of rural Latvian households. Meanwhile, both cable modem DOCSIS 3.0 and DOCSIS 3.1 remained absent from Latvia's rural areas. LTE coverage remained static over the study period, reaching 99.8% of rural homes – the same level as in mid-2020.

Latvia: Coverage by technology, rural areas, 2021

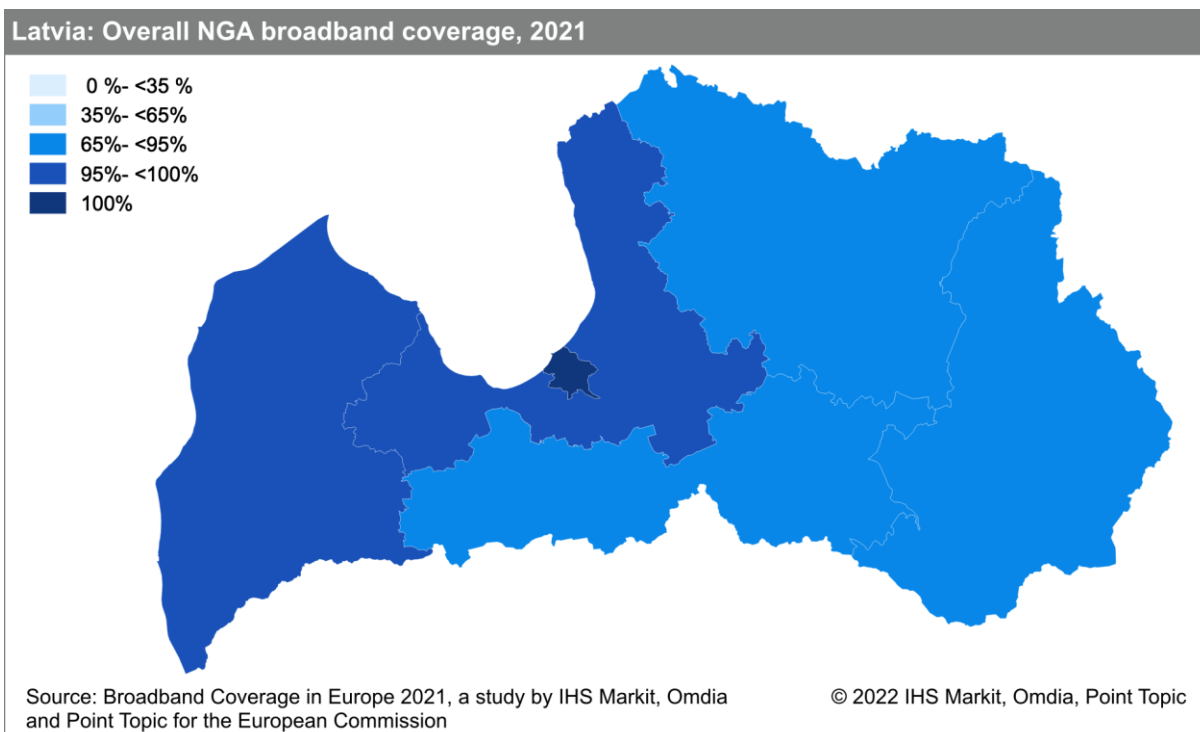


5.17.2 Regional coverage by broadband technology

Unlike in previous years, variations in fixed broadband coverage across Latvian regions are now minimal, with coverage ranging from 97.0% in three of the six regions to universal coverage in Riga.



NGA broadband coverage increased slightly across each of the individual regions during the 12 months to mid-2021, (with the exception of Riga which has already achieved universal coverage). Latgale recorded the lowest NGA coverage, at 77.3% of households, up by 2.1 p.p. since 2020.



5.17.3 Data tables for Latvia

Statistic	National
Population	1,907,675
Persons per household	2.6
Rural proportion	25.6%

	Latvia 2021		Latvia 2020		Latvia 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	28.5%	36.6%	31.3%	36.4%	33.4%	36.4%	89.3%	81.3%
VDSL	19.1%	24.2%	19.0%	22.9%	18.2%	20.0%	54.5%	39.0%
VDSL 2 Vectoring	19.0%	24.1%	18.9%	22.8%	0%	0%	36.7%	17.7%
FTTP	89.5%	75.2%	88.1%	73.8%	88.1%	73.2%	50.0%	33.8%
Cable modem DOCSIS 3.0	30.2%	0%	30.1%	0%	30.1%	0%	44.2%	11.3%
Cable modem DOCSIS 3.1	18.1%	0%	0%	0%	0%	0%	32.2%	5.7%
FWA	94.0%	84.7%	94.0%	84.4%	94.0%	84.1%	58.2%	53.6%
LTE	100.0%	99.8%	100.0%	99.8%	100.0%	99.8%	99.8%	99.6%
LTE average operator coverage	99.5%	-	99.5%	-	99.3%	-	97.5%	-
5G	0%	0%	0%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	98.5%	94.1%	98.2%	93.9%	98.2%	93.9%	97.9%	91.5%
Overall NGA broadband	93.9%	83.4%	93.0%	82.0%	93.0%	81.6%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	90.7%	75.2%	88.1%	73.8%	88.1%	73.2%	70.2%	37.1%
At least 30Mbps	93.5%	-	92.7%	-	92.7%	-	89.8%	-
At least 100Mbps	90.7%	-	89.6%	-	89.6%	-	82.1%	-
At least 1Gbps	40.3%	-	39.6%	-	0%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

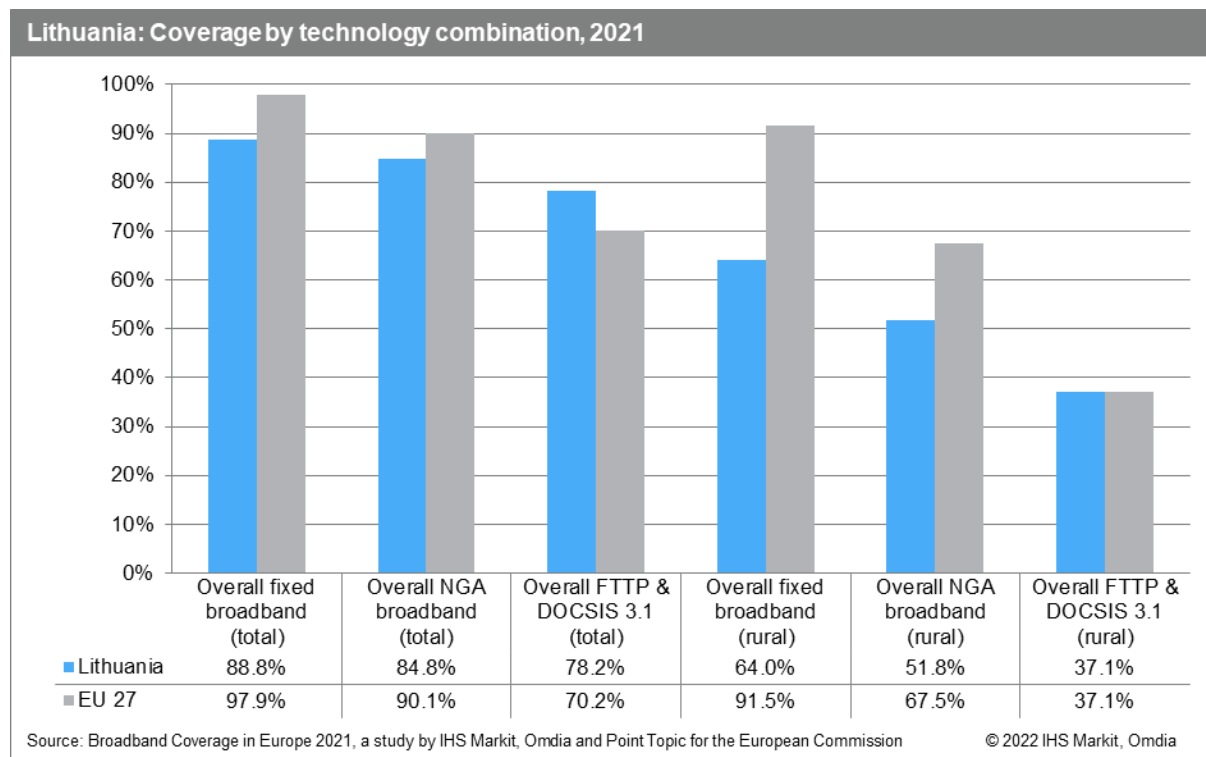
All restatements are highlighted in italics.

5.18 Lithuania

5.18.1 National coverage by broadband technology

Overall fixed broadband in Lithuania reached 88.8% of Lithuanian households at a national level, and 64.0% of households at a rural level at the end of June 2021, with coverage at both levels remaining below the EU average. A similar situation was observed in terms of NGA coverage, which remained below the EU average on both national and rural level. As of mid-2021, 84.8% of homes were passed by at least one NGA network, while just over half of rural households had access to high speed broadband services.

Despite limited fixed broadband and NGA coverage however, when examining coverage, Lithuania maintained higher than average coverage levels of FTTP & DOCSIS 3.1, with over three quarters (78.2%) of households covered by networks capable of delivering gigabit speeds owing to the country's widely deployed FTTP network.

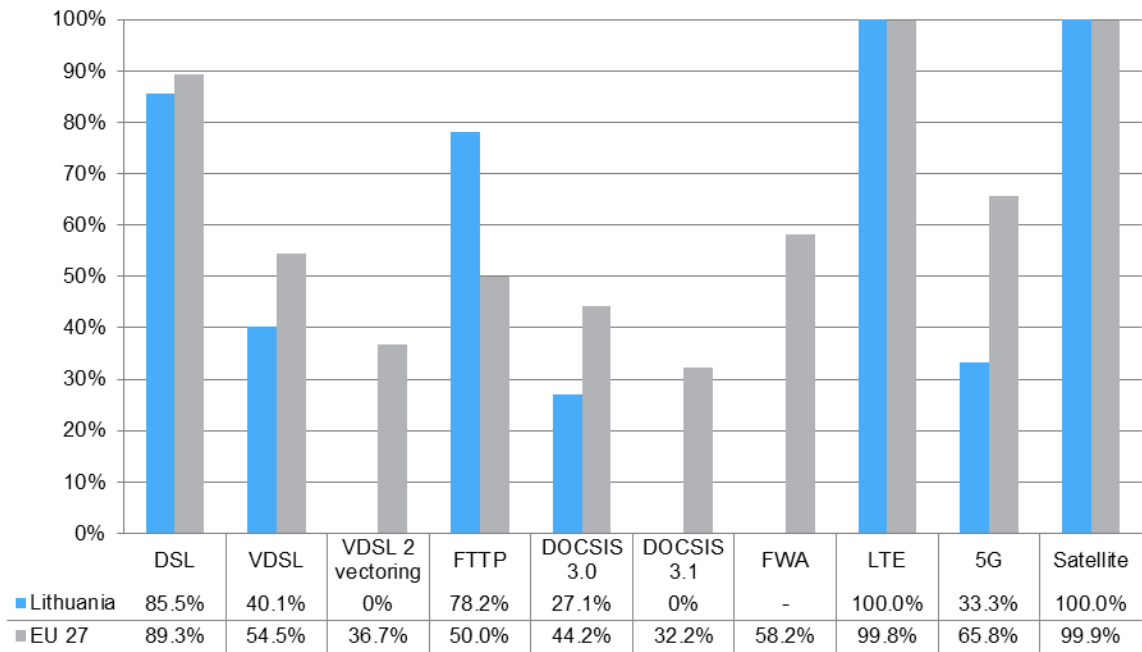


Among the individual broadband technologies, DSL remained the most prevalent, being available to 85.5% of Lithuanian households. Meanwhile FTTP remained by far the dominant NGA technology in Lithuania, with 78.2% of homes passed at the end of June 2021, well ahead of the EU average.

VDSL coverage reached 40.1% of households in 2021, but with copper network upgrades a low priority for Lithuanian operators, VDSL2 Vectoring has not been deployed in the country. Likewise cable modem DOCSIS 3.0 makes up an important part of the NGA market, with services available to 27.1% of Lithuanian households, but no DOCSIS 3.1 deployments have yet been recorded in Lithuania.

Regarding mobile broadband, LTE coverage remained stable, with the technology having become universally available for the first time to all Lithuanian households during the year to mid-2019. Commercial 5G services became available in 2021, and coverage reached 33.3% of households, focused around the three largest cities (Vilnius, Kaunas and Klaipėda).

Lithuania: Coverage by technology, total, 2021



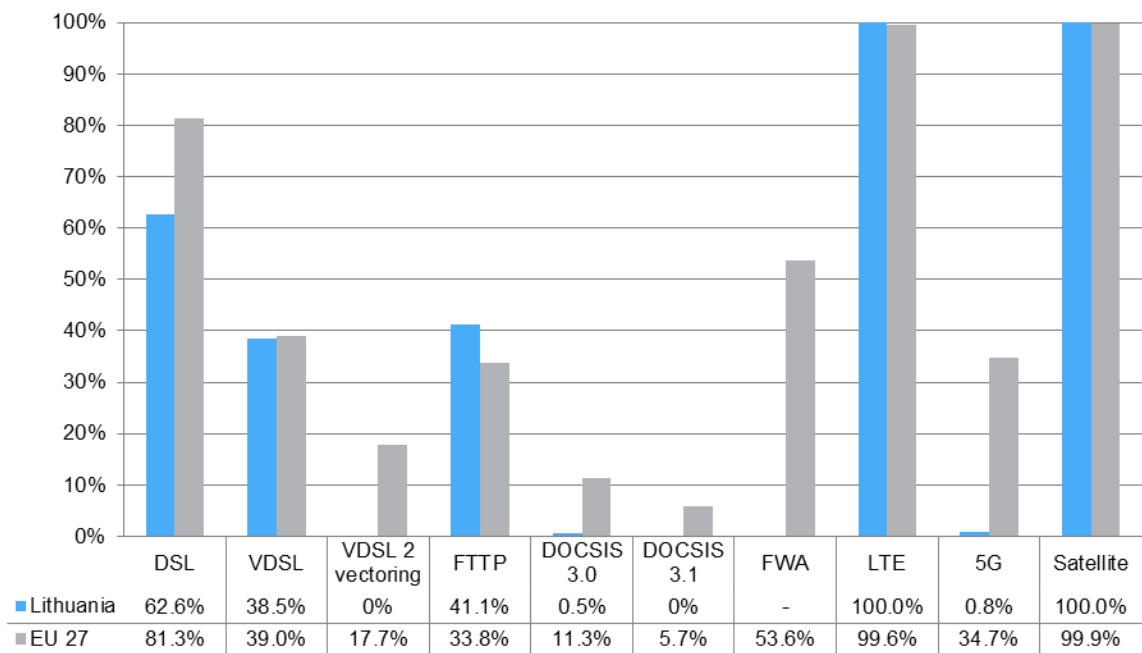
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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Within Lithuania's rural areas, DSL remained the most widely available technology over the study period, although the technology was available to just 62.6% of the country's rural households. FTTP is the leading rural NGA technology, with 41.1% of households covered, slightly ahead of VDSL (38.5%). Cable DOCSIS 3.0 coverage in rural areas is minimal, passing just 0.5% of rural households at the end of June 2021.

Rural LTE achieved universal coverage during the study period, but initial 5G deployments were focused on urban areas, and rural coverage was negligible as of June 2021 (0.8% of households).

Lithuania: Coverage by technology, rural areas, 2021

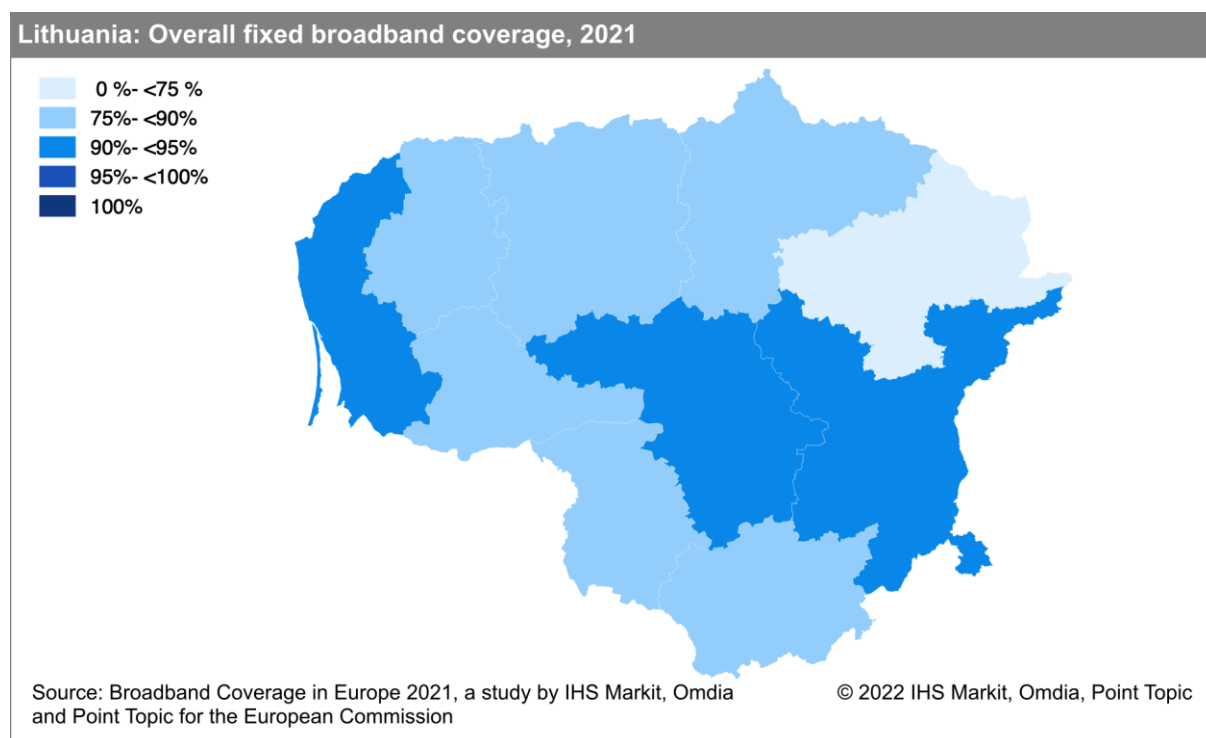


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

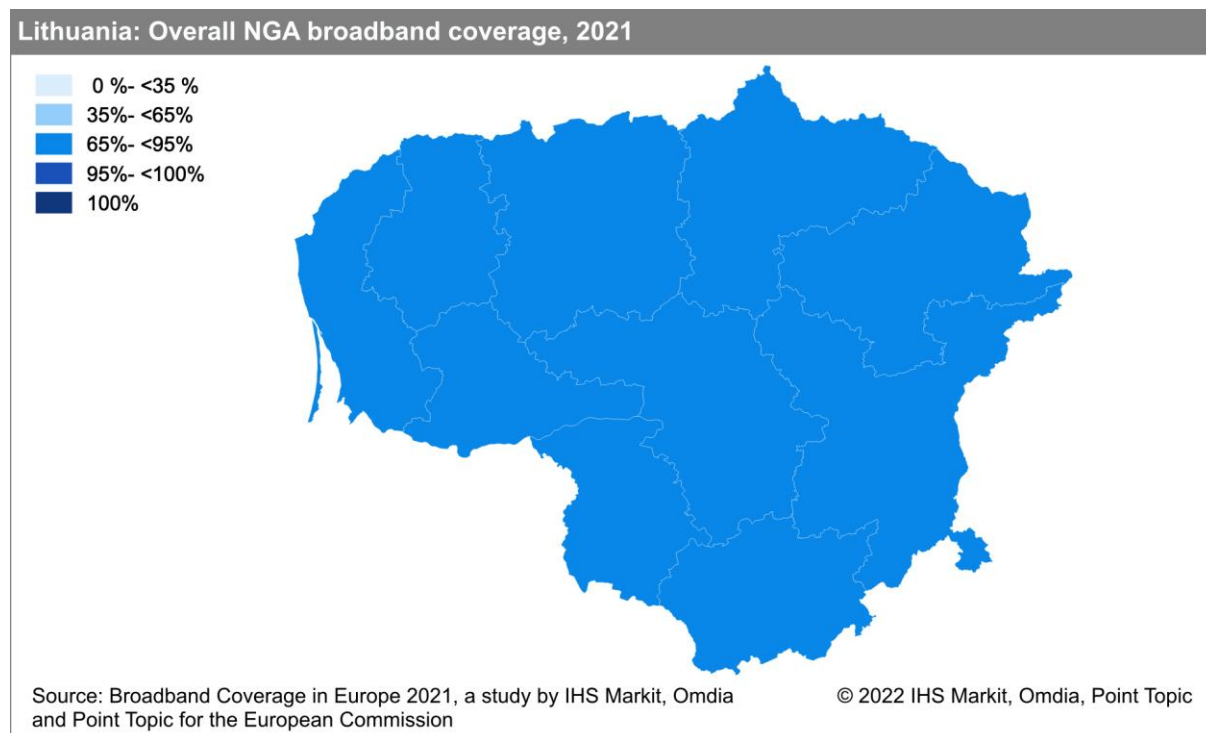
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5.18.2 Regional coverage by broadband technology

There is significant variation in overall fixed broadband coverage between the different regions of Lithuania. Coverage was the lowest in the Utena county with just 72.2% of homes covered (the lowest of any NUTS 3 region in this year's study), and highest in the Klaipėda county, with 93.6% of households covered.



Regional variance in NGA availability also remained substantial, with coverage levels ranging from 66.3% in Utena county to 84.0% in Kaunas county.



5.18.3 Data tables for Lithuania

Statistic	National
Population	2,794,090
Persons per household	2.6
Rural proportion	33.3%

	Lithuania 2021		Lithuania 2020		Lithuania 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	85.5%	62.6%	72.9%	52.6%	70.6%	51.6%	89.3%	81.3%
VDSL	40.1%	38.5%	4.1%	1.0%	3.0%	0.9%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	78.2%	41.1%	67.1%	23.3%	61.0%	22.5%	50.0%	33.8%
Cable modem DOCSIS 3.0	27.1%	0.5%	19.4%	0.5%	17.9%	0.4%	44.2%	11.3%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	32.2%	5.7%
FWA	-	-	-	-	-	-	58.2%	53.6%
LTE	100.0%	100.0%	100.0%	99.9%	100.0%	99.9%	99.8%	99.6%
LTE average operator coverage	99.9%	-	99.8%	-	99.8%	-	97.5%	-
5G	33.3%	0.8%	0%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	88.8%	64.0%	84.8%	66.7%	85.3%	65.5%	97.9%	91.5%
Overall NGA broadband	84.8%	51.8%	70.8%	29.6%	69.4%	28.7%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	78.2%	37.1%	67.1%	23.3%	61.0%	22.5%	70.2%	37.1%
At least 30Mbps	84.6%	-	70.6%	-	63.6%	-	89.8%	-
At least 100Mbps	78.1%	-	67.3%	-	61.2%	-	82.1%	-
At least 1Gbps	78.0%	-	66.9%	-	60.9%	-	62.4%	-
At least 1Gbps upload and download	78.0%	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic. The Lithuanian NRA changed its methodology for the 2021 survey and now provides data on buildings that can be connected within 4 weeks, in line with the BEREC Guidelines to assist NRAs on the consistent application of Geographical surveys of network deployments (BoR (20) 42).

Coverage data for FWA is not available for Lithuania. At the end of 2021 there were over 50 licensed FWA service providers in the country, with approximately 38,800 subscribers.

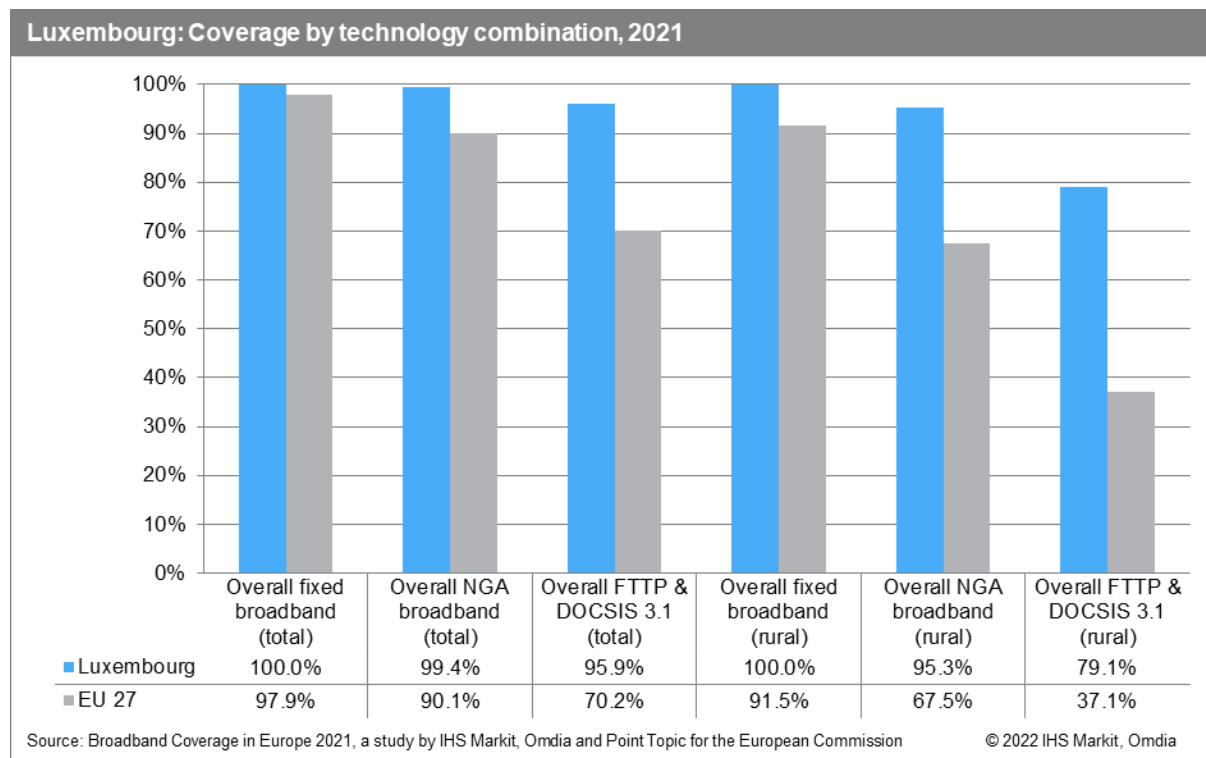
All restatements are highlighted in italics.

5.19 Luxembourg

5.19.1 National coverage by broadband technology

Since Luxembourg has achieved universal fixed broadband coverage in previous years, and near-universal NGA coverage, operators are focusing on expansion of gigabit-capable networks. At the end of June 2021, FTTP & DOCSIS 3.1 networks passed 95.9% of all Luxembourg homes and 79.1% of rural homes.

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 technologies such as FTTP and DOCSIS 3.1 has been somewhat easier in Luxembourg than in other European countries.

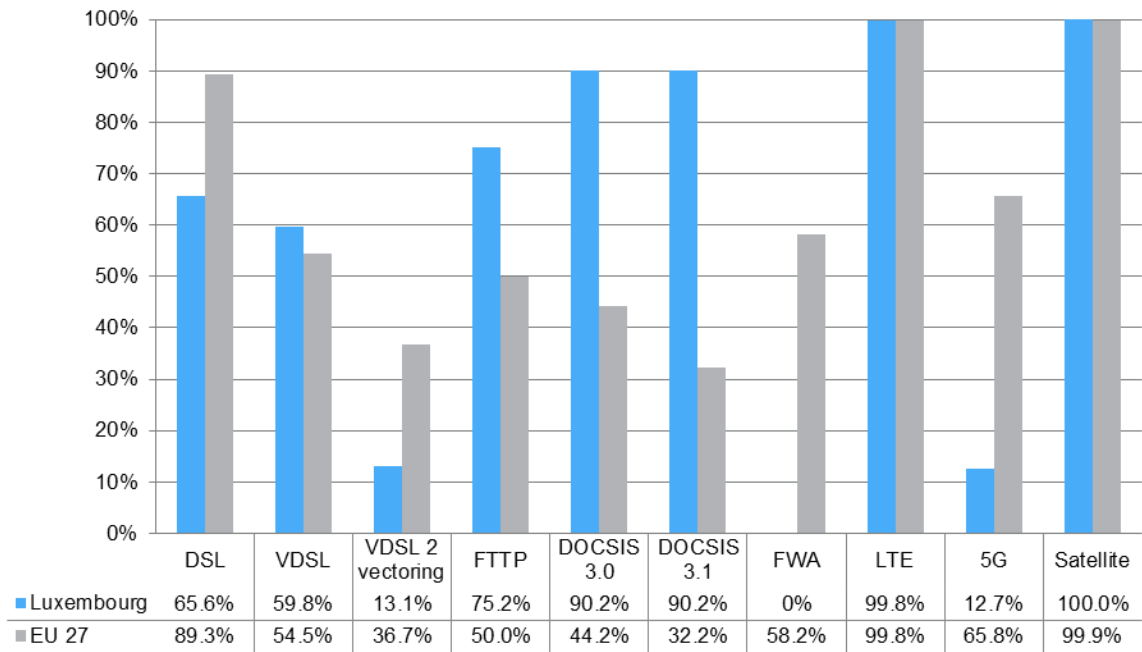


Looking at individual technologies, DSL and VDSL switch-offs continued across the country with DSL coverage dropping by 6.4 percentage points, to reach 65.6% of households. VDSL recorded a 5.7 percentage point decrease in coverage with VDSL services available to 59.8% of households. In addition, 13.1% 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 90.2% of Luxembourgish households, with the whole network having been updated to the DOCSIS 3.1 standard by mid-2020. FTTP coverage continued to improve and gained 3.1 points of coverage. As a result, 75.2% of Luxembourg households had access to FTTP broadband services at the end of June 2021.

LTE coverage remains near-universal, reaching 99.8% of households, whilst the average LTE coverage of all operators reached 98.4% at the end of June 2021. Commercial 5G services were launched by all three network operators in late 2020, and by mid-2021 coverage had reached 12.7% of households.

Luxembourg: Coverage by technology, total, 2021



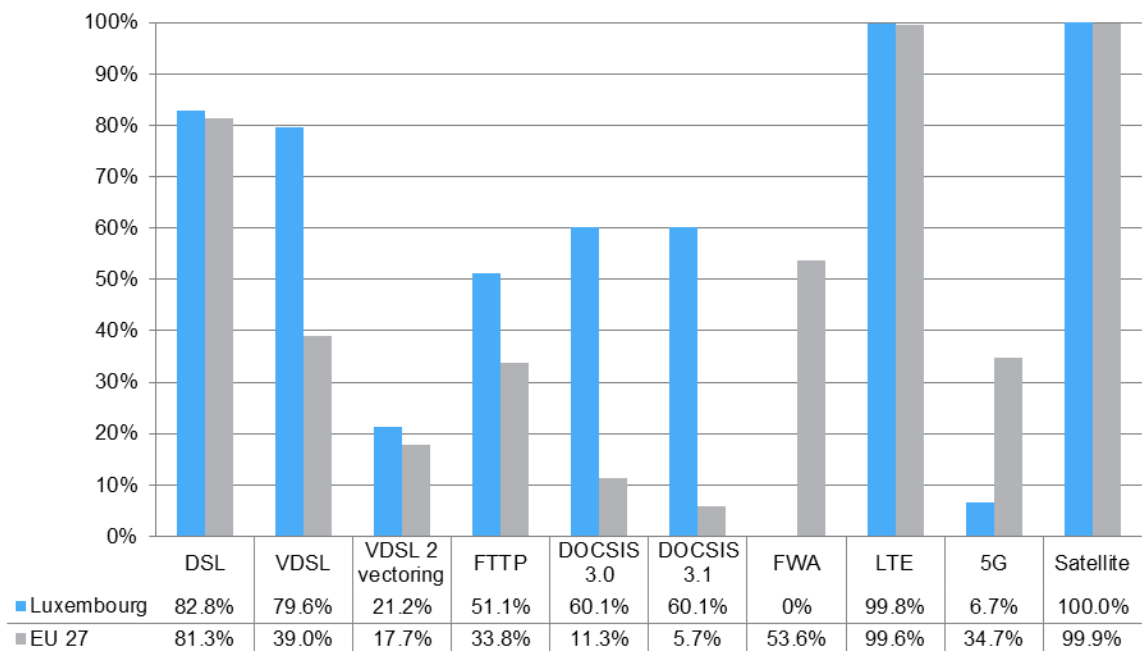
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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In terms of rural broadband availability, as was the case at a national level, DSL technology recorded a decrease in coverage, owing to operators' focus on upgrading copper lines to fibre optic networks. DSL decreased by 3.2 percentage points. VDSL coverage also decreased, by 3.4 percentage points, and VDSL services were available to 79.6% of rural households. As legacy copper lines decommissioning is targeted primarily on urban areas, Luxembourg is one of the countries where rural DSL and VDSL coverage levels exceed national coverage levels. VDSL2 Vectoring was available to 21.2% of rural homes. Cable modem DOCSIS 3.0 and DOCSIS 3.1 services were available to 60.1% of rural households, making it the most prevalent NGA technology for rural households.

For mobile broadband, rural LTE coverage remained near-universal at 99.6%, whereas 5G had only reached 6.7% of rural households as of June 2021.

Luxembourg: Coverage by technology, rural areas, 2021

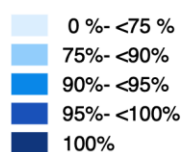


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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5.19.2 Regional coverage by broadband technology

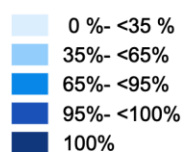
Luxembourg: Overall fixed broadband coverage, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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Luxembourg: Overall NGA broadband coverage, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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5.19.3 Data tables for Luxembourg

Statistic	National
Population	626,108
Persons per household	2.5
Rural proportion	11.1%

	Luxembourg 2021		Luxembourg 2020		Luxembourg 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	65.6%	82.8%	72.0%	86.0%	83.4%	93.0%	89.3%	81.3%
VDSL	59.8%	79.6%	65.5%	83.0%	75.5%	81.0%	54.5%	39.0%
VDSL 2 Vectoring	13.1%	21.2%	8.8%	15.1%	52.9%	63.6%	36.7%	17.7%
FTTP	75.2%	51.1%	72.1%	48.5%	67.5%	41.5%	50.0%	33.8%
Cable modem DOCSIS 3.0	90.2%	60.1%	88.9%	62.9%	83.9%	33.0%	44.2%	11.3%
Cable modem DOCSIS 3.1	90.2%	60.1%	88.9%	62.9%	83.9%	33.0%	32.2%	5.7%
FWA	0%	0%	0%	0%	0%	0%	58.2%	53.6%
LTE	99.8%	99.8%	99.8%	99.6%	99.8%	99.6%	99.8%	99.6%
LTE average operator coverage	98.4%	-	98.3%	-	98.0%	-	97.5%	-
5G	12.7%	6.7%	0%	0%	-	-	65.8%	34.7%
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%	97.9%	91.5%
Overall NGA broadband	99.4%	95.3%	99.3%	95.1%	97.8%	94.9%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	95.9%	79.1%	95.1%	80.8%	92.0%	78.9%	70.2%	37.1%
At least 30Mbps	99.8%	-	99.7%	-	97.8%	-	89.8%	-
At least 100Mbps	99.4%	-	99.3%	-	94.6%	-	82.1%	-
At least 1Gbps	95.9%	-	95.1%	-	92.0%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

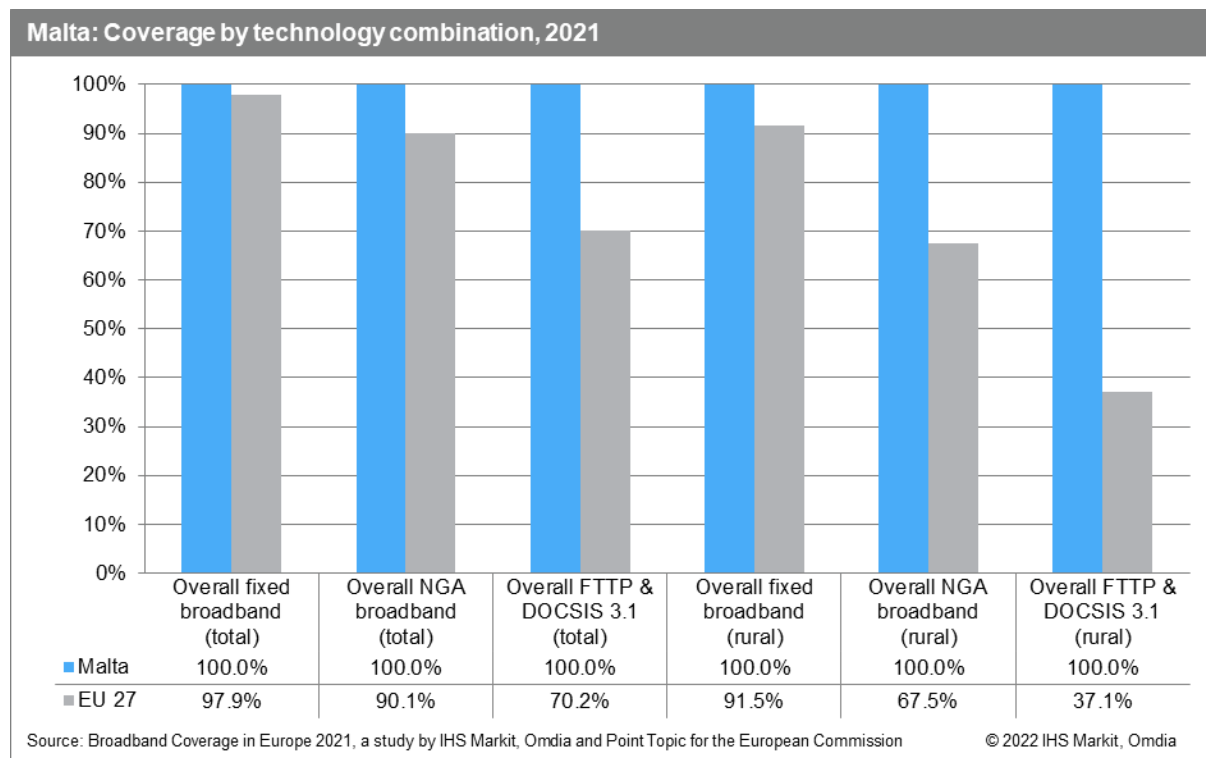
Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

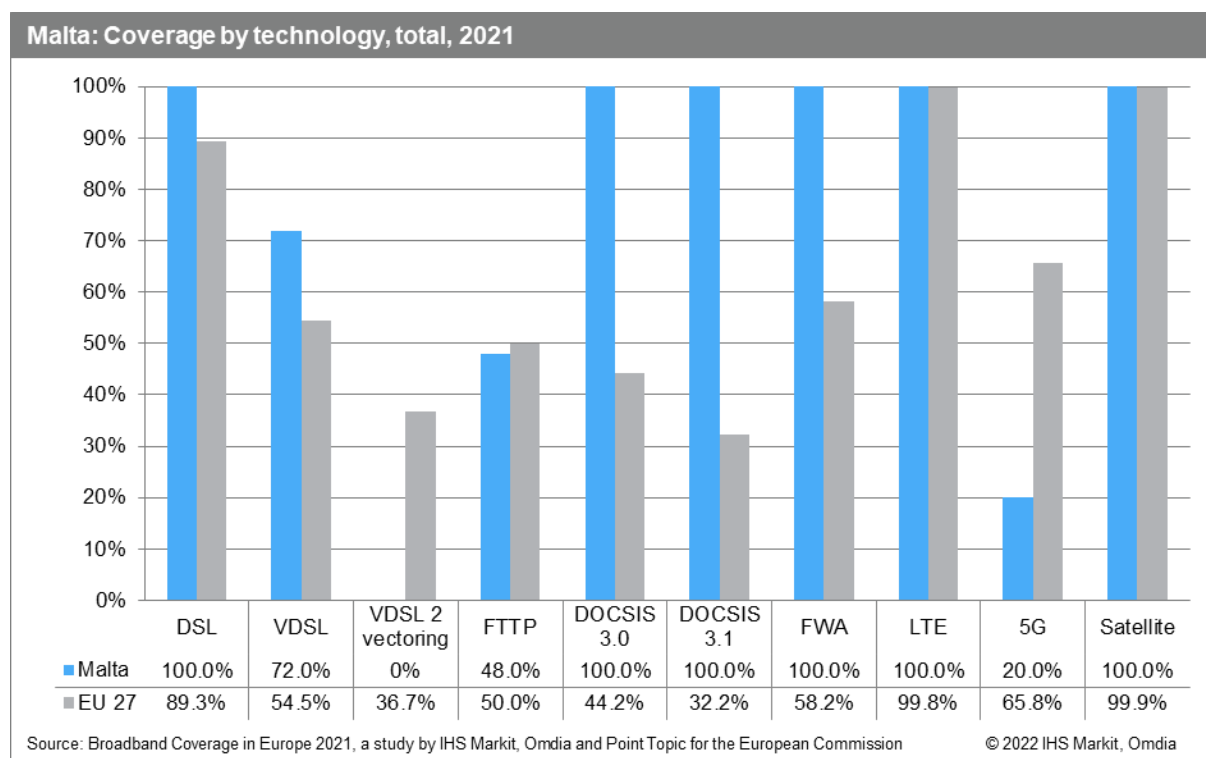
5.20 Malta

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 three combination categories, having already achieved universal fixed broadband and NGA coverage in past years, both at a national and rural level. As of June 2021, Malta remains the only country in the study to have recorded universal combined FTTP & DOCSIS 3.1 coverage.



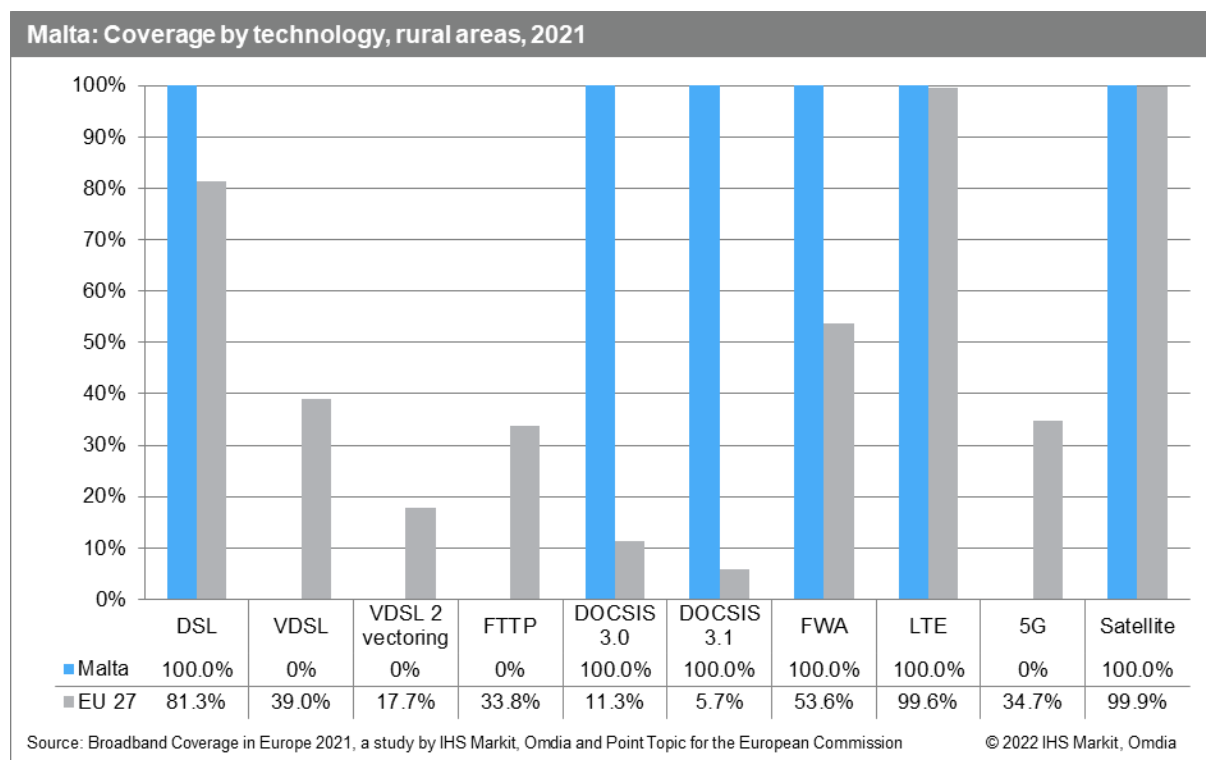
As is the case with a number of countries covering a geographically small area, achieving universal broadband coverage has been somewhat easier in Malta than in other, larger European countries. Indeed, Malta is a small, very densely populated island nation with limited rural population (only 0.6% of households were identified as rural).



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 FWA. VDSL coverage has remained stable since 2015 with 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-2021, FTTP coverage grew by 7.0 percentage points, to reach 48.0% of households – a significant acceleration in rollout from the 1.8 point increase recorded in 2020

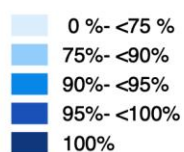
In terms of mobile technologies, all mobile network operators in Malta provided universal LTE coverage. Commercial 5G services first became available in May 2021, and coverage reached 20.0% by June.



Looking at rural regions of Malta, as was the case at a national level, there were almost no changes in terms of coverage of individual fixed broadband technologies. Malta was the only country of this study to record universal rural overall FTTP & DOCSIS 3.1 coverage. VDSL, VDSL2 Vectoring and FTTP were absent in rural areas. Rural LTE coverage is universal, but initial 5G deployments were confined to urban areas as of June 2021.

5.20.2 Regional coverage by broadband technology

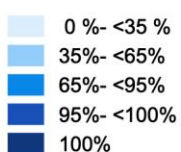
Malta: Overall fixed broadband coverage, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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Malta: Overall NGA broadband coverage, 2021



Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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5.20.3 Data tables for Malta

Statistic	National
Population	514,564
Persons per household	2.7
Rural proportion	0.6%

	Malta 2021		Malta 2020		Malta 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	89.3%	81.3%
VDSL	72.0%	0%	72.0%	0%	72.0%	0%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	48.0%	0%	41.0%	0%	39.2%	0%	50.0%	33.8%
Cable modem DOCSIS 3.0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	44.2%	11.3%
Cable modem DOCSIS 3.1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	32.2%	5.7%
FWA	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	58.2%	53.6%
LTE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.8%	99.6%
LTE average operator coverage	100.0%	-	100.0%	-	100.0%	-	97.5%	-
5G	20.0%	0%	0%	0%	-	-	65.8%	34.7%
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%	97.9%	91.5%
Overall NGA broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	70.2%	37.1%
At least 30Mbps	100.0%	-	100.0%	-	100.0%	-	89.8%	-
At least 100Mbps	100.0%	-	100.0%	-	100.0%	-	82.1%	-
At least 1Gbps	100.0%	-	100.0%	-	100.0%	-	62.4%	-
At least 1Gbps upload and download	0%	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic. In 2018, a third operator started 4G services in Malta which caused a downward change in average 4G coverage.

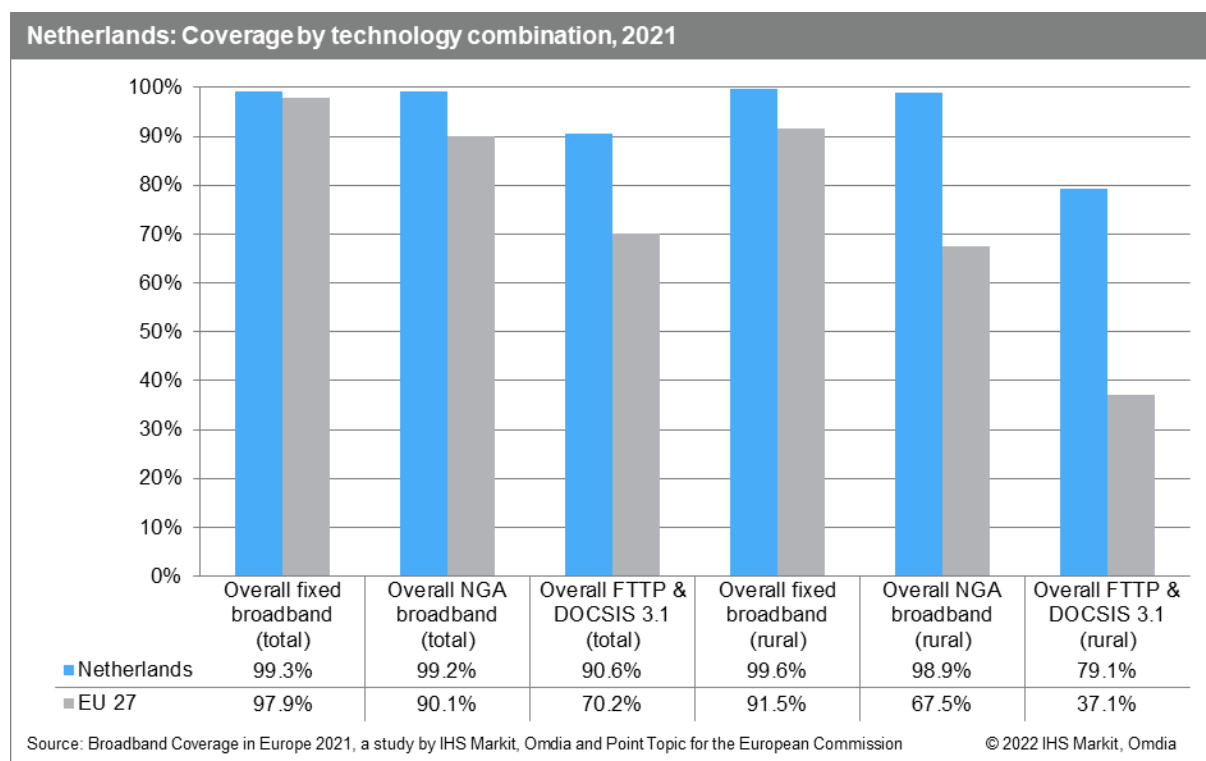
5.21 Netherlands

5.21.1 National coverage by broadband technology

Almost all Dutch households (99.3%) could access at least one fixed broadband technology by mid-2021, while NGA networks passed 99.2% of Dutch homes – scoring well above the EU averages of 97.9% and 90.1%, respectively. Broadband coverage also neared universal coverage in rural regions (99.6%) which grew by 0.7 percentage points. The availability of rural NGA networks improved by 2.1 percentage points.

In terms of FTTP & DOCSIS 3.1 coverage, the Netherlands continued to record impressive coverage levels, with 90.6% of all households and 79.1% of rural homes passed by networks capable of delivering gigabit speeds. Compared to previous year, rural FTTP & DOCSIS 3.1 coverage grew by 7.2 percentage points.

Like previous years, the Netherlands ranked among the leading countries across all three combination categories.



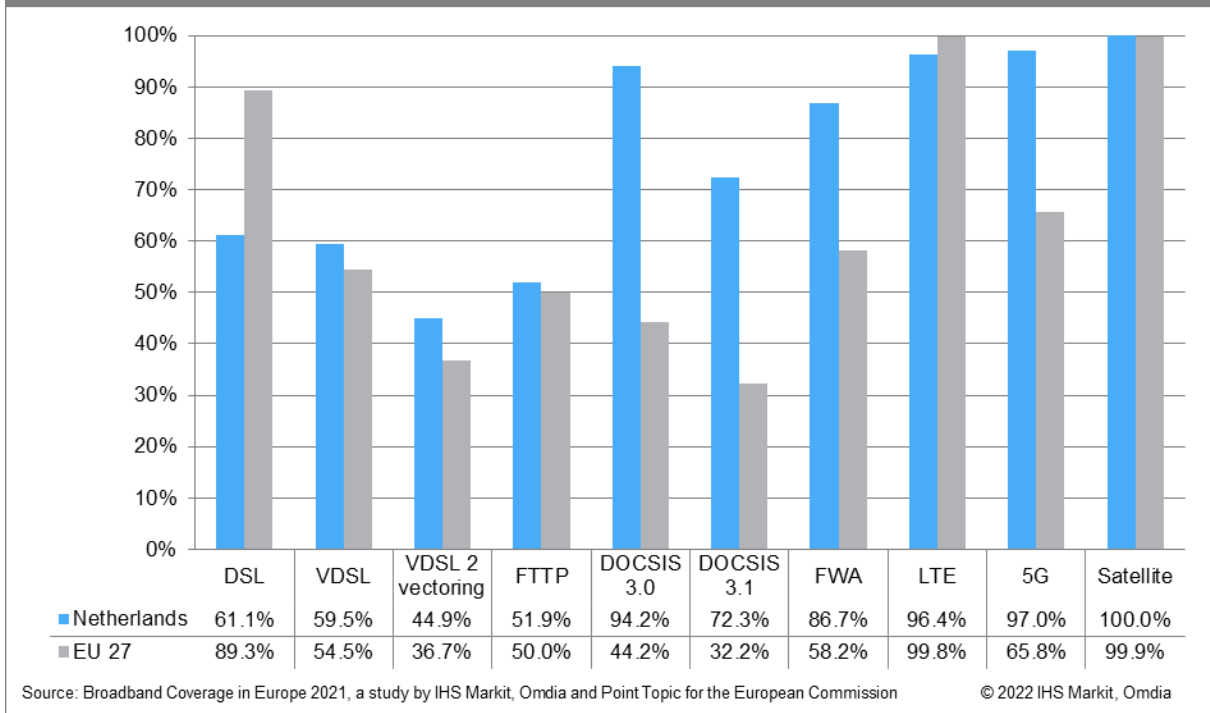
DOCSIS 3.0 remained the prevalent individual broadband technology in the Dutch market, providing coverage for 94.2% of households. In this year's study, the Netherlands recorded the third highest DOCSIS 3.0 coverage among study countries. Cable operators already upgraded large parts of their networks to the DOCSIS 3.1 standard in previous years which was available to 72.3% of households at the end of June 2021.

As was the case in previous iterations of this study, DSL coverage continued a declining trend, but the speed of decommissioning accelerated compared to previous years. By mid-2021, 61.1% of Dutch homes were covered by DSL networks, down by 8.2 percentage points. VDSL coverage declined by 5.7 percentage points, while Dutch operators continued to upgrade existing networks to VDSL2 Vectoring standard which passed a total of 44.9% of homes, up by 33.9 percentage points.

FTTP availability grew by 16.4 percentage points since the end of June 2020 and passed more than half (51.9%) of Dutch homes. Unlike last year, the country exceeded the EU average in this category. FWA networks were available to 86.7% of Dutch households, unchanged from last year.

LTE services were available to 96.4% of Dutch households, while 5G networks passed 97.0% of homes. Dutch operators already reached high 5G coverage levels by mid-2020 but grew this by another 17.0 percentage points over the last twelve-month period. With this, the country recorded the third highest 5G coverage among study countries.

Netherlands: Coverage by technology, total, 2021

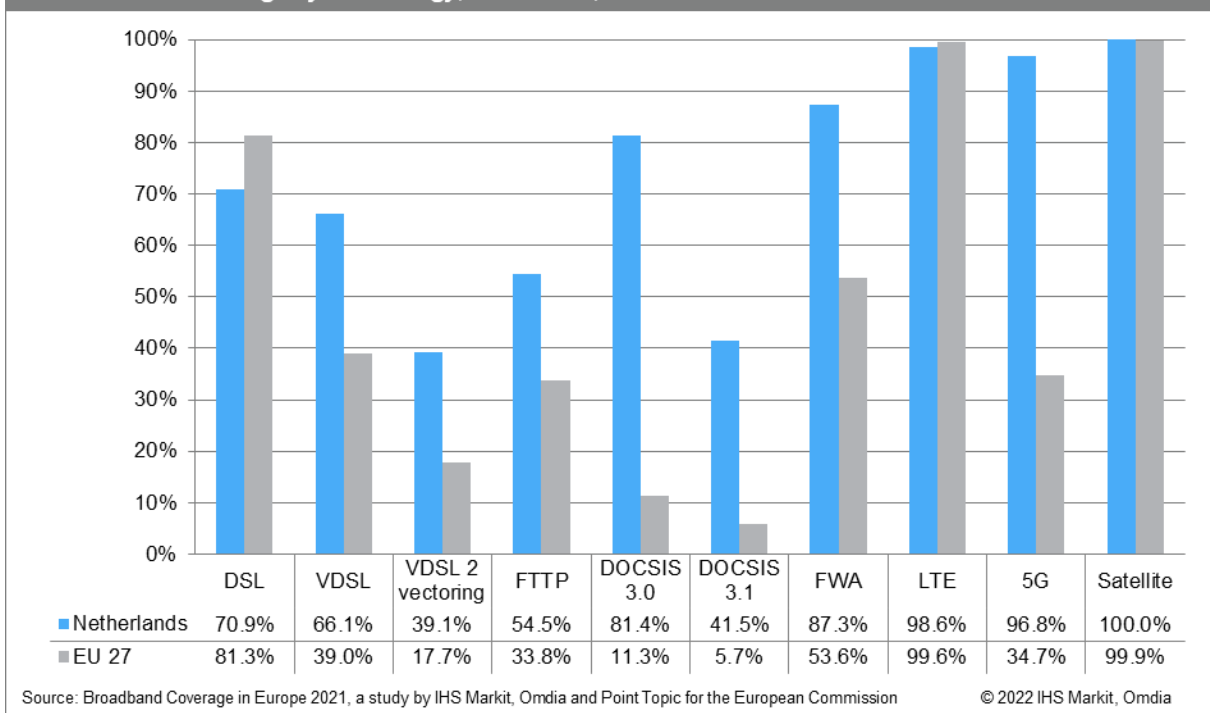


In rural regions, DOCSIS 3.0 recorded the highest coverage levels, with 81.4% of rural homes passed by mid-2021, up by 6.6 percentage points. The Netherlands was among the top countries for DOCSIS 3.0 coverage and performed 70.1 percentage points above the EU average. 41.5% of rural households were covered by DOCSIS 3.1 networks.

DSL coverage declined by 3.3 percentage points, while VDSL coverage remained unchanged, passing 70.9% and 66.1% of rural homes, respectively. 39.1% of networks had been upgraded to VDSL2 Vectoring standard by mid-2021, while FTTP services passed more than half (54.5%) of rural homes.

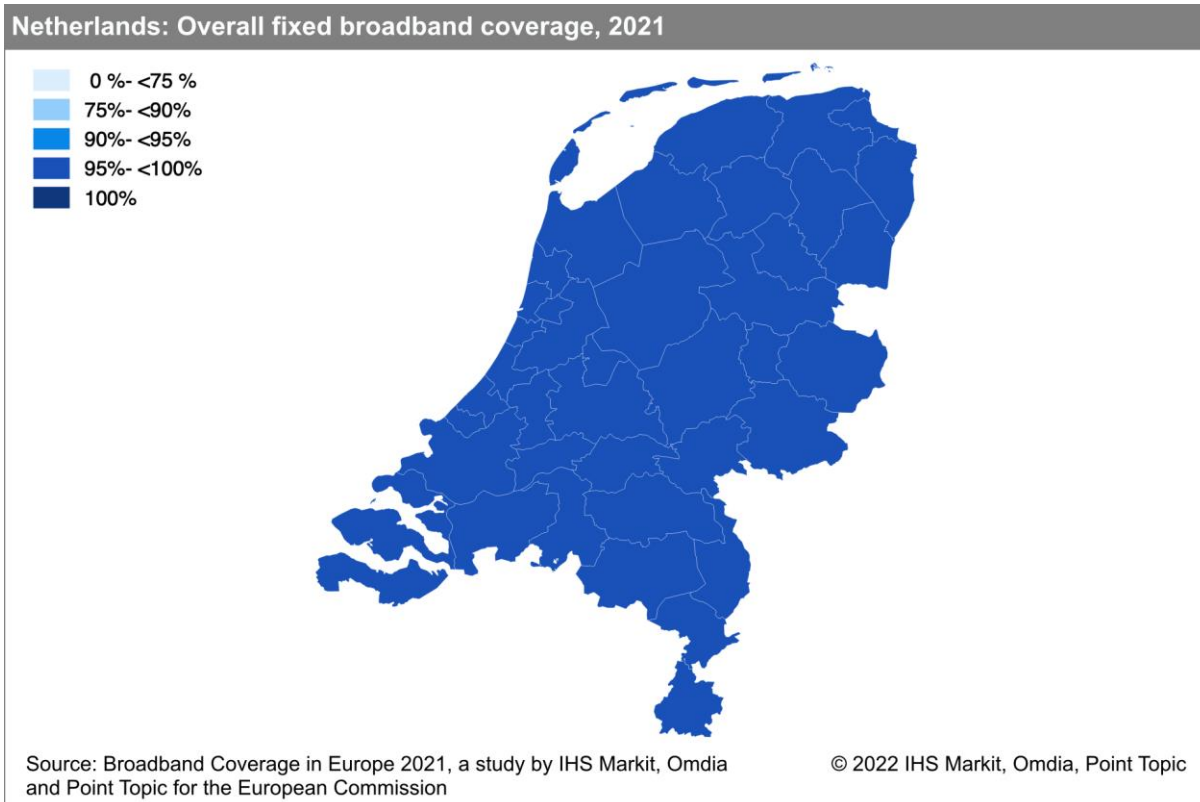
The availability of 5G services expanded by 67.7 percentage points over the study period and covered 96.8% of rural households by the end of June 2021 – the third highest coverage among study countries. LTE services were available to 98.6% of rural households. The Netherlands exceeded the EU average across all individual rural broadband technologies, except for LTE.

Netherlands: Coverage by technology, rural areas, 2021

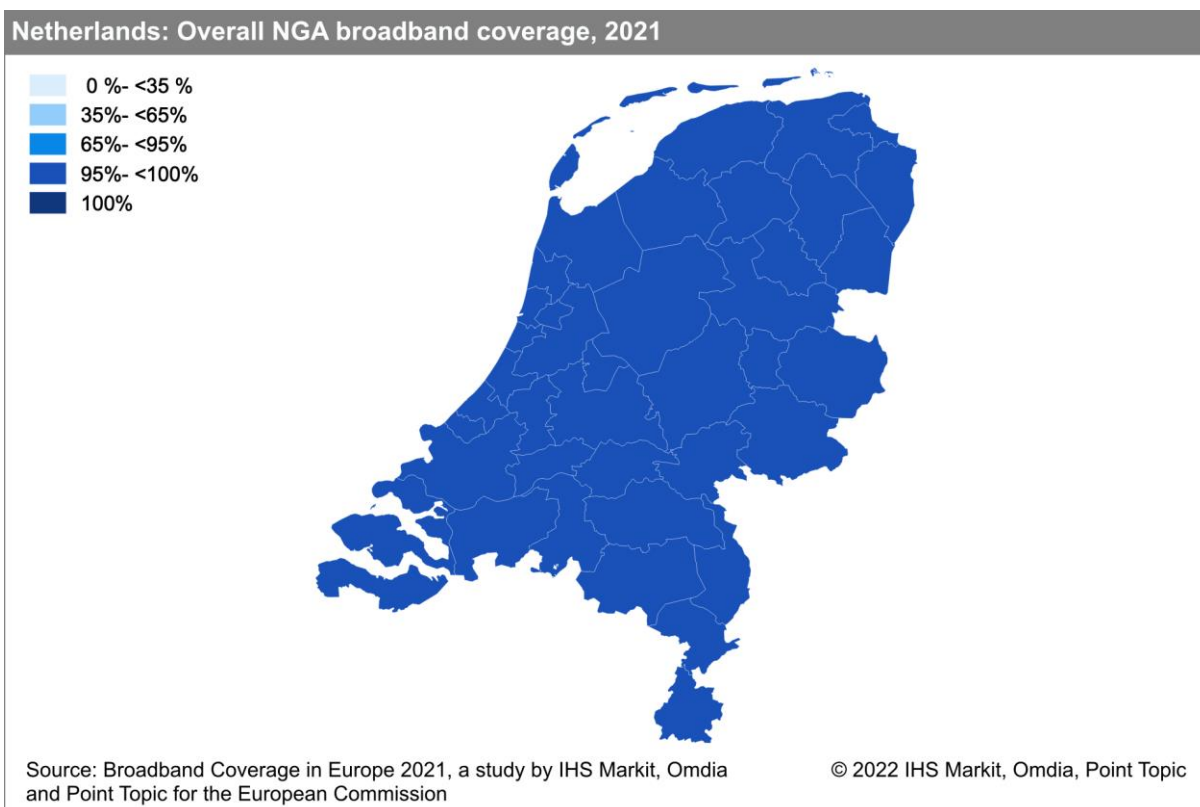


5.21.2 Regional coverage by broadband technology

All Dutch regions passed the 95% coverage threshold. Coverage ranged from 98% in Groot-Amsterdam to 99.9% in Zuidwest-Overijssel.



All regions also scored above the 95% threshold in terms of NGA availability which ranged from 97.9% in Groot-Amsterdam to 99.8% in Zaanstreek.



5.21.3 Data tables for Netherlands

Statistic	National
Population	17,407,585
Persons per household	2.2
Rural proportion	7.3%

	Netherlands 2021		Netherlands 2020		Netherlands 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	61.1%	70.9%	69.3%	74.2%	69.4%	74.2%	89.3%	81.3%
VDSL	59.5%	66.1%	65.2%	66.2%	64.3%	65.5%	54.5%	39.0%
VDSL 2 Vectoring	44.9%	39.1%	11.1%	4.4%	10.8%	4.4%	36.7%	17.7%
FTTP	51.9%	54.5%	35.6%	27.2%	34.4%	26.4%	50.0%	33.8%
Cable modem DOCSIS 3.0	94.2%	81.4%	95.2%	74.8%	95.2%	74.0%	44.2%	11.3%
Cable modem DOCSIS 3.1	72.3%	41.5%	78.6%	60.0%	77.0%	59.4%	32.2%	5.7%
FWA	86.7%	87.3%	86.7%	87.0%	86.7%	87.0%	58.2%	53.6%
LTE	96.4%	98.6%	99.5%	99.3%	99.4%	99.3%	99.8%	99.6%
LTE average operator coverage	96.8%	-	99.4%	-	99.3%	-	97.5%	-
5G	97.0%	96.8%	80.0%	29.1%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.3%	99.6%	99.5%	98.9%	99.5%	98.9%	97.9%	91.5%
Overall NGA broadband	99.2%	98.9%	98.3%	96.9%	98.3%	96.1%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	90.6%	79.1%	89.8%	71.9%	88.6%	71.2%	70.2%	37.1%
At least 30Mbps	99.2%	-	98.3%	-	98.3%	-	89.8%	-
At least 100Mbps	98.5%	-	95.8%	-	95.8%	-	82.1%	-
At least 1Gbps	88.8%	-	16.0%	-	10.2%	-	62.4%	-
At least 1Gbps upload and download	19.3%	-	-	-	-	-	-	-

Note: The drop of rural DOCSIS 3.1 coverage in 2021 was caused by a methodology change in the NRA's data collection. The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

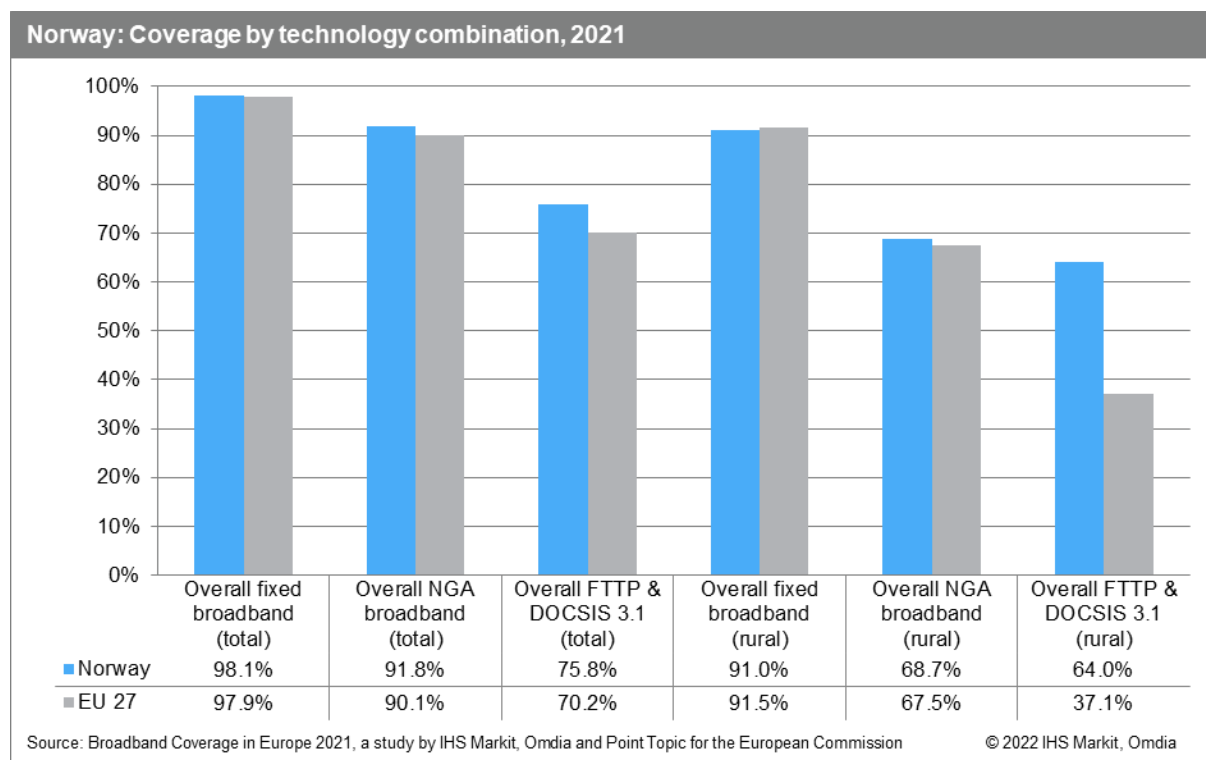
All restatements are highlighted in italics.

5.22 Norway

5.22.1 National coverage by broadband technology

Fixed broadband coverage in Norway is in line with the EU average, at 98.1% of households nationally, and 91.0% in rural areas. But coverage of faster networks is ahead of the average, especially for the fastest, gigabit-capable FTTP & DOCSIS 3.1 category.

Total NGA coverage reached 91.8% of homes at national level (1.7% ahead of the EU) and 68.7% in rural areas (0.8% ahead). But combined coverage of FTTP & DOCSIS 3.1 reached 75.8% of Norwegian households by mid-2021, 5.6% ahead of the EU, and in rural areas the difference was even more pronounced. Almost two thirds (64.0%) of rural households in Norway had access to these networks, compared with less than four in ten in the EU (37.1%).

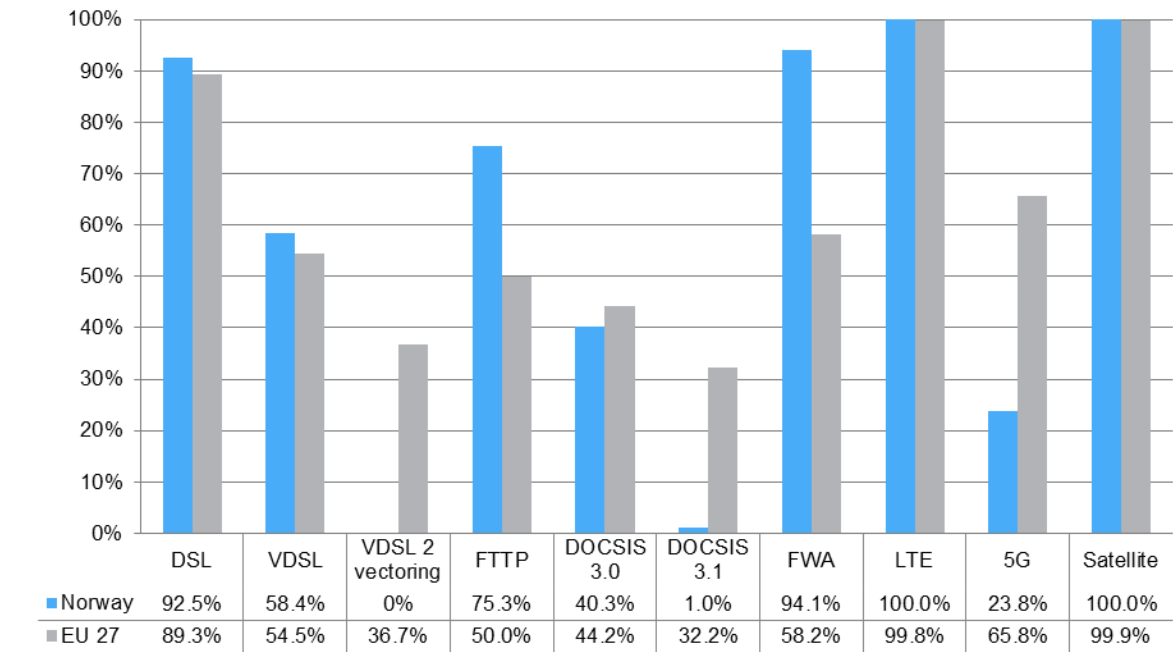


In terms of individual fixed broadband technologies, despite a drop of 2.2 percentage points DSL is still the most prevalent broadband technology, with 92.5% of households covered. VDSL coverage has also gone down (by 0.7 percentage points) to 58.4% coverage. VDSL2 Vectoring had not been deployed in Norway as of mid-2021.

FTTP remains the most widespread NGA technology available to Norwegian households, with 75.3% of homes passed, a 1.6 p.p increase. Following a 4.2 percentage point decrease cable modem DOCSIS 3.0 networks passed 44.5% of Norwegian homes after peaking at 52.5% coverage in 2016. Upgrades of the cable networks to DOCSIS 3.1 commenced during the study period, but only reached 1.0% of households by June 2021.

FWA coverage stood at 94.1% for Norwegian households by June 2021. In terms of mobile broadband coverage, LTE reached universal coverage with 100% of households reached. 5G coverage is now available in most regions, and reached 23.8% coverage by mid-2021.

Norway: Coverage by technology, total, 2021



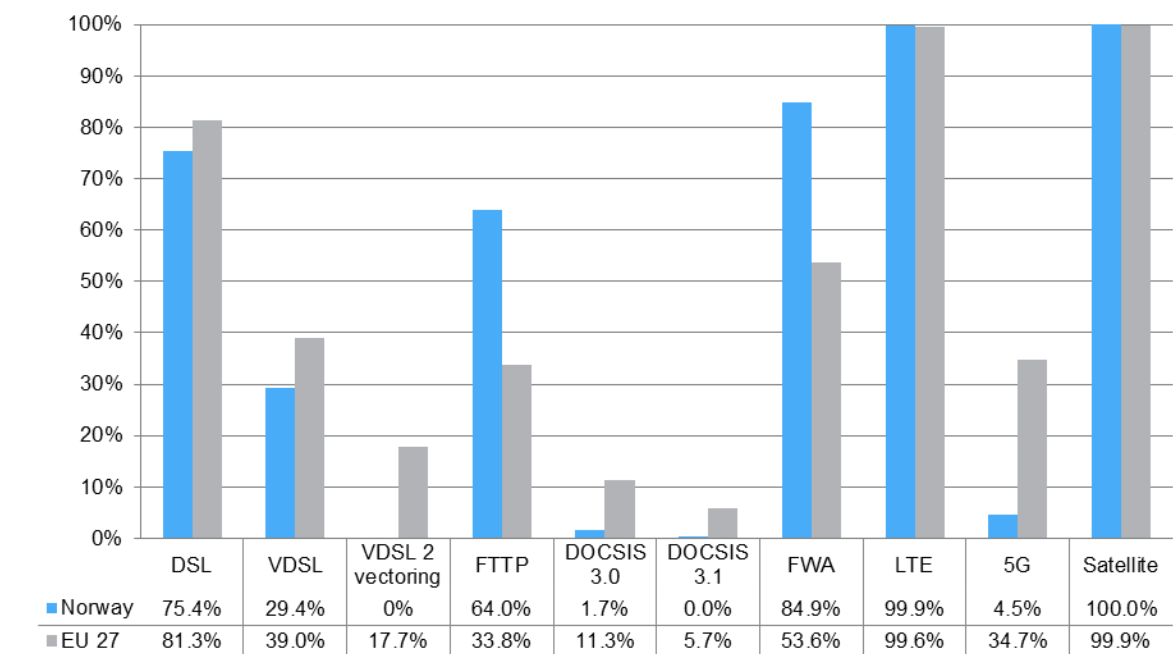
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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Looking at rural regions of Norway, DSL remained the most prevalent fixed broadband technology reaching 75.4% of rural households. VDSL coverage increased by 2.0 percentage points to 29.4%. Both these technologies fell below the EU27 average. In terms of NGA broadband technologies, rural FTTP coverage once again saw a significant coverage increase, going from 56.3% to reach 64.0% of rural homes. Rural FTTP availability was almost double the EU average, which stood at 33.8%. Cable modem DOCSIS 3.0 coverage remained limited, with only 1.7% of rural Norwegian homes passed.

LTE continued to have near universal coverage, at 99.9% of rural households covered. FWA covered 84.9% of rural Norwegian households. Early 5G deployments were focussed on urban areas, and coverage reached only 4.5% of rural households in June 2021.

Norway: Coverage by technology, rural areas, 2021

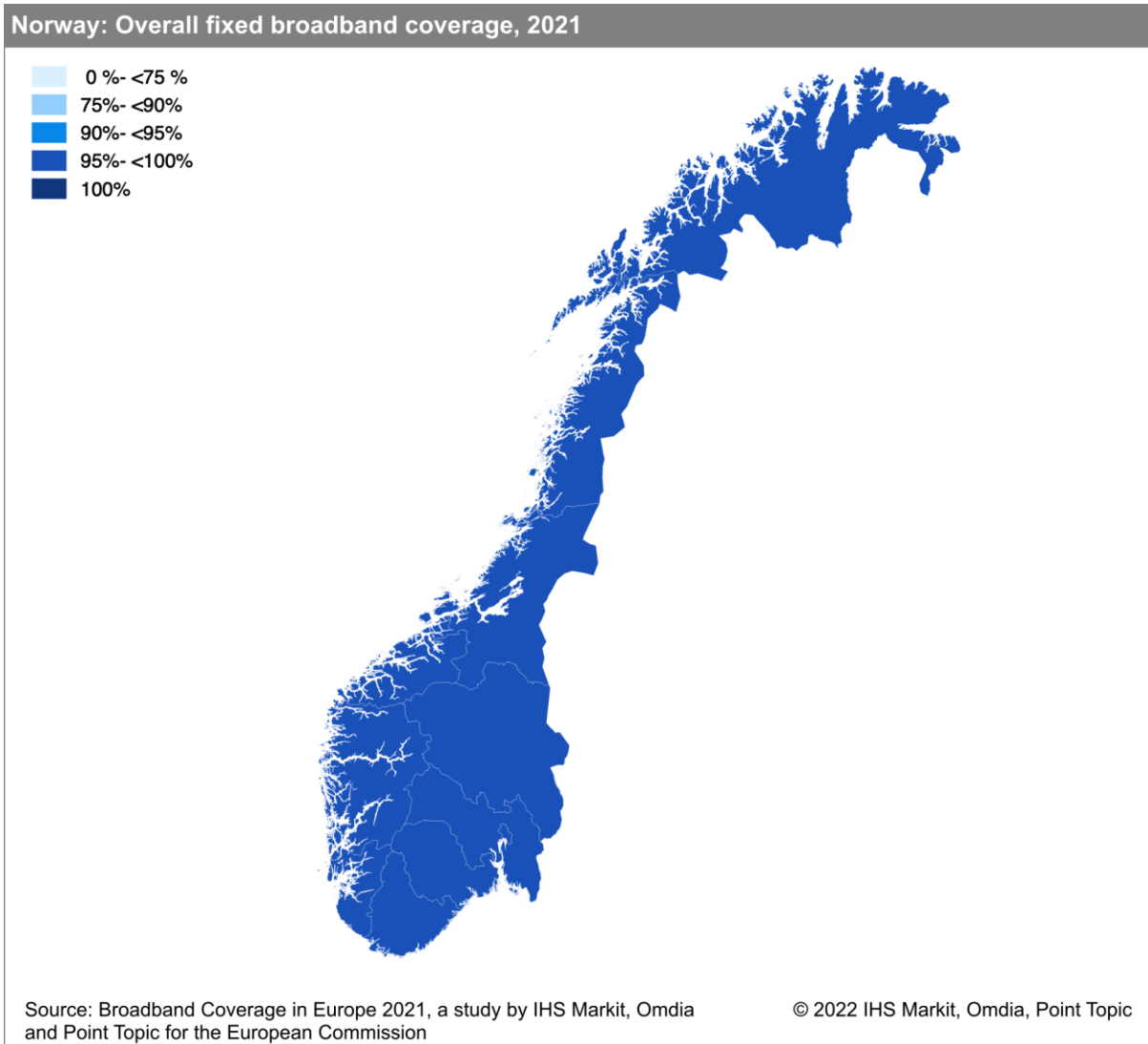


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

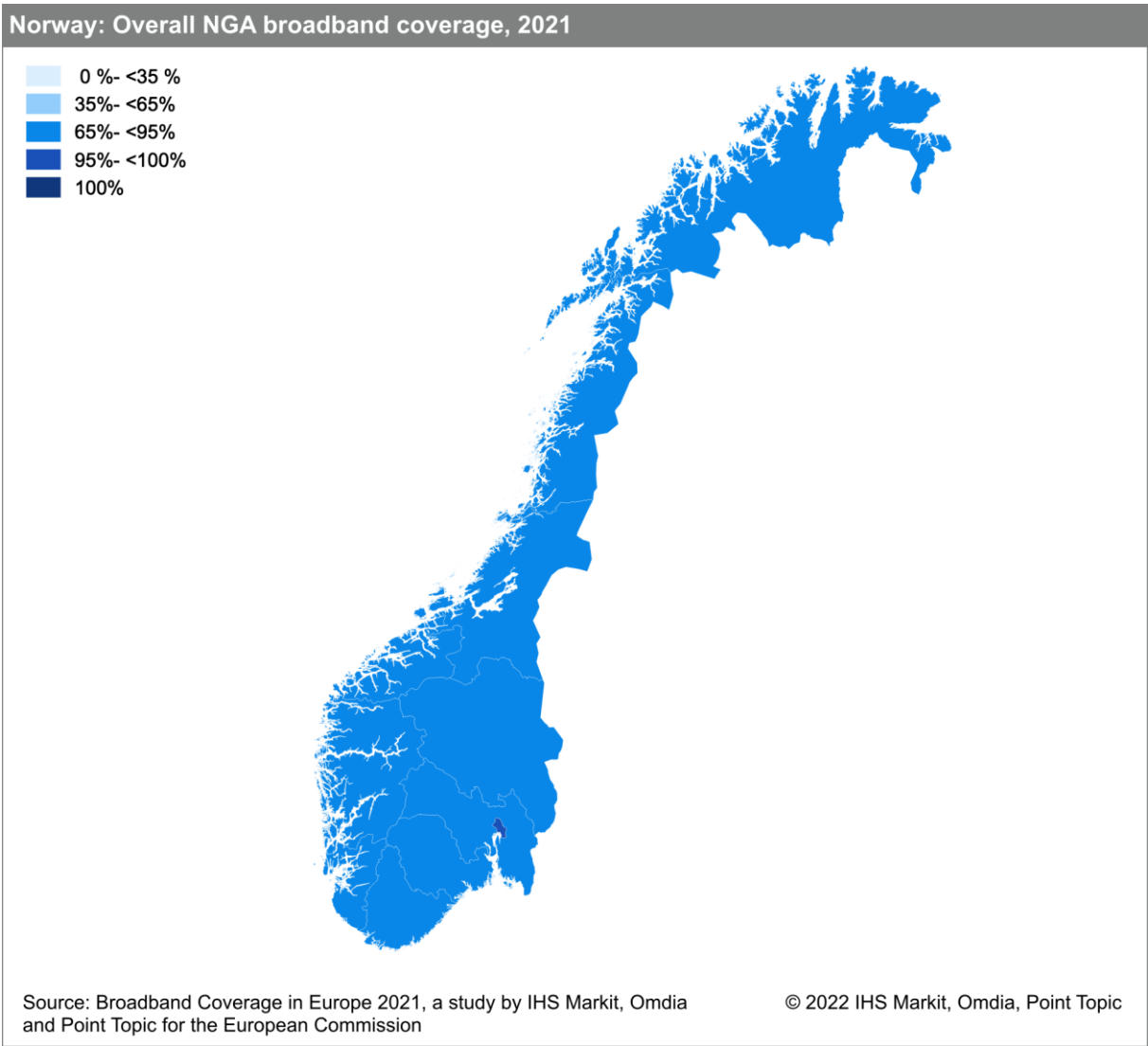
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5.22.2 Regional coverage by broadband technology

Overall fixed broadband coverage in regions of Norway ranged this year from 95.8% in Innlandet, to almost universal (99.7%) coverage in the capital, Oslo. 6 out of 11 regions had coverage above 98.0%.



Variance in terms of regional NGA coverage continued to decrease, with NGA coverage ranging this year between 82.3% in Innlandet and 98.6% in Oslo. Only Innlandet and Nordland fell below 90% coverage by mid-2021.



5.22.3 Data tables for Norway

Statistic	National
Population	5,381,299
Persons per household	2.1
Rural proportion	17.5%

	Norway 2021		Norway 2020		Norway 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	92.5%	75.4%	94.7%	78.3%	94.0%	77.4%	89.3%	81.3%
VDSL	58.4%	29.4%	59.1%	27.3%	59.8%	26.7%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	75.3%	64.0%	73.7%	56.3%	71.4%	44.8%	50.0%	33.8%
Cable modem DOCSIS 3.0	40.3%	1.7%	44.5%	1.5%	45.1%	2.9%	44.2%	11.3%
Cable modem DOCSIS 3.1	1.0%	0.0%	0%	0%	0%	0%	32.2%	5.7%
FWA	94.1%	84.9%	97.9%	93.5%	0%	0%	58.2%	53.6%
LTE	100.0%	99.9%	99.9%	99.9%	99.9%	99.9%	99.8%	99.6%
LTE average operator coverage	98.6%	-	99.9%	-	99.9%	-	97.5%	-
5G	23.8%	4.5%	2.4%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	97.2%	92.7%	97.2%	92.7%	99.9%	99.9%
Overall fixed broadband	98.1%	91.0%	98.9%	96.8%	98.6%	93.8%	97.9%	91.5%
Overall NGA broadband	91.8%	68.7%	92.8%	70.5%	89.3%	59.7%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	75.8%	64.0%	73.7%	56.3%	71.4%	44.8%	70.2%	37.1%
At least 30Mbps	91.7%	-	91.0%	-	89.3%	-	89.8%	-
At least 100Mbps	89.2%	-	88.5%	-	85.7%	-	82.1%	-
At least 1Gbps	86.5%	-	52.9%	-	50.2%	-	62.4%	-
At least 1Gbps upload and download	73.6%	-	-	-	-	-	-	-

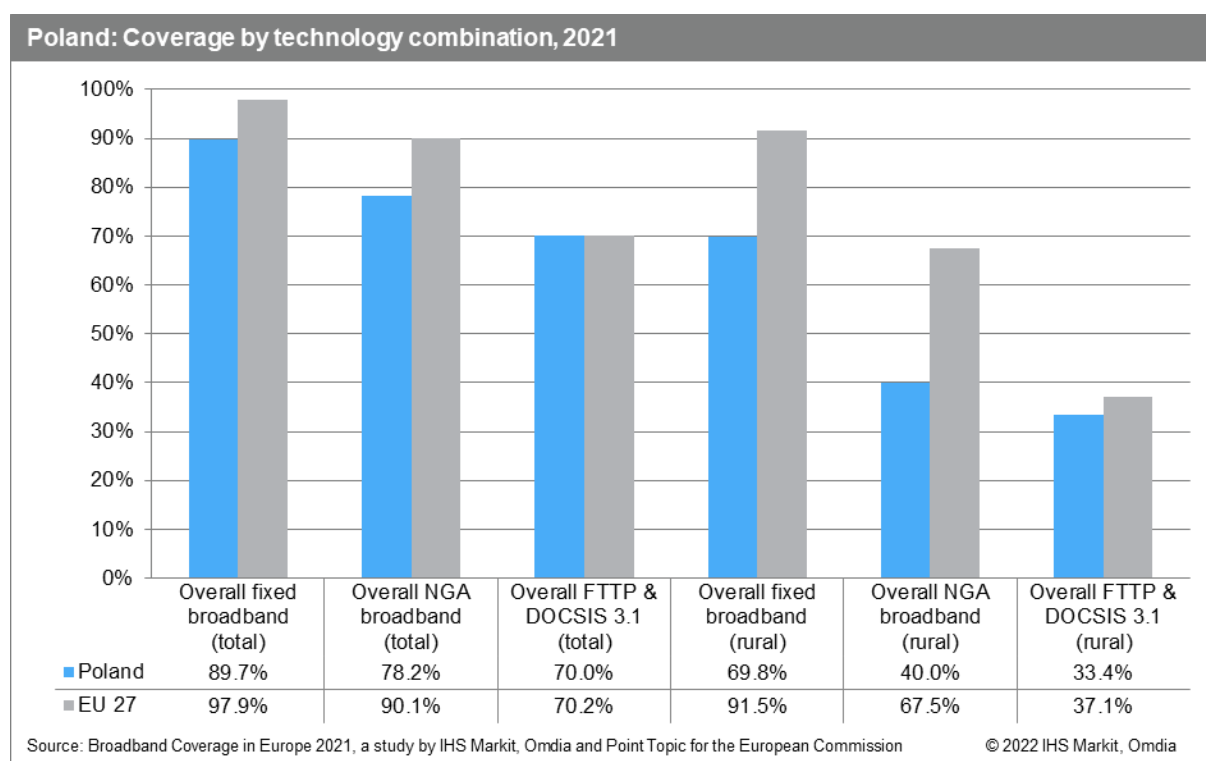
Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.23 Poland

5.23.1 National coverage by broadband technology

89.7% of Polish households had access to at least one broadband technology by the end of June 2021, an improvement of 1.1 percentage points on a year-on-year comparison. In rural regions, coverage improved by 6.0 percentage points over the study period with more than two quarters (69.8%) of rural homes passed by fixed broadband networks. In terms of NGA coverage, Poland passed 78.2% of homes nationally and 40.0% at rural level. Despite positive development in both categories, Poland continued to perform below EU average and ranked among the bottom three study countries across both categories on national and rural level in this year's study.

When looking at networks that are capable of reaching gigabit speeds (FTTP & DOCSIS 3.1), Poland expanded coverage by 5.4 percentage points on a national level and by 8.5 percentage points on a rural level. With a continuous fast rollout of FTTP technology, Poland almost reached the EU average of 70.2%, passing 70.0% of Polish homes with gigabit-capable networks by mid-2021.

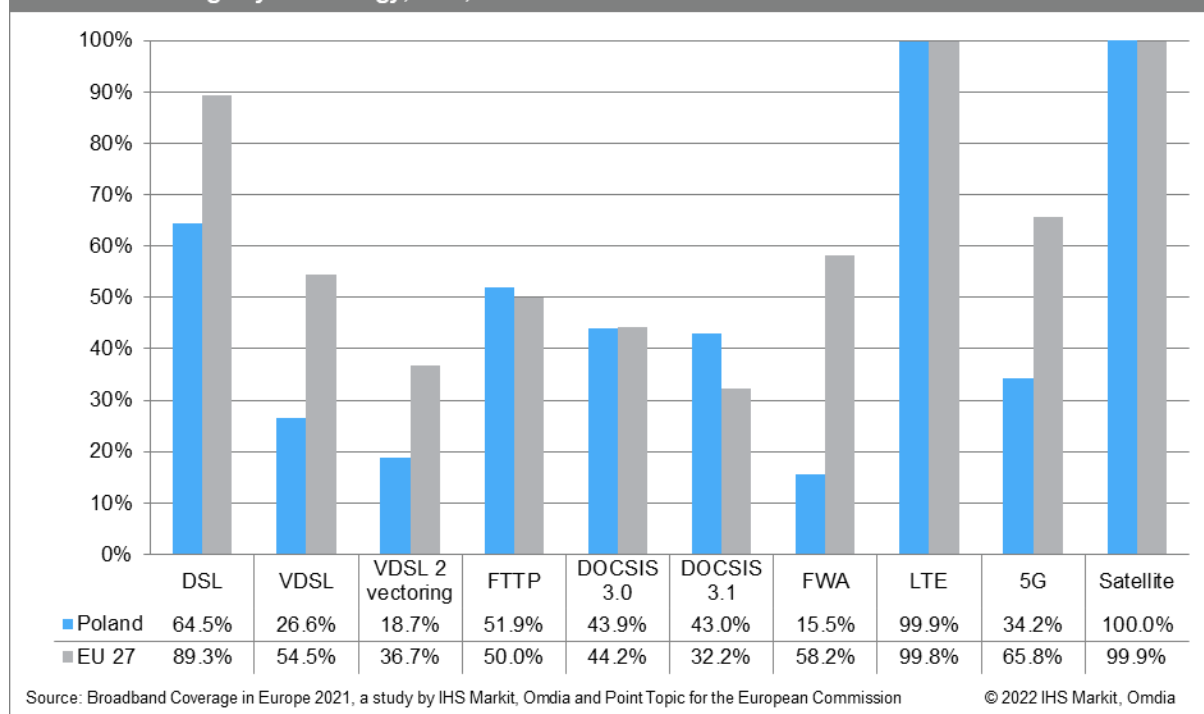


The most widespread technology in Poland remained DSL, with 64.5% of homes passed, but below the EU average of 89.3%. VDSL and VDSL2 Vectoring networks passed 26.6% and 18.7% homes, respectively. As operators continued to drive FTTP deployment, more than half (51.9%) of Polish households were covered by FTTP networks, up from 44.6% in mid-2020. As was the case last year, FTTP remained the strongest growing broadband technology in Poland and exceeded the EU average of 50.0%.

The other broadband technology in which Poland performed better than many study countries was DOCSIS 3.1. Polish cable operators have been one of the early movers in terms of DOCSIS 3.1 upgrades and had upgraded 98% of the cable footprint to this technology by mid-2021. DOCSIS 3.0 and DOCSIS 3.1 networks passed 43.9% and 43.0% homes, respectively.

Availability of LTE services remained unchanged, covering 99.9% of households by mid-2021, and 99.5% when considering the average coverage of all mobile network operators. All four mobile network operators had launched commercial 5G services by the end of June 2021 and coverage was estimated to stand at 34.2%.

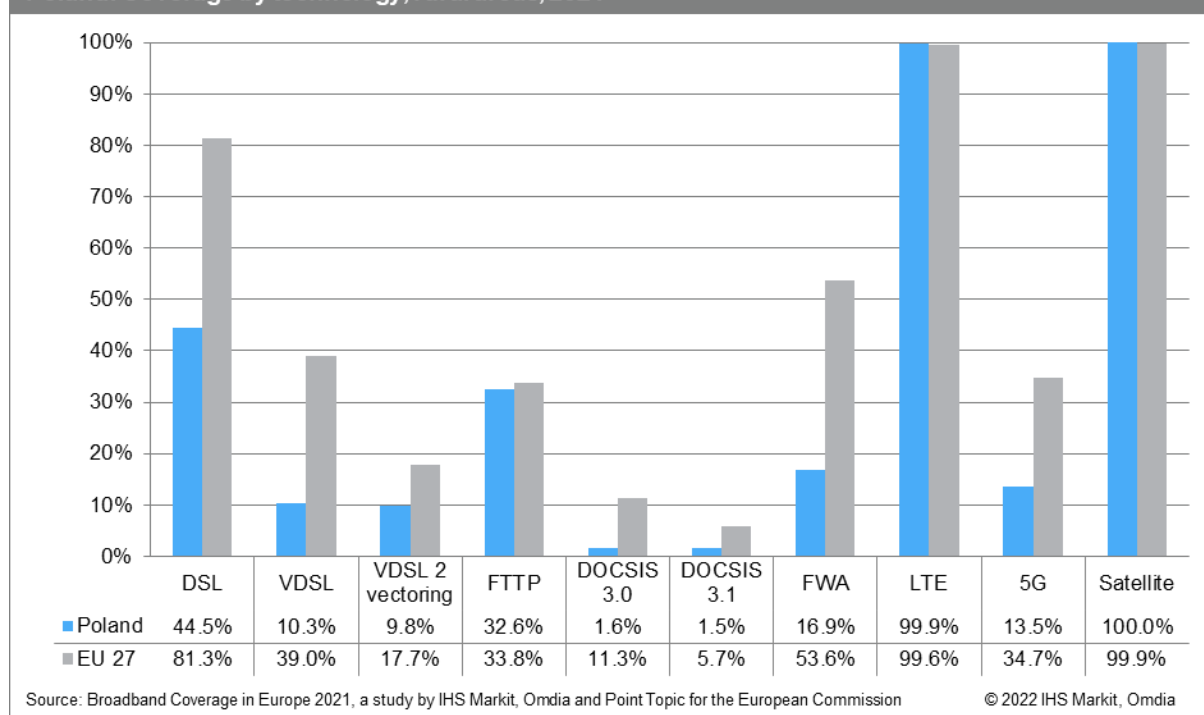
Poland: Coverage by technology, total, 2021



DSL was also the most prevalent fixed broadband technology in rural regions, with 44.5% of households covered by mid-2021. FTTP remained the leading NGA technology in rural Poland, covering one third (32.6%) of rural households, up from 24.1% in mid-2020. Although FTTP was the strongest growing technology in rural regions, it remained slightly below the EU average of 33.8%. DOCSIS 3.0 and DOCSIS 3.1 coverage remained unchanged from last year, being almost absent in rural regions with only 1.6% and 1.5% of homes passed, respectively. FWA coverage expanded by 1.2 percentage points, but as all other rural broadband technologies remained below the EU average.

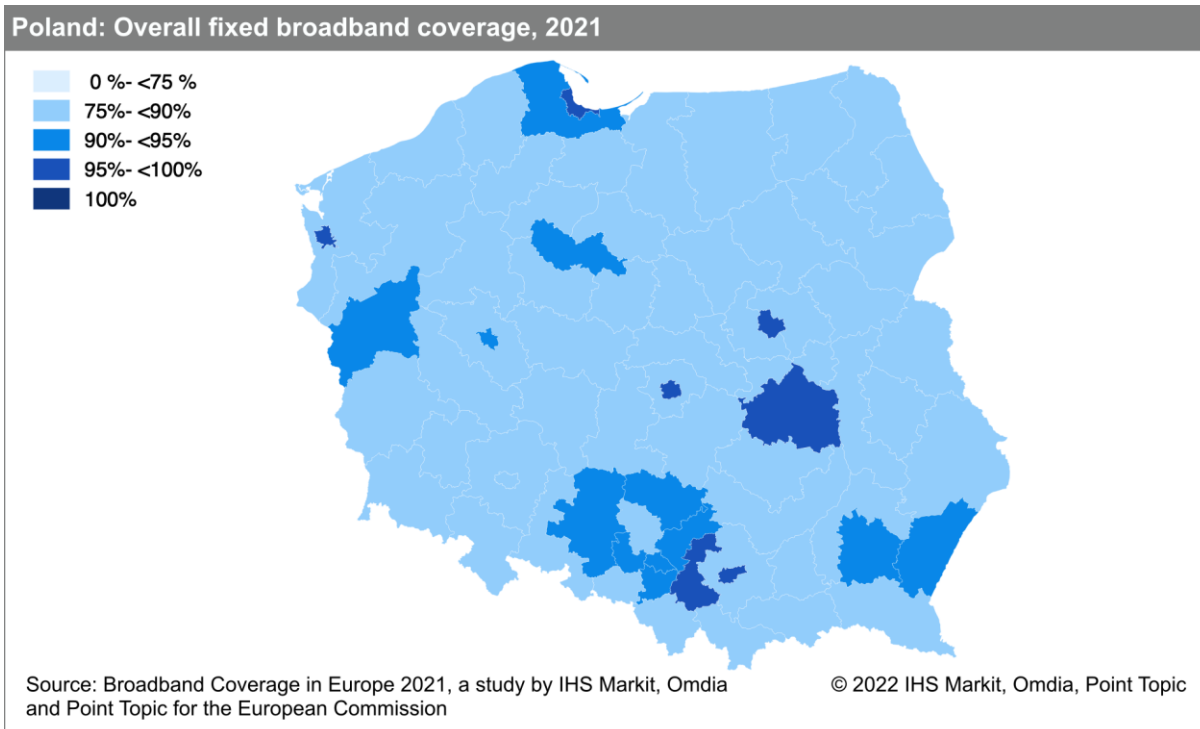
In the mobile broadband category, Poland provided LTE services to 99.9% of rural households, unchanged from last year. 5G deployment in rural areas were launched over the study period and coverage was estimated to stand at 13.5% by the end of June 2021.

Poland: Coverage by technology, rural areas, 2021

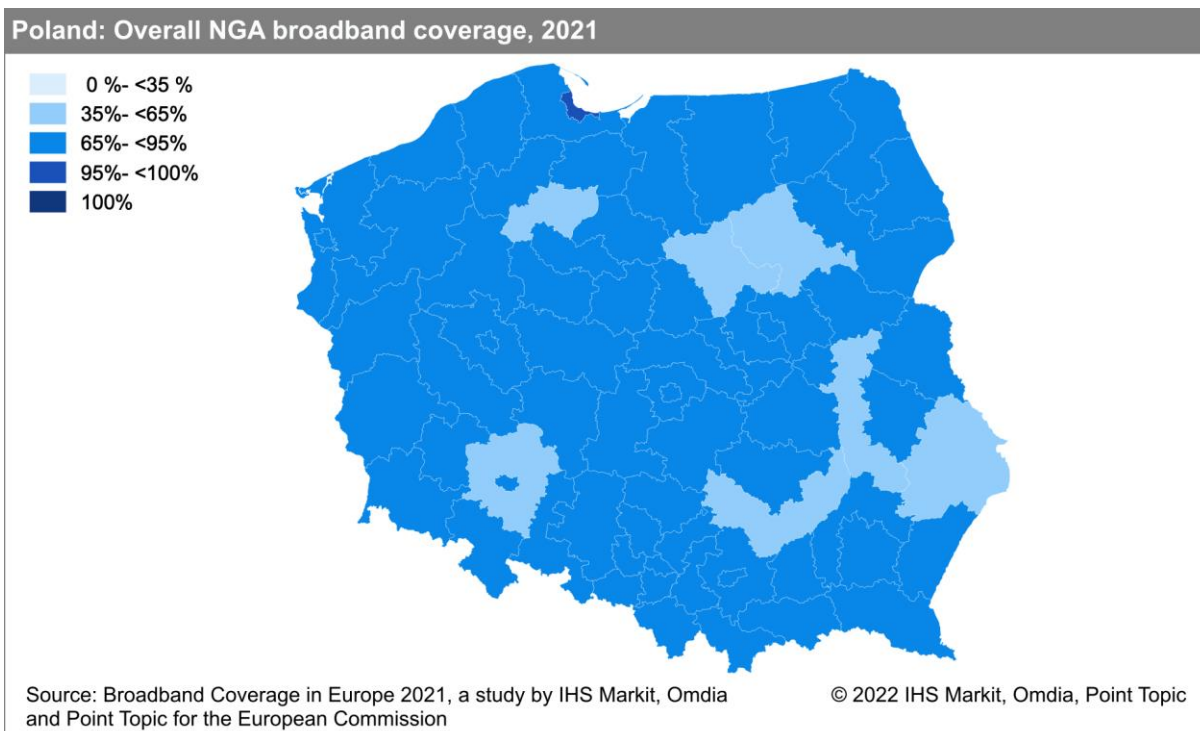


5.23.2 Regional coverage by broadband technology

Fixed broadband coverage continued to vary between Polish regions, ranging from 80.8% in Świecki to 98.0% in Miasto Kraków. This is the first year that no Polish region recorded fixed broadband coverage below 80% while seven regions reached coverage levels above 95% (Oświęcimski, Miasto Kraków, Miasto Szczecin, Trójmiejski, Miasto Łódź, Miasto Warszawa, and Radomski).



The variance of NGA coverage between Polish regions decreased compared to last year, with NGA coverage ranging from 48.5% in Sandomiersko-jędrzejowski to 96.6% in Trójmiejski.



5.23.3 Data tables for Poland

Statistic	National
Population	37,958,138
Persons per household	2.5
Rural proportion	32.5%

	Poland 2021		Poland 2020		Poland 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	64.5%	44.5%	63.4%	43.1%	65.4%	45.7%	89.3%	81.3%
VDSL	26.6%	10.3%	35.4%	17.3%	37.2%	17.7%	54.5%	39.0%
VDSL 2 Vectoring	18.7%	9.8%	27.4%	16.9%	29.3%	17.3%	36.7%	17.7%
FTTP	51.9%	32.6%	44.6%	24.1%	38.3%	17.9%	50.0%	33.8%
Cable modem DOCSIS 3.0	43.9%	1.6%	43.4%	1.5%	44.1%	1.5%	44.2%	11.3%
Cable modem DOCSIS 3.1	43.0%	1.5%	42.4%	1.5%	42.0%	1.4%	32.2%	5.7%
FWA	15.5%	16.9%	14.7%	15.7%	13.4%	14.3%	58.2%	53.6%
LTE	99.9%	99.9%	99.9%	99.9%	99.9%	99.9%	99.8%	99.6%
LTE average operator coverage	99.5%	-	99.3%	-	99.2%	-	97.5%	-
5G	34.2%	13.5%	10.3%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	89.7%	69.8%	88.6%	63.8%	83.5%	62.2%	97.9%	91.5%
Overall NGA broadband	78.2%	40.0%	76.2%	37.1%	75.9%	32.6%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	70.0%	33.4%	64.6%	24.9%	60.3%	18.7%	70.2%	37.1%
At least 30Mbps	77.0%	-	74.9%	-	59.6%	-	89.8%	-
At least 100Mbps	69.2%	-	63.4%	-	51.3%	-	82.1%	-
At least 1Gbps	55.2%	-	46.6%	-	24.4%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

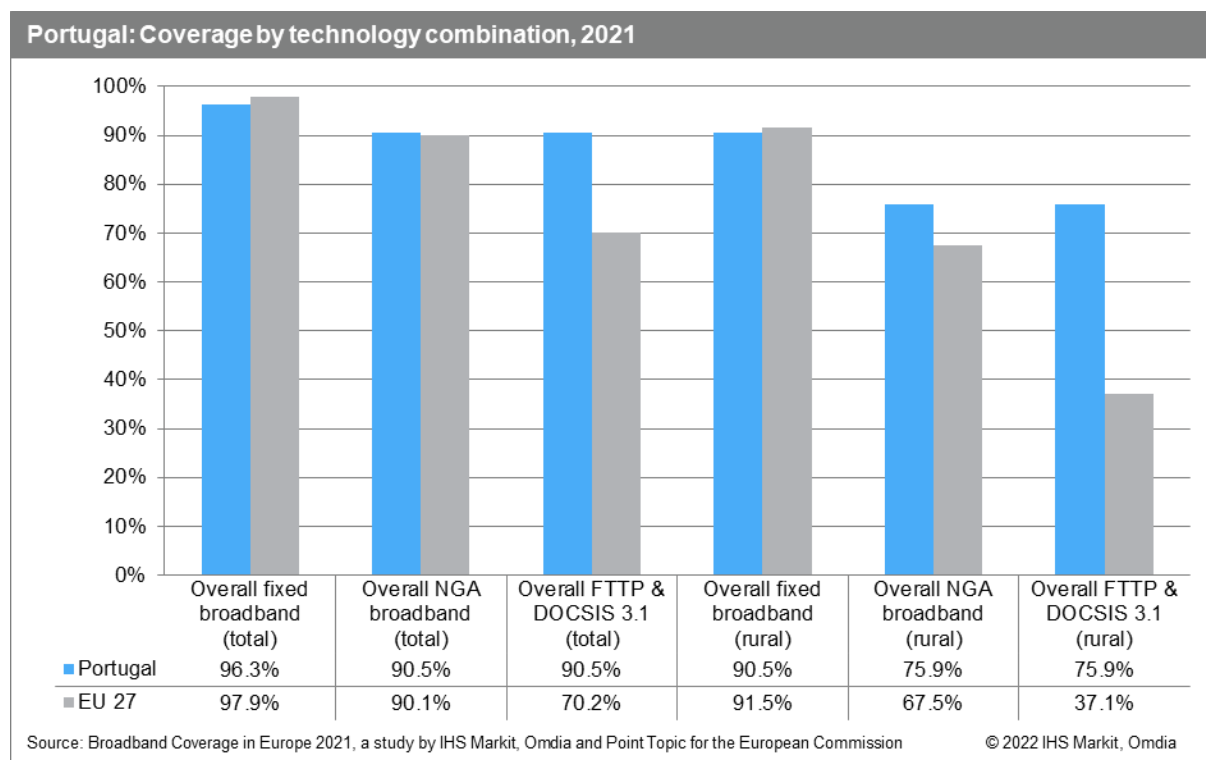
Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.24 Portugal

5.24.1 National coverage by broadband technology

By the end of June 2021, fixed broadband coverage reached 96.3% of all Portuguese households and 90.5% of rural households. NGA availability increased noticeably to reach 90.5% of homes at a national level and 75.9% at a rural level. Portugal came in just below the EU average for fixed broadband at national and rural level but surpassed the EU average for national and rural NGA coverage.

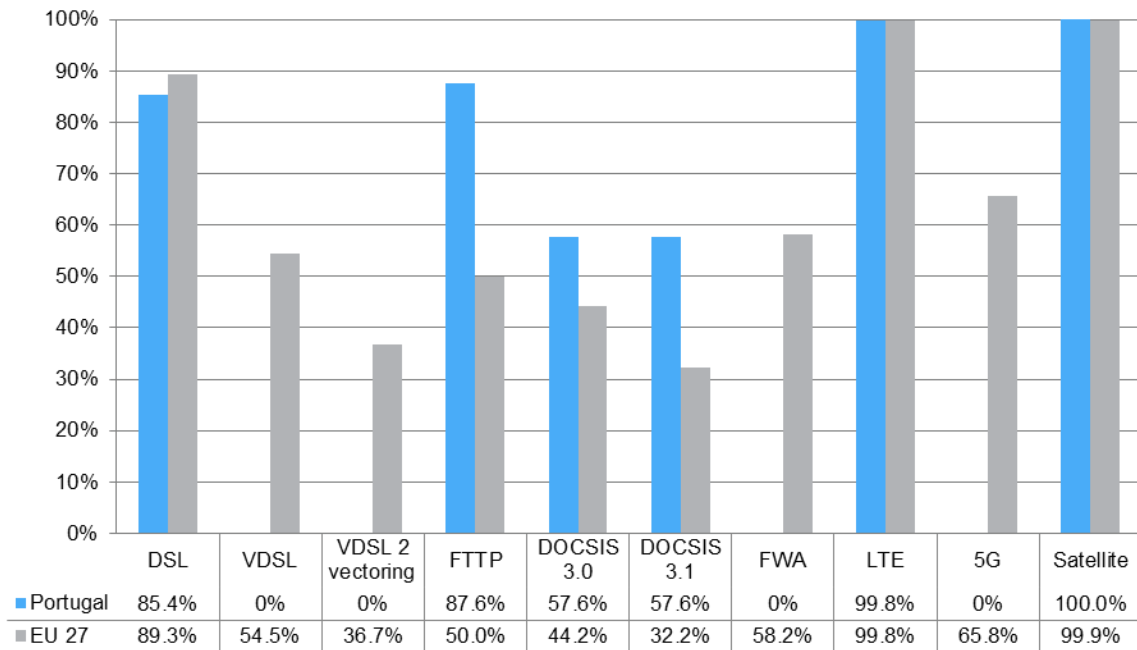
There have been no deployments of VDSL in Portugal, and cable networks have all been upgraded to support the DOCSIS 3.1 standard – thus the coverage of FTTP & DOCSIS 3.1 networks is equal to the NGA coverage. The national figure of 90.5% makes Portugal one of the leaders in this category, well ahead of the EU average (70.2%). At rural level, coverage is more than twice the EU average of 37.1%.



In terms of individual technologies, DSL coverage remained unchanged at 85.4%. As discussed previously, Portuguese operators have opted for FTTP deployment, rather than upgrading DSL to VDSL, leading to the gradual disconnection of DSL networks in favour of fibre optic networks. FTTP coverage is increasing and is now the most prevalent technology, with 87.6% of homes passed, up from 82.3% one year previously. Cable modem DOCSIS 3.1 coverage fell slightly to reach 57.6% of households, the entirety of the network having been upgraded from DOCSIS 3.0 to DOCSIS 3.1.

LTE coverage remains near-universal, reaching 99.8% of Portuguese households. The differences in terms of reach of the individual mobile operators' networks reduced over the study period, and on average 99.4% of people in Portugal had access to LTE services, up from 96.6% in mid-2020. Along with Latvia, Portugal was one of two countries in the study not to have launched commercial 5G services as of June 2021.

Portugal: Coverage by technology, total, 2021

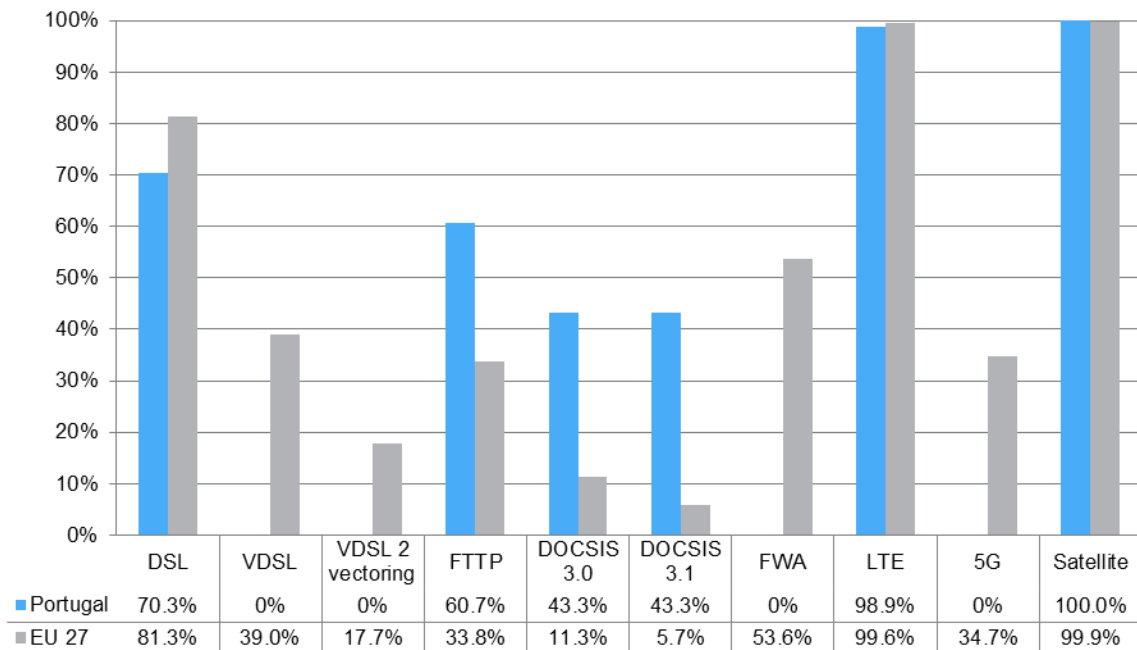


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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In terms of rural areas, DSL is still the most prevalent technology reaching 70.3% of households. In terms of NGA broadband, FTTP coverage improved by 9.4 p.p. over the study period, to reach more than six in ten rural Portuguese households, up from 51.2% in mid-2020. Rural coverage of cable modem DOCSIS 3.1 remained unchanged, at 43.3% of homes. LTE coverage of rural areas remained static at 98.9% of rural households, below the EU average of 99.6%.

Portugal: Coverage by technology, rural areas, 2021

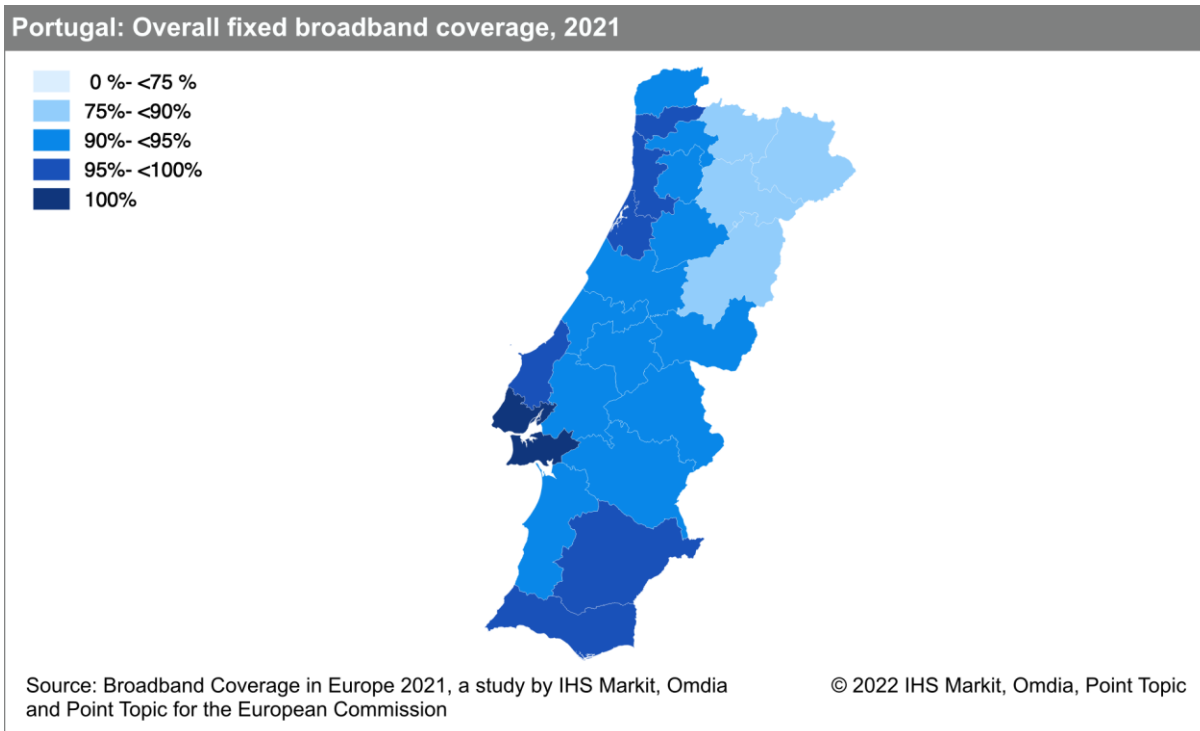


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

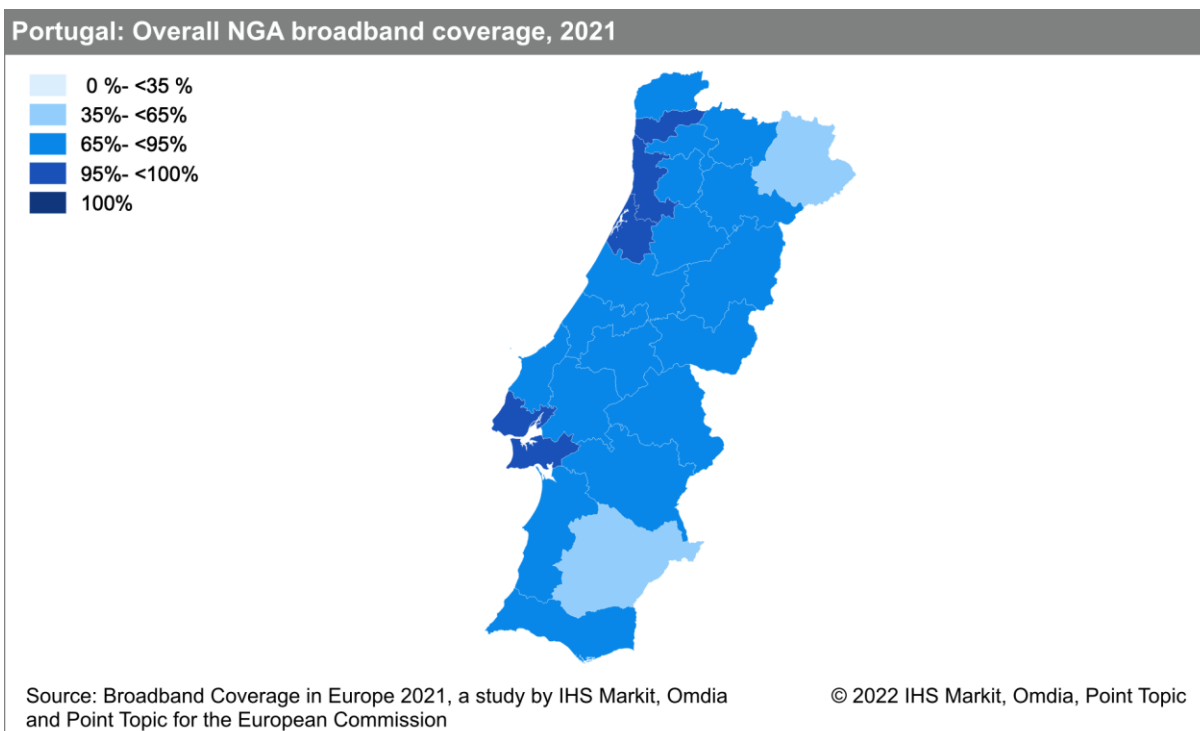
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5.24.2 Regional coverage by broadband technology

In this iteration of the study, fixed broadband coverage levels continued to vary across Portuguese regions, with no region recording coverage below 85%. Coverage ranged from universal (100.0%) in Lisbon, down to 87.6% in Alto Tâmega. Only 4 of 25 Portuguese regions had fixed broadband availability below 90%, all in the rural north-east of the country.



NGA broadband availability varied more significantly than fixed broadband. NGA broadband levels varied between 60.4% in Terras de Trás-os-Montes and 98.4% in Lisbon. Nine regions had NGA coverage above 90%, up from six in mid-2020.



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	96.1%	92.1%
P300	Região Autónoma da Madeira	99.1%	98.2%

5.24.3 Data tables for Portugal

Statistic	National
Population	10,295,909
Persons per household	2.5
Rural proportion	14.6%

	Portugal 2021		Portugal 2020		Portugal 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	85.4%	70.3%	85.4%	71.0%	85.4%	70.8%	89.3%	81.3%
VDSL	0%	0%	0%	0%	0%	0%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	87.6%	60.7%	82.3%	51.2%	76.6%	49.1%	50.0%	33.8%
Cable modem DOCSIS 3.0	57.6%	43.3%	59.4%	43.5%	59.5%	43.5%	44.2%	11.3%
Cable modem DOCSIS 3.1	57.6%	43.3%	59.4%	43.5%	59.5%	43.5%	32.2%	5.7%
FWA	0%	0%	0%	0%	0%	0%	58.2%	53.6%
LTE	99.8%	98.9%	99.9%	99.0%	99.7%	98.2%	99.8%	99.6%
LTE average operator coverage	99.4%	-	96.6%	-	95.9%	-	97.5%	-
5G	0%	0%	0%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	96.3%	90.5%	95.2%	90.0%	94.9%	89.2%	97.9%	91.5%
Overall NGA broadband	90.5%	75.9%	86.6%	70.3%	83.0%	69.4%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	90.5%	75.9%	86.6%	70.3%	83.0%	69.4%	70.2%	37.1%
At least 30Mbps	92.8%	-	89.7%	-	83.0%	-	89.8%	-
At least 100Mbps	92.8%	-	89.5%	-	76.6%	-	82.1%	-
At least 1Gbps	86.0%	-	83.4%	-	70.5%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

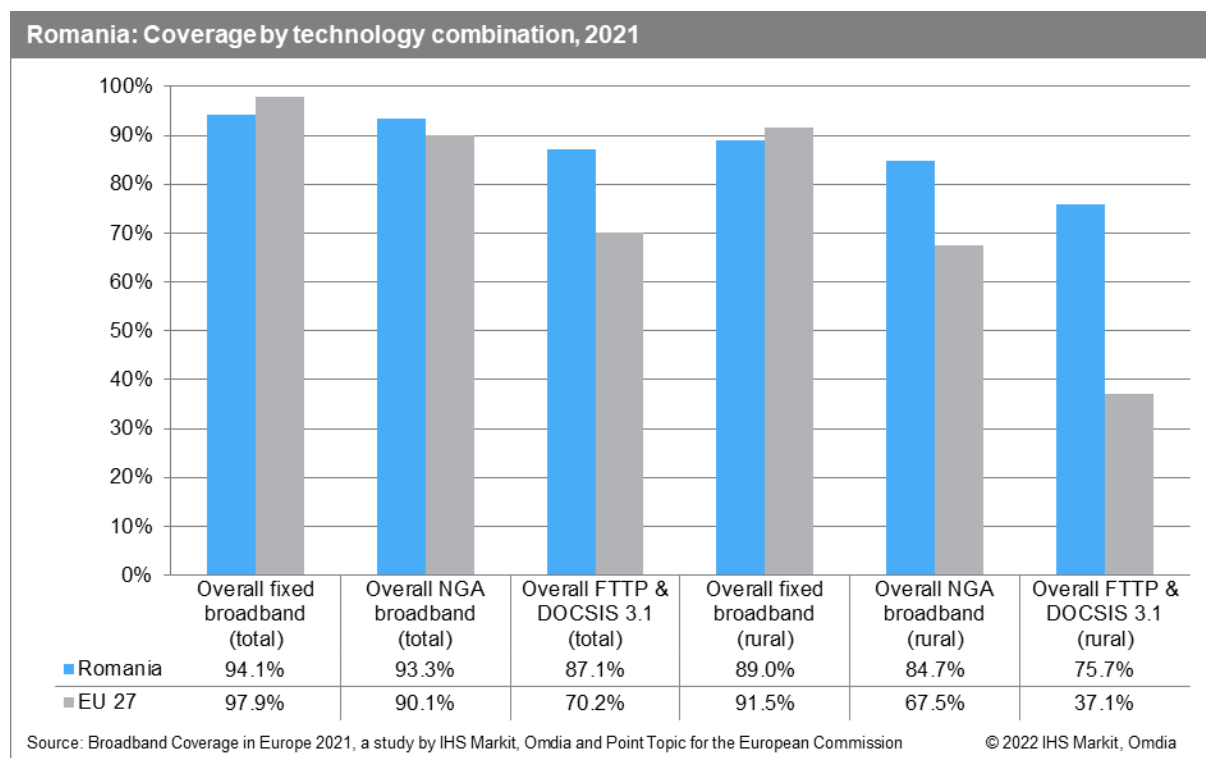
All restatements are highlighted in italics.

5.25 Romania

5.25.1 National coverage by broadband technology

Overall fixed broadband coverage in Romania increased strongly over the course of the study period, to reach 94.1% of households, up from 89.5% in mid-2020 – though it remains below the EU average. But rural fixed broadband coverage is above average and continues to improve, going from 82.9% to 89.0% of rural households. NGA coverage grew by 6.4 percentage points, to reach 93.3% of Romanian households. This is just behind the EU27 average. At a rural level, NGA coverage continued to grow significantly, reaching 84.7% of rural households by the end of June 2021, an increase of 18.1 percentage points on the previous year.

Following several years of strong growth, NGA coverage levels in Romania now exceed the EU average at national and rural level. Coverage of very high capacity networks, i.e. FTTP & DOCSIS 3.1, was again much higher than the EU average at both national and rural level. By mid-2021, 87.1% of all homes and 75.7% of rural homes were passed by networks potentially capable of delivering gigabit speeds.

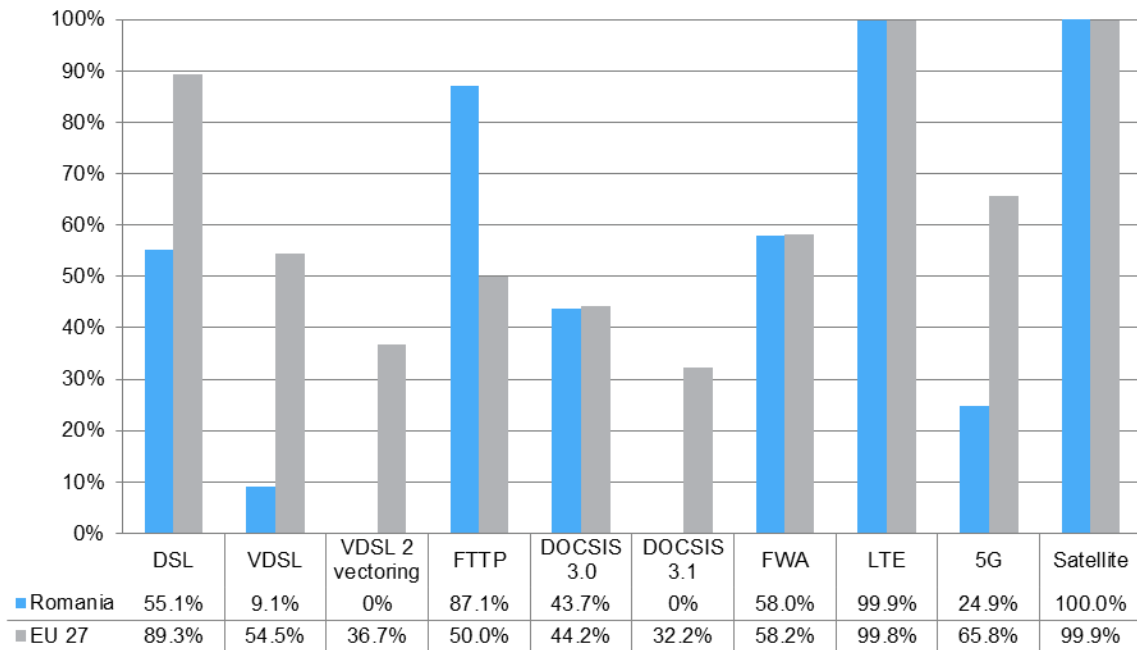


In terms of individual technologies, DSL continued to slowly decrease, with 55.1% of households covered. As is the case in several study countries, this decrease in DSL coverage is due to the incumbent Telekom Romania's focus on investing in fibre deployment and gradual decommissioning of legacy copper networks. FWA in Romania covered 58.0% of houses at the end of June 2021.

Looking at NGA technologies, FTTP coverage continued to increase in this iteration of the study, with 87.1% of households covered, up from 57.9% in mid-2021. Cable modem DOCSIS 3.0 remained the second most prevalent NGA broadband technology in Romania, reaching 43.7% of homes. As of mid-2021, cable operators in Romania have still not launched any DOCSIS 3.1 upgrades to their networks. Lastly, VDSL remained the least common NGA technology in Romania with 9.1% of households covered. VDSL2 Vectoring has not been deployed.

In terms of mobile broadband coverage, LTE coverage remains near-universal, and reached 99.9% of Romanian households, up from 99.7% in mid-2020. The average LTE coverage of all mobile network operators also grew considerably again this year from 93.9% to 97.1%. 5G coverage reached 24.9% by mid-2021.

Romania: Coverage by technology, total, 2021

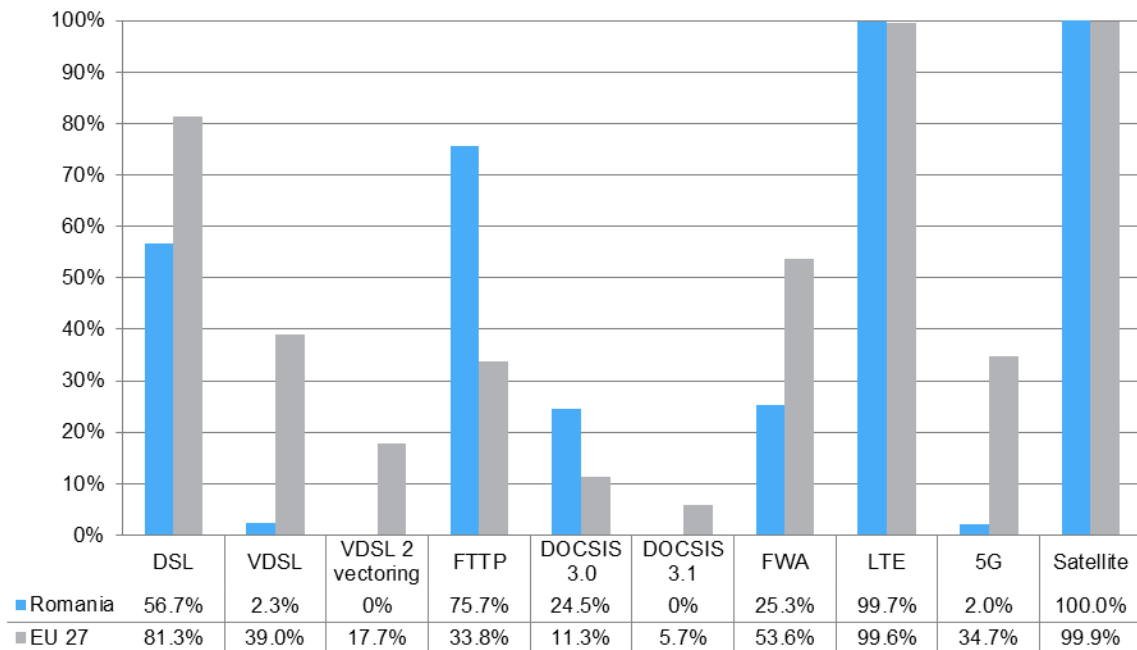


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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Looking at rural regions of Romania, overall fixed broadband coverage recorded a 6.1 p.p. increase to 89.0%. DSL has been surpassed by FTTP as the most prevalent technology in rural Romania. DSL declined to 56.7% coverage, while FTTP reached 75.7% coverage, after a 20.1 percentage point increase over the study period. Rural FTTP coverage in Romania is among the highest in Europe – more than twice as high as the EU average. Looking at the other NGA technology, DOCSIS 3.0 grew slightly in coverage from 2.4% to 24.5%. This puts it slightly behind FWA which had a coverage of 25.3% by June 2021. Rural LTE coverage remained near-universal, while 5G coverage was limited (2.0% of households) as early deployments were focussed on more densely-populated areas.

Romania: Coverage by technology, rural areas, 2021

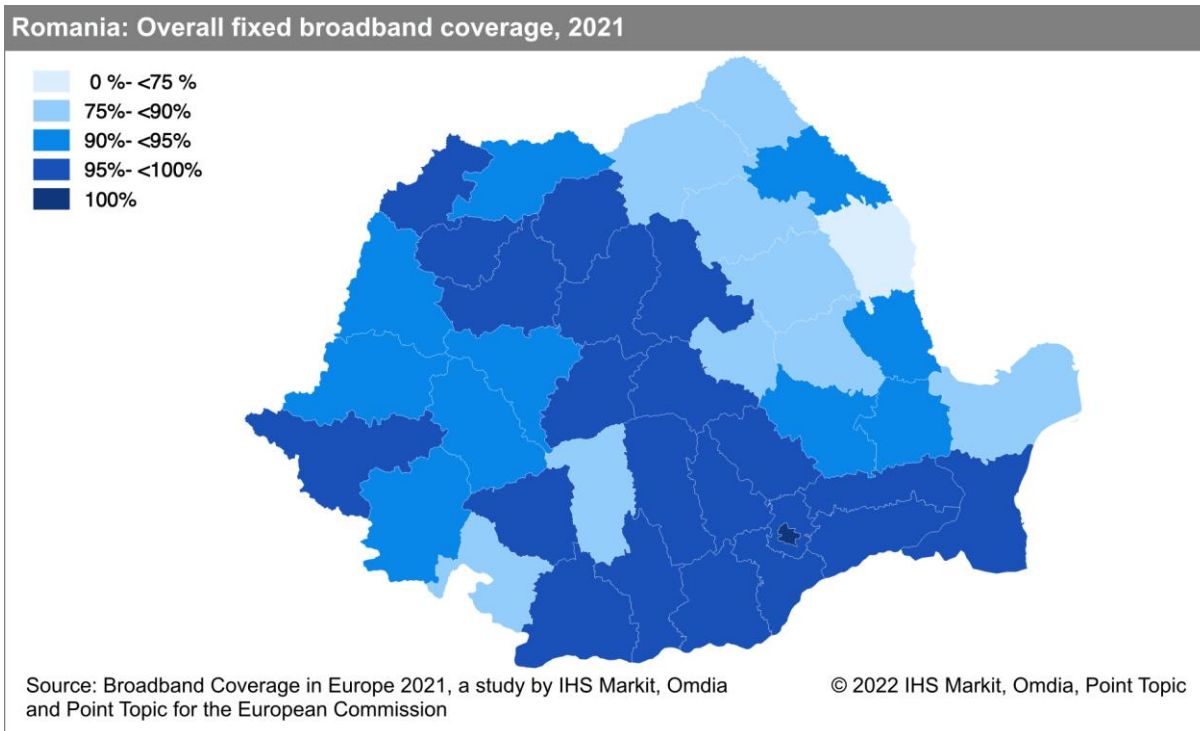


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

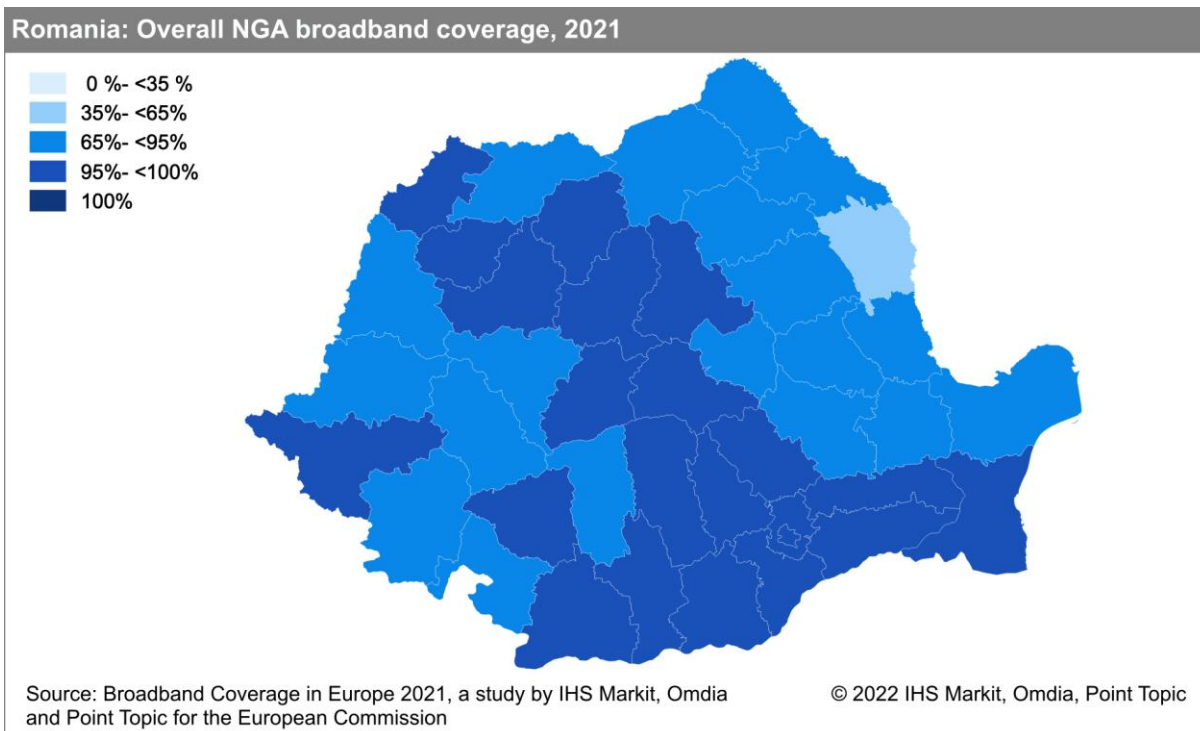
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5.25.2 Regional coverage by broadband technology

Fixed broadband coverage across Romanian regions remained varied, ranging from universal coverage in the capital region of Bucharest, to 72.9% in the region of Vaslui, which is still the only region to record fixed broadband levels under 75%. This year, the total number of regions having recorded coverage levels over 90% rose from eighteen to thirty-two.



NGA availability remained varied across Romanian regions, ranging from 51.5% in Vaslui (which surpassed 50% for the first time this year), to 100.0% in the southern region of Olt.



5.25.3 Data tables for Romania

Statistic	National
Population	19,328,838
Persons per household	2.6
Rural proportion	21.0%

	Romania 2021		Romania 2020		Romania 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	55.1%	56.7%	55.9%	57.9%	56.7%	58.6%	89.3%	81.3%
VDSL	9.1%	2.3%	9.1%	2.2%	9.2%	2.1%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	87.1%	75.7%	75.9%	55.6%	68.1%	39.1%	50.0%	33.8%
Cable modem DOCSIS 3.0	43.7%	24.5%	42.3%	23.4%	42.8%	24.8%	44.2%	11.3%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	32.2%	5.7%
FWA	58.0%	25.3%	56.1%	24.5%	56.1%	24.5%	58.2%	53.6%
LTE	99.9%	99.7%	99.7%	99.0%	99.1%	97.7%	99.8%	99.6%
LTE average operator coverage	97.1%	-	93.9%	-	85.4%	-	97.5%	-
5G	24.9%	2.0%	11.7%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	94.1%	89.0%	89.5%	82.9%	87.4%	79.3%	97.9%	91.5%
Overall NGA broadband	93.3%	84.7%	87.0%	66.5%	82.0%	53.4%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	87.1%	75.7%	75.9%	55.6%	68.1%	39.1%	70.2%	37.1%
At least 30Mbps	93.7%	-	87.0%	-	82.0%	-	89.8%	-
At least 100Mbps	88.6%	-	82.8%	-	77.7%	-	82.1%	-
At least 1Gbps	85.2%	-	72.8%	-	65.9%	-	62.4%	-
At least 1Gbps upload and download	0%	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic. Given the large number of broadband providers in Romania, data reflecting Romania's progress in terms of coverage and availability of different broadband technologies and speeds have been collected from operators accounting for 99% of the market volume (the most important ones).

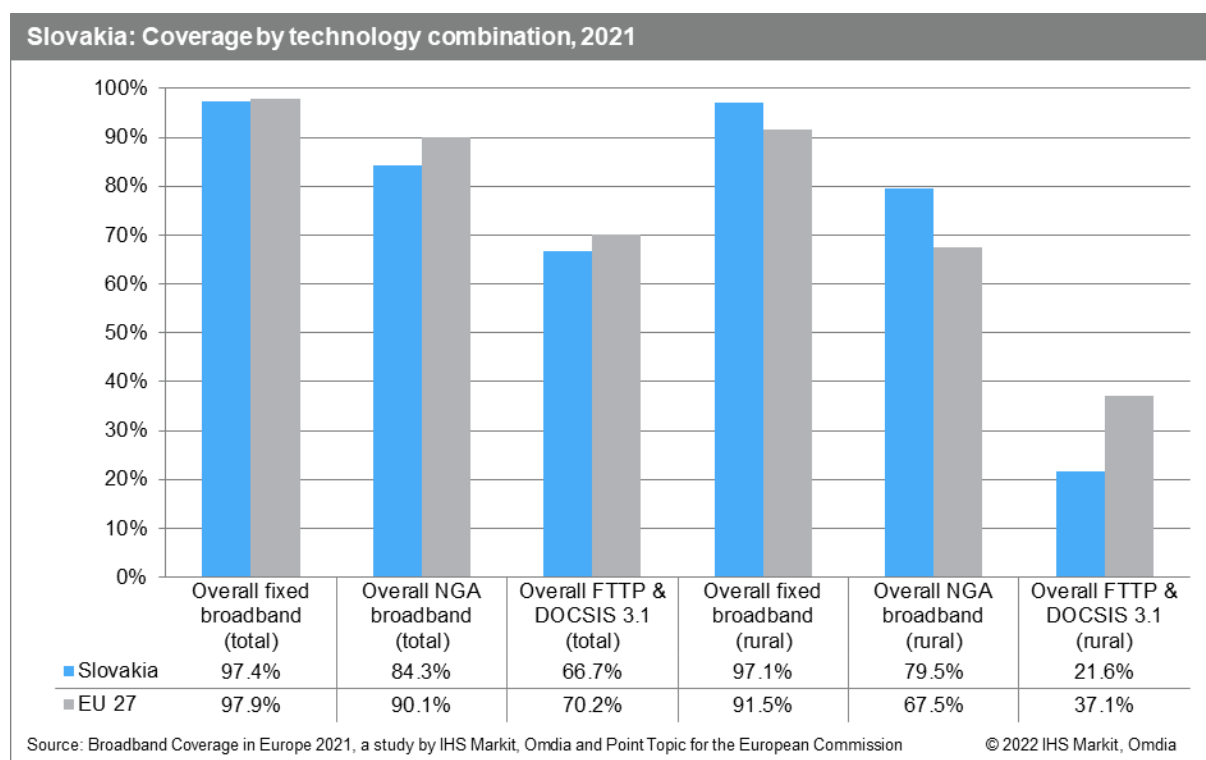
In Romania, speeds are strictly specified based on transport layer protocol payload, in line with paragraph 140 of the [BoR \(20\) 112 BEREC Guidelines on the Implementation of the Open Internet Regulation](#) (page 40). Practically, an internet offer with maximum/advertised "best-effort" speed of 1Gbps is considered as a 940Mbps 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

97.4% of Slovakian homes were passed by at least one fixed broadband network by the end of June 2021, unchanged from last year. The availability of NGA networks grew by 9.1 percentage points on national level and by 23.4 percentage points on rural level over the study period, and covered 84.3% and 79.5% of households, respectively.

Two thirds (66.7%) of Slovakian homes were passed by networks capable of delivering gigabit speed connectivity (FTTP & DOCSIS 3.1). Despite an improvement of 16.5 percentage points on a year-on-year comparison, Slovakia remained below the EU average of 66.7%. In rural regions, 21.6% of households had access to these services.



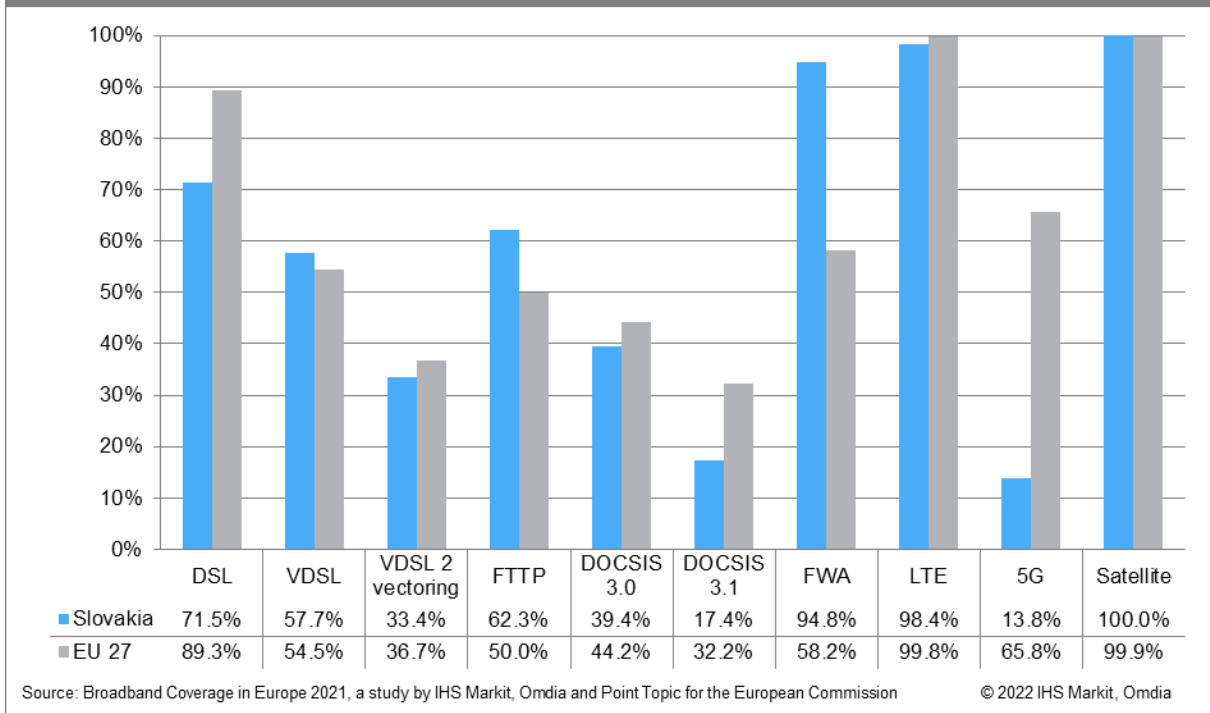
Looking at individual broadband technologies, Slovakia remained one of the study countries with comparatively low DSL coverage (71.5%). Similarly to Czechia, FWA technologies provide broadband connectivity to a large number of households (94.8%), which are typically offered by small and local operators.

Slovak operators continued to upgrade legacy copper networks to VDSL and VDSL2 Vectoring standards, as coverage grew by 18.4 percentage points and 12.4 percentage points, respectively. VDSL2 Vectoring remained slightly below the EU average as the country had only launched VDSL2 Vectoring a few years ago. FTTP services were available to 62.3% of households and recorded strong growth compared to mid-2020 (13.1 percentage points).

More than a third (39.4%) of Slovak households were able to access DOCSIS 3.0 cable networks, while operators continued to upgrade to DOCSIS 3.1 standard. The latter technology grew by 7.7 percentage points and passed 17.4% of homes by mid-2021.

LTE coverage remained unchanged and was accessible to 98.4% of Slovak households by mid-2021. However, difference in terms of reach of the individual mobile operators' networks continued to be present in the country as on average 90.9% of Slovaks were covered by LTE networks. The first Slovak operator launched commercial 5G services in late-2020, and coverage was estimated to stand at 13.8% by mid-2021 – well below the EU level of 65.8%.

Slovakia: Coverage by technology, total, 2021

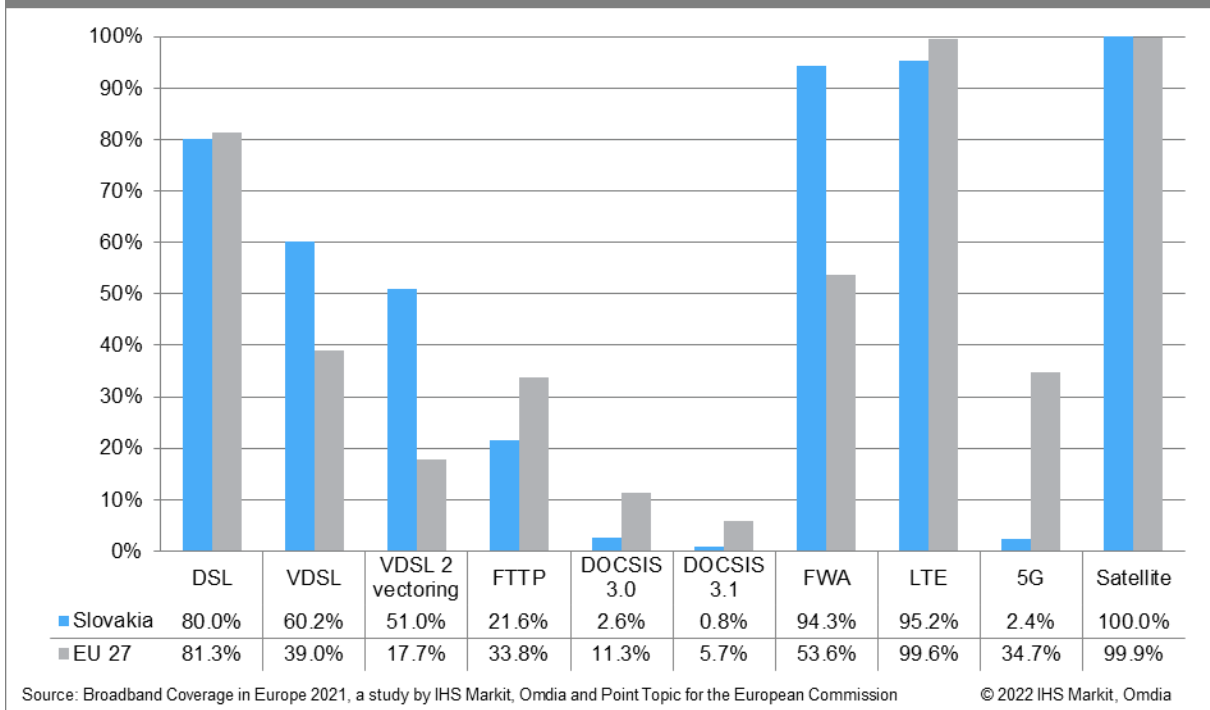


In rural regions, FWA networks have traditionally been widely available and covered 94.3% of rural households at the end of June 2021. DSL was the second most widespread technology, with 80.0% of homes passed, an improvement of 6.0 percentage points compared to mid-2020. 60.2% and 51.0% of rural households were also covered by VDSL and VDSL2 Vectoring technologies, which grew by 13.8 percentage points and 17.0 percentage points, respectively.

FTTP services were available to 21.6% of rural households, while DOCSIS 3.0 networks covered 2.6% of households. Slovakia remained below the EU average in both categories. Unlike last year, DOCSIS 3.1 deployment had started in rural Slovakia and passed 0.8% of rural homes by mid-2021.

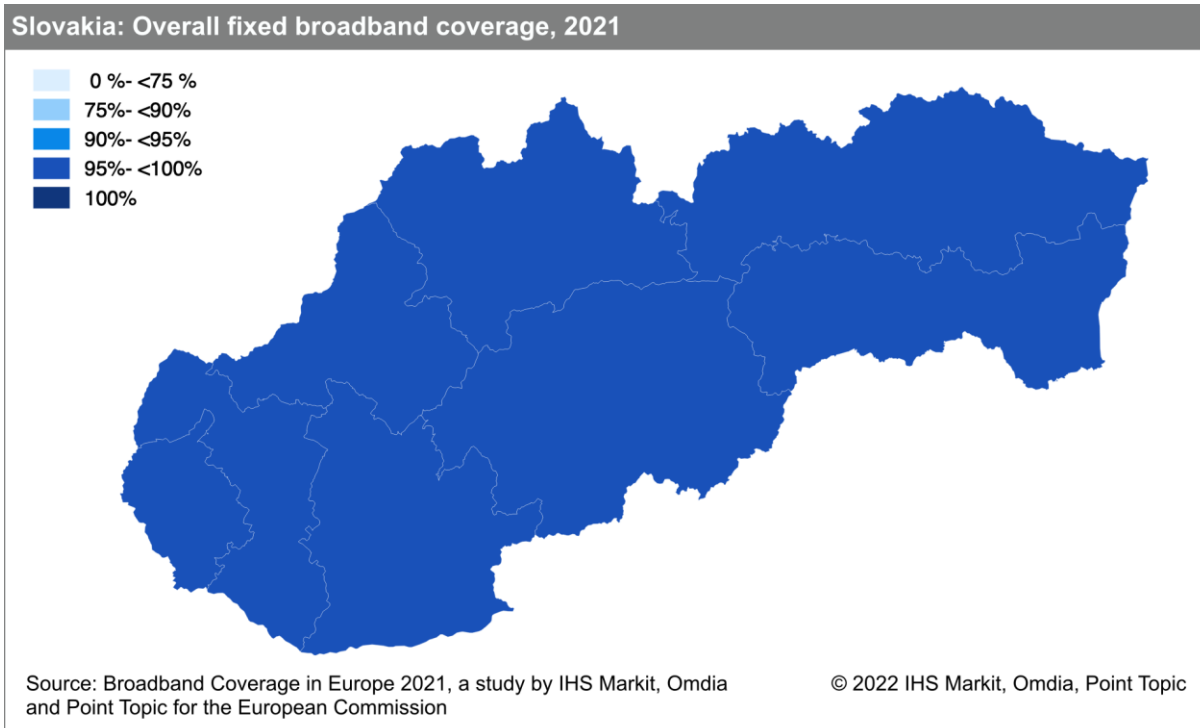
Rural LTE coverage increased by 0.9 percentage points and services were accessible to 95.2% of rural households. 5G services were estimated to cover 2.4% of rural homes as deployments remained focused on urban areas.

Slovakia: Coverage by technology, rural areas, 2021

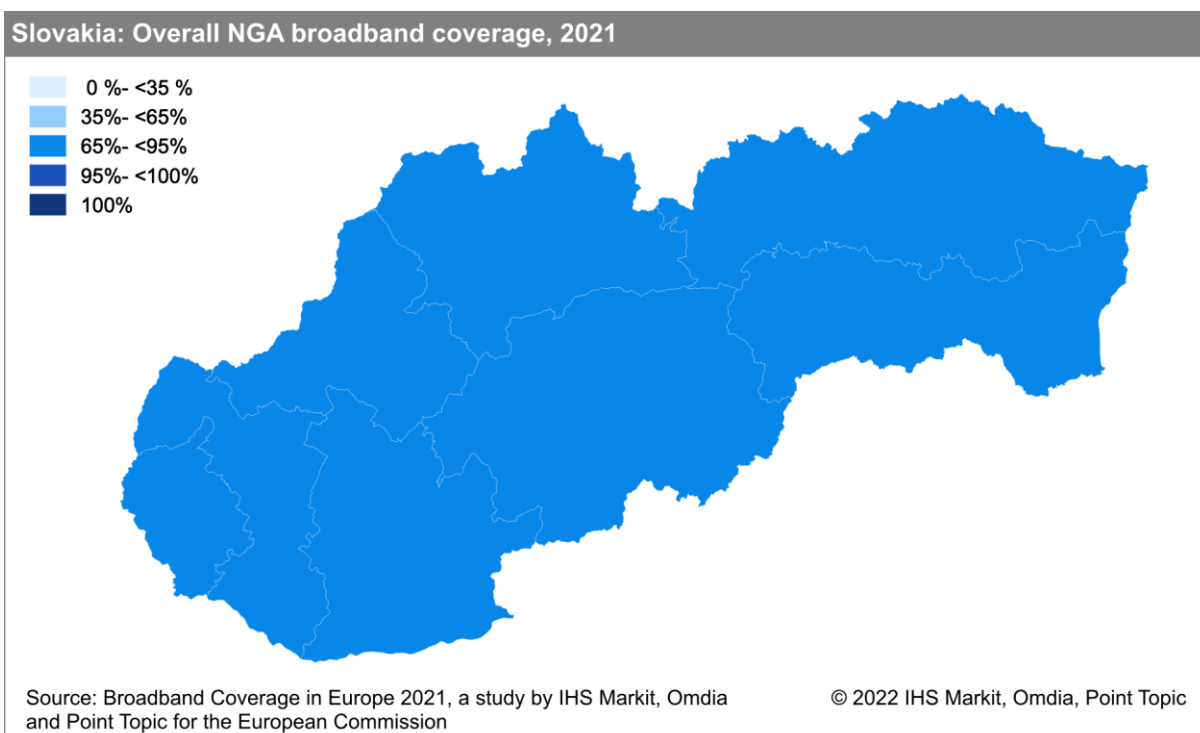


5.26.2 Regional coverage by broadband technology

All regions in Slovakia reported fixed broadband coverage levels higher than 97.0%. Žilinský kraj reported the highest coverage at the end of June 2021 (97.6%).



Slovakia's capital, Bratislava recorded the highest level of NGA coverage (90.3%), while Presovský remained the region with the lowest NGA availability (78.0%).



5.26.3 Data tables for Slovakia

Statistic	National
Population	5,457,873
Persons per household	3.2
Rural proportion	32.6%

	Slovakia 2021		Slovakia 2020		Slovakia 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	71.5%	80.0%	77.0%	74.0%	77.0%	70.0%	89.3%	81.3%
VDSL	57.7%	60.2%	39.3%	46.4%	39.3%	37.0%	54.5%	39.0%
VDSL 2 Vectoring	33.4%	51.0%	21.0%	34.0%	0%	0%	36.7%	17.7%
FTTP	62.3%	21.6%	49.2%	18.0%	44.3%	15.3%	50.0%	33.8%
Cable modem DOCSIS 3.0	39.4%	2.6%	32.9%	1.7%	32.2%	1.2%	44.2%	11.3%
Cable modem DOCSIS 3.1	17.4%	0.8%	9.7%	0%	8.6%	0%	32.2%	5.7%
FWA	94.8%	94.3%	94.8%	94.3%	78.1%	85.8%	58.2%	53.6%
LTE	98.4%	95.2%	98.4%	94.4%	98.4%	94.4%	99.8%	99.6%
LTE average operator coverage	90.9%	-	89.6%	-	88.8%	-	97.5%	-
5G	13.8%	2.4%	0%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.4%	97.1%	97.4%	97.2%	92.9%	93.3%	97.9%	91.5%
Overall NGA broadband	84.3%	79.5%	75.2%	56.1%	73.7%	45.3%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	66.7%	21.6%	50.2%	18.0%	45.5%	15.3%	70.2%	37.1%
At least 30Mbps	82.3%	-	74.1%	-	70.9%	-	89.8%	-
At least 100Mbps	75.4%	-	61.9%	-	57.3%	-	82.1%	-
At least 1Gbps	28.0%	-	21.4%	-	19.2%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

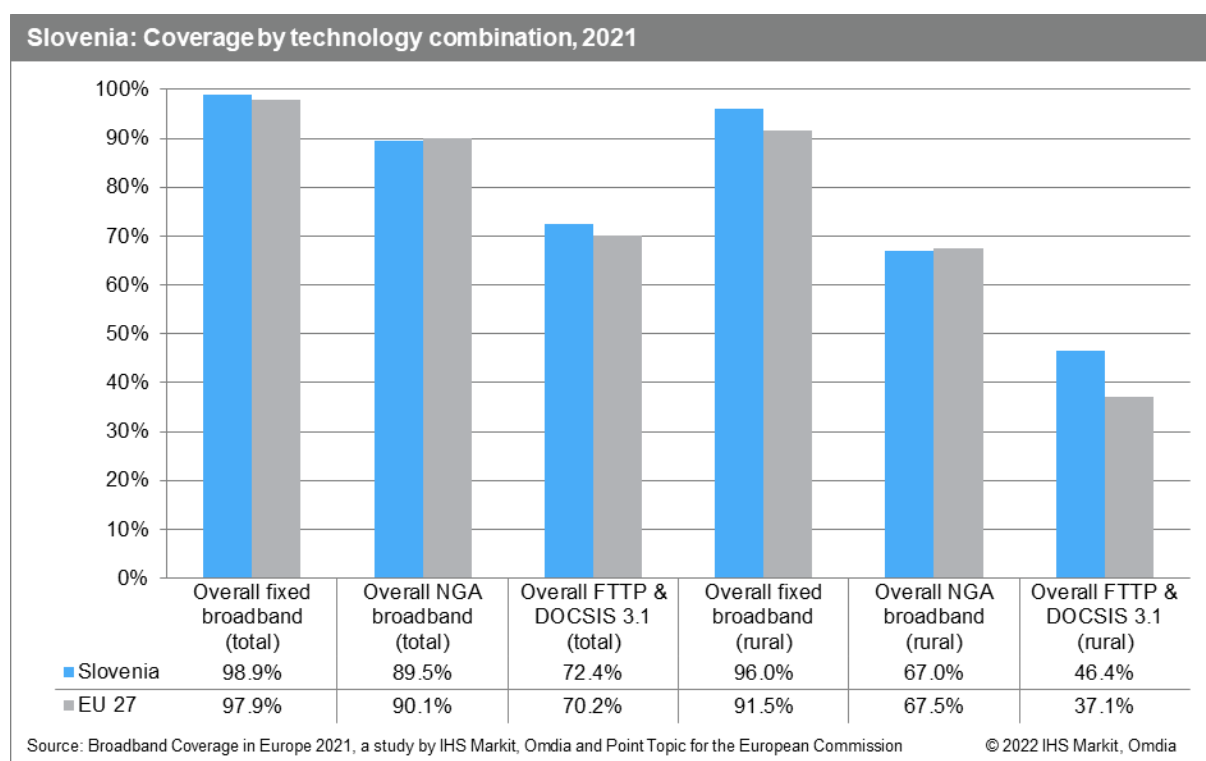
Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.27 Slovenia

5.27.1 National coverage by broadband technology

98.9% of Slovenian households has access to fixed broadband services by the end of June 2021, unchanged from last year. In rural regions, broadband coverage also remained unchanged, covering 96.0% of rural households. NGA coverage increased by 1.9 percentage points on national level and 4.3 percentage points in rural areas. Despite good progress, NGA coverage remained slightly below the EU average.

Slovenia made good progress in terms of 1Gbps-capable networks which were accessible to 72.4% of households by mid-2021, up by 6.9 percentage points on a year-on-year comparison. In rural Slovenia, coverage improved by 7.4 percentage points with almost half (46.4%) of rural homes passed by gigabit networks. The combined FTTP & DOCSIS 3.1 category was limited to FTTP, as there was no record of DOCSIS 3.1 deployments by the end of June 2021. Given the widespread availability of FTTP networks, Slovenia still outperformed the EU average in this metric.

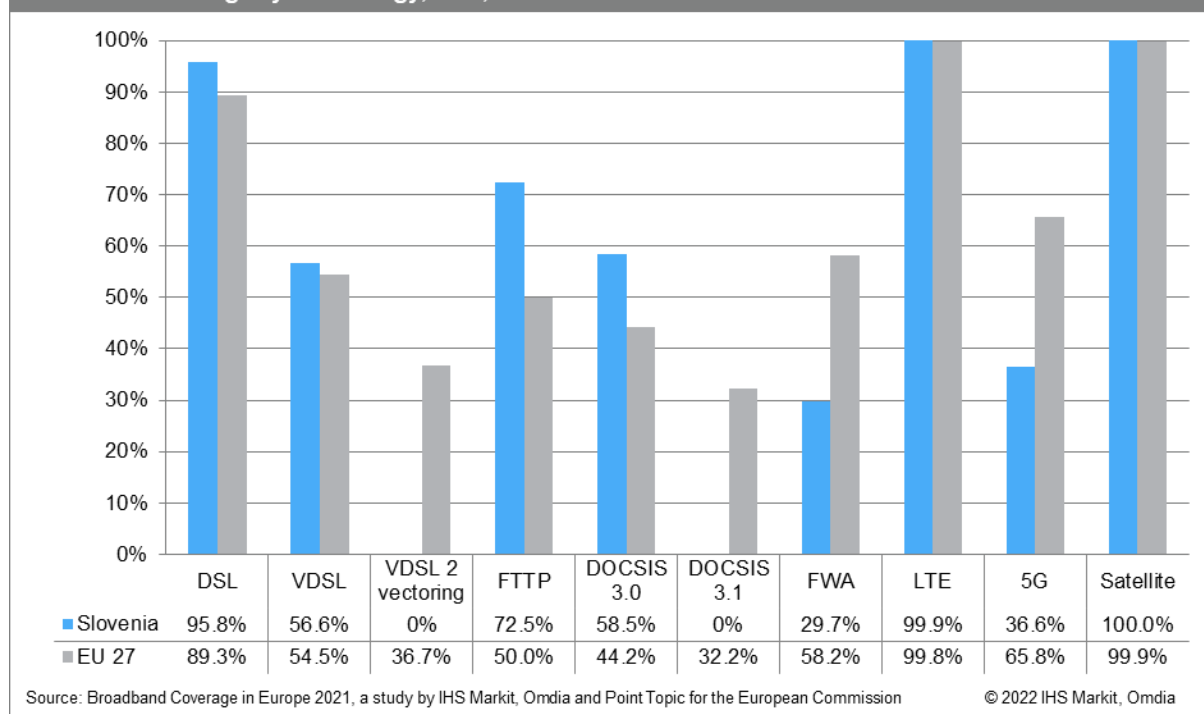


DSL remained the most prevalent individual technology in Slovenia, covering 95.8% of households. VDSL networks were available to 56.6% of households, while no upgrades to VDSL2 Vectoring had taken place by mid-2021.

In the NGA category, Slovenia recorded strong growth in the FTTP coverage (6.9 percentage points), which was available to 72.5% of households by the end of June 2021 and outperformed the EU average of 50.0%. Cable modem DOCSIS 3.0 passed 58.5% of households, while DOCSIS 3.1 technology had not been deployed yet.

LTE coverage remained unchanged, providing almost universal coverage with 99.9% of Slovenian homes passed. When considering the average coverage of LTE networks of all mobile network operators, 99.6% of Slovenes had access to LTE services. While 5G services were absent in the previous edition of this study, more than a third (36.6%) of Slovenian households were covered by 5G networks by mid-2021. Slovenian operators launched 5G services in late-2020 and early-2021.

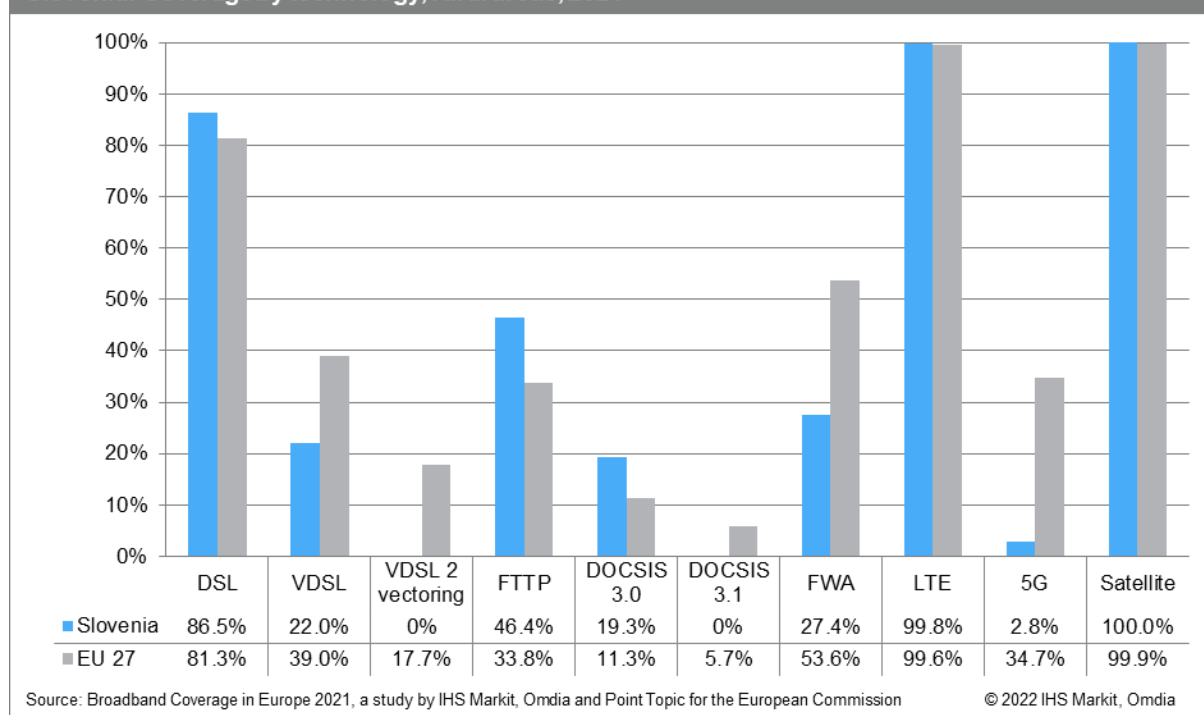
Slovenia: Coverage by technology, total, 2021



In rural Slovenia, DSL networks were available to 86.5% of households, while 22.0% were covered by VDSL networks. In terms of NGA broadband technologies, FTTP remained the leading technology, covering 46.4% of rural households which was well above the EU average of 33.8%. FTTP was also the strongest growing rural technology in this year's study (7.4 percentage points).

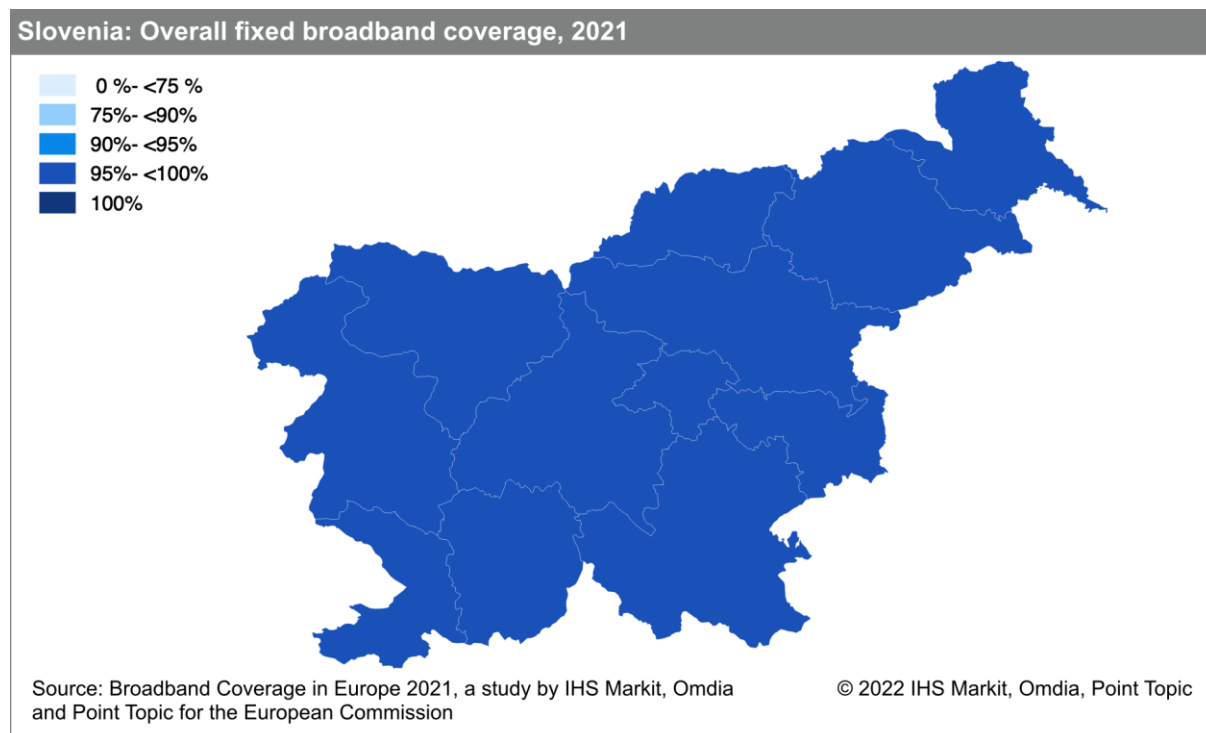
Rural LTE services provided coverage for 99.8% of households which surpassed the EU average, as seen in previous years. 5G rollouts remained largely focused on urban areas as only 2.8% of rural households were covered by mid-2021.

Slovenia: Coverage by technology, rural areas, 2021

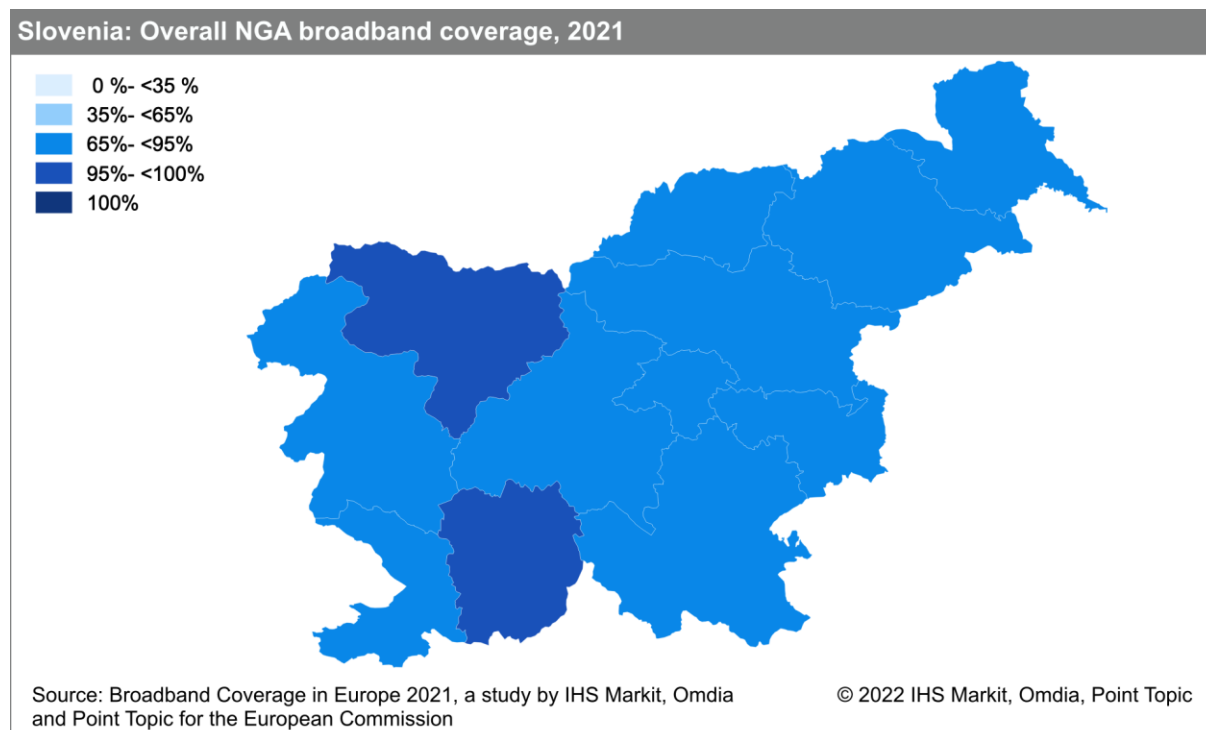


5.27.2 Regional coverage by broadband technology

All Slovenian regions recorded fixed broadband coverage levels above 95%, ranging from 96.8% in Posavska to 99.6% in Primorsko-notranjska.



NGA coverage continued to vary more than total fixed broadband coverage: the lowest NGA coverage (80.8%) was recorded in the Savinjska region while Primorsko-notranjska recorded the highest NGA coverage (97.8)%. Gorenjska was the only other region that passed the 95% threshold in Slovenia.



5.27.3 Data tables for Slovenia

Statistic	National
Population	2,046,668
Persons per household	3.0
Rural proportion	22.6%

	Slovenia 2021		Slovenia 2020		Slovenia 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	95.8%	86.5%	95.9%	86.8%	95.9%	86.9%	89.3%	81.3%
VDSL	56.6%	22.0%	56.2%	21.9%	56.2%	22.1%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	72.5%	46.4%	65.6%	39.0%	63.8%	38.0%	50.0%	33.8%
Cable modem DOCSIS 3.0	58.5%	19.3%	58.7%	19.8%	57.6%	19.7%	44.2%	11.3%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	32.2%	5.7%
FWA	29.7%	27.4%	36.2%	33.3%	33.7%	28.9%	58.2%	53.6%
LTE	99.9%	99.8%	99.9%	99.7%	99.7%	98.8%	99.8%	99.6%
LTE average operator coverage	99.6%	-	99.5%	-	98.8%	-	97.5%	-
5G	36.6%	2.8%	0%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	98.9%	96.0%	98.9%	96.0%	98.7%	95.5%	97.9%	91.5%
Overall NGA broadband	89.5%	67.0%	87.6%	62.7%	86.9%	62.2%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	72.4%	46.4%	65.6%	39.0%	63.8%	38.0%	70.2%	37.1%
At least 30Mbps	89.5%	-	87.6%	-	86.9%	-	89.8%	-
At least 100Mbps	85.5%	-	82.1%	-	80.9%	-	82.1%	-
At least 1Gbps	0.9%	-	0.8%	-	0.5%	-	62.4%	-
At least 1Gbps upload and download	0.9%	-	-	-	-	-	-	-

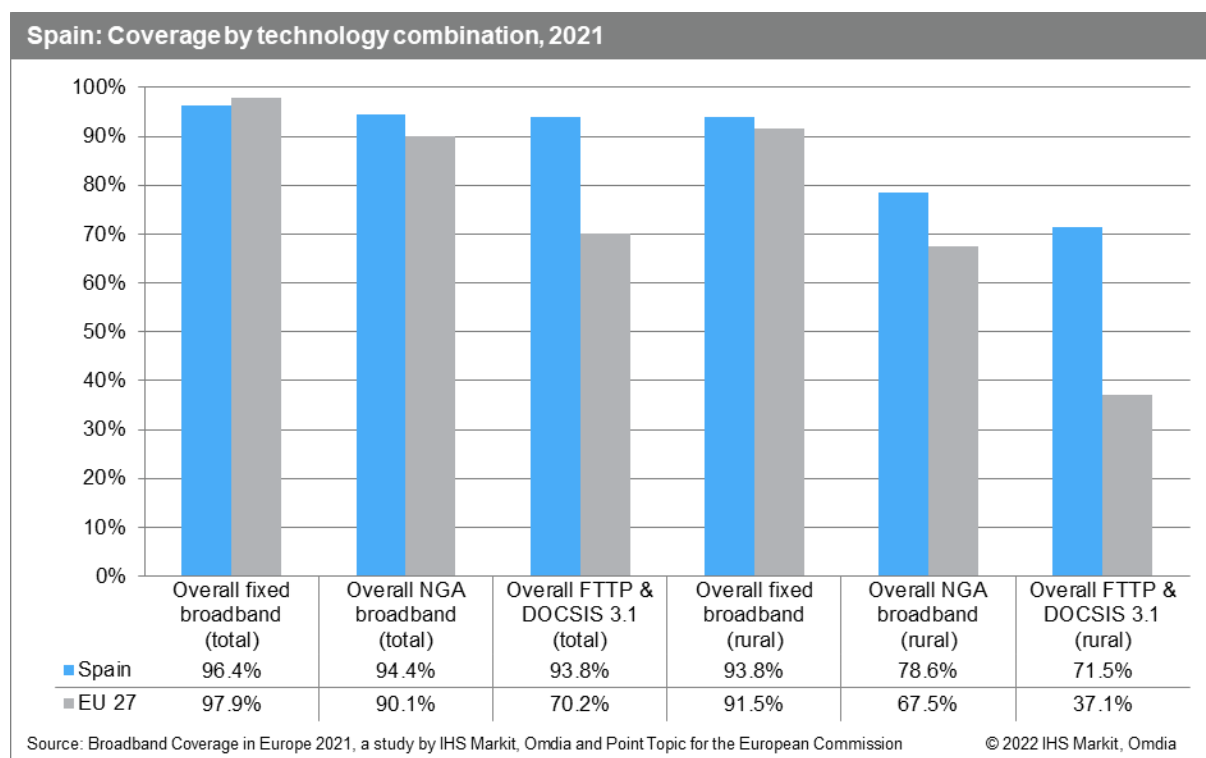
Note: The decline in 2021 in FWA coverage was caused by an increase of quality of data in the Evidence of Network Termination Points and due to general population movements in the country. The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.28 Spain

5.28.1 National coverage by broadband technology

Fixed broadband coverage improved by 0.9 percentage points to cover 96.4% of Spanish households by the end of June 2021. In rural regions, fixed broadband coverage surpassed the EU average, with a total of 93.8% of rural homes passed. NGA coverage on both national and rural levels also exceeded the EU averages, with a total of 94.4% and 78.6% homes passed, respectively. Spain recorded strong growth in the NGA category on a year-on-year comparison, as coverage expanded by 2.1 percentage points on a national level and by 8.5 percentage points in rural regions. Spain also reported good progress in terms of 1Gbps-capable networks (FTTP & DOCSIS 3.1), particularly in rural regions in which coverage grew by 7.3 percentage points.

Except in the national fixed broadband category, Spain outperformed the EU average across all three combination categories, at both national and rural levels.

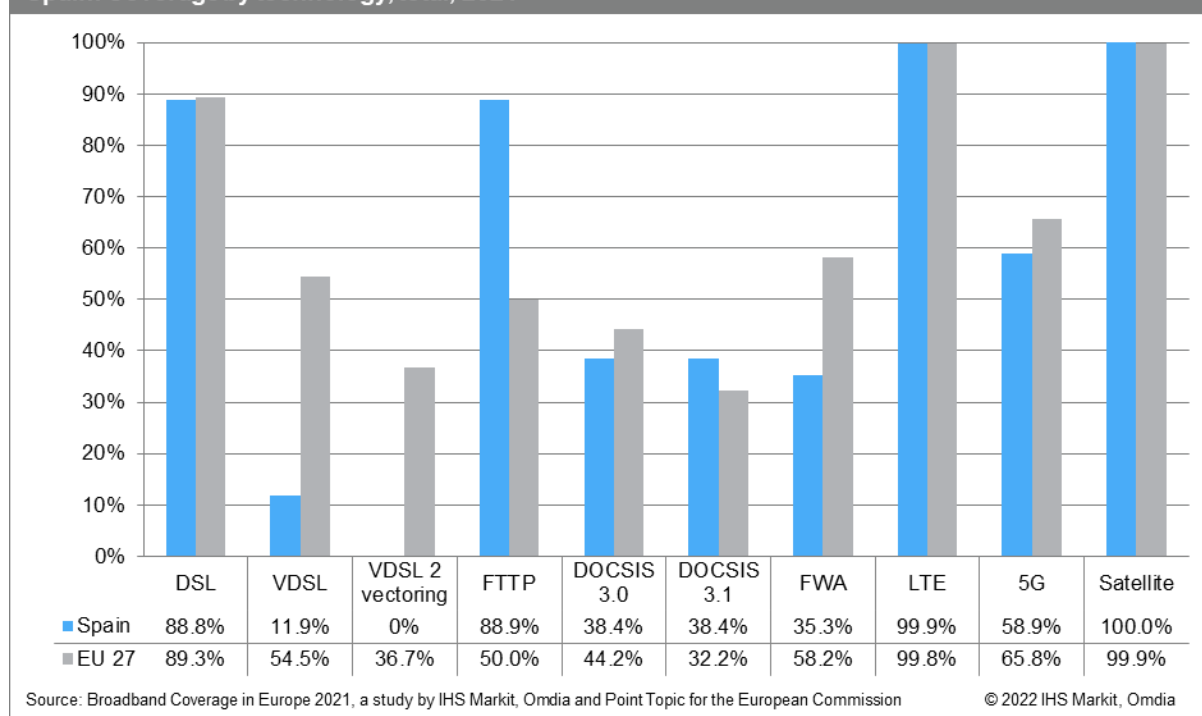


Looking at individual broadband technologies, FTTP became the most prevalent technology in Spain which had previously been DSL. As Spanish operators progressed with FTTP rollouts, coverage expanded by 4.0 percentage points over the twelve-month period, while DSL declined by 0.3 percentage points. Almost nine out of ten (88.9%) Spanish households were covered by FTTP networks by mid-2021, which was the fourth highest coverage level among this year's study countries.

As Spanish operators focused on FTTP deployments rather than copper upgrades, the proportion of DSL networks upgraded to VDSL remained low, with only 11.9% of households covered. As seen in previous years, VDSL2 Vectoring deployment remained absent. Cable modem DOCSIS 3.0 networks covered 38.4% of Spanish households which was equal to DOCSIS 3.1 coverage as Spanish operators had upgraded their entire cable networks to the DOCSIS 3.1 standard by mid-2019. Spain's DOCSIS 3.1 availability scored well above the EU average. FWA was available to 35.3% of households.

LTE coverage remained unchanged, nearing universal coverage with 99.9% of Spanish homes passed. The average coverage of LTE networks improved by 1.0 percentage point which enabled 96.3% of Spanish households to access at least one LTE network by mid-2021. Spanish operators also made progress in 5G as availability expanded to 58.9%, an improvement of 46.4 percentage points compared to mid-2020. While in last year's study, only Vodafone had started to deploy commercial 5G networks, all Spanish operators offered 5G services by mid-2021.

Spain: Coverage by technology, total, 2021



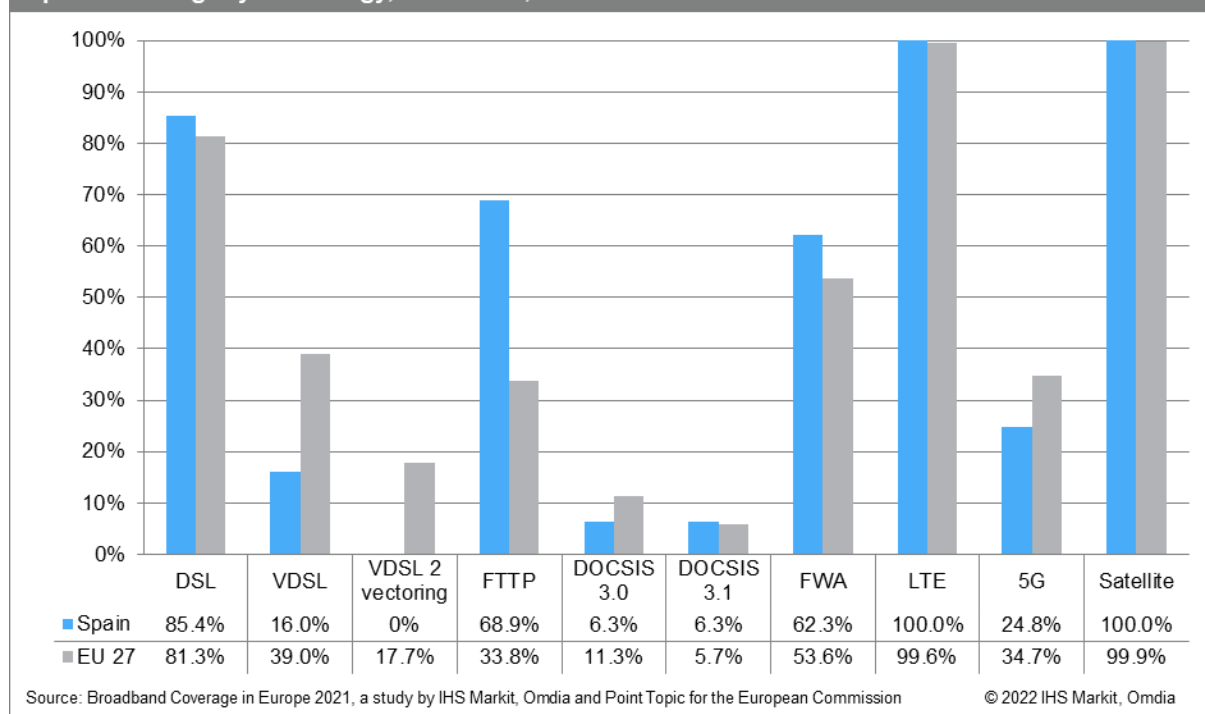
In rural Spain, DSL remained the most common broadband technology, covering 85.4% of households by the end of June 2021. FTTP recorded the strongest growth among broadband technologies (9.4 percentage points) and became the second most prevalent broadband access type in this year's study. With a total of 68.9% of rural homes passed, Spain exceeded the EU average by more than 30 percentage points.

Rural FTTP coverage has grown rapidly in the last years (13.8 percentage points in 2019 and 13.1 percentage points in 2020) as rollouts continue to be driven by projects of the 2018 and 2019 tenders of the Spanish national broadband plan, "Programa Nacional de Extensión de la Banda Ancha de Nueva Generación (PEBA-NGA)" which primarily focused on rural areas, given an already high FTTP coverage in urban areas¹¹.

FWA recorded the third highest coverage in rural Spain, with 62.3% of rural homes passed. Over the study period, LTE coverage grew by 0.7 percentage points and reached universal coverage (100%). A quarter of Spain's rural households (24.8%) were covered by 5G networks by mid-2021, while commercial 5G rollouts in rural areas had not started in the previous edition of this study.

¹¹ https://www.mineco.gob.es/stfls/mineco/prensa/ficheros/noticias/2018/190415_np_peba.pdf

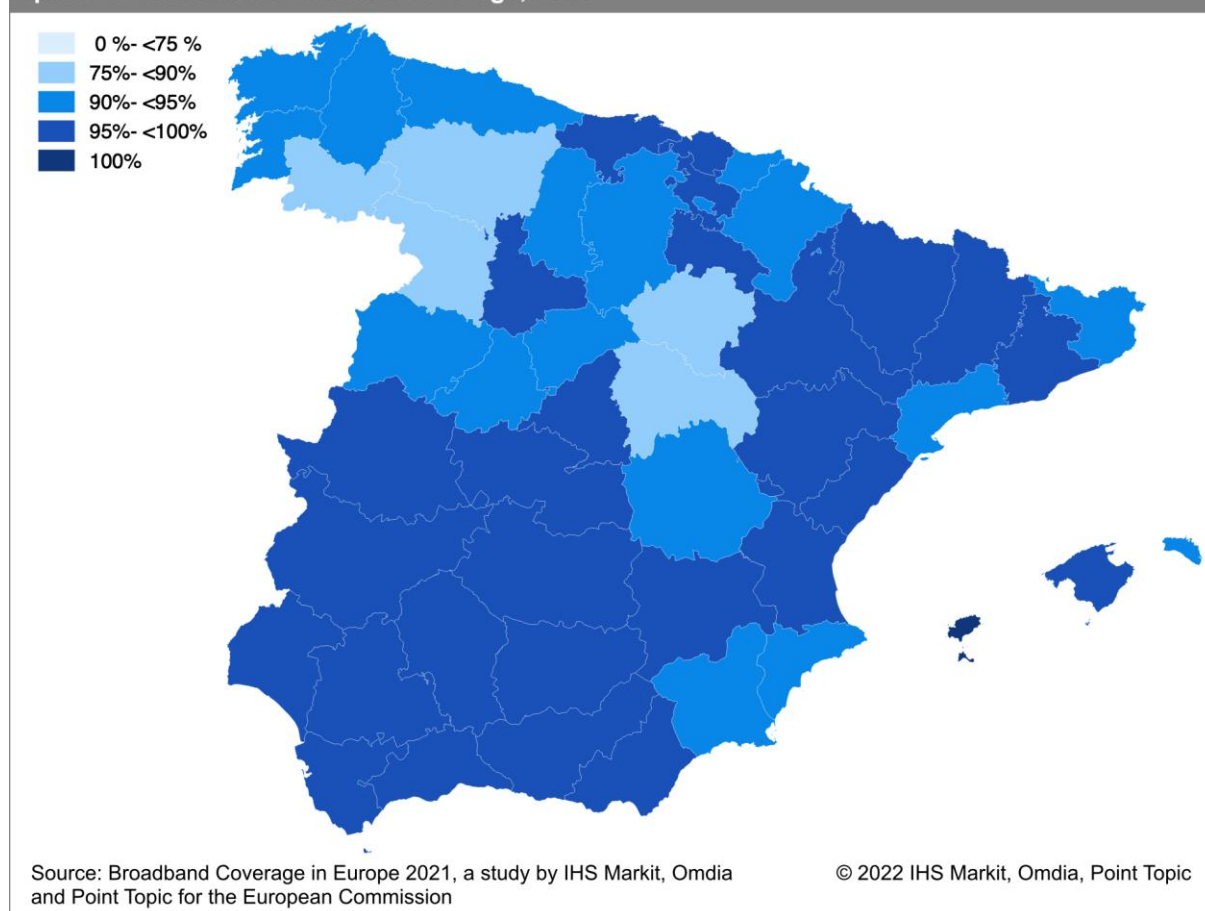
Spain: Coverage by technology, rural areas, 2021



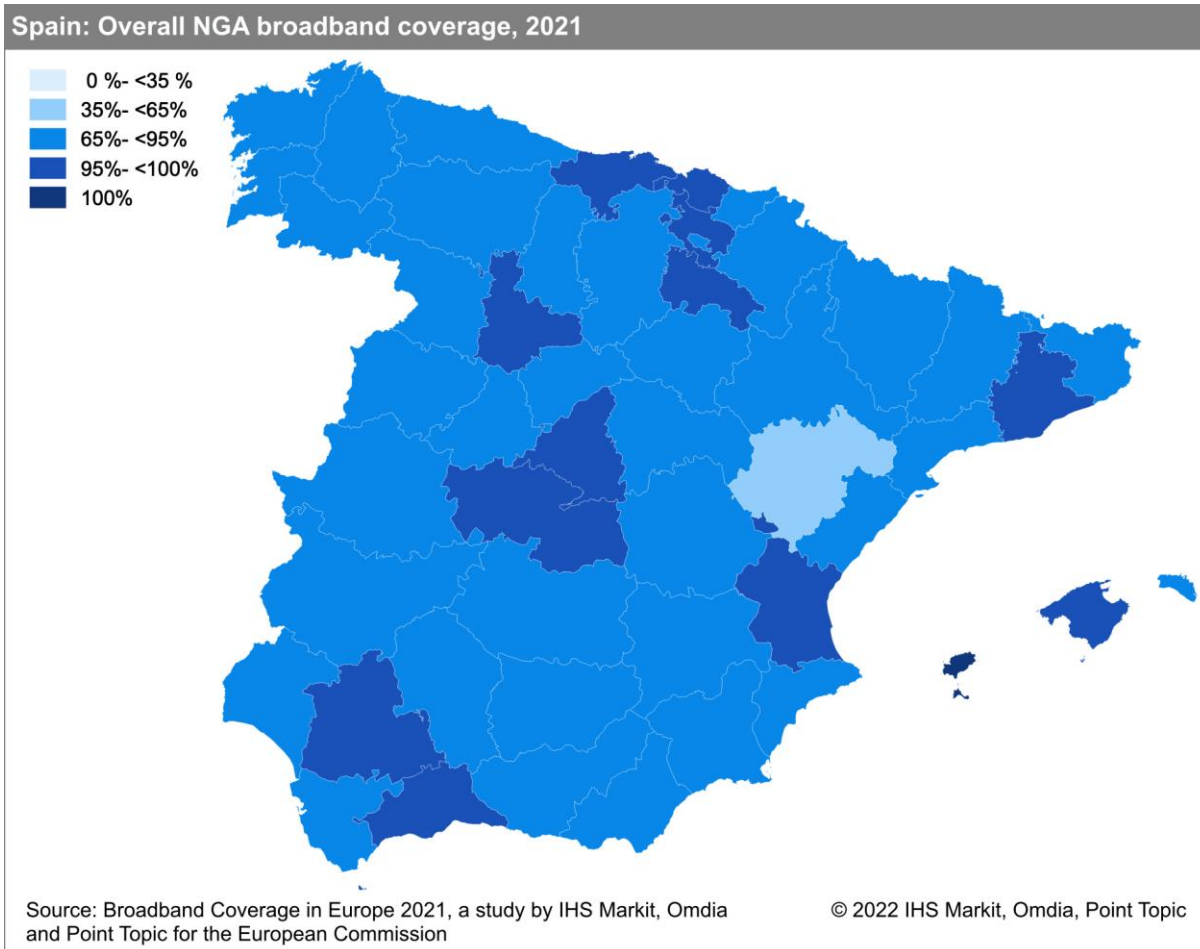
5.28.2 Regional coverage by broadband technology

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 86% of households covered, and the highest in the regions of Eivissa y Formentera which had universal fixed broadband availability (100%). Four out of 59 regions had coverage below 90%, compared to seven regions last year.

Spain: Overall fixed broadband coverage, 2021



NGA coverage across Spanish regions varied more widely than fixed broadband coverage, as seen in most study countries. By mid-2021, NGA coverage ranged from 58.7% in Teruel to 100% in Eivissa y Formentera.



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	99.6%	99.6%
ES640	Melilla	99.8%	99.8%
ES703	El Hierro	86.0%	75.7%
ES704	Fuerteventura	96.3%	93.6%
ES705	Gran Canaria	96.7%	96.7%
ES706	La Gomera	91.5%	91.5%
ES707	La Palma	93.0%	84.0%
ES708	Lanzarote	96.1%	96.1%
ES709	Tenerife	97.2%	97.2%

5.28.3 Data tables for Spain

Statistic	National
Population	47,332,614
Persons per household	2.6
Rural proportion	16.7%

	Spain 2021		Spain 2020		Spain 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	88.8%	85.4%	89.1%	83.1%	89.8%	84.1%	89.3%	81.3%
VDSL	11.9%	16.0%	11.6%	15.1%	11.8%	15.1%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	88.9%	68.9%	84.9%	59.5%	80.4%	46.4%	50.0%	33.8%
Cable modem DOCSIS 3.0	38.4%	6.3%	45.8%	10.8%	48.9%	11.2%	44.2%	11.3%
Cable modem DOCSIS 3.1	38.4%	6.3%	45.8%	10.8%	48.9%	11.2%	32.2%	5.7%
FWA	35.3%	62.3%	35.5%	64.0%	35.7%	62.9%	58.2%	53.6%
LTE	99.9%	100.0%	99.9%	99.3%	99.8%	98.8%	99.8%	99.6%
LTE average operator coverage	96.3%	-	95.3%	-	95.1%	-	97.5%	-
5G	58.9%	24.8%	12.5%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	96.4%	93.8%	95.5%	92.9%	95.6%	93.3%	97.9%	91.5%
Overall NGA broadband	94.4%	78.6%	92.3%	70.1%	89.8%	58.7%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	93.8%	71.5%	91.7%	64.2%	89.0%	51.9%	70.2%	37.1%
At least 30Mbps	96.2%	-	92.3%	-	91.0%	-	89.8%	-
At least 100Mbps	93.8%	-	91.7%	-	89.0%	-	82.1%	-
At least 1Gbps	92.5%	-	91.7%	-	89.0%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

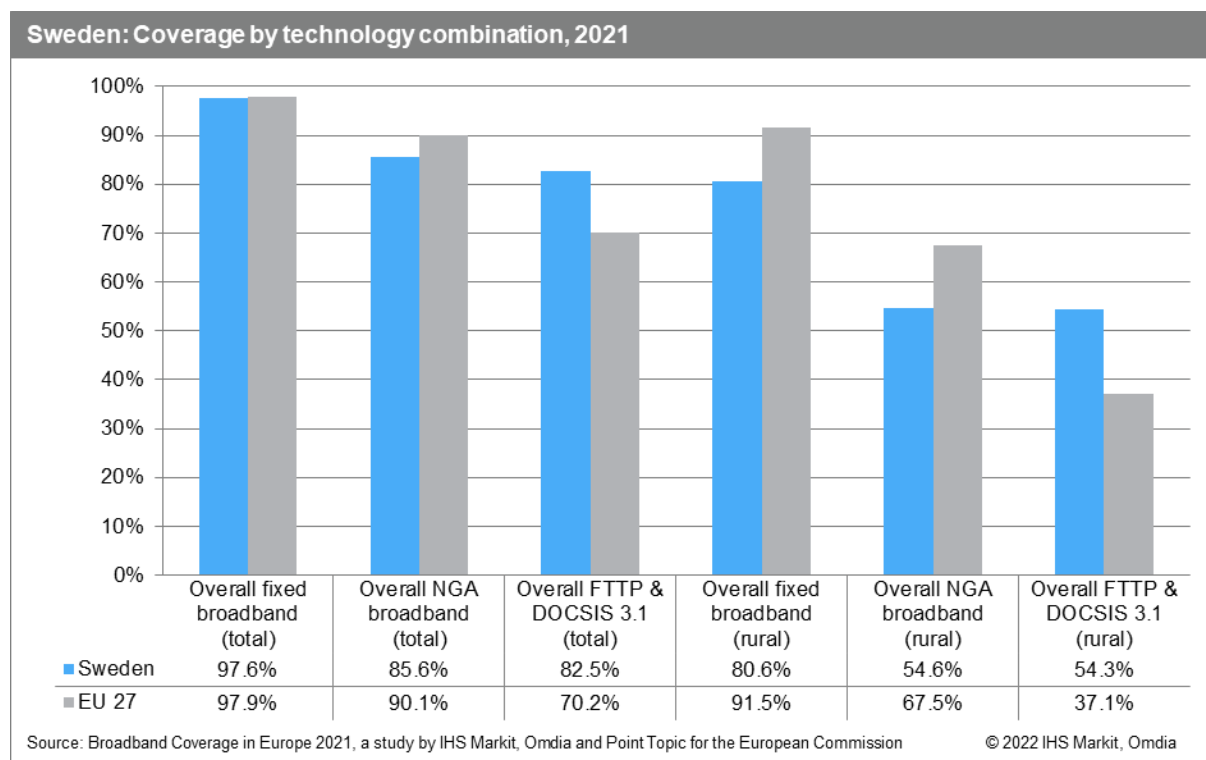
Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

5.29 Sweden

5.29.1 National coverage by broadband technology

Fixed broadband coverage at the national level in Sweden remained in line with the EU average, with 97.6% of homes passed by at least one fixed broadband network at the end of June 2021. However, with just 80.6% of rural households having access to fixed broadband services, Sweden remained below the EU average of 91.5%. The country fell below the EU average for availability of NGA broadband at both national level (with 85.6% of homes passed), and rural level (54.6%), despite a 6.2 percentage point increase in rural NGA availability.

However, overall coverage of FTTP & DOCSIS 3.1 remained significantly above the EU average at both rural and national level, thanks to Sweden's high coverage of FTTP.

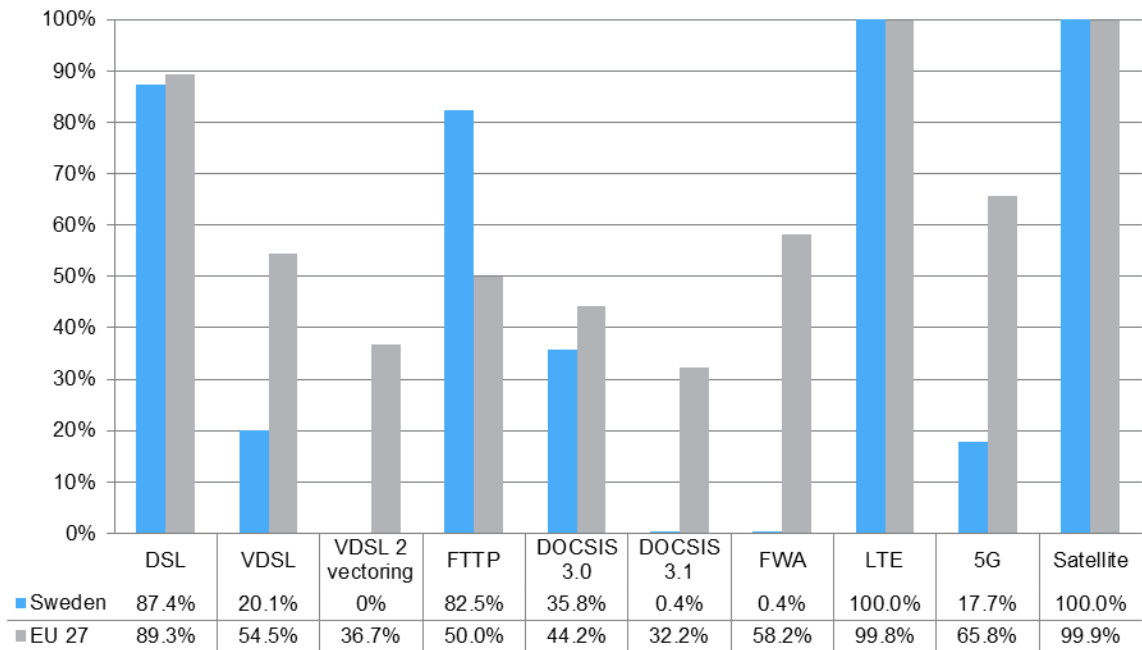


DSL remained the most prevalent individual fixed broadband technology in Sweden, covering 87.4% of households nationally. As the incumbent Telia continued with its deployment of fibre and gradual closing of copper networks, DSL decreased by 1.6 percentage points year-on-year, as did VDSL (by 0.9 percentage points). By the end of June 2021, 20.1% of Swedish households had access to VDSL broadband services compared to 21.0% in mid-2020. As in previous years, there were no VDSL2 Vectoring deployments reported in Sweden.

By far the leading NGA technology is FTTP, with networks passing 82.5% of homes and coverage increasing by 2.0 percentage points since mid-2020. Cable modem DOCSIS 3.0 stood at 35.8% of homes passed at the end of June 2021. Meanwhile, although DOCSIS 3.1 upgrades have launched in Sweden, the technology's reach remains extremely limited, with only 0.4% of homes having access to the new standard.

With Sweden having achieved universal LTE coverage in mid-2017, mobile broadband coverage of Sweden did not change over the study period. The landscape is evolving due to the introduction of 5G, which had reached 17.7% of homes nationally at the end of June 2021, a moderate increase on the previous year.

Sweden: Coverage by technology, total, 2021



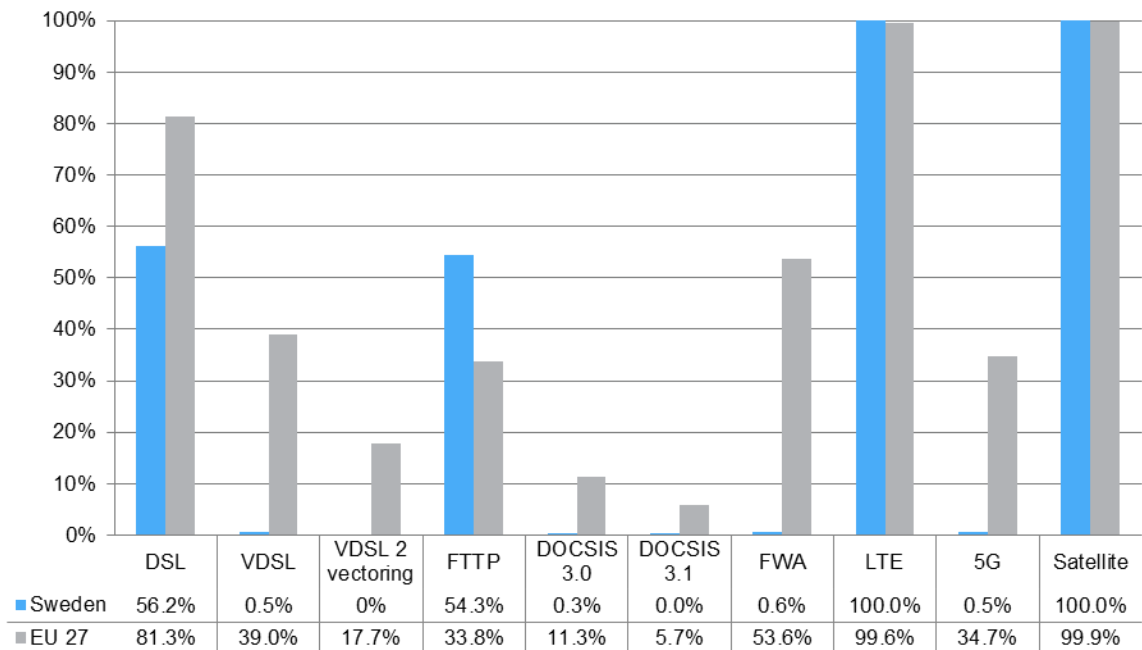
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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Looking at broadband availability in rural Sweden, DSL remained the most prevalent access technology despite a 6.1 p.p fall in coverage, with 56.2% of households covered. But FTTP is not far behind and remains the most prevalent NGA broadband technology for rural households, passing 54.3% of homes, and recording an increase in coverage of 6.3 percentage points since mid-2020. Rural VDSL and cable modem DOCSIS 3.0 coverage remained negligible, with both remaining below 1.0% of coverage, at 0.5% and 0.3% respectively.

As was the case on a national level, LTE coverage remained universal across rural Sweden, but 5G coverage is minimal at 0.5%.

Sweden: Coverage by technology, rural areas, 2021

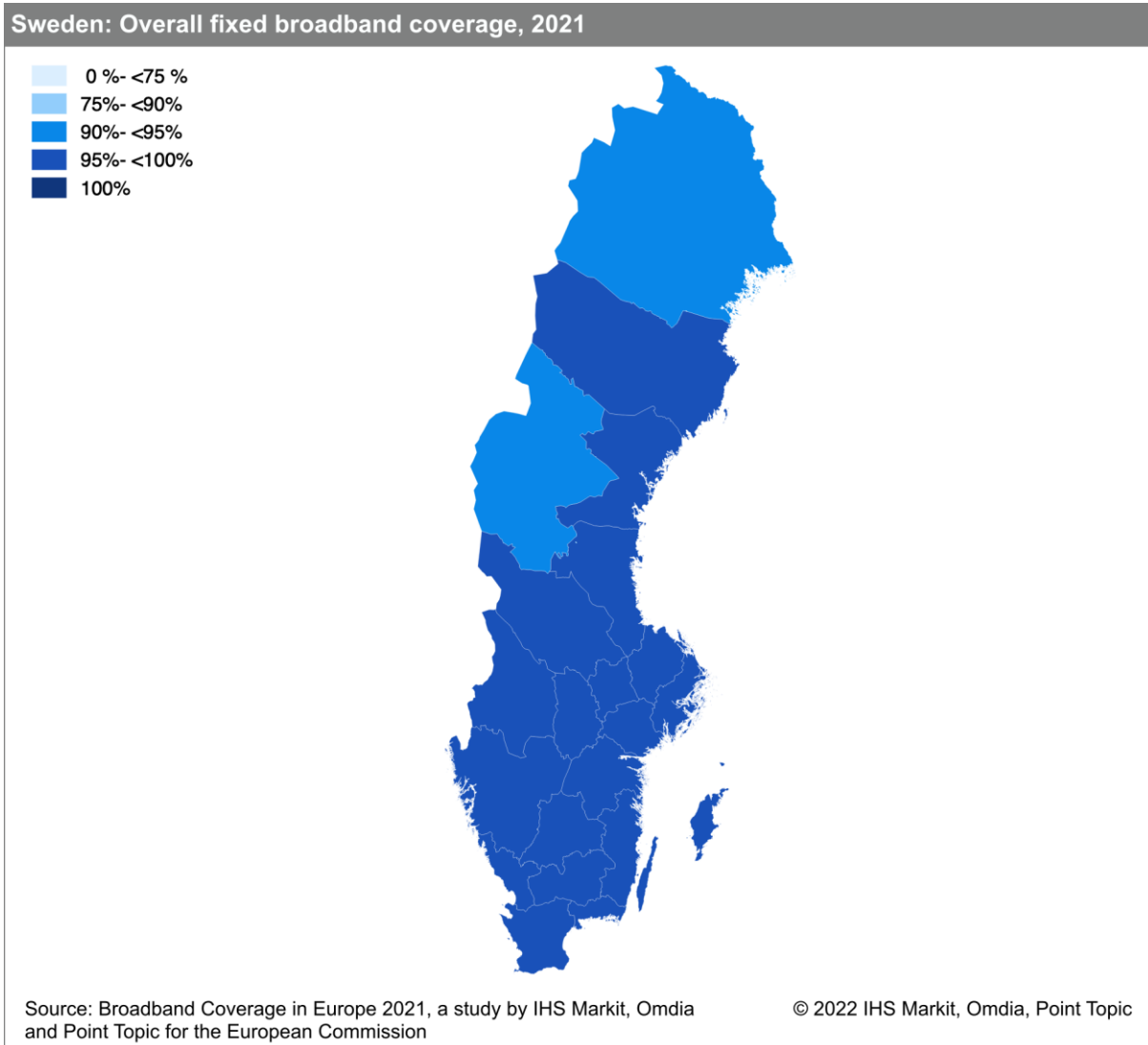


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

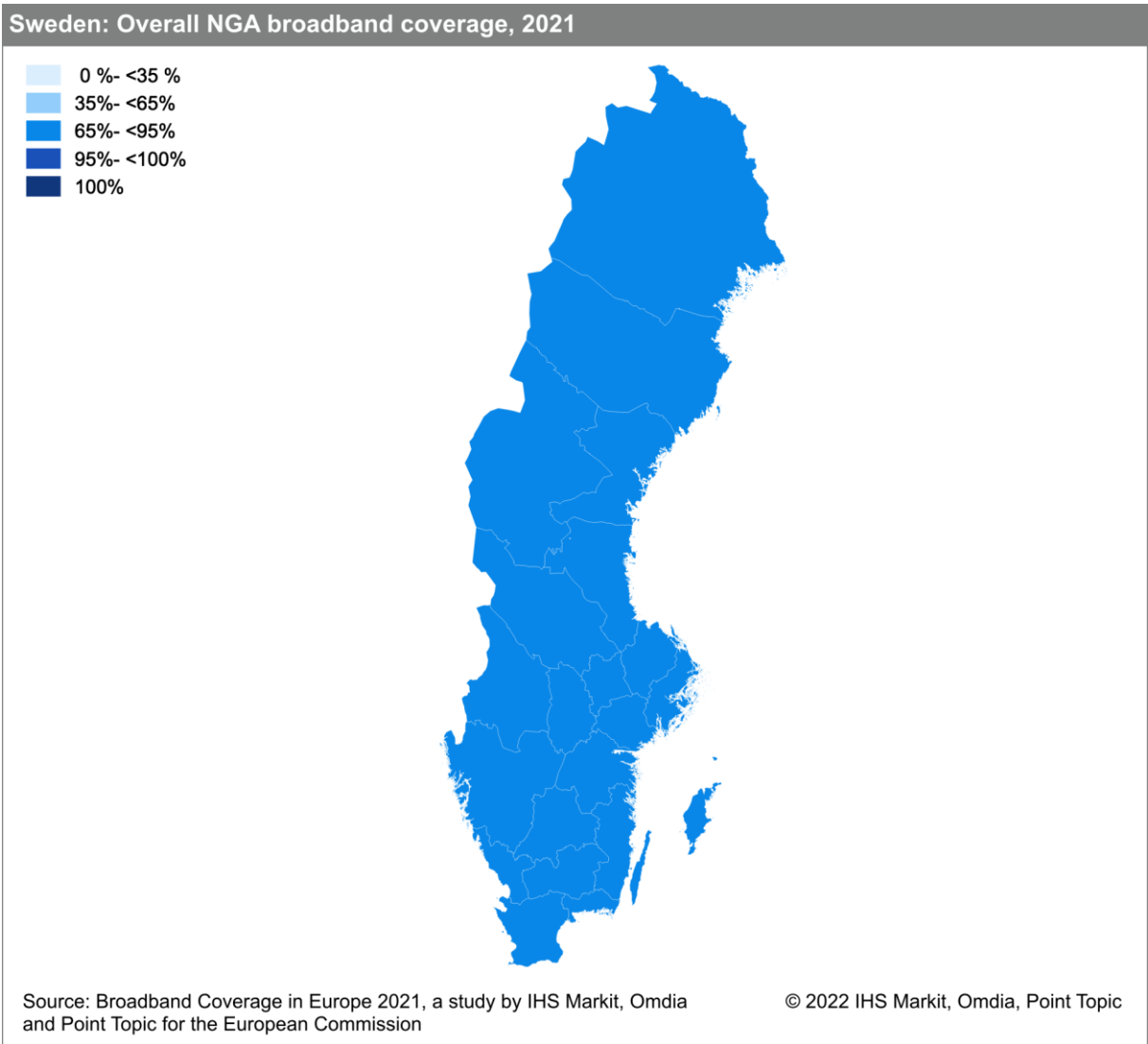
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5.29.2 Regional coverage by broadband technology

At the end of June 2021, overall fixed broadband coverage in almost all Swedish regions exceeded 95%, except for Jämtlands län and Norrbottens län which recorded household coverage of 91.4% and 93.9% respectively. The capital region of Stockholm recorded the highest fixed broadband coverage level, with 99.5% of homes passed.



As with most of the countries studied, NGA technologies coverage recorded a higher level of variance across regions than fixed broadband – although the range is narrower than in the previous iteration. NGA broadband availability varied between 76.1% in Jämtlands län (up by 0.2 percentage points since mid-2020) and 91.8% in the capital region of Stockholm.



5.29.3 Data tables for Sweden

Statistic	National
Population	10,327,599
Persons per household	2.1
Rural proportion	9.1%

	Sweden 2021		Sweden 2020		Sweden 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	87.4%	56.2%	88.9%	62.4%	89.3%	63.9%	89.3%	81.3%
VDSL	20.1%	0.5%	21.0%	0.7%	20.8%	0.6%	54.5%	39.0%
VDSL 2 Vectoring	0%	0%	0%	0%	0%	0%	36.7%	17.7%
FTTP	82.5%	54.3%	80.5%	48.1%	77.1%	40.6%	50.0%	33.8%
Cable modem DOCSIS 3.0	35.8%	0.3%	37.3%	0.3%	35.7%	0.3%	44.2%	11.3%
Cable modem DOCSIS 3.1	0.4%	0.0%	0.3%	0.0%	0.3%	0.0%	32.2%	5.7%
FWA	0.4%	0.6%	0.2%	0.4%	0.2%	0.3%	58.2%	53.6%
LTE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.8%	99.6%
LTE average operator coverage	98.1%	-	99.6%	-	96.8%	-	97.5%	-
5G	17.7%	0.5%	13.6%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.6%	80.6%	97.7%	81.3%	97.4%	80.5%	97.9%	91.5%
Overall NGA broadband	85.6%	54.6%	87.5%	48.4%	85.1%	40.9%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	82.5%	54.3%	80.5%	48.1%	77.1%	40.6%	70.2%	37.1%
At least 30Mbps	88.9%	-	87.5%	-	85.1%	-	89.8%	-
At least 100Mbps	86.7%	-	85.1%	-	82.2%	-	82.1%	-
At least 1Gbps	82.5%	-	80.5%	-	77.1%	-	62.4%	-
At least 1Gbps upload and download	0%	-	-	-	-	-	-	-

Note: Because of the NRA's data collection cycles, data for Sweden each year represents the most recent available data, which is for 1st October of the previous year, e.g. the 2021 figures represent the state of broadband coverage at 1st October 2020. The 2020 and 2019 figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

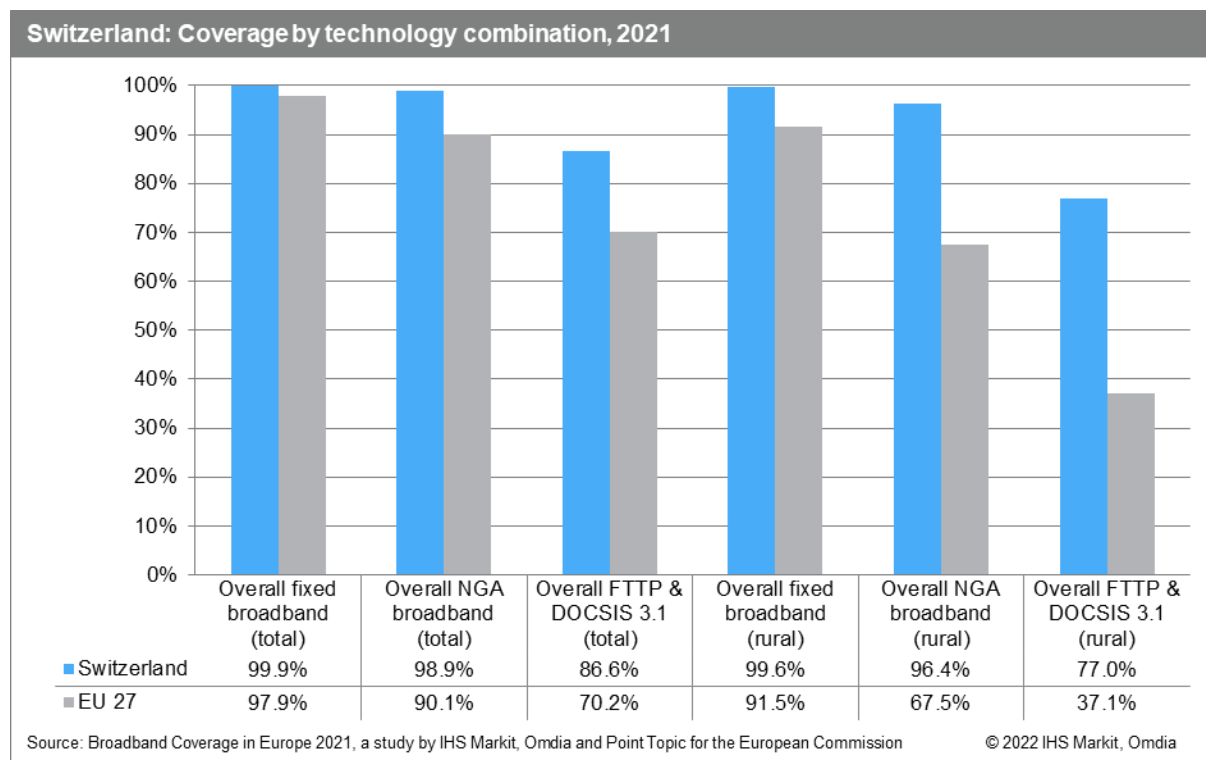
5.30 Switzerland

5.30.1 National coverage by broadband technology

As in 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.

Almost all Swiss households (99.9%) were able to access at least one broadband technology by mid-2021, which was unchanged from last year. In rural regions, broadband services passed 99.6% of rural homes. NGA networks were available to 98.9% and 96.4% of households on national and rural level, respectively. The availability of FTTP & DOCSIS 3.1 networks expanded by 0.7 percentage points and 3.5 percentage points over the study period, respectively.

Switzerland exceeded the EU average across all combination categories, both on national and rural levels.

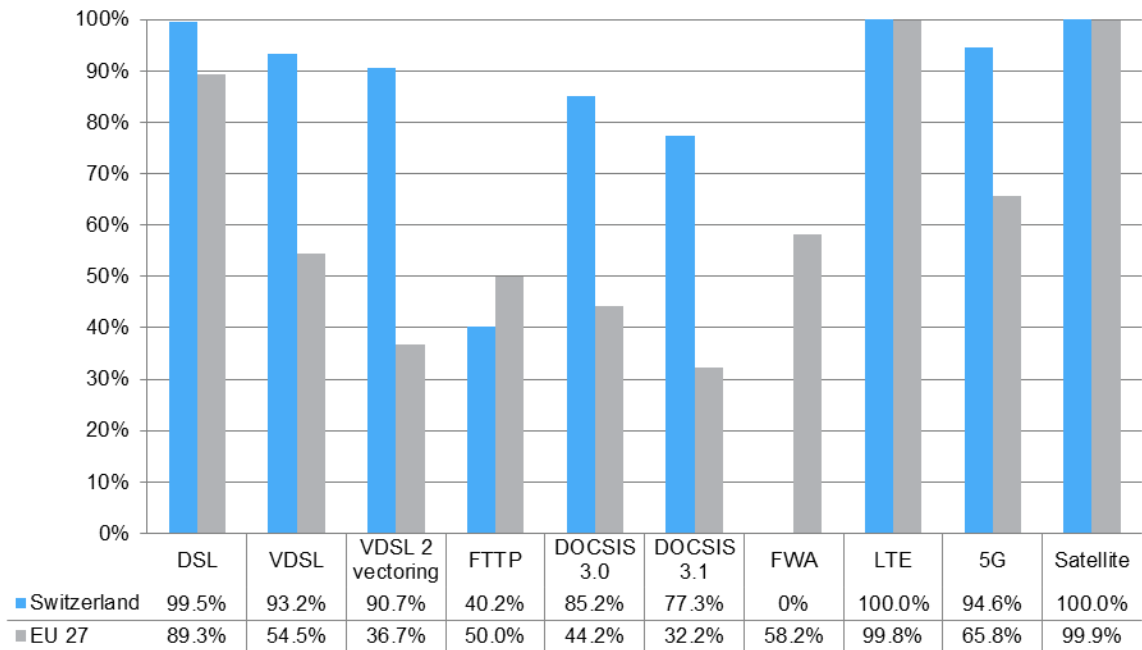


DSL remained the leading broadband technology in Switzerland, providing almost universal coverage (99.5%), as seen in previous years. Availability of high-speed copper-based technologies continued to be much higher than in other study countries: VDSL coverage expanded by 2.3 percentage points and reached 93.2% of households, while VDSL2 Vectoring networks passed 90.7% of homes. Switzerland recorded the highest VDSL2 Vectoring coverage in this year's study and came third in terms of VDSL coverage.

DOCSIS 3.0 services were available to 85.2% of households by mid-2021. The majority of cable networks have been upgraded to DOCSIS 3.1 standard, which was available to 77.3% of Swiss households. FTTP was the only broadband technology that performed below EU average, with only 40.2% of Swiss homes passed, compared to the EU average of 50.0%.

Switzerland provided universal LTE coverage (100.0%) and passed 94.6% of Swiss households with 5G technology. Switzerland was the first European country to launch 5G services in April 2019 and recorded the highest 5G coverage in last year's study (mid-2020). However, as pace of 5G rollouts accelerated across the continent, Switzerland only came fourth in this year's study.

Switzerland: Coverage by technology, total, 2021



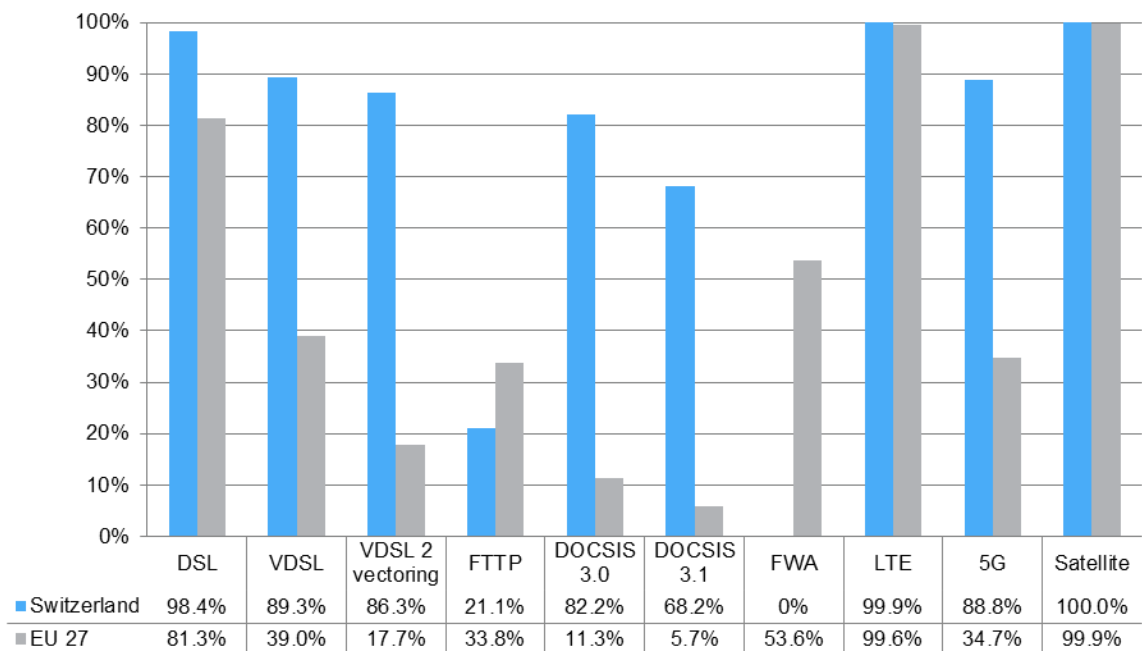
Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

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In rural regions, DSL remained the most widespread technology with 98.4% of rural households covered, unchanged from last year. VDSL coverage (89.3%) was more than double the average EU level (39.0%), while VDSL2 Vectoring (86.3%) was almost five times higher than the EU average (17.7%).

Cable modem DOCSIS 3.0 passed 82.2% of rural homes, an improvement of 2.6 percentage points compared to mid-2020. Availability of DOCSIS 3.1 increased by 4.0 percentage points and covered more than two thirds (68.2%) of rural households. FTTP coverage remained low compared to other NGA technologies as only 21.1% of rural homes were passed by FTTP networks.

Switzerland: Coverage by technology, rural areas, 2021

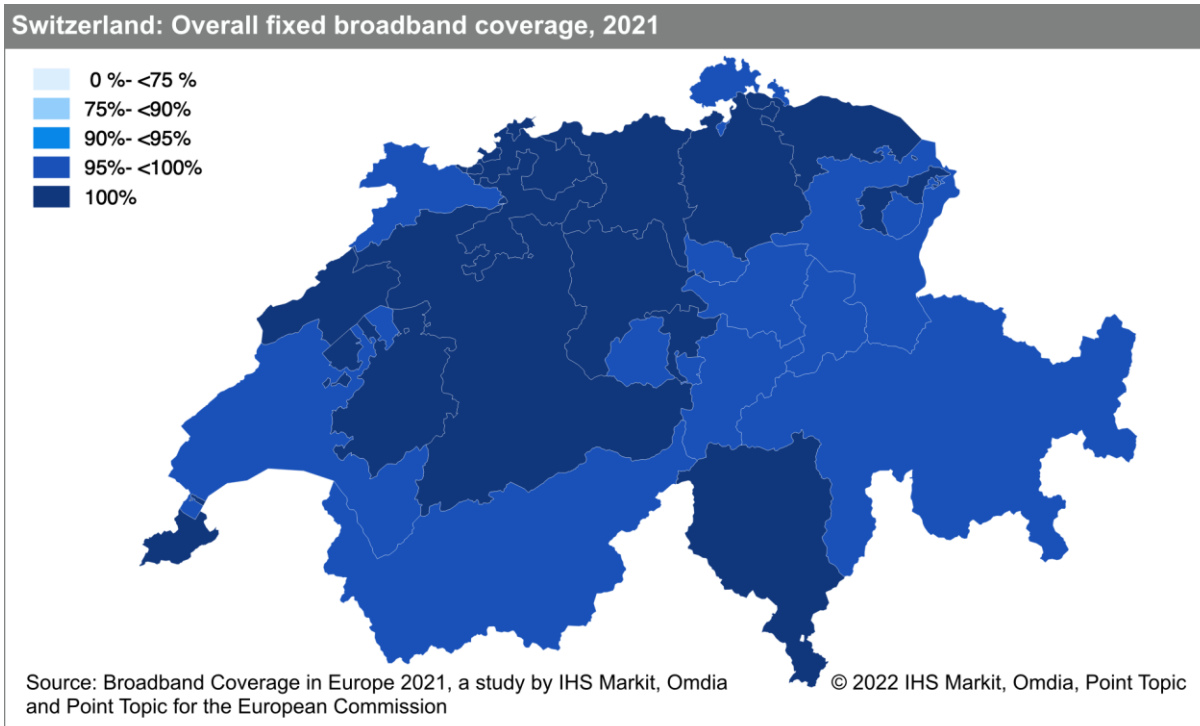


Source: Broadband Coverage in Europe 2021, a study by IHS Markit, Omdia and Point Topic for the European Commission

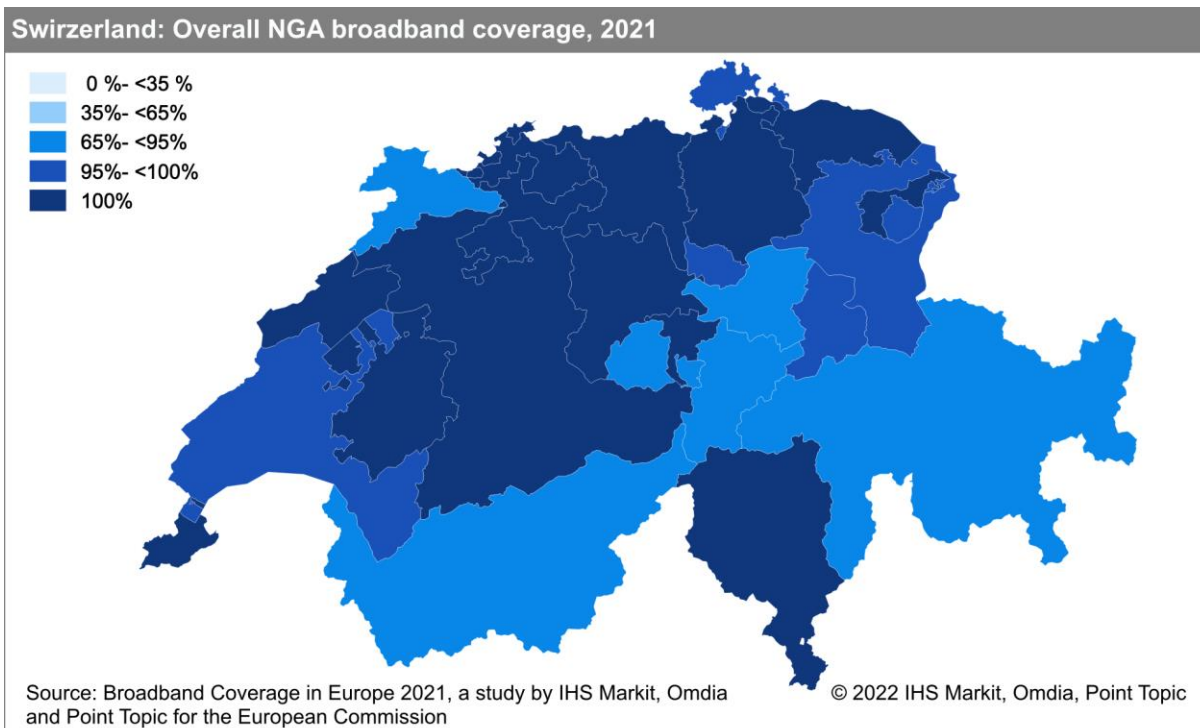
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5.30.2 Regional coverage by broadband technology

Like in the previous year, only four regions out of 26 recorded fixed broadband levels under 99.0% in Switzerland. The lowest coverage (98.6%) was measured in Glarus, while 14 regions recorded universal coverage (100.0%).



Fourteen Swiss regions recorded universal NGA coverage (100.0%), while the lowest coverage was measured in Graubünden (90.1%), Valais (91.0%), and Obwalden (91.9%).



5.30.3 Data tables for Switzerland

Statistic	National
Population	8,606,033
Persons per household	2.2
Rural proportion	12.4%

	Switzerland 2021		Switzerland 2020		Switzerland 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.5%	98.4%	99.5%	98.4%	99.5%	96.4%	89.3%	81.3%
VDSL	93.2%	89.3%	90.9%	85.8%	90.5%	67.6%	54.5%	39.0%
VDSL 2 Vectoring	90.7%	86.3%	87.3%	81.4%	80.2%	37.4%	36.7%	17.7%
FTTP	40.2%	21.1%	39.7%	20.4%	34.9%	8.6%	50.0%	33.8%
Cable modem DOCSIS 3.0	85.2%	82.2%	84.3%	79.6%	84.4%	79.8%	44.2%	11.3%
Cable modem DOCSIS 3.1	77.3%	68.2%	76.5%	64.2%	71.7%	63.0%	32.2%	5.7%
FWA	0%	0%	0%	0%	0%	0%	58.2%	53.6%
LTE	100.0%	99.9%	99.9%	99.9%	99.9%	99.8%	99.8%	99.6%
LTE average operator coverage	99.7%	-	98.9%	-	98.6%	-	97.5%	-
5G	94.6%	88.8%	89.2%	40.0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.9%	99.6%	99.9%	99.5%	99.8%	98.6%	97.9%	91.5%
Overall NGA broadband	98.9%	96.4%	99.0%	95.5%	99.0%	95.1%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	86.6%	77.0%	85.9%	73.5%	79.4%	67.5%	70.2%	37.1%
At least 30Mbps	99.8%	-	99.8%	-	99.8%	-	89.8%	-
At least 100Mbps	98.6%	-	98.6%	-	98.6%	-	82.1%	-
At least 1Gbps	63.7%	-	62.9%	-	40.3%	-	62.4%	-
At least 1Gbps upload and download	32.7%	-	-	-	-	-	-	-

Note: The 2020 rural FTTP coverage was restated due to a change in methodology and is lower than in the previous edition of this study. The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

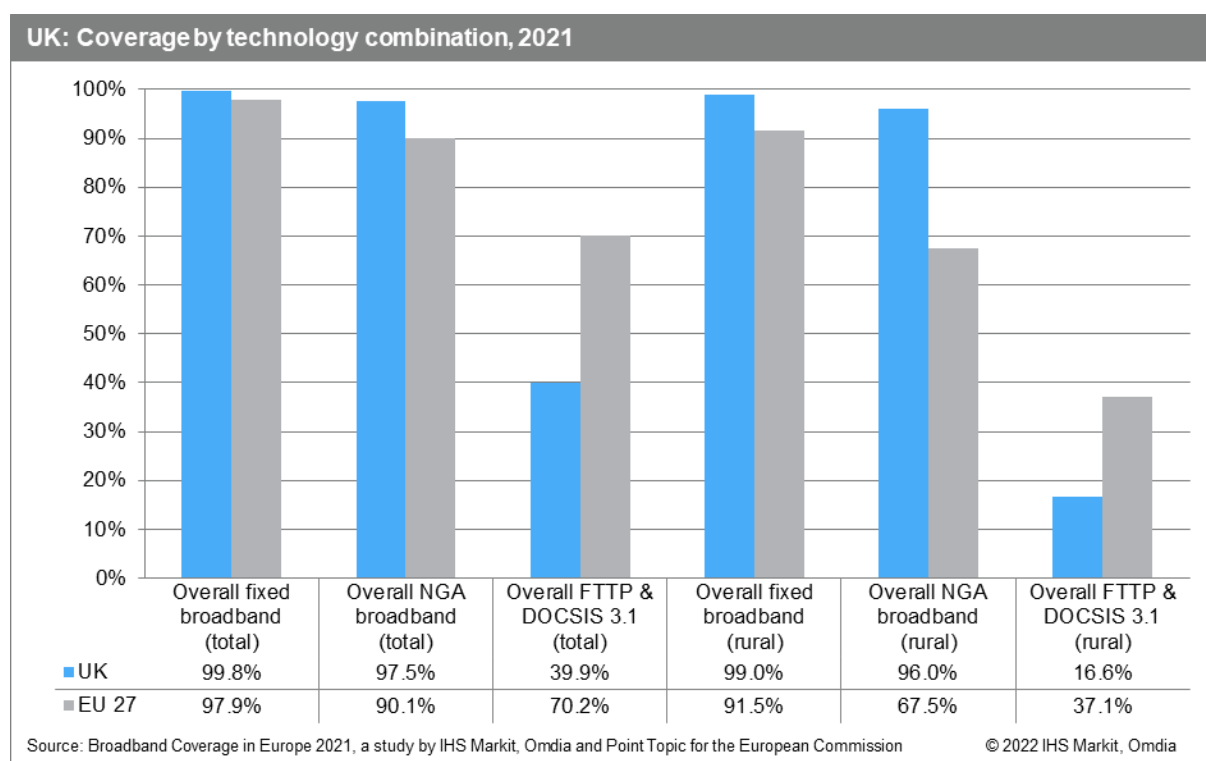
All restatements are highlighted in italics.

5.31 United Kingdom

5.31.1 National coverage by broadband technology

Over the study period, fixed broadband coverage in the UK remained near-universal, at both national and rural levels. Availability of NGA broadband remained stable at national level (97.5%), and increased by 0.5 percentage points at a rural level, to reach 96.0% of rural homes. In both categories, the UK surpassed the EU average.

However, as most NGA advancements have been driven by VDSL deployments, when overall combined coverage of FTTP & DOCSIS 3.1 networks is considered, fewer than four in ten (39.9%) of UK homes were passed by networks capable of offering gigabit speeds. In rural areas, just 16.6% of rural households had access to such services. And despite considerable progress, which saw FTTP & DOCSIS 3.1 coverage growing by 18.8 percentage points at a national level and by 4.7 percentage points at a rural level, the UK ranked among the countries with the lowest overall FTTP & DOCSIS 3.1 coverage levels.



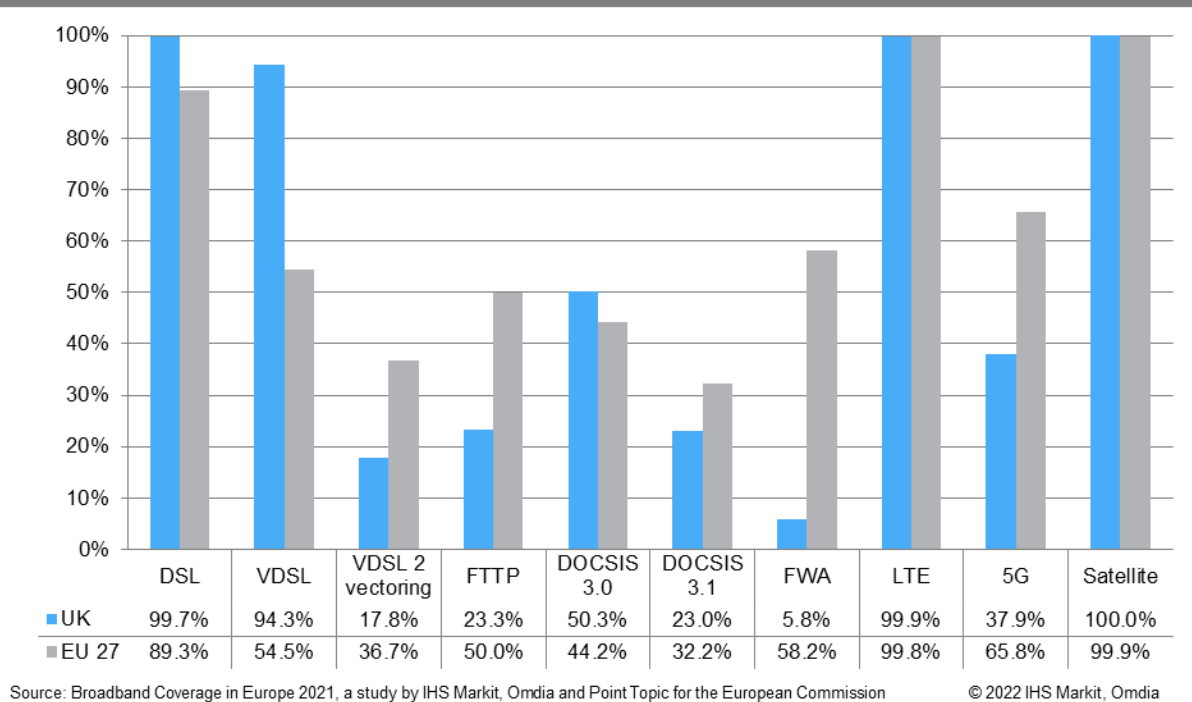
Looking at individual technologies, DSL continued to be the most widespread broadband technology, providing near-universal coverage to UK households. FWA coverage increased slightly to 5.8% of premises. VDSL remained the leading NGA technology, with 94.3% of UK households having access to VDSL services. Moreover, 17.8% of UK households had access to VDSL2 Vectoring services providing download speeds higher than 100Mbps, a 1.6 p.p. increase year-on-year.

Cable modem DOCSIS 3.0 coverage remained stable over the study period, reaching just over half (50.3%) of households. The UK cable operator, Virgin Media O2, has continued the upgrade of its network to the DOCSIS 3.1 standard and by mid-2021, 23.0% of UK households were covered, up from 7.9% in 2020.

The UK incumbent BT/Openreach has revisited its network deployment strategy in recent years and is now focussed primarily on FTTP rollouts. This shift in strategy, combined with the continued efforts of alternative network operators resulted in continued strong growth in FTTP coverage and by mid-2021, 23.3% of households had access to FTTP broadband services, 8.8 p.p. higher than in 2020. Yet the UK remained well below the EU average of 50.0% and the UK's FTTP coverage level remained among the lowest recorded in this study, with only Belgium, Greece and Germany recording lower FTTP coverage levels.

LTE coverage of the UK remained stable and near-universal at 99.9% of households covered. UK mobile network operators launched 5G networks in 2019 and by the end of June 2021, an estimated 37.9% of UK households were covered by 5G networks, up from 20.4% the previous year.

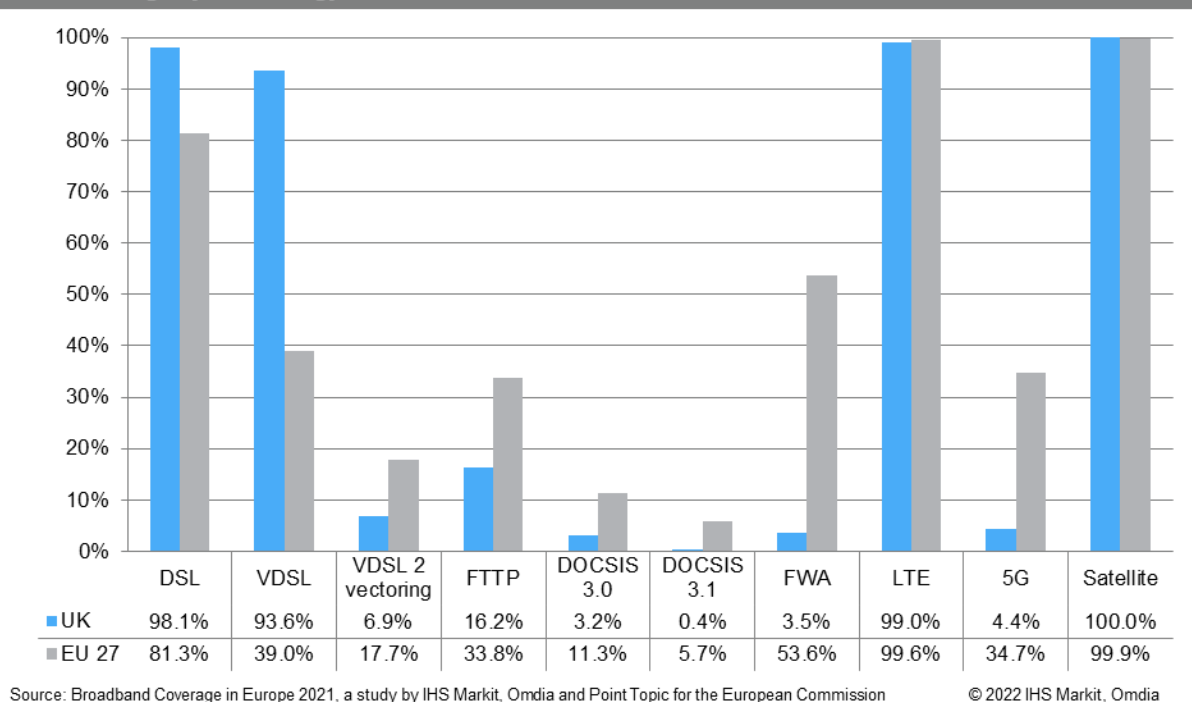
UK: Coverage by technology, total, 2021



In rural regions of the UK, DSL remained the most prevalent broadband technology, covering 99.5% of rural households. Fixed Wireless Access services were available to 3.5% of rural households.

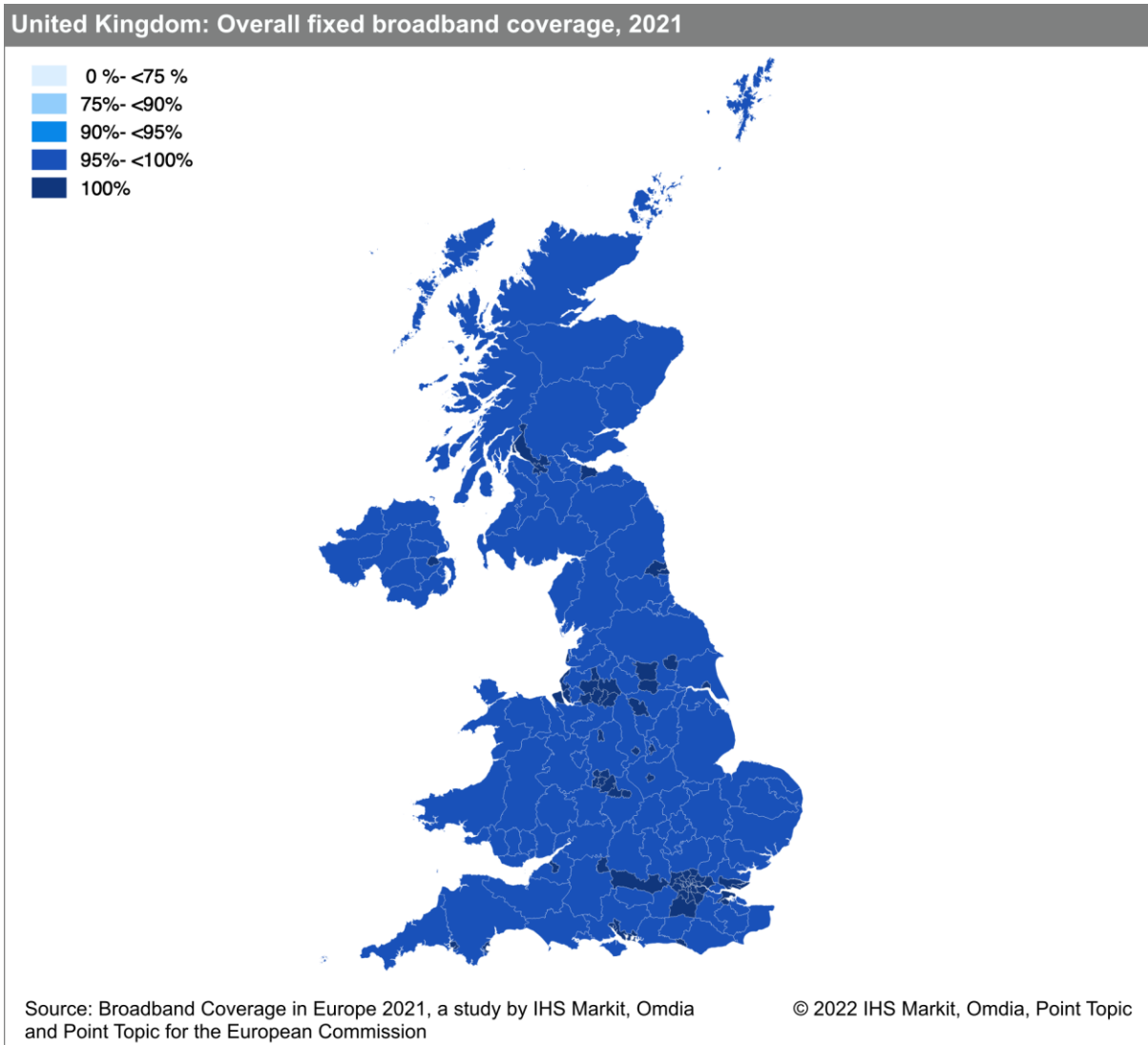
In terms of rural NGA availability, VDSL remained the only technology with significant coverage, reaching 93.6% of rural households at the end of June 2021. VDSL2 Vectoring-enabled services were available to 6.9% of rural households and DOCSIS 3.0 remained limited with only 3.2% rural households covered by mid-2021. FTTP networks passed 16.2% of rural homes registering an 4.4 percentage point growth year-on-year.

UK: Coverage by technology, rural areas, 2021

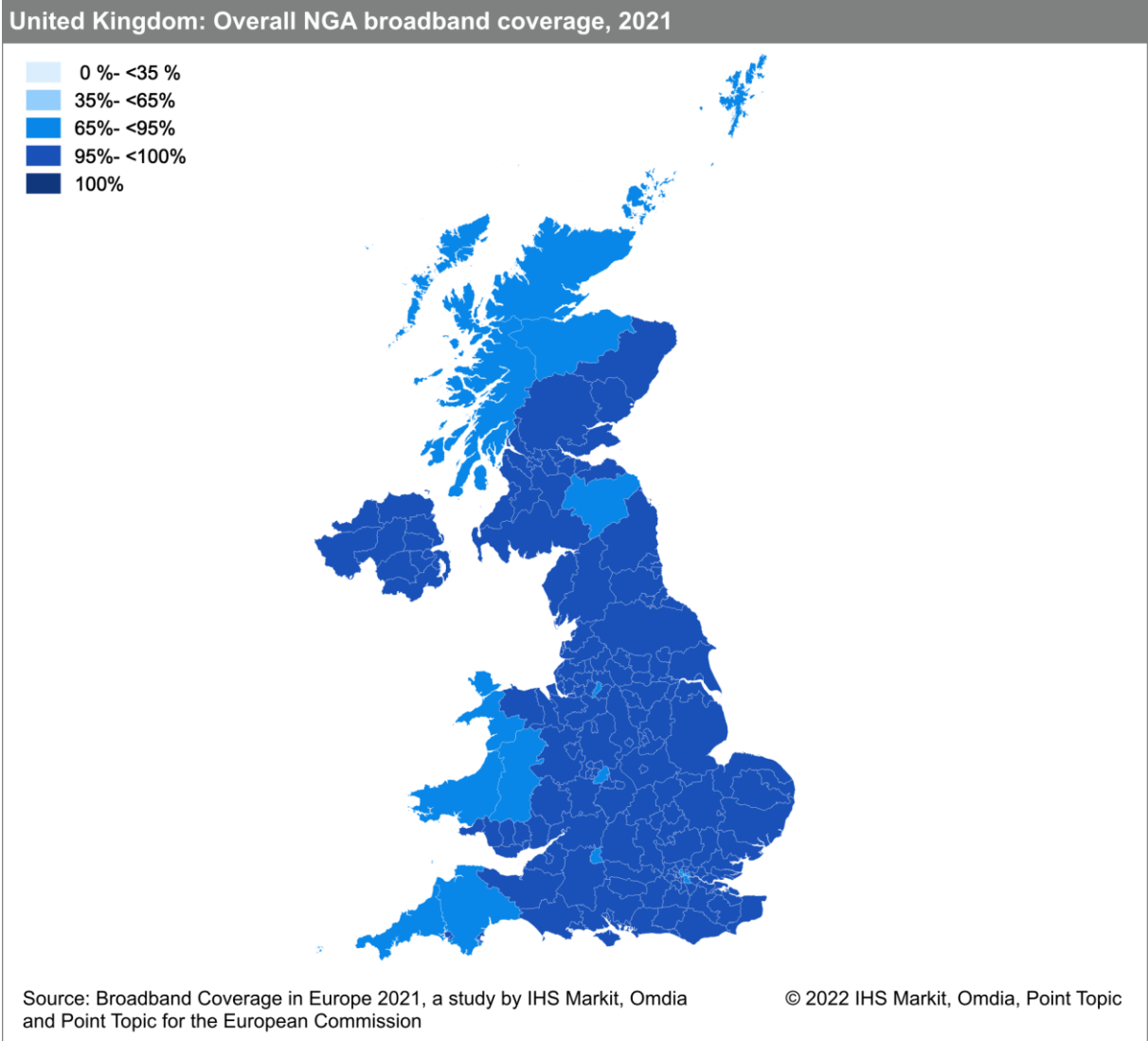


5.31.2 Regional coverage by broadband technology

Looking at fixed broadband coverage in UK regions, all regions recorded fixed broadband coverage of at least 96%. Many urban areas reported universal coverage, while coverage was lowest in the more rural areas such as the Orkney Islands, Powys and Fermanagh & Omagh.



As in previous iterations of this study, regional NGA coverage remained varied from 76.5% in the Orkney Islands to >99% in 15 regions across the UK.



5.31.3 Data tables for the United Kingdom

Statistic	National
Population	66,589,306
Persons per household	2.3
Rural proportion	9.1%

	UK 2021		UK 2020		UK 2019		EU27 2021	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.7%	98.1%	100.0%	99.5%	100.0%	99.5%	89.3%	81.3%
VDSL	94.3%	93.6%	94.2%	92.3%	90.2%	89.4%	54.5%	39.0%
VDSL 2 Vectoring	17.8%	6.9%	16.2%	6.3%	12.3%	4.5%	36.7%	17.7%
FTTP	23.3%	16.2%	14.5%	11.9%	8.5%	8.1%	50.0%	33.8%
Cable modem DOCSIS 3.0	50.3%	3.2%	50.3%	3.1%	50.3%	3.1%	44.2%	11.3%
Cable modem DOCSIS 3.1	23.0%	0.4%	7.9%	0%	0%	0%	32.2%	5.7%
FWA	5.8%	3.5%	4.9%	2.8%	3.0%	1.5%	58.2%	53.6%
LTE	99.9%	99.0%	99.9%	99.3%	99.9%	99.3%	99.8%	99.6%
LTE average operator coverage	99.3%	-	99.3%	-	98.8%	-	97.5%	-
5G	37.9%	4.4%	20.4%	0%	-	-	65.8%	34.7%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.8%	99.0%	100.0%	100.0%	100.0%	100.0%	97.9%	91.5%
Overall NGA broadband	97.5%	96.0%	97.6%	95.5%	95.7%	93.3%	90.1%	67.5%
Overall FTTP & DOCSIS 3.1	39.9%	16.6%	21.0%	11.9%	8.5%	5.9%	70.2%	37.1%
At least 30Mbps	95.0%	-	94.8%	-	94.8%	-	89.8%	-
At least 100Mbps	63.2%	-	59.0%	-	57.0%	-	82.1%	-
At least 1Gbps	38.7%	-	21.0%	-	0%	-	62.4%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2021 figures represent the state of broadband coverage at the end of June 2021. The 2020 (end of June) and 2019 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, 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 2Mbps. 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.
VDSL2 Vectoring	VDSL2 Vectoring is a solution that eliminates crosstalk between all the lines that terminate on a single DSLAM leading to an improved performance VDSL2 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.
Cable modem 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 means of providing wireless broadband connectivity using radio links between two fixed points, as an alternative method of providing wireless broadband connectivity, while eliminating the need for physical connections (copper, fibre). It can be implemented various standardised technologies (e.g. WiMAX, LTE, 5G).
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).
5G	5G is the fifth-generation technology standard for mobile broadband standardised by the 3rd Generation Partnership Project and capable of supporting downstream speeds of up to 10Gbps.

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.
VDSL2 Vectoring	A household has VDSL2 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.
Cable modem 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. Population coverage (in percentage terms) in a given area is understood to be equal to household coverage.
LTE Average operator coverage	A simple average of LTE coverage of all mobile network operators active in a study country.
5G	A household has 5G coverage if it is in the stated coverage area for at least one 5G mobile network. Population coverage (in percentage terms) in a given area is understood to be equal to household coverage.

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 FTTP & DOCSIS 3.1***	Overall fixed broadband coverage*	Overall NGA coverage**	Overall FTTP & DOCSIS 3.1***
AT	99.0%	93.1%	45.4%	95.6%	67.7%	15.7%
BE	99.7%	99.1%	68.9%	97.7%	91.4%	55.1%
BG	97.3%	93.3%	84.7%	93.6%	70.1%	61.0%
HR	99.9%	87.8%	51.7%	99.4%	47.0%	14.0%
CY	100.0%	100.0%	41.4%	100.0%	100.0%	22.4%
CZ	99.9%	92.6%	52.5%	99.6%	68.5%	7.0%
DK	99.6%	97.7%	94.9%	98.6%	86.4%	79.1%
EE	93.0%	90.2%	73.4%	78.6%	65.6%	21.1%
FI	89.9%	74.8%	68.0%	82.4%	12.4%	12.4%
FR	99.9%	73.7%	63.4%	99.9%	47.2%	28.8%
DE	99.5%	95.9%	74.9%	97.5%	85.3%	22.5%
EL	99.4%	91.7%	19.8%	96.1%	66.3%	0%
HU	98.4%	96.7%	78.6%	95.9%	80.0%	38.3%
IS	99.2%	98.8%	88.7%	88.0%	82.1%	78.4%
IE	97.6%	96.4%	88.7%	97.0%	93.5%	45.8%
IT	99.8%	97.0%	44.2%	99.1%	88.4%	17.3%
LT	88.8%	84.8%	78.2%	64.0%	51.8%	37.1%
LV	98.5%	93.9%	90.7%	94.1%	83.4%	75.2%
LU	100.0%	99.4%	95.9%	100.0%	95.3%	79.1%
MT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
NL	99.3%	99.2%	90.6%	99.6%	98.9%	79.1%
NO	98.1%	91.8%	75.8%	91.0%	68.7%	64.0%
PL	89.7%	78.2%	70.0%	69.8%	40.0%	33.4%
PT	96.3%	90.5%	90.5%	90.5%	75.9%	75.9%
RO	94.1%	93.3%	87.1%	89.0%	84.7%	75.7%
SK	97.4%	84.3%	66.7%	97.1%	79.5%	21.6%
SI	98.9%	89.5%	72.4%	96.0%	67.0%	46.4%
ES	96.4%	94.4%	93.8%	93.8%	78.6%	71.5%
SE	97.6%	85.6%	82.5%	80.6%	54.6%	54.3%
CH	99.9%	98.9%	86.6%	99.6%	96.4%	77.0%
UK	99.8%	97.5%	39.9%	99.0%	96.0%	16.6%
EU27	97.9%	90.1%	70.2%	91.5%	67.5%	37.1%

* Fixed broadband coverage includes DSL, VDSL, VDSL2 Vectoring, FTTP, Cable modem DOCSIS 3.0, DOCSIS 3.1, FWA

** NGA coverage includes VDSL, VDSL2 Vectoring, FTTP, Cable modem DOCSIS 3.0, DOCSIS 3.1

*** Includes FTTP and DOCSIS 3.1

6.2.2 Total coverage by technology for each country

	DSL*	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0**	DOCSIS 3.1	FWA	LTE	5G***	Satellite
AT	97.3%	78.7%	50.7%	26.6%	59.3%	32.0%	19.9%	100.0%	76.8%	100.0%
BE	94.2%	92.2%	51.6%	9.7%	96.5%	67.7%	97.7%	100.0%	4.2%	100.0%
BG	85.4%	18.2%	0%	84.7%	70.5%	0%	18.8%	99.9%	40.1%	100.0%
HR	99.7%	78.2%	11.3%	38.7%	36.3%	34.5%	4.4%	99.5%	33.8%	100.0%
CY	100.0%	100.0%	43.5%	41.4%	65.9%	0%	88.8%	99.5%	75.0%	100.0%
CZ	97.6%	84.7%	84.6%	35.8%	41.9%	33.3%	81.4%	99.8%	49.4%	100.0%
DK	90.6%	59.4%	15.3%	74.1%	67.5%	67.1%	9.8%	100.0%	98.0%	100.0%
EE	46.9%	37.7%	8.6%	73.4%	78.5%	0%	8.6%	99.7%	18.3%	75.4%
FI	60.2%	47.0%	40.4%	40.0%	36.9%	36.9%	0%	100.0%	71.6%	100.0%
FR	98.8%	15.7%	0%	63.4%	23.1%	0%	58.1%	99.9%	74.4%	100.0%
DE	99.4%	91.3%	79.4%	15.4%	67.9%	67.2%	90.0%	100.0%	86.5%	100.0%
EL	98.8%	81.3%	53.7%	19.8%	0%	0%	0.8%	99.5%	66.1%	100.0%
HU	84.2%	50.8%	0%	64.2%	78.2%	21.7%	0%	99.7%	17.6%	100.0%
IS	89.0%	84.0%	64.3%	87.6%	3.3%	3.3%	2.1%	99.7%	41.0%	0%
IE	92.9%	85.7%	64.1%	62.2%	48.6%	48.5%	30.0%	99.0%	72.1%	100.0%
IT	99.8%	96.0%	68.3%	44.2%	0%	0%	97.3%	99.9%	99.7%	100.0%
LT	85.5%	40.1%	0%	78.2%	27.1%	0%	-	100.0%	33.3%	100.0%
LV	28.5%	19.1%	19.0%	89.5%	30.2%	18.1%	94.0%	100.0%	0%	100.0%
LU	65.6%	59.8%	13.1%	75.2%	90.2%	90.2%	0%	99.8%	12.7%	100.0%
MT	100.0%	72.0%	0%	48.0%	100.0%	100.0%	100.0%	100.0%	20.0%	100.0%
NL	61.1%	59.5%	44.9%	51.9%	94.2%	72.3%	86.7%	96.4%	97.0%	100.0%
NO	92.5%	58.4%	0%	75.3%	40.3%	1.0%	94.1%	100.0%	23.8%	100.0%
PL	64.5%	26.6%	18.7%	51.9%	43.9%	43.0%	15.5%	99.9%	34.2%	100.0%
PT	85.4%	0%	0%	87.6%	57.6%	57.6%	0%	99.8%	0%	100.0%
RO	55.1%	9.1%	0%	87.1%	43.7%	0%	58.0%	99.9%	24.9%	100.0%
SK	71.5%	57.7%	33.4%	62.3%	39.4%	17.4%	94.8%	98.4%	13.8%	100.0%
SI	95.8%	56.6%	0%	72.5%	58.5%	0%	29.7%	99.9%	36.6%	100.0%
ES	88.8%	11.9%	0%	88.9%	38.4%	38.4%	35.3%	99.9%	58.9%	100.0%
SE	87.4%	20.1%	0%	82.5%	35.8%	0.4%	0.4%	100.0%	17.7%	100.0%
CH	99.5%	93.2%	90.7%	40.2%	85.2%	77.3%	0%	100.0%	94.6%	100.0%
UK	99.7%	94.3%	17.8%	23.3%	50.3%	23.0%	5.8%	99.9%	37.9%	100.0%
EU27	89.3%	54.5%	36.7%	50.0%	44.2%	32.2%	58.2%	99.8%	65.8%	99.9%

* DSL figures include VDSL and VDSL2 Vectoring coverage

** Cable modem DOCSIS 3.0 figures include DOCSIS 3.1 coverage

*** 5G coverage includes coverage provided using Dynamic Spectrum Sharing (DSS)

6.2.3 Rural coverage by technology for each country

	DSL*	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0**	DOCSIS 3.1	FWA	LTE	5G***	Satellite
AT	93.7%	43.0%	24.2%	14.9%	12.6%	0.9%	26.2%	99.7%	36.3%	100.0%
BE	93.6%	80.2%	18.4%	0.7%	54.6%	54.6%	94.9%	100.0%	0%	100.0%
BG	75.7%	8.8%	0%	61.0%	26.5%	0%	9.8%	99.7%	8.6%	100.0%
HR	98.9%	28.2%	2.7%	7.1%	25.6%	9.3%	6.7%	97.8%	9.3%	100.0%
CY	100.0%	100.0%	25.7%	22.4%	0%	0%	4.2%	97.4%	32.2%	100.0%
CZ	92.9%	63.2%	63.2%	6.9%	3.6%	0.1%	85.3%	99.8%	43.3%	100.0%
DK	90.2%	16.9%	4.4%	77.8%	5.3%	5.3%	15.6%	100.0%	98.0%	100.0%
EE	48.5%	37.2%	8.8%	21.1%	23.7%	0%	9.1%	99.4%	1.5%	75.4%
FI	74.4%	0%	0%	12.4%	0%	0%	0%	100.0%	18.9%	100.0%
FR	98.3%	24.8%	0%	28.8%	0.3%	0%	91.2%	99.7%	48.2%	100.0%
DE	97.3%	79.3%	59.3%	11.3%	17.5%	16.8%	87.9%	99.9%	49.4%	100.0%
EL	95.3%	65.9%	10.0%	0%	0%	0%	3.9%	97.6%	17.3%	100.0%
HU	91.1%	48.4%	0%	37.9%	46.9%	0.8%	0%	99.6%	7.0%	100.0%
IS	48.9%	7.6%	0.7%	78.4%	1.0%	1.0%	19.6%	93.9%	6.7%	0%
IE	92.3%	86.8%	45.8%	43.1%	3.8%	3.4%	19.4%	97.4%	36.2%	100.0%
IT	98.9%	85.7%	28.0%	17.3%	0%	0%	97.2%	99.9%	99.8%	100.0%
LT	62.6%	38.5%	0%	41.1%	0.5%	0%	-	100.0%	0.8%	100.0%
LV	36.6%	24.2%	24.1%	75.2%	0%	0%	84.7%	99.8%	0%	100.0%
LU	82.8%	79.6%	21.2%	51.1%	60.1%	60.1%	0%	99.8%	6.7%	100.0%
MT	100.0%	0%	0%	0%	100.0%	100.0%	100.0%	100.0%	0%	100.0%
NL	70.9%	66.1%	39.1%	54.5%	81.4%	41.5%	87.3%	98.6%	96.8%	100.0%
NO	75.4%	29.4%	0%	64.0%	1.7%	0.0%	84.9%	99.9%	4.5%	100.0%
PL	44.5%	10.3%	9.8%	32.6%	1.6%	1.5%	16.9%	99.9%	13.5%	100.0%
PT	70.3%	0%	0%	60.7%	43.3%	43.3%	0%	98.9%	0%	100.0%
RO	56.7%	2.3%	0%	75.7%	24.5%	0%	25.3%	99.7%	2.0%	100.0%
SK	80.0%	60.2%	51.0%	21.6%	2.6%	0.8%	94.3%	95.2%	2.4%	100.0%
SI	86.5%	22.0%	0%	46.4%	19.3%	0%	27.4%	99.8%	2.8%	100.0%
ES	85.4%	16.0%	0%	68.9%	6.3%	6.3%	62.3%	100.0%	24.8%	100.0%
SE	56.2%	0.5%	0%	54.3%	0.3%	0.0%	0.6%	100.0%	0.5%	100.0%
CH	98.4%	89.3%	86.3%	21.1%	82.2%	68.2%	0%	99.9%	88.8%	100.0%
UK	98.1%	93.6%	6.9%	16.2%	3.2%	0.4%	3.5%	99.0%	4.4%	100.0%
EU27	81.3%	39.0%	17.7%	33.8%	11.3%	5.7%	53.6%	99.6%	34.7%	99.9%

* DSL figures include VDSL and VDSL2 Vectoring coverage

** Cable modem DOCSIS 3.0 figures include DOCSIS 3.1 coverage

*** 5G coverage includes coverage provided using Dynamic Spectrum Sharing (DSS)

6.2.4 Broadband coverage by speed category for each country

	Broadband coverage (>30Mbps)	Broadband coverage (>100Mbps)	Broadband coverage (>1Gbps)	Broadband coverage (>1Gbps upload and download)*
AT	93.3%	82.8%	45.4%	17.5%
BE	99.1%	97.2%	69.0%	69.0%
BG	93.3%	91.9%	15.9%	-
HR	87.8%	62.1%	52.3%	-
CY	100.0%	82.9%	41.4%	-
CZ	98.1%	89.2%	38.1%	-
DK	97.7%	96.3%	90.7%	73.9%
EE	89.2%	83.5%	36.7%	-
FI	77.0%	65.0%	51.0%	-
FR	74.4%	65.3%	63.8%	-
DE	95.9%	89.6%	62.1%	-
EL	96.6%	54.6%	19.0%	18.6%
HU	94.9%	88.7%	44.8%	-
IS	98.8%	88.3%	85.6%	85.6%
IE	90.1%	87.7%	67.4%	-
IT	90.6%	77.6%	44.2%	44.2%
LT	84.6%	78.1%	78.0%	78.0%
LV	93.5%	90.7%	40.3%	-
LU	99.8%	99.4%	95.9%	-
MT	100.0%	100.0%	100.0%	0%
NL	99.2%	98.5%	88.8%	19.3%
NO	91.7%	89.2%	86.5%	73.6%
PL	77.0%	69.2%	55.2%	-
PT	92.8%	92.8%	86.0%	-
RO	93.7%	88.6%	85.2%	0%
SK	82.3%	75.4%	28.0%	-
SI	89.5%	85.5%	0.9%	0.9%
ES	96.2%	93.8%	92.5%	-
SE	88.9%	86.7%	82.5%	0%
CH	99.8%	98.6%	63.7%	32.7%
UK	95.0%	63.2%	38.7%	-
EU27	89.8%	82.1%	62.4%	-

* Only available where reported by the NRA

6.2.5 Average operator LTE coverage for each country

	Average operator LTE coverage
AT	99.2%
BE	100.0%
BG	81.4%
HR	98.8%
CY	98.3%
CZ	99.5%
DK	100.0%
EE	97.9%
FI	99.1%
FR	99.3%
DE	98.0%
EL	98.3%
HU	94.0%
IS	98.4%
IE	99.0%
IT	94.9%
LV	99.9%
LT	99.5%
LU	98.4%
MT	100.0%
NL	96.8%
NO	98.6%
PL	99.5%
PT	99.4%
RO	97.1%
SK	90.9%
SI	99.6%
ES	96.3%
SE	98.1%
CH	99.7%
UK	99.3%
EU27	97.5%

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