European Commission

Broadband Coverage in Europe 2023

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:

Brought to you by Informa Tech

Digital Single Market

This study was carried out for the European Commission by

OMDIA
240 Blackfriars Road
London SE1 8NW
United Kingdom
www.omdia.com

Point Topic
International House
24 Holborn Viaduct
London EC1A 2BN
United Kingdom
www.point-topic.com

Internal identification

Contract number: LC-01889470

Tender reference number: CNECT/2021/OP/0081

DISCLAIMER

By the European Commission, Directorate-General of Communications Networks, Content & Technology.

The information and views set out in this publication are those of the author(s) and do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this study. Neither the Commission nor any person acting on the Commission's behalf may be held responsible for the use which may be made of the information contained therein.

ISBN: 978-92-68-16769-4

doi: 10.2759/094495

Luxembourg: Publications Office of the European Union, 2024

Contents

Abstract

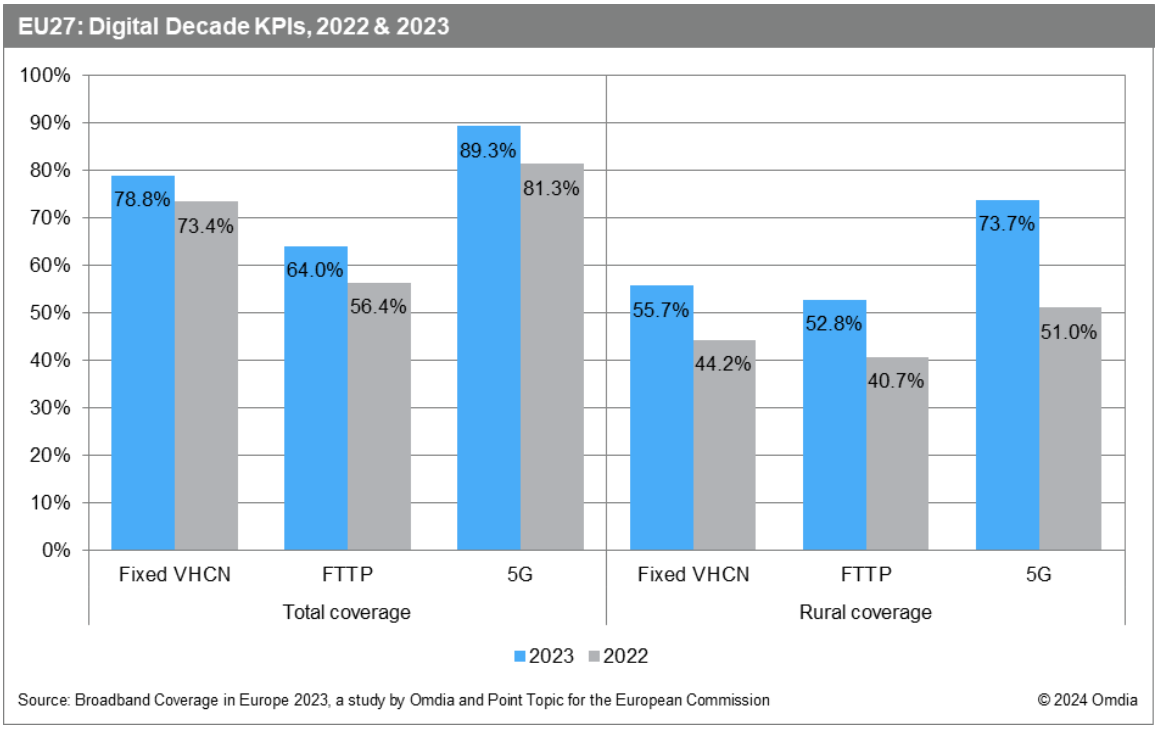
The Broadband Coverage in Europe study is designed to monitor the progress of EU Member States towards the gigabit coverage and 5G coverage targets as set out in the Digital Decade Policy programme – namely: 'Gigabit connectivity for all by 2030' and 'at least 5G in all populated areas'. This report 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, 5G, 5G in the 3.4–3.8 GHz band, and satellite) across each market, at national and rural levels. In addition, four combination categories indicating the availability of one or more forms of broadband connection are included in the study. These cover overall fixed broadband availability, next-generation access (NGA) availability, overall fixed Very High Capacity Network (VHCN) availability (comprised of the combined FTTP & DOCSIS 3.1 availability), and BEREC-defined Very High Capacity Network (VHCN) availability, which includes both fixed and mobile networks. 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.

Préface

L'étude sur la Couverture Haut-Débit en Europe a été conçue pour suivre la progression des États membres de l'UE vers les objectifs de couverture très haut débit et 5G définis dans le programme politique de la décennie numérique - à savoir : « connectivité très haut débit pour tous d'ici à 2030 » et « au moins une couverture 5G dans toutes les zones peuplées ». 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, 5G, couverture 5G sur la bande de fréquences 3,4–3,8 GHz et satellite) sur chacun des marchés, à la fois au niveau national et dans les zones rurales. De plus, quatre combinaisons indiquant la disponibilité d'une ou plusieurs formes de connexion haut débit sont incluses dans l'étude. Celles-ci comprennent la disponibilité globale du haut débit fixe, la disponibilité de l'Accès à une Nouvelle Génération (ANG), la disponibilité globale du réseau fixe à très haute capacité (VHCN) (comprenant la disponibilité combinée FTTP et DOCSIS 3.1) et la disponibilité du réseau à très haute capacité (VHCN) définie par l'ORECE, qui inclut à la fois les réseaux fixes et mobiles. 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 dans des chapitres dédiés.

Executive Summary

- The Broadband Coverage in Europe study is designed to monitor the progress of EU Member States towards the gigabit coverage and 5G coverage targets as set out in the Digital Decade Policy programme – namely: 'Gigabit connectivity for all by 2030' and 'at least 5G in all populated areas'.
- In 2022, DG CONNECT selected 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 2023 compared to the situation at the end of June 2022. For the 2023 edition, the research team reviewed the technologies and combination coverage categories included in the study and upon discussion with DG CONNECT, excluded the 'LTE coverage' category as all countries were reporting universal or near-universal availability. A new combination category was added to monitor coverage of Very High Capacity Networks (VHCN) as defined by the "BEREC Guidelines on Very High Capacity Networks" (BoR (23) 164).
- This report covers 31 countries across Europe – the EU27, plus Norway, Iceland, Switzerland, and the UK and analyses the availability of eleven broadband access technologies (DSL, VDSL, VDSL2 Vectoring, cable modem DOCSIS 3.0, cable modem DOCSIS 3.1, FTTP, FWA, 5G, 5G coverage in the 3.4–3.8 GHz band, and satellite) across each market, at national and rural levels. In addition, four combination categories indicating the availability of one or more forms of broadband coverage are also included in the study. These cover overall fixed broadband availability, next generation access (NGA) availability, overall fixed VHCN availability (comprised of the combined FTTP & DOCSIS 3.1 availability), and BEREC-defined VHCN availability, which includes criteria considering both fixed and mobile networks.
- 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.
- In June 2023, the European Commission issued the Implementing Decision (EU) 2023/1353 setting out key performance indicators (KPIs) to measure the progress towards the digital targets of the Digital Decade Policy Programme 2030. Three of these KPIs are included in the Broadband Coverage in Europe study: (1.) Overall fixed Very High-Capacity Networks (VHCN) coverage measures gigabit connectivity of the technologies considered to currently be able to deliver gigabit connectivity, namely FTTP and cable DOCSIS 3.1; (2.) FTTP coverage is also considered separately when interpreting fixed VHCN coverage data; and (3.) 5G coverage, which presently measures coverage of next-generation wireless high-speed networks with at least 5G equivalent performance in accordance with the principle of technology neutrality.
- The Digital Decade target on gigabit connectivity is measured as the percentage of households covered by fixed Very High-Capacity Networks (VHCN). The technologies considered are those currently capable of supporting gigabit speeds, namely FTTP and cable DOCSIS 3.1. At the end of June 2023, 78.8% of EU homes were passed by either FTTP or cable DOCSIS 3.1 networks. Compared to mid-2022, fixed VHCN (FTTP & DOCSIS 3.1) coverage grew significantly, increasing by 5.4 percentage points, representing a slight acceleration in growth compared with the previous study period. This can be attributed to an increased investment in fibre networks rollouts in several study countries.
- Rural overall fixed VHCN (FTTP & DOCSIS 3.1) coverage reached 55.7% of rural households, growing by 11.4 percentage points in the twelve months to mid-2023. In absolute terms, 17.0 million rural households across the EU were passed by either FTTP or DOCSIS 3.1 networks at the end of June 2023.

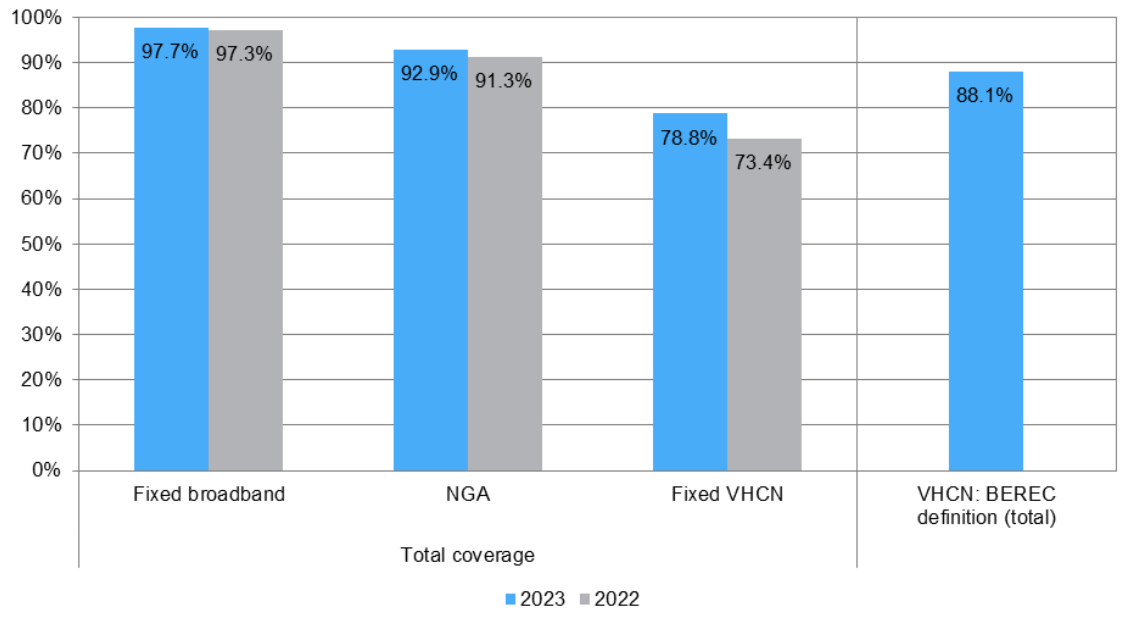


- FTTP availability, identified by the European Commission as one of the Digital Decade KPIs, continued to grow at an increasing rate compared to previous years, rising by 7.6 percentage points to pass nearly two thirds (64.0%) of EU homes at the end of June 2023. FTTP was the fastest growing broadband technology.
- In the twelve months to the end of June 2023, FTTP coverage expanded more quickly than other fixed broadband technologies in rural areas. Rural FTTP availability increased by 12.1 percentage points, reaching more than half (52.8%) of EU households. This significant increase indicates the increased focus of many European operators on deploying FTTP networks even in traditionally less profitable rural areas.
- 5G coverage, also highlighted as a Digital Decade KPI, made significant progress in the twelve months to mid-2023 and official data on 5G coverage is now available in most countries. Following an 8.0 percentage point increase compared to mid-2022, 5G services were available to 89.3% of EU households. This high coverage can be largely attributed to the use of dynamic spectrum sharing (DSS), which has been deployed by many leading European mobile network operators[1].
- The BCE 2023 data collection also included two additional 5G categories to measure 5G coverage in any band achieving a carrier-aggregate 80 MHz bandwidth and 5G coverage using the 3.4–3.8 GHz frequency band or achieving a carrier-aggregated spectrum bandwidth of at least 80 MHz. The aim of introducing these two additional indicators was to allow for a more technology-neutral monitoring of the progress of high-quality 5G connectivity that is not reliant on the mid-band spectrum allocation. However, the research team was not able to obtain data from all study countries and results that were received, were largely in line with coverage reported for the overall 5G coverage and/or for the 5G in the 3.4–3.8 GHz frequency band. Due to the inconsistencies and patchiness of the data, a decision has been made not to include data for these two additional metrics in this report.
- While 5G deployments were initially focused on urban areas, in the twelve months to the end of June 2023 availability of 5G services in rural areas increased considerably thanks to the deployment of dynamic spectrum sharing (DSS), with nearly two thirds (73.7%) of rural households being able to connect to 5G networks in mid-2023.
- The collected data also shows that more than 188 million EU households (97.7%) had access to at least one of the main fixed broadband access technologies at the end of June 2023, a slight increase in coverage compared to the end of June 2022.

[1] The current KPI for the 5G target does not take into account the quality of service provided under peak time conditions. A key challenge is to ensure that the deployed networks respond to future needs, notably support key industry sectors and critical applications that will benefit consumers and businesses in all sectors. To measure Member States readiness to overcome this challenge, further examination is required to enhance and broaden the measurement framework for 5G.

- By mid-2023, the availability of Next Generation Access (NGA) services (VDSL, VDSL2 Vectoring, DOCSIS 3.0, DOCSIS 3.1 and FTTP) in the EU reached 92.9% of households. This equates to a 1.6 percentage point increase, or 4.22 million additional households, compared to the end of June 2022. In total, 179 million households had access to NGA services in mid-2023.

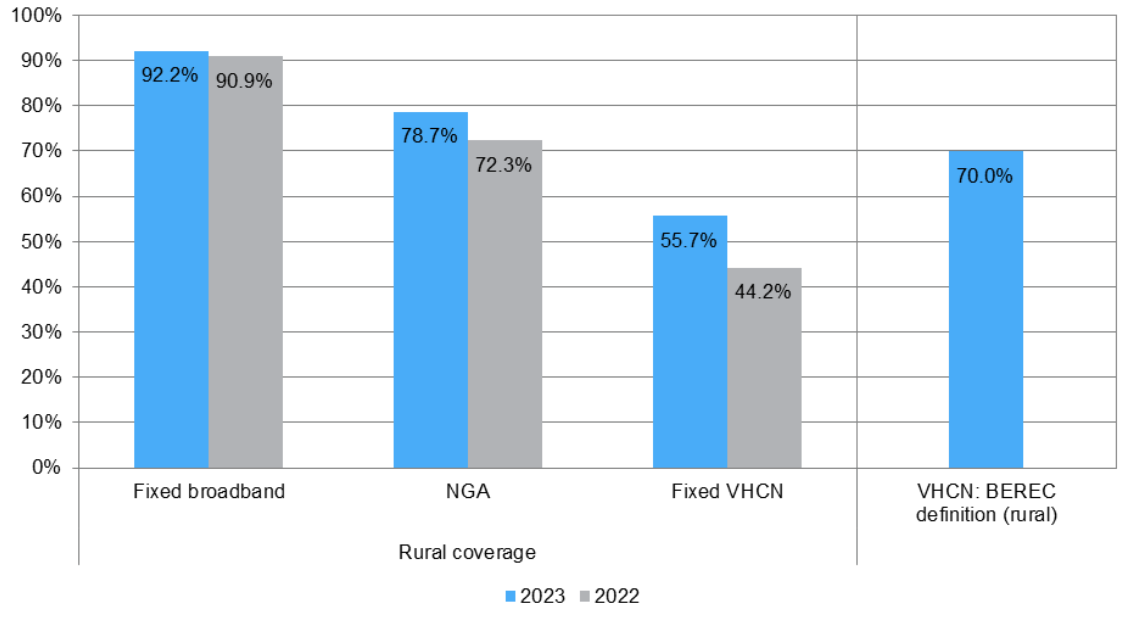
EU27: Coverage by technology combination, total, 2022 & 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission © 2024 Omdia

- Rural broadband coverage continued to be lower than national coverage across EU Member States. In mid-2023, 92.2% of rural EU homes were passed by at least one fixed broadband technology and nearly eight in ten (78.7%) had access to high-speed next generation services. Rural NGA coverage increased by 6.4 percentage points, equating to over 1.9 million additional rural households having access to NGA broadband services compared to the end of June 2022.

EU27: Coverage by technology combination, rural areas, 2022 & 2023

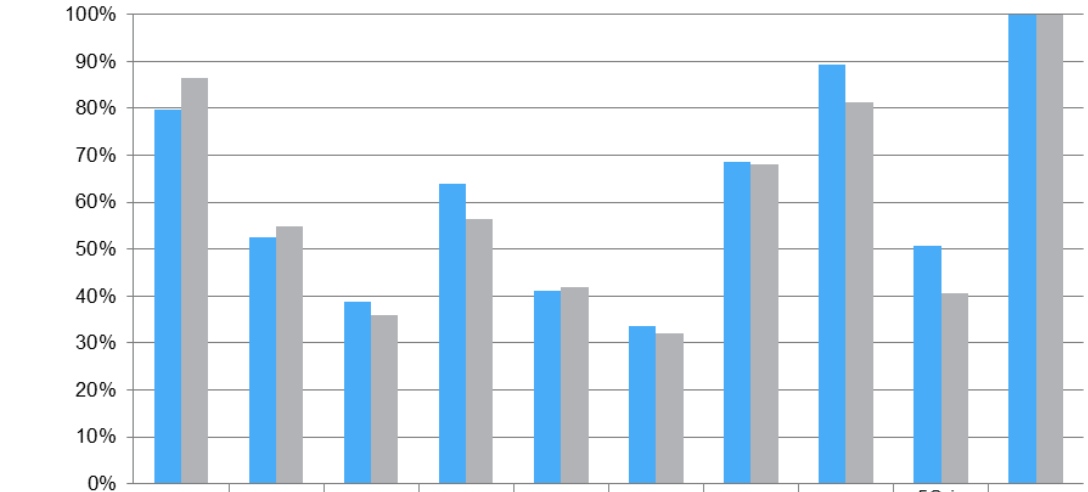


Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission © 2024 Omdia

- In mid-2023, DSL remained the dominant fixed access technology in the EU27, passing 79.7% of homes. This equates to a decline of 6.7 percentage points compared to mid-2022, as new DSL deployments are limited and exceeded by total household growth. Moreover, in increasing number of countries legacy copper networks are being decommissioned and replaced by FTTP networks, thus further contributing to the decrease in DSL coverage.

- At the end of June 2023, VDSL services were available to 52.6% of EU households, a decrease of 2.2 percentage points during the twelve-month period. VDSL is no longer the most pervasive NGA technology in the EU27, having been overtaken by FTTP in the previous study period. VDSL coverage growth has plateaued in 2020 as operators have diverted investments towards more advanced technologies (especially FTTP) in pursuit of the Digital Decade targets.
- Availability of VDSL2 Vectoring reached 38.7% of EU households, a 2.8 percentage point increase compared to mid-2022. 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.
- By mid-2023, 41.1% of EU households had access to high-speed cable broadband services and 33.6% of EU homes were passed by cable networks upgraded to the DOCSIS 3.1 standard, which is capable of delivering gigabit broadband connections. Cable DOCSIS 3.0 coverage decreased by 0.9 percentage points due to decommissioning in favour of FTTP in a number of study countries, while DOCSIS 3.1 coverage increased slightly by 1.5 percentage points year-on-year.

EU27: Coverage by technology, total, 2022 & 2023

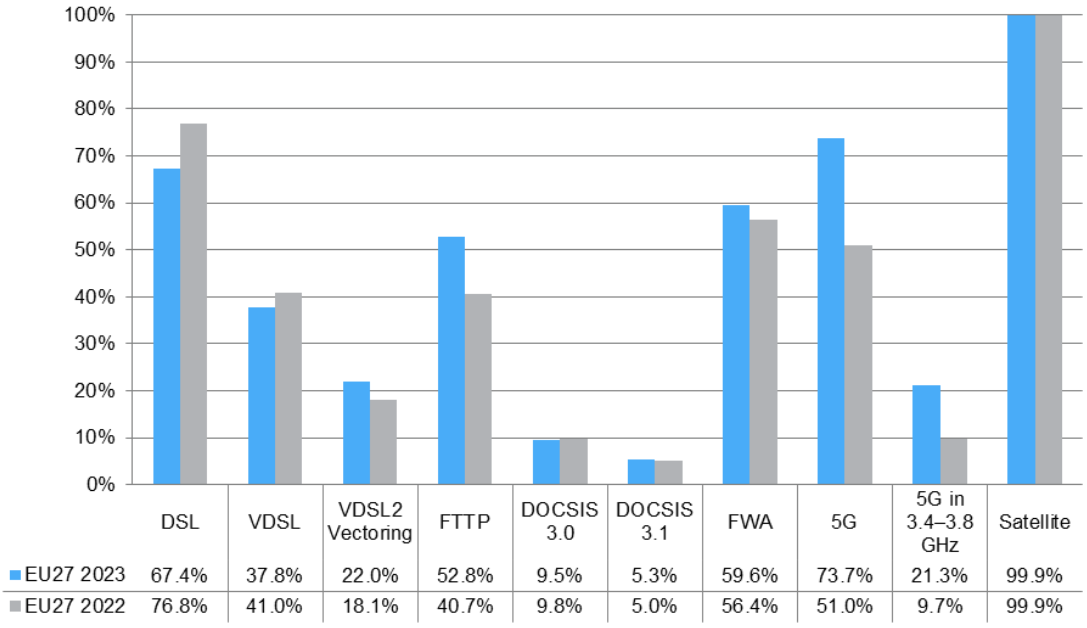


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
EU27 2023	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%
EU27 2022	86.4%	54.8%	35.9%	56.4%	42.0%	32.1%	67.9%	81.3%	40.5%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

- 5G services were available to 89.3% of EU households while 5G coverage in the 3.4–3.8 GHz band capable of delivering high throughput reached half (50.6%) of EU households as of June 2023.

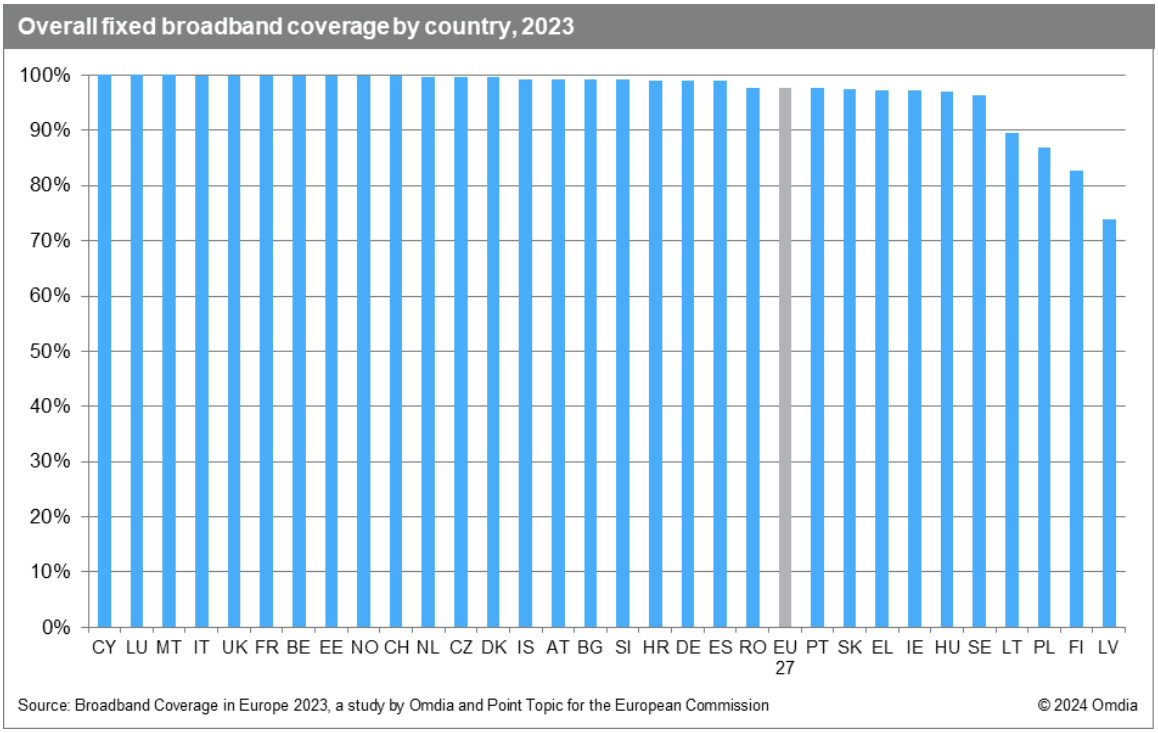
EU27: Coverage by technology, rural areas, 2022 & 2023



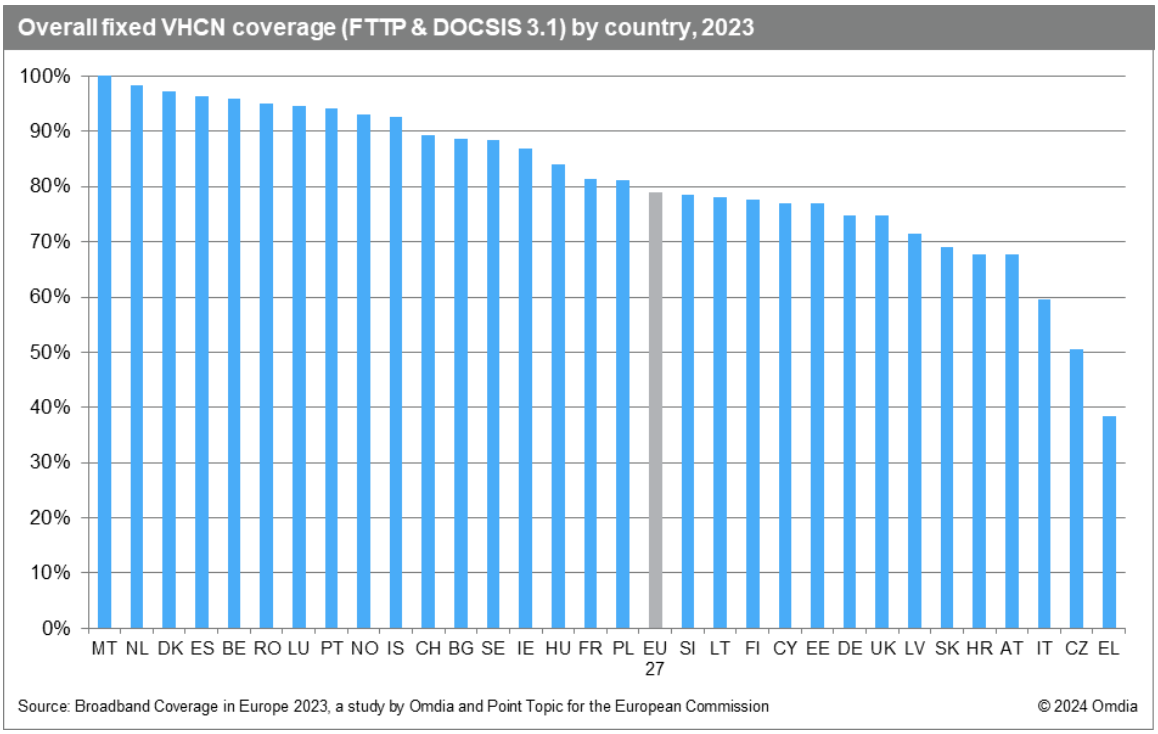
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
EU27 2023	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	21.3%	99.9%
EU27 2022	76.8%	41.0%	18.1%	40.7%	9.8%	5.0%	56.4%	51.0%	9.7%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

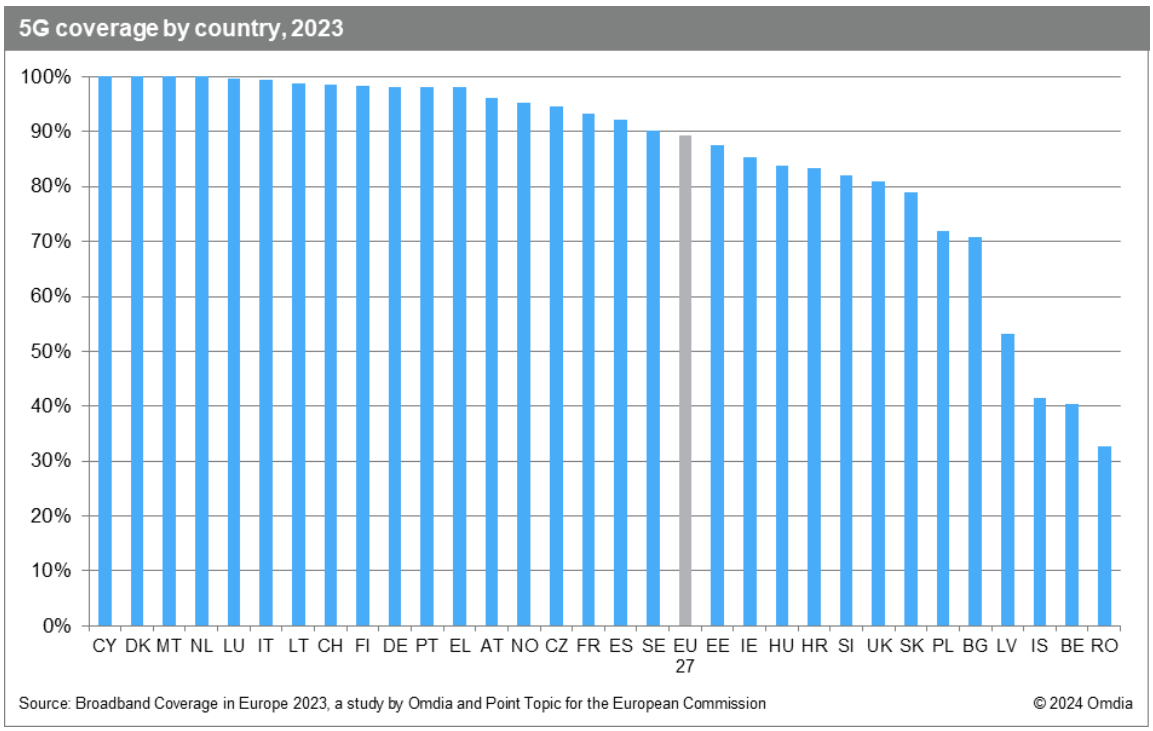
- Examining rural broadband coverage, there was a difference of 5.5 percentage points between the availability of fixed broadband services at a total level (97.7%) and at a rural level (92.2%). The gap was much wider in terms of NGA technologies, as NGA networks passed 78.7% of rural EU homes, 14.2 percentage 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.
- Rural VDSL coverage recorded a decrease for the first time as DSL networks in general are being decommissioned in favour of fibre networks. By mid-2023, rural VDSL coverage decreased by 3.2 percentage points and reached 37.8% of rural EU households.
- Examining mobile broadband technologies, the availability of 5G networks in rural areas increased considerably, growing by 22.7 percentage points and reaching nearly two thirds (73.7%) of rural EU households.
- Deployments of 5G coverage in the 3.4–3.8 GHz band have been primarily focussed on urban and sub-urban areas, because this spectrum band is less well-suited to rural coverage (due to the need for much higher base station density and near perfect line of sight) than lower-frequency bands such as the 700 MHz band. Nevertheless, by June 2023, 5G coverage in the 3.4–3.8 GHz band also increased and was available to 15.2% of rural households in the EU.
- Out of the 31 study countries, 27 countries registered fixed broadband coverage levels above 95%, while 21 countries had fixed broadband coverage above the EU27 average (97.7%). Three countries registered complete fixed broadband coverage including Cyprus, Luxembourg, and Malta. In four countries (Lithuania, Poland, Finland, and Latvia), fixed broadband services were available to fewer than 90% of households.



- Malta was the only country to report complete fixed VHCN coverage, thus reaching the Digital Decade gigabit connectivity target, which is measured as the percentage of households covered by fixed networks capable of supporting gigabit broadband speeds – FTTP and cable DOCSIS 3.1. Malta, the Netherlands, Denmark, Spain, and Belgium recorded fixed VHCN coverage levels above 95%.
- Out of the 31 study countries, 17 countries reported fixed VHCN (FTTP & DOCSIS 3.1) coverage above the EU27 average (78.8%). At 38.4%, Greece is the lowest ranked country in this study in terms of the proportion of homes passed by the gigabit-speed capable networks.



- Looking at mobile broadband technologies, commercial 5G services had been launched in all 31 study countries and 18 study countries achieved 5G coverage greater than 90% as of June 2023.

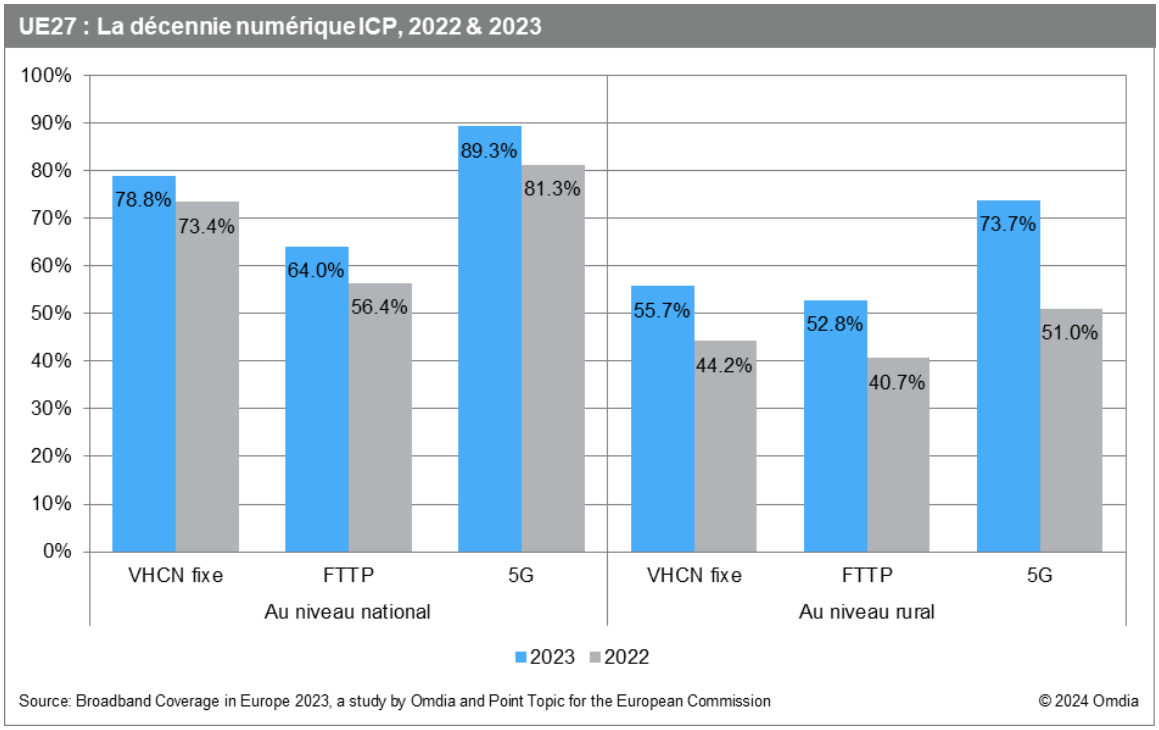


- 5G coverage in the 3.4–3.8 GHz band surpassed 70% in five countries (Finland, Italy, Denmark, Switzerland, and Austria), and a further 11 countries achieved coverage greater than 50%.

Résumé

- L’étude sur la Couverture Haut-Débit en Europe a été conçue pour suivre la progression des États membres de l’UE vers les objectifs de couverture en gigabits et en 5G définis dans le programme politique de la décennie numérique - à savoir : « connectivité très haut débit pour tous d’ici à 2030 » et « au moins une couverture 5G dans toutes les zones peuplées ».
- En 2022, la DG CONNECT a sélectionné Omdia, en partenariat avec Point Topic, pour mener à bien ce projet de trois ans. Dans chaque pays participant, l'équipe de recherche a 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 2023, à comparer avec la situation fin juin 2022. Pour l’édition 2023, l’équipe de recherche a réévalué les technologies et les combinaisons de technologies incluses dans l’étude, et en accord avec l’équipe DG CONNECT, a exclu la catégorie "Couverture LTE " étant donné que tous les pays faisaient état d'une disponibilité universelle ou quasi-universelle. Une nouvelle catégorie de combinaison a été ajoutée pour surveiller la couverture des réseaux à très haute capacité (VHCN) comme indiqué dans les recommandations de l'ORECE (BoR (23) 164).
- 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, 5G, couverture 5G sur la bande de fréquences 3,4–3,8 GHz et satellite) sur chacun des marchés, au niveau national et dans les zones rurales. De plus, quatre combinaisons indiquant la disponibilité d’une ou plusieurs formes de connexion haut débit sont également incluses dans l'étude. Celles-ci couvrent la disponibilité globale du haut débit, la disponibilité de l’Accès de Nouvelle Génération (ANG), la disponibilité globale du réseau fixe à très haute capacité (VHCN) (comprenant la disponibilité combinée FTTP et DOCSIS 3.1) et la disponibilité du réseau à très haute capacité (VHCN) définie par l'ORECE, qui inclut à la fois les réseaux fixes et mobiles.
- 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.
- En juin 2023, la Commission européenne a publié la décision d'exécution (UE) 2023/1353 établissant des indicateurs clés de performance pour mesurer les progrès accomplis dans la réalisation des objectifs numériques du programme politique 2030 de la décennie numérique. Trois de ces ICP sont inclus dans l'étude Broadband Coverage in Europe : (1) la couverture globale FTTP & DOCSIS 3.1 mesure la connectivité gigabit des réseaux fixes à très haute capacité (VHCN), c'est-à-dire les technologies considérées comme étant actuellement capables de fournir une connectivité gigabit, à savoir le FTTP et le câble DOCSIS 3.1 ; (2.) la couverture FTTP est également considérée séparément lors de l'interprétation des données de couverture VHCN fixe ; et (3.) la couverture 5G, qui mesure actuellement la couverture des réseaux sans fil à haut débit de la prochaine génération avec une performance au moins équivalente à la 5G, conformément au principe de neutralité technologique.
- L'objectif de la décennie numérique en matière de connectivité gigabit est mesuré en pourcentage de ménages couverts par des réseaux fixes à très haute capacité (VHCN). Les technologies prises en compte sont celles qui sont actuellement capables de supporter des vitesses de l'ordre du gigabit, à savoir le FTTP et le câble DOCSIS 3.1. A la fin juin 2023, 78,8% 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. Par rapport à la mi-2022, la couverture combinée des réseaux FTTP et DOCSIS 3.1 a augmenté de 5,4 points de pourcentage, ce qui représente une légère accélération de la croissance par rapport à la période d'étude précédente. Cela peut être attribuée à un investissement accru dans le déploiement de réseaux de fibre optique dans plusieurs pays étudiés.

- La couverture VHCN fixe (FTTP et DOCSIS 3.1) dans les zones rurales a atteint 55,7% des ménages ruraux, augmentant de 11,4 points de pourcentage au cours des douze mois précédant la mi-2023. En termes absolus, 17,0 millions de ménages ruraux dans l'UE étaient desservis par des réseaux FTTP ou DOCSIS 3.1 à la fin du mois de juin 2023.



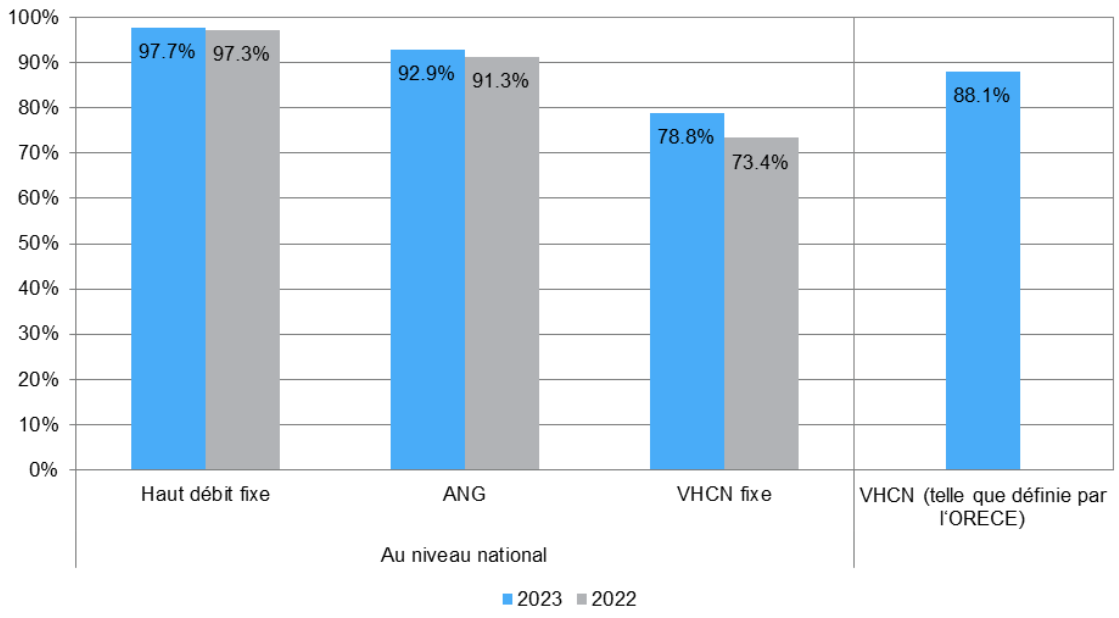
- La disponibilité des réseaux FTTP, identifiée par la Commission européenne comme l'un des indicateurs clés de performance de la décennie numérique, a continué de croître à un rythme similaire à celui de l'année dernière, avec une hausse de 7,6 points de pourcentage, pour atteindre près des deux tiers (64,0%) des ménages européens couverts à la fin juin 2023. La vitesse de déploiement de la fibre FTTP reste la plus élevée.
- Au cours des douze mois précédant juin 2023, 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 12,0 points de pourcentage, atteignant plus de la moitié des ménages ruraux de l'UE (52,7%). 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 5G, également identifiée comme l'un des indicateurs clés de performance de la décennie numérique, s'est fortement répandue entre juin 2021 et juin 2023 et les données officielles sur la couverture 5G sont désormais disponibles dans la plupart des pays. Après une augmentation de 8,0 points de pourcentage par rapport à la mi-2022, les services 5G étaient disponibles pour 89,3% des ménages de l'UE. Cette couverture élevée peut être attribuée en grande partie à l'introduction du partage dynamique du spectre (DSS), qui a été déployé par de nombreux principaux opérateurs de réseaux mobiles européens.2
- La collecte de données de l'étude sur la Couverture Haut-Débit en Europe 2023 comprenait également deux catégories 5G supplémentaires pour mesurer la couverture 5G. D'abord une bande passante globale de 80 MHz pour l'opérateur, mais également une couverture 5G utilisant la bande de fréquences de 3,4 à 3,8 GHz, ou atteignant une bande passante spectrale globale d'au moins 80 MHz. L'objectif de l'introduction de ces deux indicateurs supplémentaires permettait un suivi plus neutre sur le plan technologique des progrès de la connectivité 5G de haute qualité, qui ne dépend pas de l'attribution du spectre de bande moyenne. Cependant, l'équipe de recherche n'a pas été en mesure d'obtenir des données de tous les pays étudiés et les résultats reçus étaient largement conformes à la couverture rapportée pour la couverture globale 5G et/ou pour la 5G

[2] L'ICP actuel pour l'objectif 5G ne tient pas compte de la qualité du service fourni en période de pointe. L'un des principaux défis consiste à faire en sorte que les réseaux déployés répondent aux besoins futurs, notamment en soutenant les secteurs industriels clés et les applications essentielles qui profiteront aux consommateurs et aux entreprises dans tous les secteurs. Pour mesurer l'état de préparation des États membres à relever ce défi, un examen plus approfondi est nécessaire pour améliorer et élargir le cadre de mesure de la 5G.

dans la bande de fréquences 3,4–3,8 GHz. En raison des incohérences et du caractère irrégulier des données, il a été décidé de ne pas inclure les données pour ces deux mesures supplémentaires dans ce rapport.

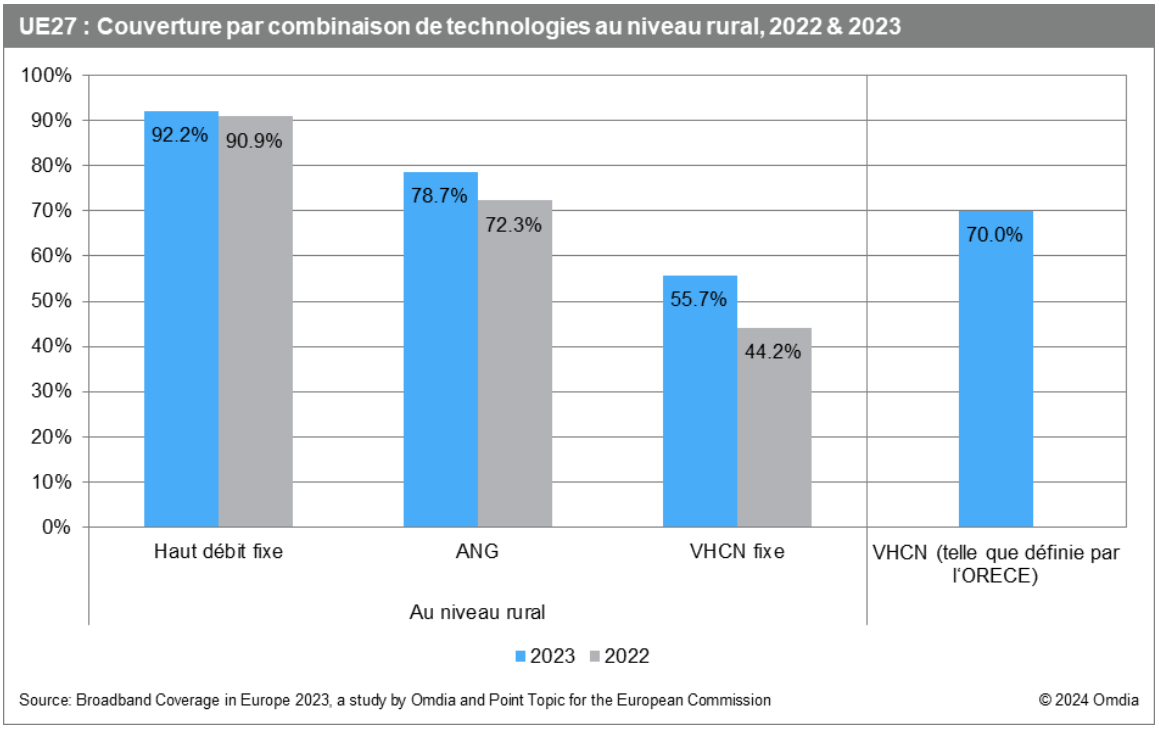
- Alors que les déploiements de la 5G se sont d'abord axés sur les zones urbaines, la disponibilité des services 5G dans les zones rurales a considérablement augmenté grâce au déploiement du partage dynamique du spectre (DSS), avec presque trois quarts (73,7%) des ménages ruraux de l'UE couverts à la mi-2023.
- Les résultats de l'enquête montrent aussi que plus de 188 millions de ménages de l'UE (97,7%) avaient accès à au moins une des principales technologies haut débit fixe en juin 2023, indiquant une légère augmentation de la couverture par rapport à la fin juin 2022.
- A la mi-2023, la couverture en services d'accès nouvelle génération (VDSL, VDSL2 Vectoring, DOCSIS 3.0, DOCSIS 3.1 et FTTP) atteignait 92,9% des ménages européens. Cela représente une hausse de 1,6 point de pourcentage, soit 4,22 millions de ménages supplémentaires par rapport à la fin juin 2022. Au total, 179 millions de ménages avaient accès au haut débit de nouvelle génération à la mi-2023.

UE27 : Couverture par combinaison de technologies au niveau national, 2022 & 2023



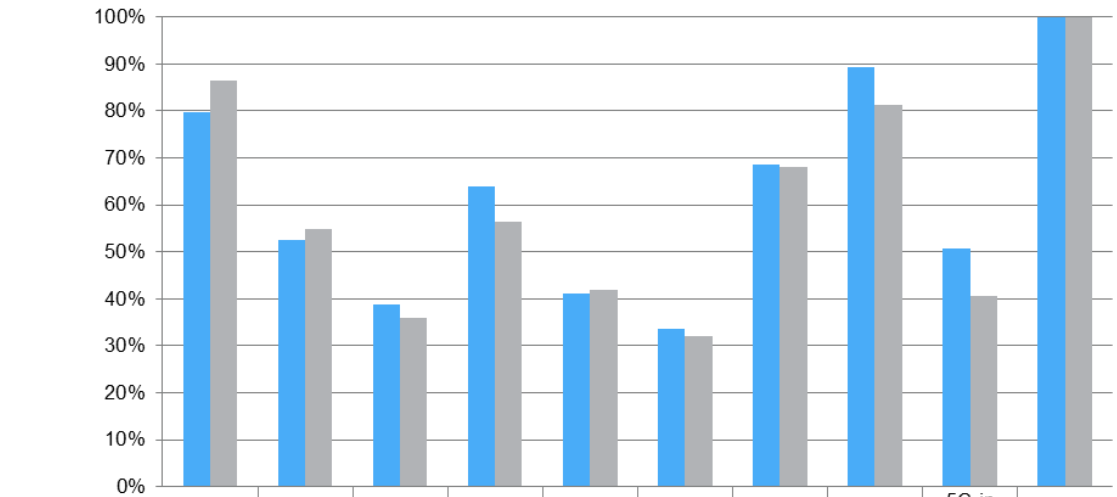
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

- 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-2023, 92,2% des foyers ruraux étaient couverts par au moins une technologie de haut débit fixe, et près de huit sur dix (78,7%) avaient accès aux services très haut débit de nouvelle génération. La couverture rurale ANG a augmenté de 6,4 points de pourcentage, ce qui équivaut à plus de 1,9 million de ménages ruraux supplémentaires ayant accès aux services à large bande ANG par rapport à la fin du mois de juin 2022.



- A la mi-2023, la connexion par modem DSL continue d'être la technologie de haut débit fixe la plus répandue dans l'UE27, couvrant 79,7% des ménages européens. Cela représente une diminution de 6,7 points de pourcentage comparé à mi-2022, en raison des déploiements limités de nouveaux réseaux DSL, rattrapés par la croissance totale des ménages. De plus, dans un nombre croissant de 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 2023, la technologie VDSL couvrait 52,6% des ménages européens, soit une augmentation de 2,2 points de pourcentage au cours de la période de douze mois. VDSL n'est plus la technologie ANG la plus répandue dans l'UE27, ayant été dépassé par le FTTP au cours de la période étudiée précédente. La croissance de la couverture VDSL s'est stabilisée depuis 2020, 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
- VDSL2 Vectoring était disponible pour 38,7% des foyers de l'UE fin juin 2023, soit une augmentation de 2,8 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.
- A la mi-2023, 41,1% des foyers de l'Union européenne avaient accès à une connexion rapide via câble modem et 33,6% 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. La couverture du câble DOCSIS 3.0 a diminué de 0,9 points de pourcentage en raison du déclassement en faveur du FTTP dans un certain nombre de pays étudiés, tandis que la couverture DOCSIS 3.1 a légèrement augmenté de 1,5 point de pourcentage d'une année sur l'autre.

UE27 : Couverture par technologie au niveau national, 2022 & 2023

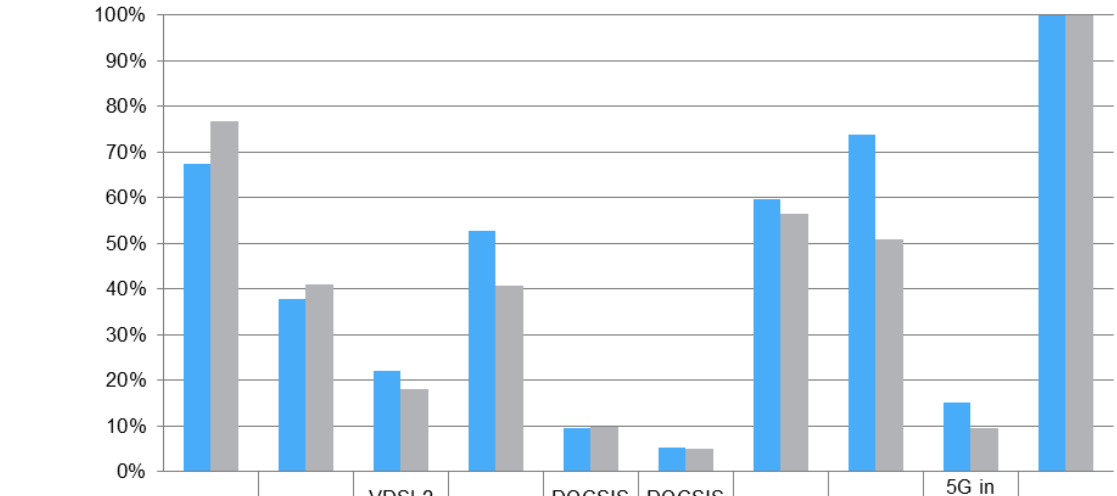


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
EU27 2023	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%
EU27 2022	86.4%	54.8%	35.9%	56.4%	42.0%	32.1%	67.9%	81.3%	40.5%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission © 2024 Omdia

- Les services 5G étaient disponibles pour 89,3% des foyers de l'UE, tandis que la couverture 5G dans la bande 3,4–3,8 GHz, capable de fournir un débit élevé, atteignait la moitié (50,6%) des foyers de l'UE en juin 2023.

UE27 : Couverture par technologie au niveau rural, 2022 & 2023

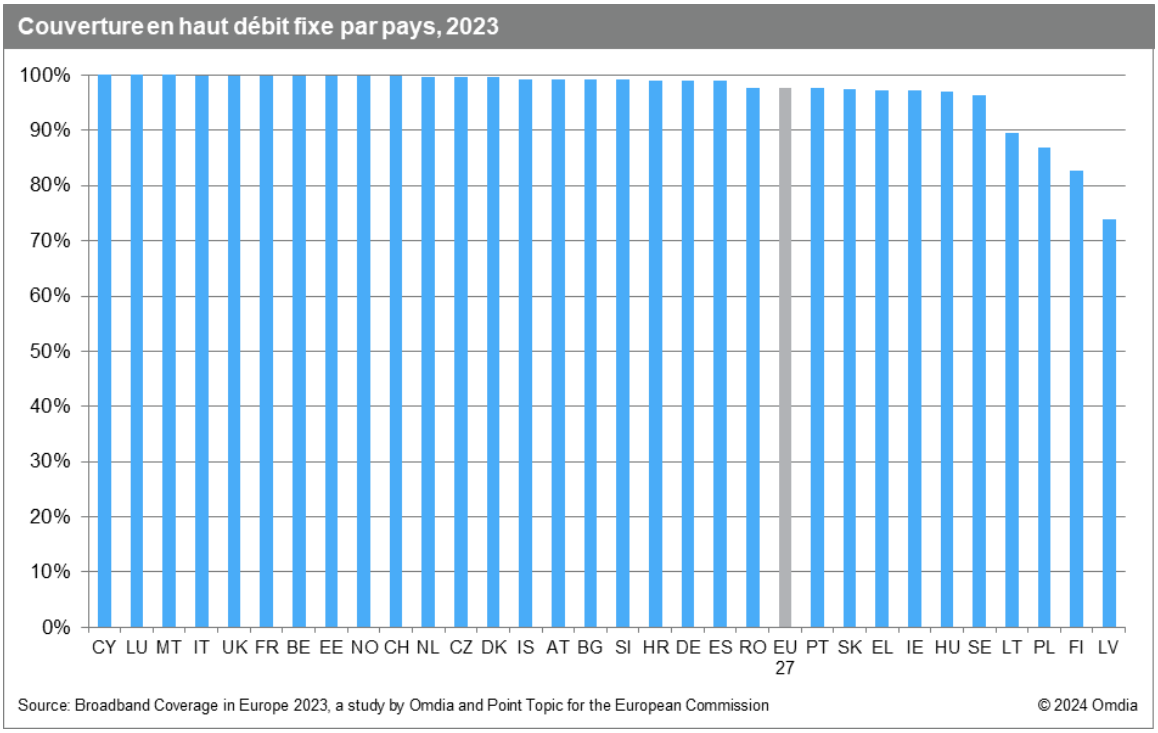


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
EU27 2023	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%
EU27 2022	76.8%	41.0%	18.1%	40.7%	9.8%	5.0%	56.4%	51.0%	9.7%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission © 2024 Omdia

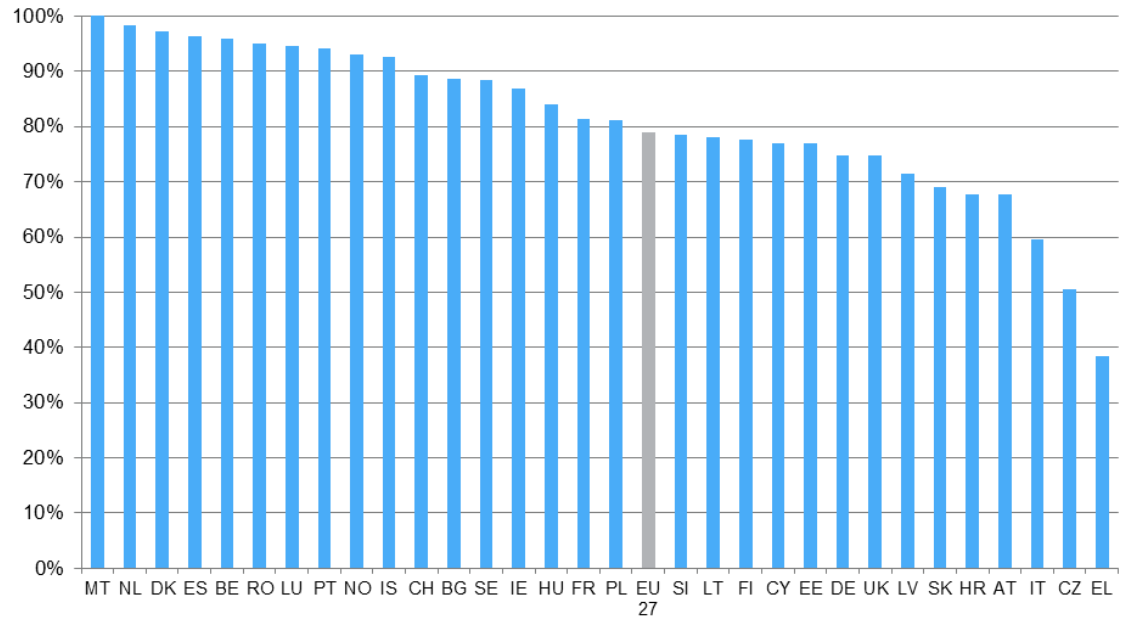
- En ce qui concerne le haut débit dans les zones rurales, il existe une différence de 5,5 points de pourcentage entre la couverture en haut débit fixe au niveau global (97,7%) et au niveau rural (92,2%). Cette différence était davantage marquée en termes de technologies ANG : ces réseaux étaient accessibles pour 78,7% des ménages ruraux, soit 14,2 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.
- La couverture des réseaux VDSL des zones rurales a enregistré une diminution pour la première fois, les réseaux DSL en général étant mis hors service au profit des réseaux fibre. À la mi-2023, la couverture VDSL rurale avait diminué de 3,2 points de pourcentage et atteignait 37,8% des foyers ruraux de l'UE.

- En ce qui concerne les technologies mobiles à haut débit, la disponibilité des réseaux 5G dans les zones rurales a considérablement augmenté, augmentant de 22,7 points de pourcentage et atteignant presque trois quarts (73,7%) des ménages ruraux de l'UE.
- Les déploiements de la couverture 5G sur la bande de fréquences 3,4–3,8 GHz ont été principalement axés sur les zones urbaines et suburbaines, car cette bande de fréquences est moins bien adaptée à la couverture rurale (en raison de la nécessité d'une densité de stations de base beaucoup plus élevée et d'une ligne de visée presque parfaite) que les bandes de fréquences inférieures telles que la bande 700 MHz. En juin 2023, 5G sur la bande de fréquences 3,4–3,8 GHz était disponible pour 15,2% des ménages ruraux de l'UE.
- Parmi les 31 pays étudiés, 27 atteignaient une couverture en haut débit fixe supérieure à 95%, et 21 pays offraient une couverture en haut débit fixe supérieure à la moyenne des UE27 (97,7%). Trois pays étudiés offraient une couverture en haut débit fixe complète de leur territoire, notamment Chypre, le Luxembourg, et Malte. Dans quatre pays (Lituanie, Pologne, Finlande, et Lettonie), moins de 90,0% des ménages avait accès à une connexion en haut débit fixe.



- Malte est le seul pays à avoir déclaré une couverture VHCN fixe complète, atteignant ainsi l'objectif de connectivité gigabit de la décennie numérique, qui est mesuré comme le pourcentage de ménages couverts par des réseaux capables de supporter des vitesses de haut débit gigabit - FTTP et câble DOCSIS 3.1. Malte, les Pays-Bas, le Danemark, l'Espagne et la Belgique ont enregistré des niveaux de couverture VHCN fixe supérieurs à 95%.
- Sur les 31 pays étudiés, 17 ont déclaré une couverture VHCN fixe (FTTP & DOCSIS 3.1) supérieure à la moyenne de l'UE27 (78,8%). Avec 38,4%, la Grèce est le pays le moins bien classé de cette étude en termes de proportion de foyers desservis par des réseaux capables d'atteindre la vitesse du gigabit.

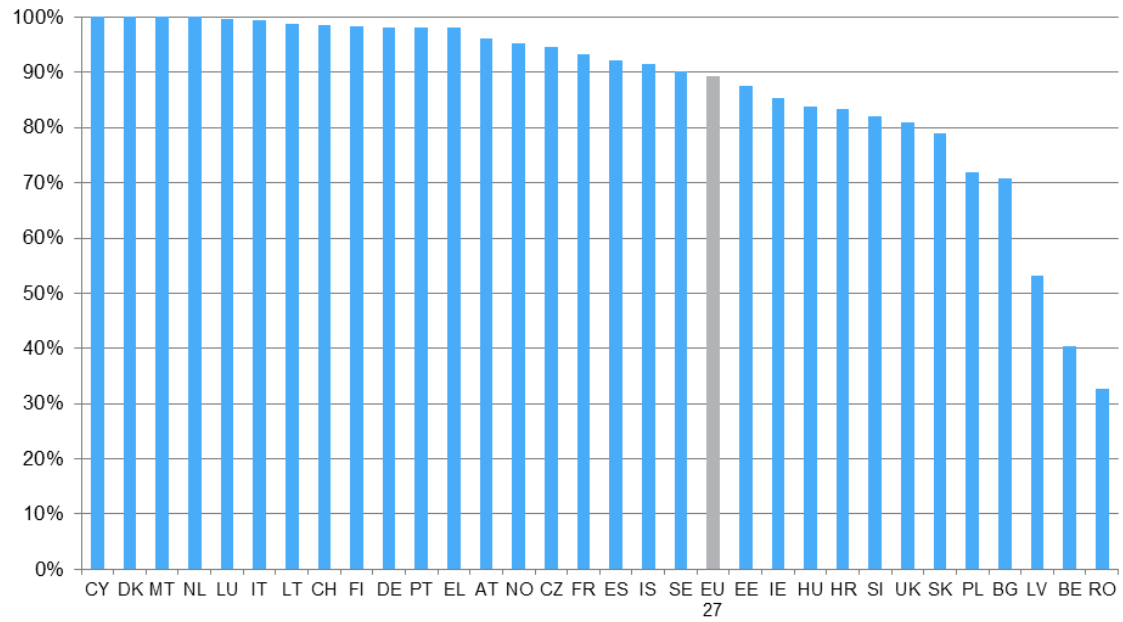
Couverture en haut débit VHCN fixe (DOCSIS 3.1 ou FTTP) par pays, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission © 2024 Omdia

- S'agissant du haut débit mobile, la 5G était commercialement déployée dans les 31 pays étudiés et 18 pays étudiés ont atteint une couverture 5G supérieure à 90% en juin 2023.

Couverture 5G, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission © 2024 Omdia

- La couverture 5G dans la bande 3,4–3,8 GHz a dépassé 70% dans cinq pays (Finlande, Italie, Danemark, Suisse et Autriche), et 11 autres pays ont atteint une couverture supérieure à 50%.

1. 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 ICT[3], 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%[4]. Moreover, OECD estimates that 10% increase in broadband penetration can raise labour productivity by 1.5%[5] and an EIB study asserts that a doubling of broadband speeds can result in 0.3% GDP growth[6].

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 2025[7]. 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 Digital Decade Policy Programme 2030 (DDPP) confirms and operationalises the vision of the Digital Compass communication for Europe's digital transformation by 2030.[8]

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 dimensions focuses on connectivity and measures the deployment and quality of broadband infrastructure.

---

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

[4] 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

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

[6] 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

[7] 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

[8] Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030 (Text with EEA relevance), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022D2481

In order to monitor the progress of broadband networks' deployment across the Member States, DG CONNECT (the European Commission Directorate General for Communications Networks, Content and Technology) has commissioned the Broadband Coverage in Europe (BCE) project to examine household coverage of all of the main fixed and wireless broadband technologies with a specific focus on Next Generation Access (NGA) technologies. In 2013, DG CONNECT selected the consortium of IHS Markit & VVA to run the three-year project. In 2016, IHS Markit partnered with the previous research provider of the BCE study, Point Topic, and was subsequently chosen to continue to deliver the broadband coverage research for the period 2016–2018. In 2019, the IHS Markit and Point Topic research team was awarded the research contract until 2021. In August 2019, IHS Markit Technology, which the Broadband Coverage in Europe research team was part of, was acquired by Informa Group and the new research organisation has been since rebranded as Omdia. The original research team now belongs under Omdia and in 2022 was again awarded the research contract for the period 2022–2024, again in partnership with 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), which will form part of the State of the Digital Decade report as well as 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 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)
- 5G
- 5G in the 3.4–3.8 GHz band
- 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 agreement with DG CONNECT, coverage of LTE networks has been discontinued in this edition of the study.

With 5G coverage of urban areas and major terrestrial transport paths being one of the Gigabit Society connectivity targets, 5G was included among the technologies tracked by the study for the first time in 2020, and in 2022 an additional category was added, tracking the coverage of 5G in the 3.4–3.8 GHz spectrum band.

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. For this edition of the study, a fourth combination category has been added, measuring the coverage of Very High Capacity Networks (VHCN), as defined by BEREC.

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

- Very High Capacity Network (VHCN) coverage
    - Includes fixed-line broadband access technologies primarily capable of achieving gigabit download speeds
    - Combination of DOCSIS 3.1 and FTTP

- BEREC-defined Very High Capacity Network (VHCN) coverage
    - Includes any network which fulfils one (or more) of the four criteria set out in the "BEREC Guidelines on Very High Capacity Networks" (BoR (23) 164).
    - In accordance with the principle of technology neutrality this metric can include coverage from any fixed or wireless technology meeting the required criteria

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 1,383 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 2012–2022 data (with the exemption of the two new categories for 5G coverage introduced in the 2023 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.

For the 2022 study, following discussions with DG CONNECT, the definition of speed coverage was changed to align with the BEREC definition of "expected peak download speed" as outlined in BEREC guidelines BoR (20) 42 and BoR (20) 165. Speed coverage data for previous years depicts actual achievable speeds.

The following table details the scope of the Broadband Coverage in Europe 2023 study.

Scope	Description of Broadband Coverage Metrics
Geographical coverage	• EU27 + Iceland, Norway, Switzerland, and the UK • Rural and national coverage
Technologies	The following technologies are included: • DSL (including VDSL and VDSL2 Vectoring) • VDSL • VDSL2 Vectoring • Cable modem DOCSIS 3.0 (including DOCSIS 3.1) • DOCSIS 3.1 • FTTP (Fibre-to-the-Premises, i.e. Fibre-to-the-Home and Fibre-to-the-Building) • Fixed Wireless Access (FWA) • 5G • 5G in the 3.4–3.8 GHz band • Satellite The study also covers the following technology combinations: • 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) • Fixed Very High Capacity Network (VHCN) coverage (including FTTP & DOCSIS 3.1) • BEREC-defined Very High Capacity Network (VHCN) coverage
Speeds	The study covers the following speed categories: • At least 30Mbps download • At least 100Mbps download • At least 1Gbps download • At least 1Gbps upload/download

Acknowledgements

It would not be possible to deliver the results of this project without the support of all involved parties. 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. 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. Methodological approach in detail

The methodological approach used in the 2023 edition of the Broadband Coverage in Europe study mirrors the approach used in the 2013–2022 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 2023 (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 2012–2022. 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 2012–2022 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 download speeds of at least 30Mbps, 100Mbps and 1Gbps, and both upload and download speeds of at least 1Gbps.

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.

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 2013–2023 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 2023. 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.[9]

3.5 Establishing coverage for technology combinations categories

After reaching the broadband coverage figures by individual technologies in each country and NUTS 3 regions, coverage data for the following three technology combinations is calculated 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 fixed Very High Capacity Network (VHCN) coverage (including FTTP & DOCSIS 3.1).

With the proliferation of broadband mapping tools used by NRAs in their individual national data collections, the research team increasingly relies on the NRAs to also provide data for the technology combination categories. These typically include granular insights into technology overlaps, often times available on address level.

In the cases where combination categories coverage data is not provided, the research team applies a methodology that has been used since the 2012 edition of the BCE study, which uses a standardised default formula 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 are 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.

3.6 Establishing coverage of Very High Speed Networks according to BEREC definition

In order to better capture the quality of service provided by fixed and mobile broadband networks, DG CONNECT requested introduction of a new combination coverage category aimed at monitoring coverage of for Very High Capacity Networks (VHCN) as defined in the "BEREC guidelines on Very High Capacity Networks (BoR (23) 164)", which state:

In accordance with the EECC, BEREC has determined that any network which fulfils one (or more) of the following four criteria is a very high capacity network:

Criterion 1: Any network providing a fixed-line connection with a fibre roll out at least up to the multi-dwelling building.

Criterion 2: Any network providing a wireless connection with a fibre roll out up to the base station.

Criterion 3: Any network providing a fixed-line connection which is capable of delivering, under usual peak-time conditions, services to end-users with the following quality of service (performance thresholds 1):

a. Downlink data rate ≥ 1000 Mbps
b. Uplink data rate ≥ 200 Mbps
c. IP packet error ratio (Y.1540) ≤ 0.05%
d. IP packet loss ratio (Y.1540) ≤ 0.0025%
e. Round-trip IP packet delay (RFC 2681) ≤ 10 ms

[9] With the exception of Iceland and the UK, where data on 5G in the 3.4–3.8 GHz band is not available.

f. IP packet delay variation (RFC 3393) ≤ 2 ms
g. IP service availability (Y.1540) ≥ 99.9% per year

Criterion 4: Any network providing a wireless connection which is capable of delivering, under usual peak-time conditions, services to end-users with the following quality of service (performance thresholds 2):

a. Downlink data rate ≥ 350 Mbps
b. Uplink data rate ≥ 50 Mbps
c. IP packet error ratio (Y.1540) ≤ 0.01%
d. IP packet loss ratio (Y.1540) ≤ 0.01%
e. Round-trip IP packet delay (RFC 2681) ≤ 18 ms
f. IP packet delay variation (RFC 3393) ≤ 5 ms
g. IP service availability (Y.1540) ≥ 99.9% per year

Given the large number of possible permutations of criteria combinations falling within the BEREC definition, the research team did not attempt to estimate BEREC-defined VHCN coverage levels for countries, which did not report this metric. In addition, the research team received data from 15 out of the 31 study countries and each NRA had a slightly different approach to the individual criteria considerations. The research team therefore concludes that it is not yet possible to provide comparable cross-country results for this metric and any direct comparison of the results presented in this study will be misleading.

3.7 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 2023 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.

For the 2022 study, the definition of speed coverage was changed to align with the BEREC definition of "expected peak download speed" as outlined in BEREC guidelines BoR (20) 42 and BoR (20) 165 from the previously applied definition of "actual achievable speed". This definition was maintained in the 2023 study.

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 peak time speeds of at least 30Mbps. The expected peak time speed is the speed that a household could expect to receive when using a broadband service during the whole peak-time period. The speed should describe the actual capability of the network. This category encompasses VDSL (including VDSL2 Vectoring), FTTP, DOCSIS 3.0/3.1 cable broadband and FWA (4G TD LTE standard and 5G FWA). However, not all connections utilizing these technologies can achieve 30Mbps and higher actual peak download speeds. For example, VDSL connections with distance from the exchange point higher than 500m see radical decrease in actual speeds or FWA over 4G can face issues in terms of speed and connection stability. Therefore, respondents were asked to exclude those connections from their answers.

- Coverage by broadband network/s capable of realistically achieving actual peak time download speeds of at least 100Mbps. The expected peak time speed is the speed that a household could expect to receive when using a broadband service during the whole peak-time period. This category encompasses FTTP, DOCSIS 3.0/3.1 cable broadband, VDSL2 Vectoring 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 FTTB (fibre-to-the-building) connections included in the FTTP category in-building wiring can pose significant constraints on achievable end-user broadband speeds), respondents were asked to exclude those connections from their answers.
- Coverage by broadband network/s capable of realistically achieving actual peak time 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 peak time 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 during the whole peak time period – i.e. the time of the day with a typical duration of one hour when the network load is at its maximum.

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.

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.

3.8 Establishing coverage for additional mobile coverage metrics

As required in the Tender Specifications for CNECT/2021/OP/0081 and following the discussions with DG CONNECT at the inception meeting, the research team has included two mobile metrics as part of the Broadband Coverage in Europe 2023 study, both aimed to monitor availability of 5G mobile broadband services to European consumers:

- 5G coverage
- 5G coverage in the 3.4–3.8 GHz band

5G coverage was included in the Broadband Coverage in Europe study for the first time in 2020, reflecting the progress of mobile operators that had deployed and launched their 5G networks at that time. Over the three years to mid-2023, 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 two years, 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.

Given the quite vast differences in performance quality delivered over 5G networks, in 2022 the research team (in coordination with DG CONNECT) introduced a second metric aimed at examining progress in the roll-out of 5G networks utilizing the 3.4–3.8 GHz frequency band, which is considered the most appropriate for 5G (5G primary band), capable of delivering high throughput (large contiguous bandwidth) and at the same time traveling significant distances, which in general means an improvement in quality of service and user experience.

The BCE 2023 data collection also included two additional 5G categories to measure 5G coverage in any band achieving a carrier-aggregate 80 MHz bandwidth and 5G coverage using the 3.4–3.8 GHz frequency band or achieving a carrier-aggregated spectrum bandwidth of at least 80 MHz. The aim of introducing these two additional indicators was to allow for a more technology-neutral monitoring of the progress of high-quality 5G connectivity that is not reliant on the mid-band spectrum allocation. However, the research team was not able to obtain data from all study countries, and the results that were received were largely in line with coverage reported for the overall 5G coverage and/or for the 5G in the 3.4–3.8 GHz frequency band. Due to the inconsistencies and patchiness of the data, a decision has been made not to include data for these two additional metrics in this report.

3.9 Final data confirmation, feedback and reporting

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 DESI 2023 dashboard for the Digital Decade 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 2023 study.

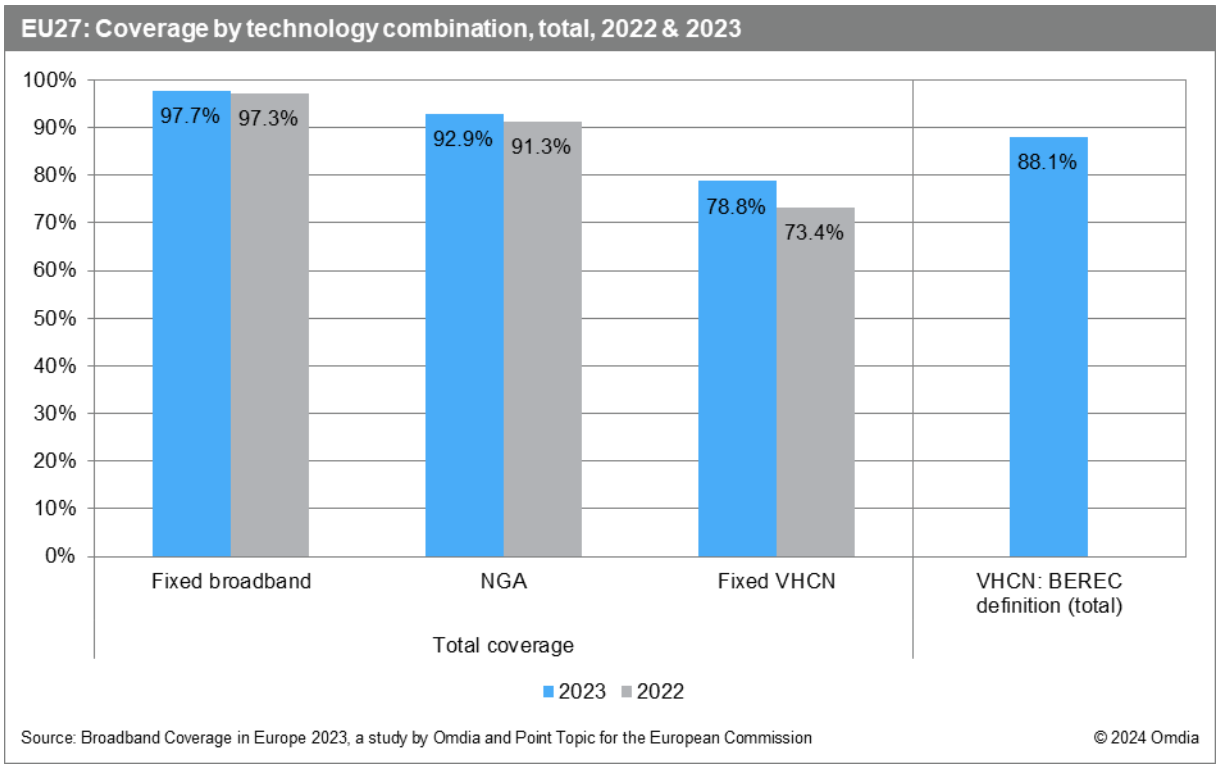
4. European Overview

4.1 Europe-wide coverage by technology combinations

The main objective of the Broadband Coverage in Europe 2023 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 2023 edition of the BCE study: DSL, VDSL, VDSL2 Vectoring, FTTP, cable modem DOCSIS 3.0, DOCSIS 3.1, FWA, 5G, 5G in the 3.4–3.8 GHz band, and satellite. All technologies 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 (97.7%) had access to at least one of the main fixed broadband access technologies in mid-2023 (excluding satellite). The proportion of homes passed by at least one fixed broadband network (DSL, cable DOCSIS 3.0, FTTP or FWA) increased during the twelve months to mid-2023, by 0.4 percentage points (p.p.).



The largest growth among the combination categories was witnessed in fixed VHCN coverage, i.e. 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 initiative[10]. During the twelve-month period to mid-2023, overall fixed VHCN coverage increased by 5.4 percentage points. This marked an acceleration in coverage growth compared to the twelve months to mid-2022 (3.6 percentage points), due to the acceleration of FTTP rollout in a number of member states, notably Germany, Poland, and the Netherlands. Coverage of these ultra-high speed networks now reaches an additional 11.4 million EU homes, for a total of over 151 million EU households.

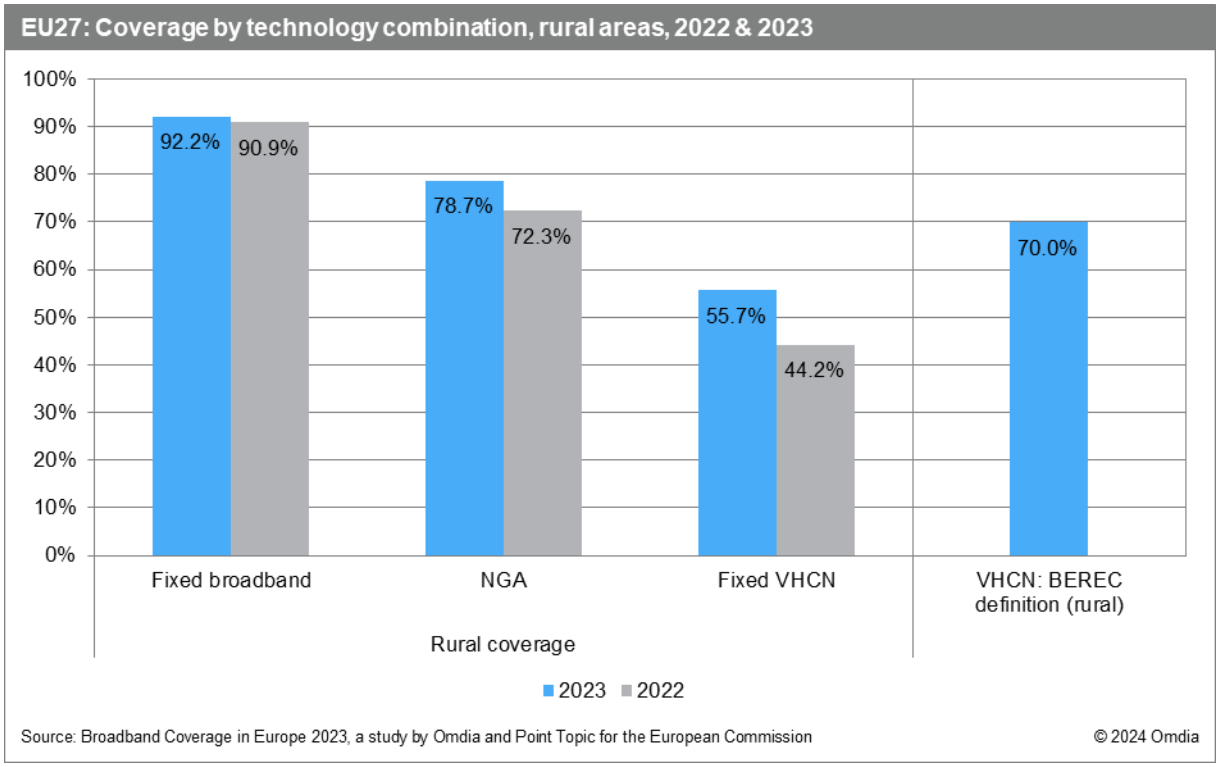
For the 2023 edition of the BCE study, a new combination category was introduced, measuring the coverage of Very High Capacity Networks (VHCN), as defined by BEREC in the "BEREC Guidelines on Very High Capacity Networks" (BoR (23) 164). The NRAs of 15 member states[11] provided coverage data for this measure, reporting average coverage of 88.1% of households.

Coverage of NGA broadband continued to grow steadily, reaching 92.9% of EU households in mid-2023, an increase of 1.6 percentage points. Over 4.2 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 almost 179 million EU homes were passed by at least one NGA

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

[11] Cyprus, Czechia, Denmark, France, Italy, Lithuania, Latvia, Luxembourg, Malta, Netherlands, Romania, Slovakia, Slovenia, Spain, Sweden

network. In the future, it can be expected that growth in NGA coverage will slow down as NGA networks approach universal coverage levels.



Access to fast broadband services in rural areas remains a key priority for the EU. At the end of June 2023, 92.2% of rural households across the EU had access to at least one fixed broadband technology, an increase of 1.3 p.p. since the previous year (90.9%). Growth in rural coverage of fixed VHCN networks continued to accelerate, as coverage increased by more than 11.4 p.p. to reach 55.7% of rural homes in the EU – 17.0 million households in total, more than double the level recorded in 2020. This growth also helped to drive an increase in rural NGA coverage, and more than three quarters of rural households (78.7%) now have access to NGA, an increase of 6.4 p.p. since mid-2022.

This year's survey also asked about coverage of VHCN in rural areas, and in the 15 member states which reported this metric coverage reached 70.0%.

Broadband coverage levels in rural regions remain notably lower than total national coverage, with the 92.2% rural fixed broadband coverage 5.5 percentage points below the total coverage of 97.7%, a slight reduction since the previous year. But the gap between total coverage and rural coverage of fixed VHCN networks remained much larger, at 23.2 percentage points, though it continued to narrow during the twelve months to mid-2023, from 29.2 percentage points in 2022. Meanwhile, the difference in total and rural NGA coverage continued to narrow in 2023, falling to 14.2 p.p., highlighting the continued shift in NGA network deployments towards rural areas.

4.2 Europe-wide coverage by individual technologies

4.2.1 Coverage by technology in total

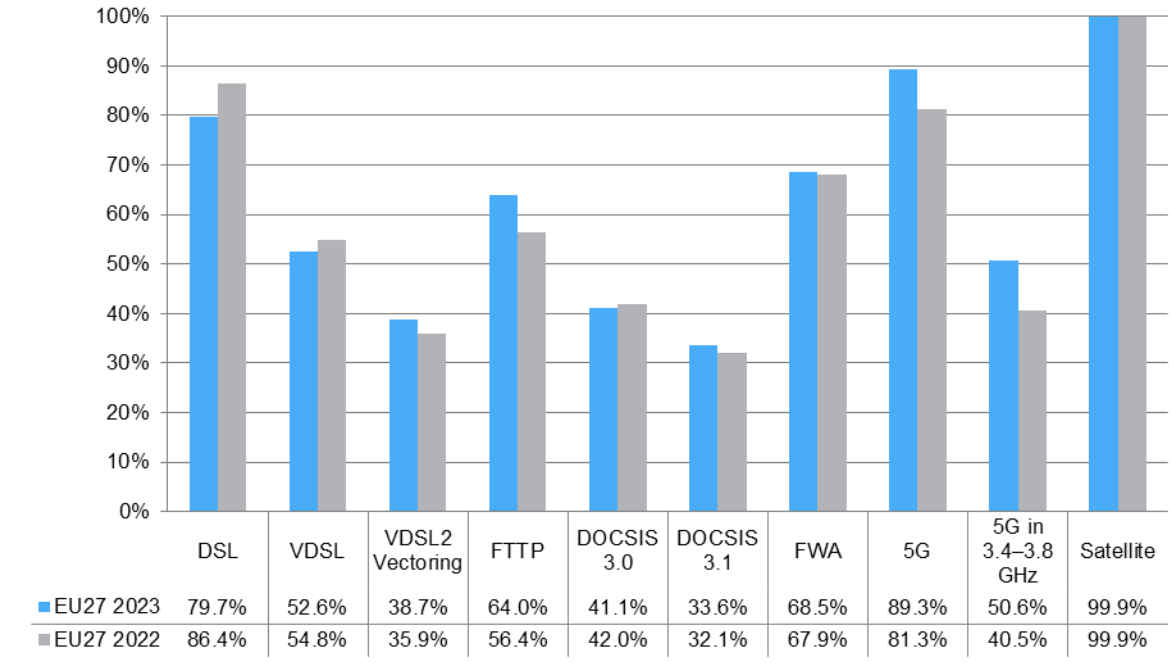
Examining the availability of fixed broadband technologies, DSL remained the most pervasive broadband technology, despite falling below 80% coverage of EU households in mid-2023 (79.7%). This represents a 6.7 percentage point decline compared to mid-2022, underpinned by the growing number of operators opting for disconnection of copper lines and upgrade to fibre.

FTTP growth continued strongly over the year, and FTTP networks are now available to almost two thirds of homes in the EU, with 64.0% of households having coverage, an increase of 7.6 p.p. since mid-2022. FTTP is now the leading NGA technology at EU level, reaching over 123 million households (an increase of 15.4 million).

Coverage of cable modem networks declined slightly again over the year to mid-2023, as the focus shifted further towards rollout of FTTP infrastructure. By mid-2023, 41.1% of EU households had access to high-speed cable broadband provided by DOCSIS 3.0, a decrease of 0.9 p.p. from mid-2022. Cable services provided over DOCSIS 3.1 were available to 33.6% of EU households, which means that 81.3%

of DOCSIS 3.0 networks had been upgraded to the DOCSIS 3.1 standard at the end of June 2023, up from 76.6% the previous year.

EU27: Coverage by technology, total, 2022 & 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
EU27 2023	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%
EU27 2022	86.4%	54.8%	35.9%	56.4%	42.0%	32.1%	67.9%	81.3%	40.5%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Over the study period, VDSL coverage declined by 2.2 percentage points to just over half of EU households (52.6%). VDSL coverage in Europe has peaked as operators have diverted investments towards more advanced technologies (especially FTTP) in pursuit of the Digital Decade targets. But availability of VDSL2 Vectoring technology increased, and by mid-2023, 38.7% of EU homes were passed by VDSL2 Vectoring, a 2.8 percentage point increase compared to the end of June 2022.

Fixed Wireless Access, which includes Wi-Fi, WiMAX, 4G LTE-TDD, and 5G FWA was available to 68.5% of EU households at the end of June 2023, a 0.6 percentage point increase compared to mid-2022. 5G FWA access is becoming increasingly important as an alternative for households which lack access to gigabit-capable wireline networks, and the research team expects continued strong growth in the next few years.

Examining mobile network coverage, mobile network operators made further progress in 5G over the year. Official data on 5G coverage is now available for most 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 2023 almost nine in ten households across the EU (89.3%) were passed by 5G networks, an 8.0 p.p. increase since the previous year.

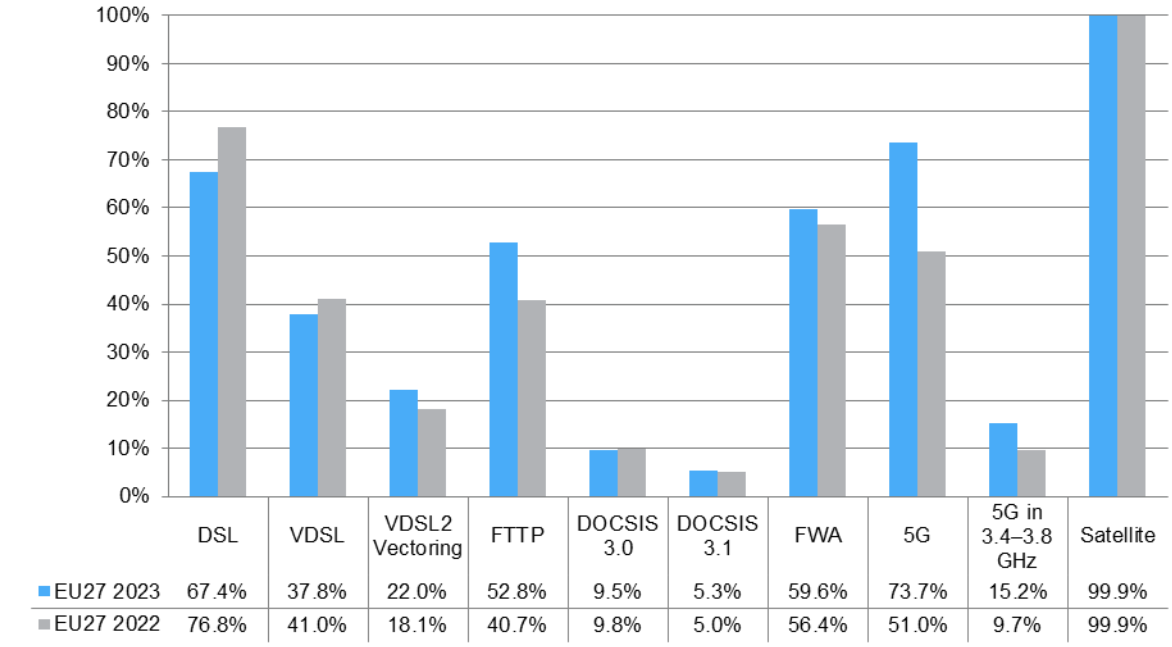
Much of this 5G coverage has been provided by the use of Dynamic Spectrum Sharing technology (DSS), which has allowed operators to deploy 5G coverage rapidly using existing infrastructure. In order to better track the deployment of new 5G infrastructure, the research team added a second 5G category for the 2022 study, tracking the coverage of 5G networks using the 3.4–3.8 GHz band. Coverage of these networks reached 50.6% of EU households as of mid-2023, meaning that more than half of EU citizens have access to fast 5G services using this band.

At the end of June 2023, 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 2022. 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 country with no availability of satellite broadband services.

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.

EU27: Coverage by technology, rural areas, 2022 & 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
EU27 2023	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%
EU27 2022	76.8%	41.0%	18.1%	40.7%	9.8%	5.0%	56.4%	51.0%	9.7%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

The most widespread fixed broadband technology in rural areas continued to be DSL, reaching 67.4% of rural EU households by mid-2023, down by 9.4 p.p. over the year due to the withdrawal of copper access in favour of FTTP, in a growing number of member states. FTTP coverage continued to expand more quickly than other fixed broadband technologies in rural areas. Rural FTTP availability increased by 12.1 percentage points, reaching more than half of rural EU households (52.8%). This significant growth indicates the increased focus of many European operators on deploying FTTP networks even in traditionally less profitable rural areas.

Cable coverage in rural areas remained limited due to the high costs associated with deploying cable networks historically, and the shift in focus to FTTP in recent years. At the end of June 2023, cable modem DOCSIS 3.0 networks passed only 9.5% of rural EU homes, down fractionally since mid-2022. But rural availability of DOCSIS 3.1 increased marginally, reaching 5.3% of rural households at the end of June 2023, meaning that more than half of rural cable networks (52.0%) have now been upgraded to the DOCSIS 3.1 standard.

During the twelve months to mid-2023, rural VDSL coverage declined by 3.2 percentage points, reaching 37.8% of rural households. The rural VDSL footprint is evolving differently across Europe – in some cases expanding as operators continue to invest in upgrades to existing DSL infrastructure (especially in Eastern Europe), but elsewhere declining as copper networks are replaced with FTTP (primarily in Western Europe). This year the balance has tipped in favour of substitution by FTTP, leading to a reduction in overall coverage. Meanwhile investment in VDSL2 Vectoring has continued, and the technology was available to 22.0% of rural households: an increase of 3.9 p.p. from the previous year, but 16.7 p.p. fewer than on a national level.

Fixed Wireless Access was available to 59.6% of rural households in mid-2023, up by 3.2 p.p. over the study period. Recent years have seen the emergence of fixed wireless solutions as substitutes to traditional fixed broadband technologies in remote areas, mostly in rural regions.

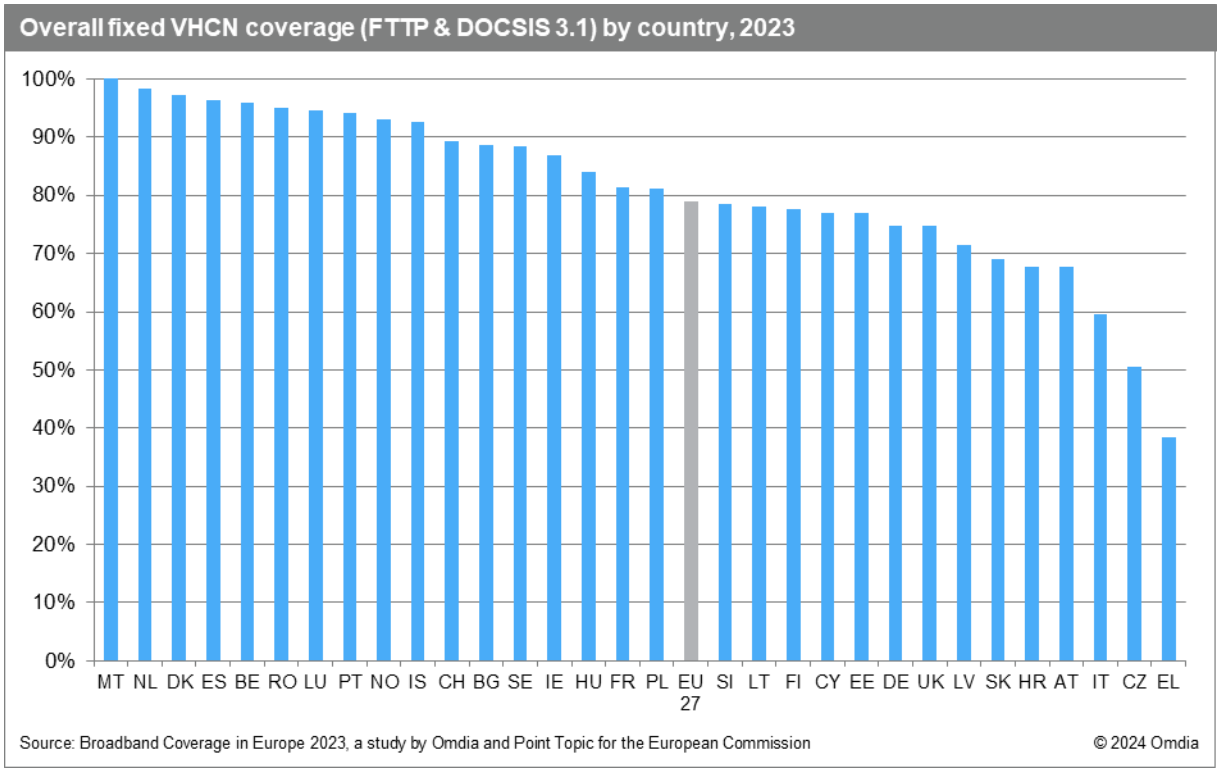
Although 5G deployments tend to focus first on urban areas, availability of 5G services in rural areas has grown substantially, with almost three quarters (73.7%) of rural EU households covered by 5G networks at June 2023. Much of this coverage uses DSS, or the lower-frequency 700 MHz band, therefore rural 5G coverage using the 3.4–3.8 GHz spectrum band was much lower as of mid-2023, at only 15.2% of rural households.

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 VHCN (FTTP & DOCSIS 3.1) coverage by country

The Digital Decade target on gigabit connectivity is measured as the percentage of households covered by fixed Very High Capacity Networks (VHCN), i.e. technologies currently capable of supporting gigabit speeds, namely FTTP and cable DOCSIS 3.1.[12] At the end of June 2023, 78.8% of EU households were passed by at least one FTTP or DOCSIS 3.1 network, with coverage growing by 5.5 percentage points on the EU27 level. Overall fixed VHCN coverage ranges between 38.4% 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 the Netherlands both reaching coverage levels over 98%. Denmark, Romania and Spain were also among the leaders in this category owing to extensive FTTP coverage in both countries.



On the other hand, countries such as Greece, Czechia, and Italy recorded the lowest levels, due to operators' past preference for VDSL upgrades over FTTP deployments, and in the case of Greece and Italy the absence of any cable networks.

4.3.1.1 Total FTTP coverage by country

As stated in the Commission Implementing Decision setting out KPIs to measure the Digital Decade targets, the evolution of FTTP coverage will also be taken into consideration when interpreting gigabit capable (VHCN) coverage. In the twelve months to mid-2023, FTTP coverage increased by 7.6 percentage points. Overall, 64.0% of EU homes were passed by FTTP networks with eleven countries recording FTTP coverage below the EU average.

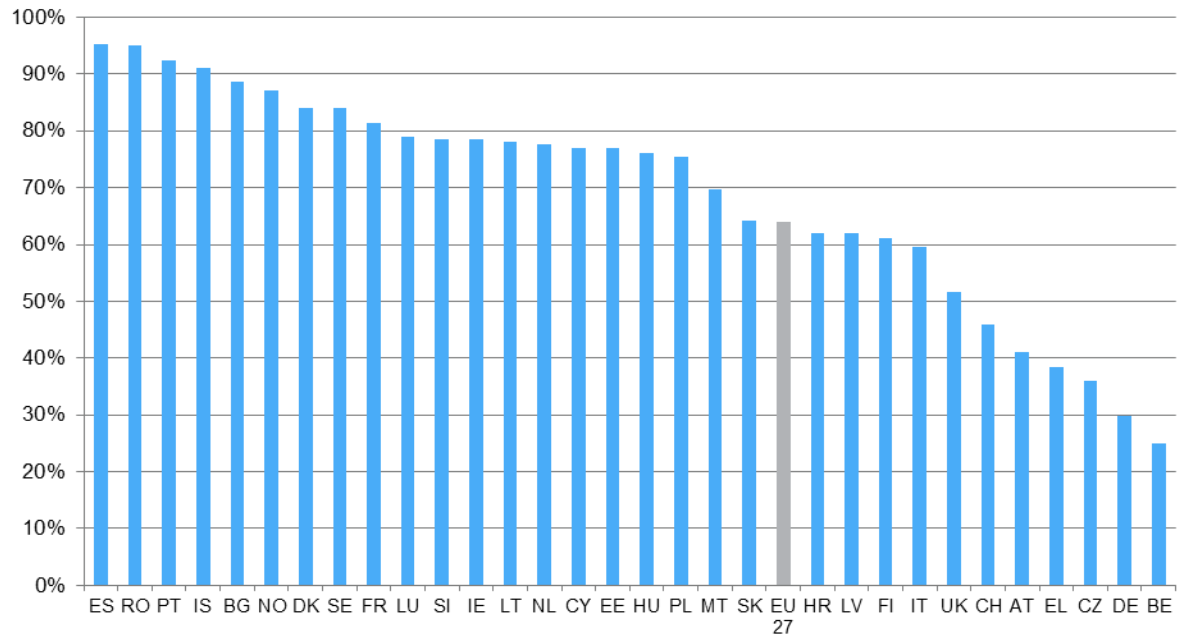
Spain is now the country with the highest FTTP coverage level, with 95.2% of homes passed, following a 4.2 p.p. increase over the year. Two other countries – Romania and Portugal – reached FTTP coverage levels higher than 90%, and a further six surpassed 80%. As a testament to the increased FTTP deployment activity across Europe, this year eight study countries recorded double-digit growth in FTTP coverage (up from six in last year's study) – Cyprus, Finland, Germany, Greece, Malta, the Netherlands, Poland, and the UK.

Whilst FTTP networks were available in all study countries, availability remained limited in some. However, this year, no country recorded FTTP coverage below 20% and only two countries, Belgium and Germany, recorded coverage below 30%. In both these countries, the incumbent has historically

[12] As set out in the Implementing decision setting out key performance indicators to measure the progress towards the digital targets, see EUR-Lex - 32023D1353 - EN - EUR-Lex (europa.eu), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023D1353

prioritised VDSL upgrades to existing networks as opposed to investing in the typically more expensive FTTP technology. A similar strategy was adopted by operators in other countries such as Austria, Czechia, Greece, and the UK, which all ranked in the bottom seven countries for FTTP coverage in mid-2023. But it is worth noting that some operators (such as BT/Openreach in the UK) have now revisited their network deployment strategies to prioritise FTTP roll-out over legacy network upgrades, and this has led to some significant increases in FTTP coverage over the last two years. In the UK, FTTP coverage grew by 15.2 p.p. in the year to June 2023, while Greece saw a 10.6 p.p. increase.

FTTP coverage by country, 2023

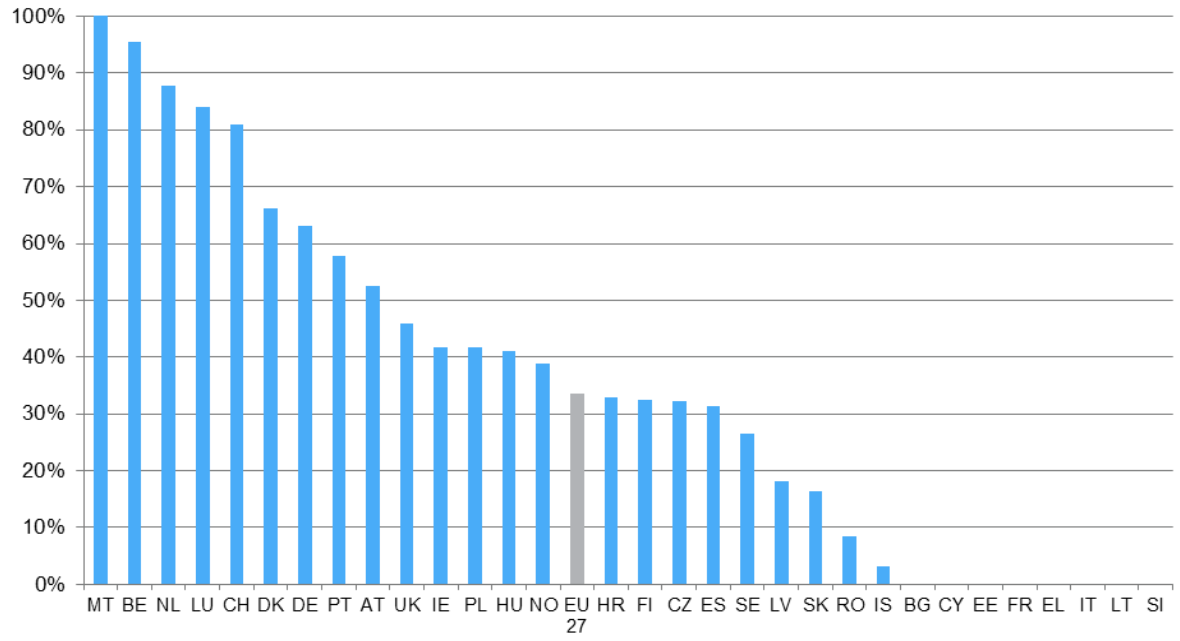


Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

4.3.1.2 Total DOCSIS 3.1 coverage by country

The DOCSIS 3.1 standard allows cable operators to compete with fibre operators on the ultrafast broadband market, and as of mid-2023, DOCSIS 3.1 was available to a third of EU households (33.6%), up by 1.5 p.p. since 2022. Moreover, more than four fifths (81.3%) of DOCSIS 3.0 networks have been upgraded to the DOCSIS 3.1 standard by the end of June 2023, compared to 76.6% the year prior.

DOCSIS 3.1 by country, 2023

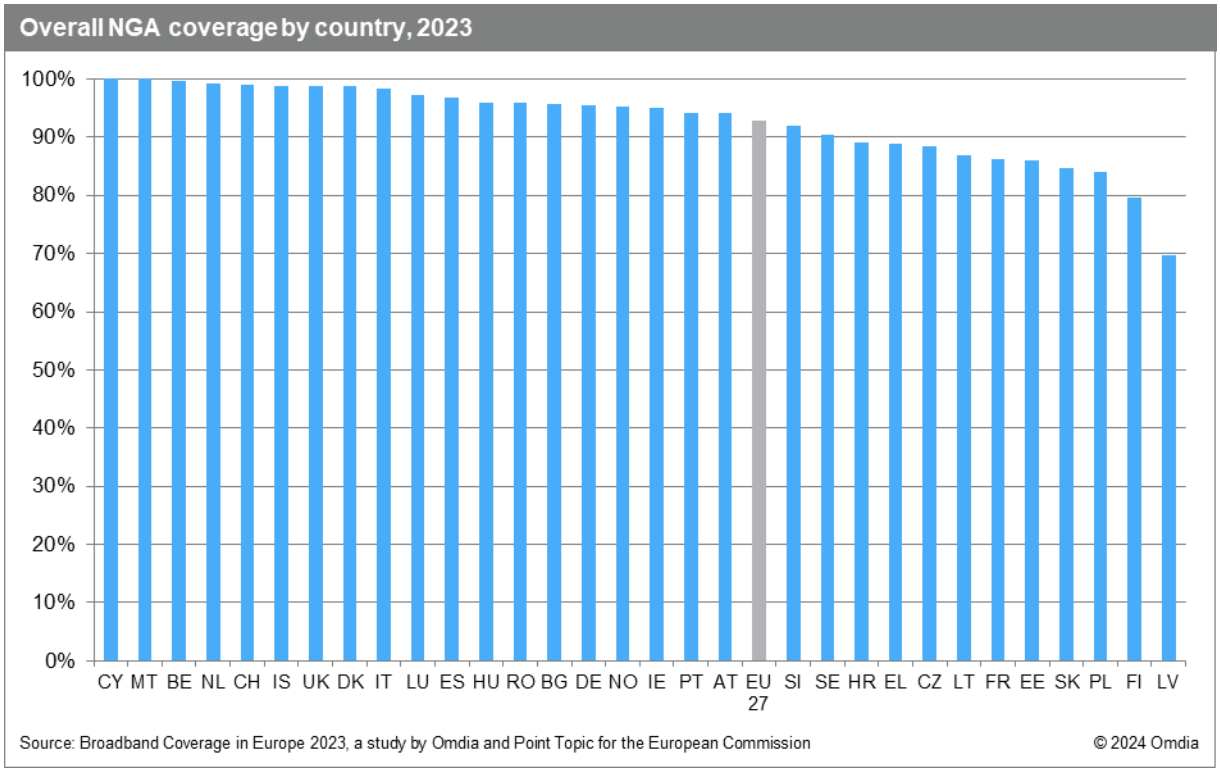


Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

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 Belgium, Croatia, Denmark, Finland, Germany, Iceland, Ireland, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Spain, and the UK, cable networks have been upgraded almost entirely or entirely to the DOCSIS 3.1 standard.

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 vary[13]). 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 2023, there continued to be considerable differences in NGA coverage across the study countries, reflecting the various strategies adopted by network operators across Europe to deploy high-speed broadband. Cyprus and Malta were the two countries that recorded complete NGA coverage, whilst Belgium, the Netherlands, Switzerland, Iceland, the UK, Denmark, and Italy all reached near-universal NGA coverage levels (>98%).

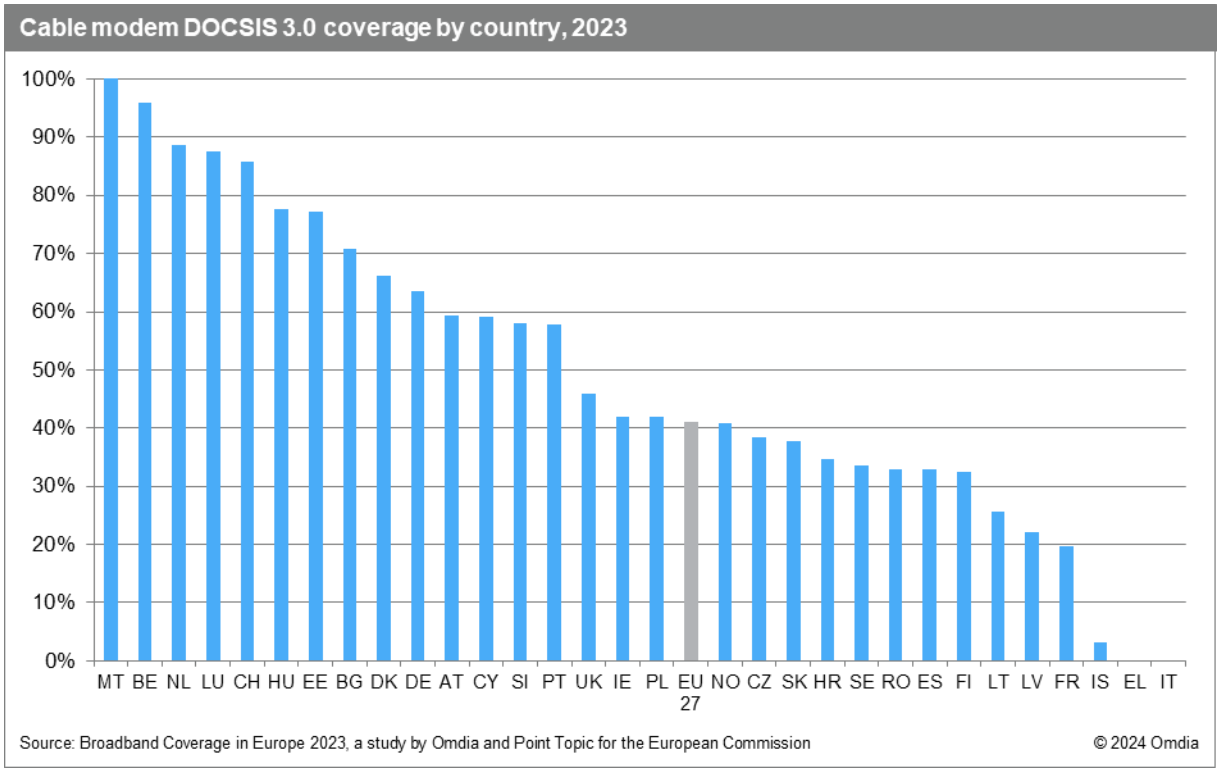
On the other hand, twelve countries reported coverage levels below the European average of 92.9%, with two countries failing to reach 80% coverage – Finland (79.7%), and Latvia (69.8%)[14].

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

[14] In 2023, the Latvian NRA, SPRK, began providing data on fixed broadband coverage. SPRK calculated coverage based on data collected from internet service providers regarding the availability of fixed broadband internet access at the address level (the first data collection was in 2023). The data collection revealed that previous reports had overstated coverage levels, as they were based on data provided by the incumbent and other institutions. As a result, a decision was made to restate all previous years' values.

4.3.2.1 Total DOCSIS 3.0 coverage by country

At the end of June 2023, cable modem DOCSIS 3.0 services were available to 41.1% 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 was the only other country where coverage exceeded 90%.



In most countries, 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 FTTP has already started in several study countries, with Romania witnessing the largest decrease of 7.3 percentage points compared to mid-2022, and Finland, Ireland, and the Netherlands all seeing declines of more than 5 percentage points.

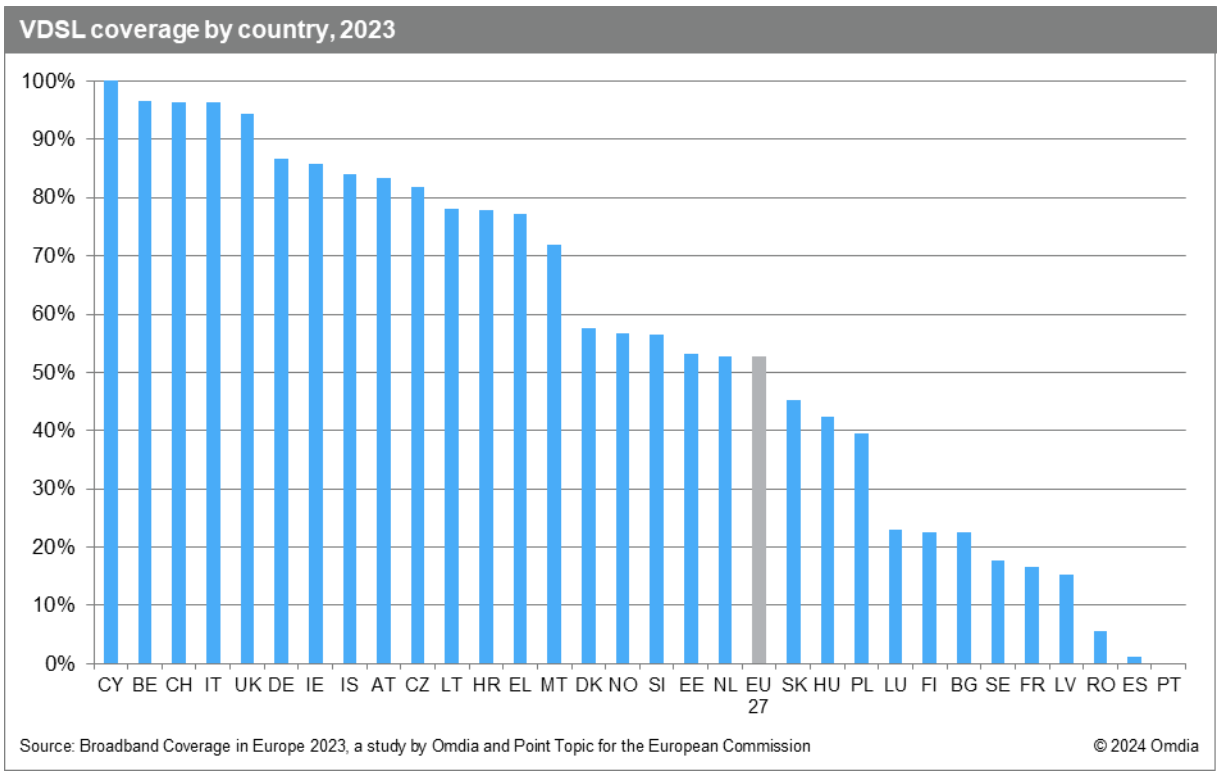
4.3.2.2 Total VDSL coverage by country

VDSL broadband services were available to 52.6% of EU households by mid-2023, down slightly from mid-2022. After slowing down gradually in the last few years, the pace of growth in VDSL coverage has now gone into reverse, 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.[15]

By mid-2023, Cyprus, Belgium, Switzerland, Italy, and the UK all recorded VDSL coverage levels that exceeded 90%, whilst VDSL networks passed more than 80% of homes in five other countries (Germany, Ireland, Iceland, Austria, and Czechia). Overall, 19 study countries recorded VDSL coverage levels that were higher than the EU average. Over the study period, a number of countries saw significant reductions in coverage as a result of copper decommissioning. Luxembourg's coverage fell by 31.5 p.p., while Finland, Germany, Hungary, Slovakia, and Spain all saw declines of more than 5 percentage points.

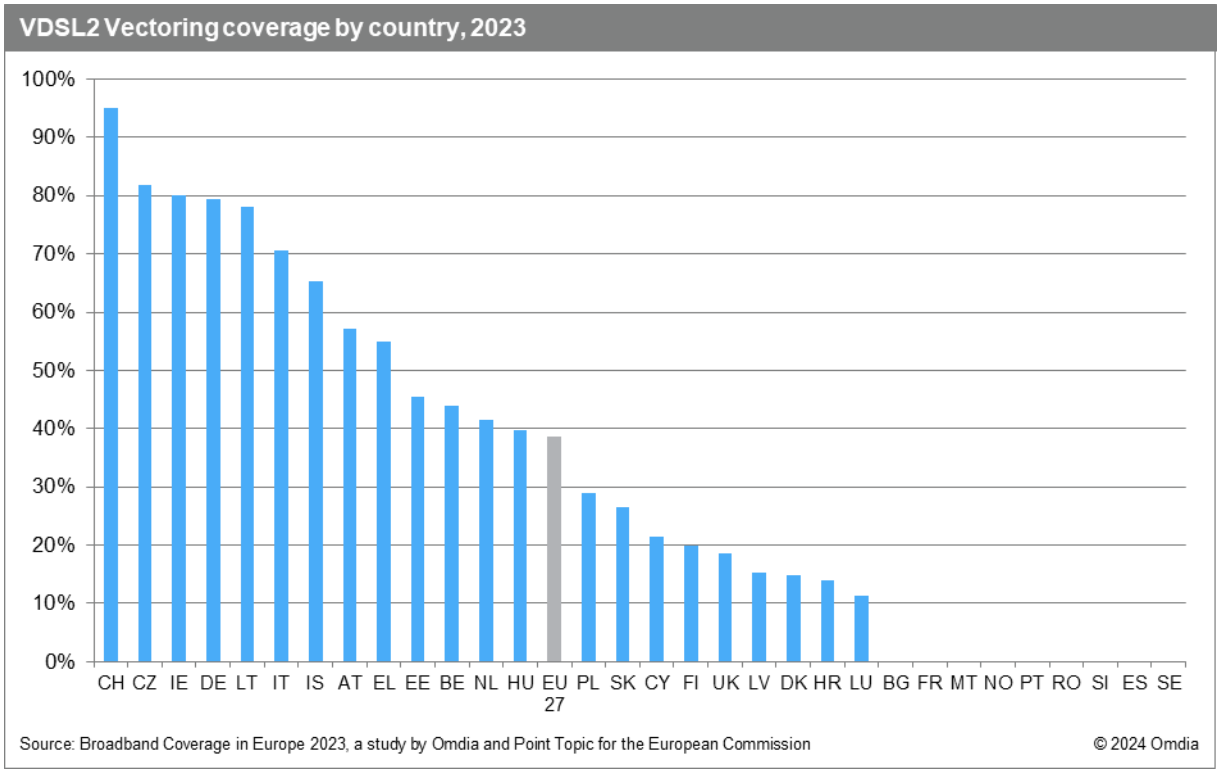
[15] For further analysis of actual download speed coverage please see Chapter 4.5.



VDSL services remained far from widespread in a number of countries. Spain, Romania, Latvia, France, and Sweden 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.

4.3.2.3 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.



Overall, VDSL2 Vectoring coverage reached 38.7% of EU households at the end of June 2023. However, availability of VDSL2 Vectoring services continued to vary widely across the EU, between

zero and 94.9%. The technology was absent in nine study countries, while its coverage surpassed 50% of households in nine others. 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.

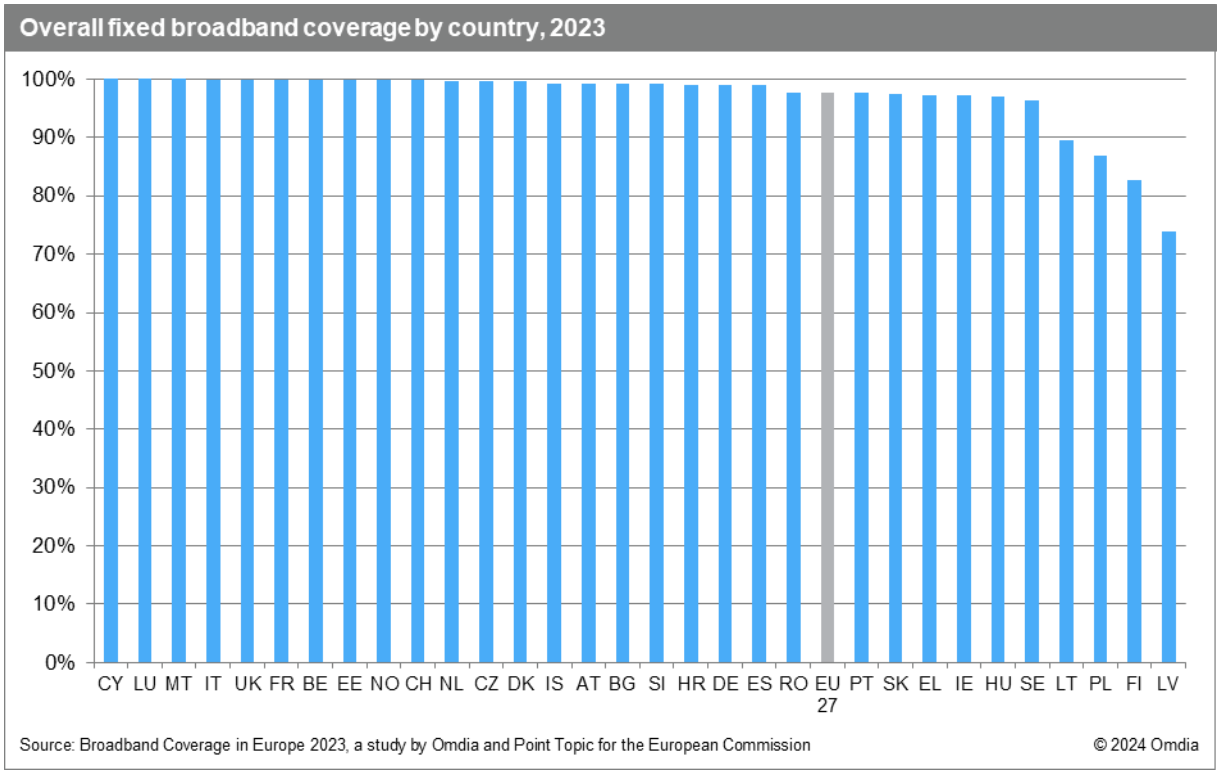
Switzerland recorded the highest VDSL2 Vectoring coverage of this study, with 94.9% of homes passed by VDSL2 Vectoring, followed by Czechia, where VDSL2 Vectoring services were available to 81.7% of households. Moreover, due to the focus of the Czech incumbent's infrastructure arm on deploying VDSL2 Vectoring solutions over the last couple of years, Czechia's whole VDSL network footprint has been upgraded to this technology.

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.

4.3.3 Total overall fixed broadband coverage 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 previous chapter *4.3.1.1 Total FTTP coverage by country*, and cable trends in *4.3.1.2 Total DOCSIS 3.1 coverage by country*, and

4.3.2.1 Total DOCSIS 3.0 coverage by country.

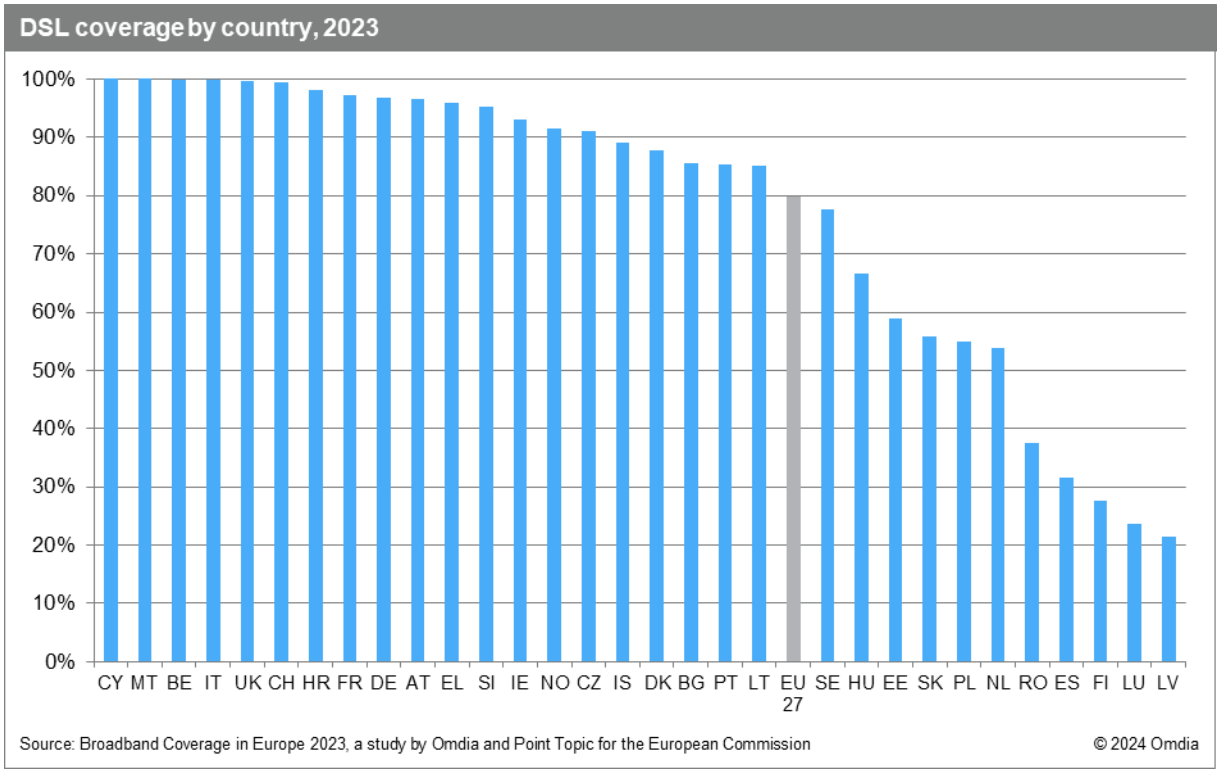


In total, 27 out of the 31 study countries registered fixed broadband coverage of above 95%, highlighting the breadth of fixed broadband coverage in most countries. As of mid-2023, three countries recorded complete fixed broadband coverage (Cyprus, Luxembourg, and Malta), and a further ten surpassed 99.5%. On the other hand, Lithuania, Poland, Finland, and Latvia were the only countries with fixed broadband coverage levels below 90%.

4.3.3.1 Total DSL coverage by country

In this year's study, DSL was the most pervasive fixed broadband technology in just 15 out of the 31 study countries, down from 18 countries the previous year. Elsewhere it has been surpassed by cable, FTTP or FWA. In total, 15 out of the 31 study countries recorded DSL coverage above 90%, although the EU27 average for DSL availability declined by 6.7 percentage points since mid-2022. At the end of June 2023, Cyprus and Malta again 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.

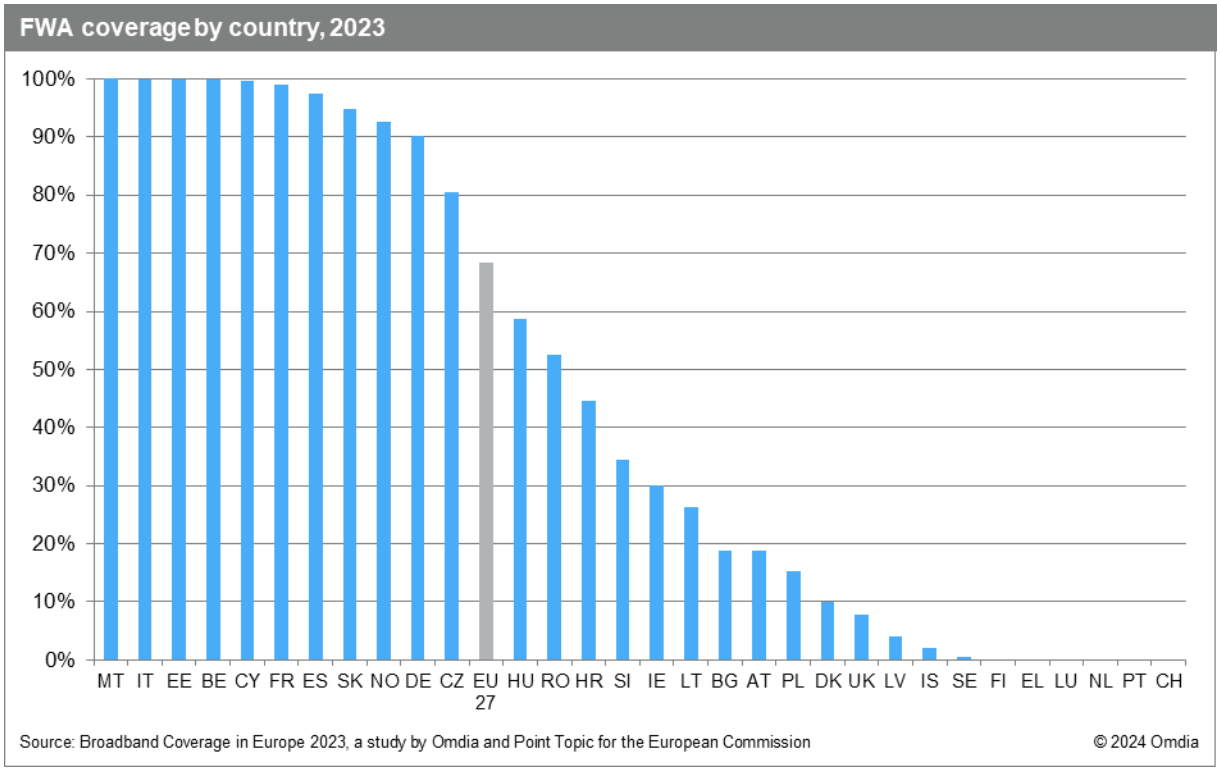
Universal or near-universal DSL coverage (i.e. very close to 100% of households) was observed in countries with the most developed traditional telephone networks as DSL technology utilizes legacy fixed line twisted-pair copper network infrastructure.



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, Finland, Romania, Poland, the Netherlands, and Luxembourg all recorded DSL coverage levels below 60%.

4.3.3.2 Total 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 68.5% at the end of June 2023, 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.

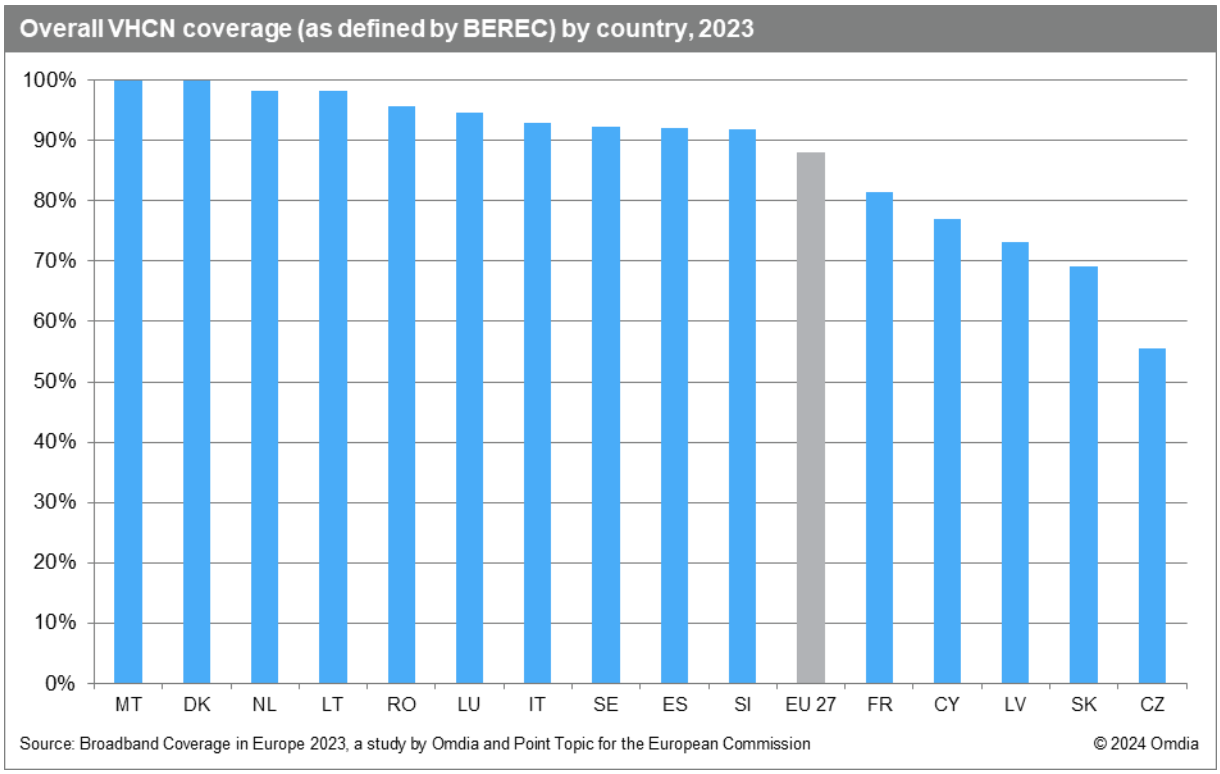


4.3.4 Total BEREC-defined VHCN coverage by country

In order to better capture the quality of service provided by fixed and mobile broadband networks, a new combination coverage category aimed at monitoring coverage of for Very High Capacity Networks (VHCN) as defined in the "BEREC guidelines on Very High Capacity Networks (BoR (23) 164)" was included in the BCE 2023 study.

Out of the 31 study countries, only 15 NRAs were able to provide VHCN coverage data corresponding to the BEREC definition. Moreover, the rather broad scope of the four criteria included in the definition allow for varying interpretations of the definitions and the technologies considered for this indicator. As each NRA had a slightly different approach to the individual criteria considerations, the research team cautions against any direct cross-country comparisons.

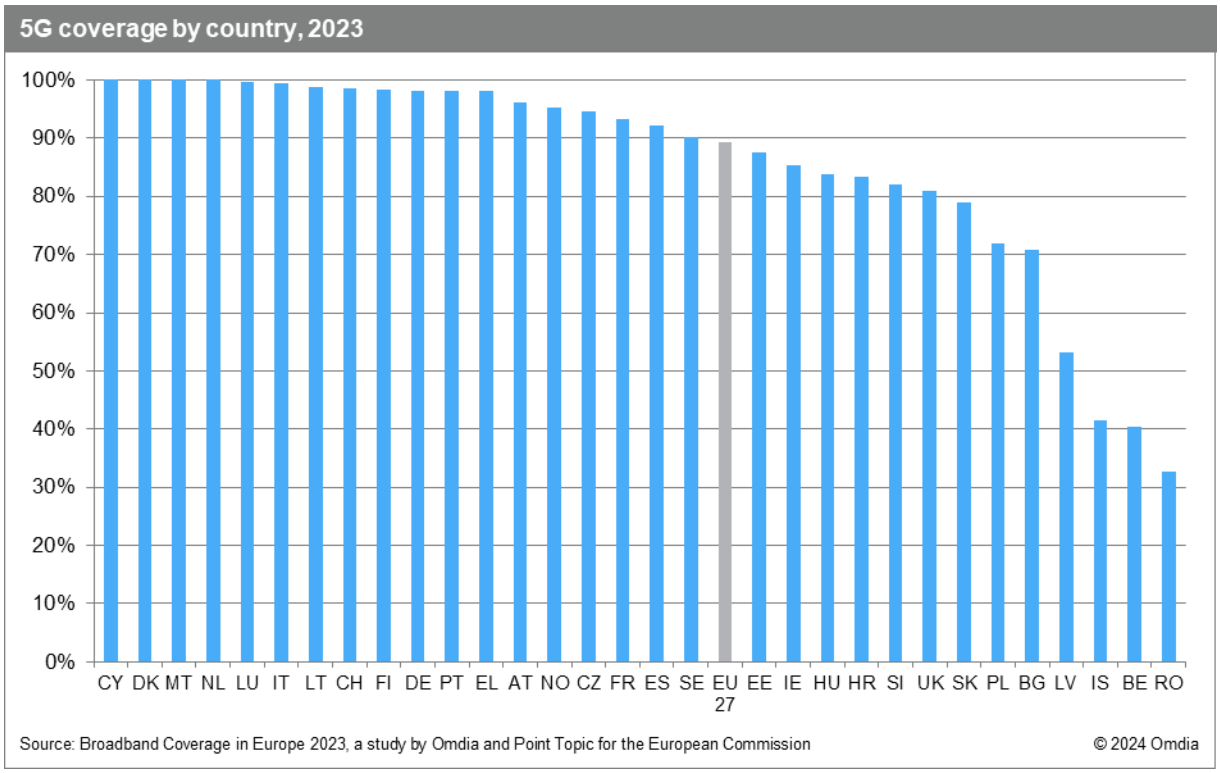
Malta and Denmark reported universal VHCN coverage and in the Netherlands and Lithuania VHCN broadband services were available to more than 97.0% of households. The EU average (calculated as the average of study countries for which this data was available) reached 88.1% of EU households.



4.3.5 Total mobile broadband coverage by country

4.3.5.1 Total 5G coverage by country

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. Where the research team has estimated 5G coverage based on information published by operators on the cities and areas where their 5G services have been launched, we have taken into consideration that not all of a given city or an area would have been covered initially.



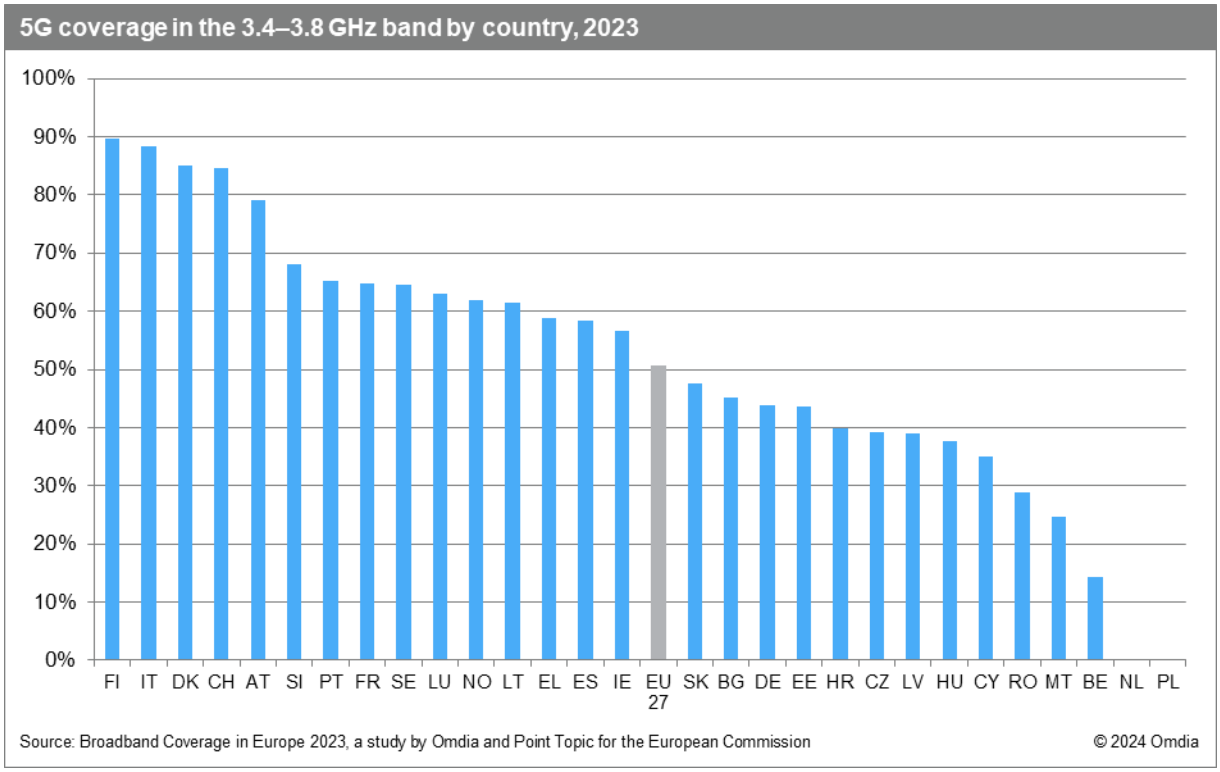
Note: 5G coverage includes coverage provided using Dynamic Spectrum Sharing (DSS)

Mobile network operators made further significant progress in 5G over the year to June 2023 with 5G services being available to >30% of households in all study countries. Much of this coverage has been provided 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 the Netherlands, where 5G coverage is universal at 100.0% of households, a level also reached by Cyprus, Denmark, and Malta. In a further eight countries, 5G coverage reached more than 98% of households by mid-2023, and overall 18 out of the 31 study countries surpassed 90% 5G coverage.

At the end of June 2023, only four countries failed to achieve 70% coverage of 5G services – Latvia, Iceland, Belgium, and Romania.

4.3.5.2 Total 5G coverage in the 3.4–3.8 GHz band by country

For the 2022 study, the Broadband Coverage in Europe team added an additional technology category to track 5G coverage in the 3.4–3.8 GHz band. As of June 2023, these services were available to just over half (50.6%) of households in the EU, up by more than 10 p.p. since June 2022. But availability ranged widely between different countries. Five countries – Finland, Italy, Denmark, Switzerland, and Austria – recorded coverage greater than 75%, and a further seven surpassed 60%. But two countries recorded zero coverage using this band – Poland and the Netherlands, the latter of which recorded 100% 5G coverage using other frequencies and DSS. Poland completed its 3.4–3.8 GHz spectrum auction in October 2023, while the auction in the Netherlands is scheduled for summer 2024.



Note: Data on 5G coverage in the 3.4–3.8 GHz band is not available for Iceland and the UK

4.3.6 Total satellite coverage by country

At the end of June 2023, 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.

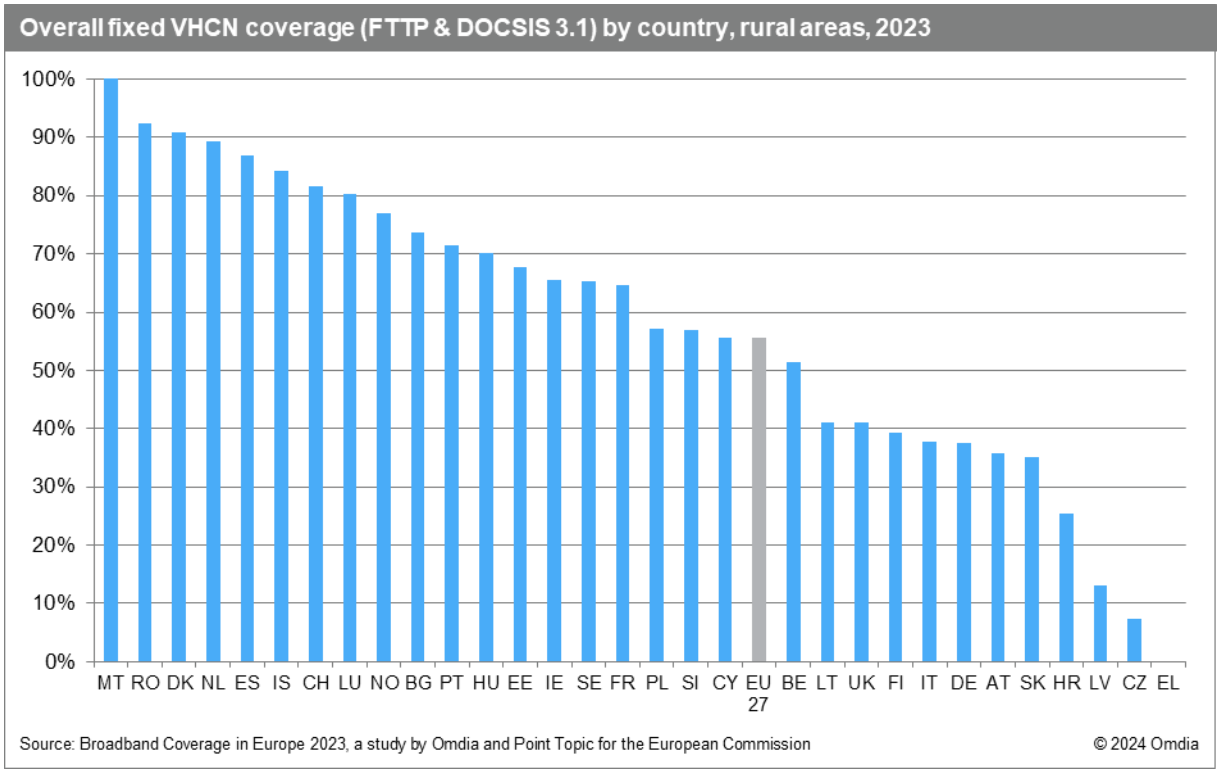
As in the previous years, the research team estimated the total EU coverage of satellite broadband as reaching over 99.0% of EU households. Satellite coverage in rural areas was assumed to be identical to the total satellite coverage and satellite coverage for overseas administrative areas was assumed 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 VHCN (FTTP & DOCSIS 3.1) coverage by country

By mid-2023, 55.7% of rural EU homes were passed by either FTTP or DOCSIS 3.1 networks. Despite growing by 11.4 percentage points compared to the end of June 2022, overall fixed VHCN coverage of rural regions across the EU was 23.2 percentage points lower than on a national level, although this gap has closed by 10.5 p.p. since 2022, indicating an increased focus on rural gigabit coverage by governments, regulators, and operators.

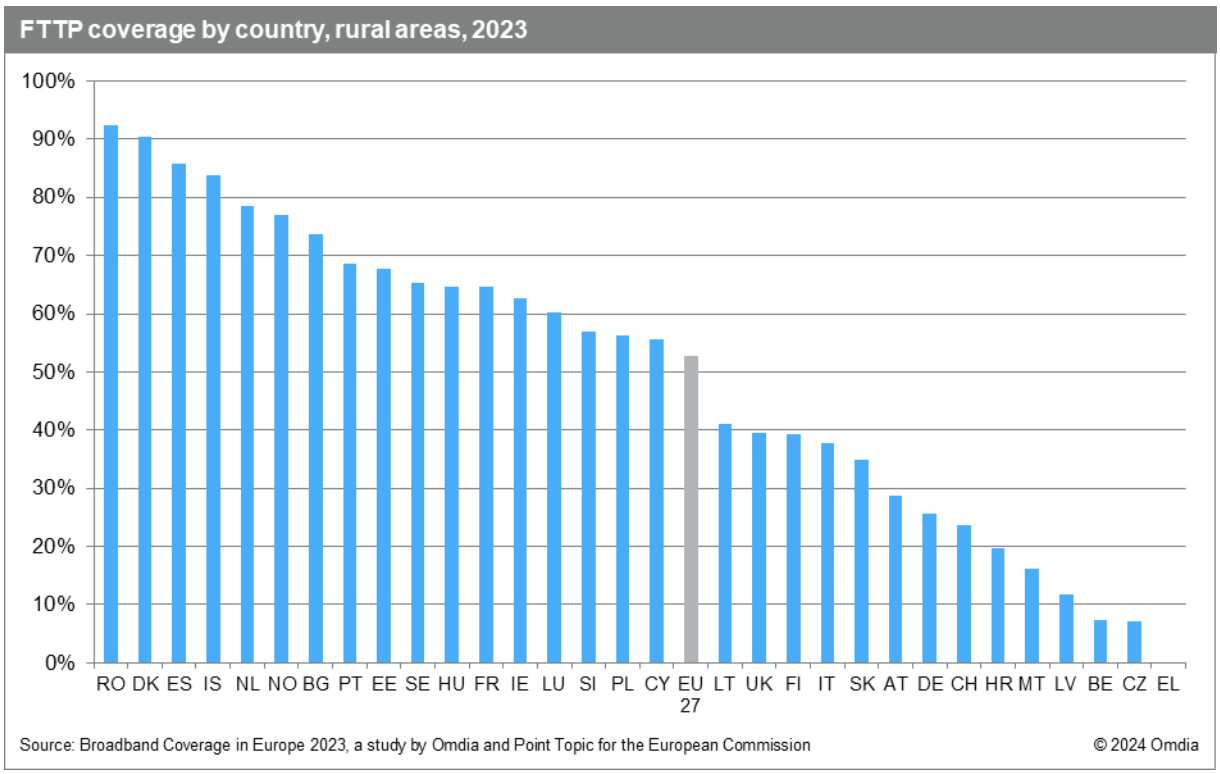
Greece was again the only country to record a complete absence of fixed VHCN rural coverage, with rural regions being covered by DSL-based technologies only. Twelve countries recorded rural fixed VHCN coverage levels below the EU average. Malta is the only country with complete FTTP & DOCSIS 3.1 rural coverage and another six countries (Romania, Denmark, the Netherlands, Spain, Switzerland, and Luxembourg) recorded coverage above 80%, up from three a year previously.



4.4.1.1 Rural FTTP coverage by country

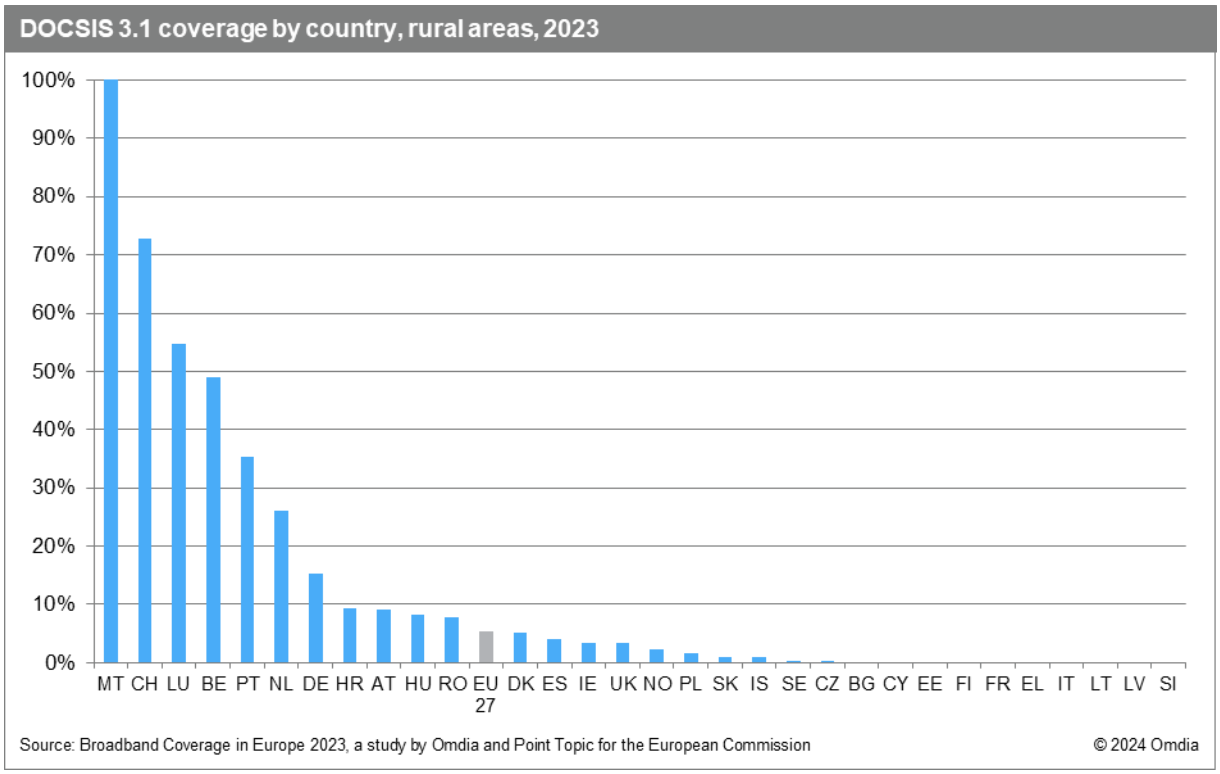
As of mid-2023, Romania remained the leader in terms of rural FTTP coverage (92.5%) followed closely by Denmark where FTTP services were available to 90.3% of rural households. In addition, FTTP networks passed more than 70% of rural homes in Spain, Iceland, the Netherlands, Norway, and Bulgaria. A further ten countries surpassed the 50% threshold. Rural FTTP coverage in Estonia continued to accelerate and recorded the largest year-on-year increase, growing by 33.9 percentage points and reaching two thirds (67.8%) of rural Estonian households.

Conversely, fourteen countries recorded rural FTTP coverage below the EU average of 52.8% and FTTP remained absent from rural regions of Greece.



4.4.1.2 Rural DOCSIS 3.1 coverage by country

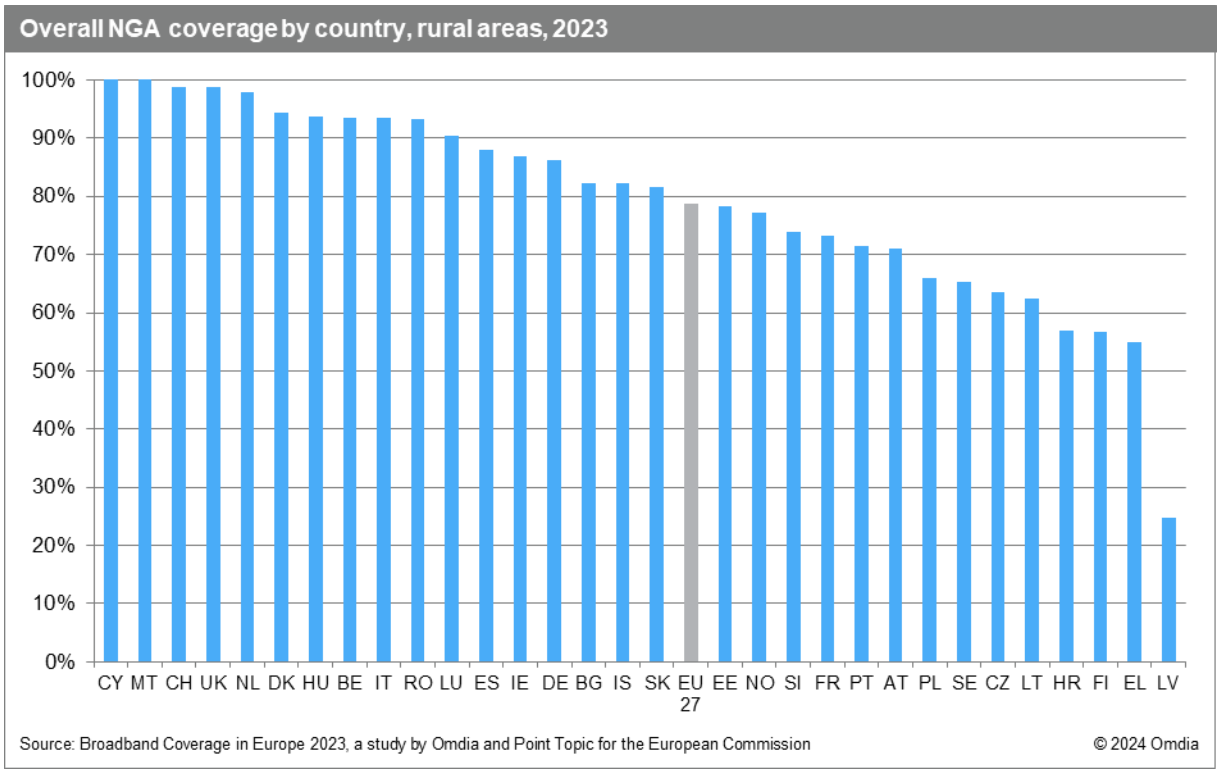
At the end of June 2023, DOCSIS 3.1 was absent from rural regions of eleven study countries. DOCSIS 3.1 was also the fixed broadband technology with the lowest rural coverage at EU level, at 5.3% of rural households. Malta was the only country to record complete rural DOCSIS 3.1 coverage, and only two other countries (Switzerland, and Luxembourg) recorded coverage over 50%.



4.4.2 Rural overall 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 2023, the rural EU average for NGA coverage was 78.7%, an increase of 6.4 percentage points compared to mid-2022. Although rural NGA coverage was 14.2 percentage points below total NGA coverage (92.9%), 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 27.4 percentage points in mid-2020, and 38.3 percentage points in mid-2017. This indicates that network deployment is shifting towards rural areas, as urban areas start to reach saturation for NGA coverage.

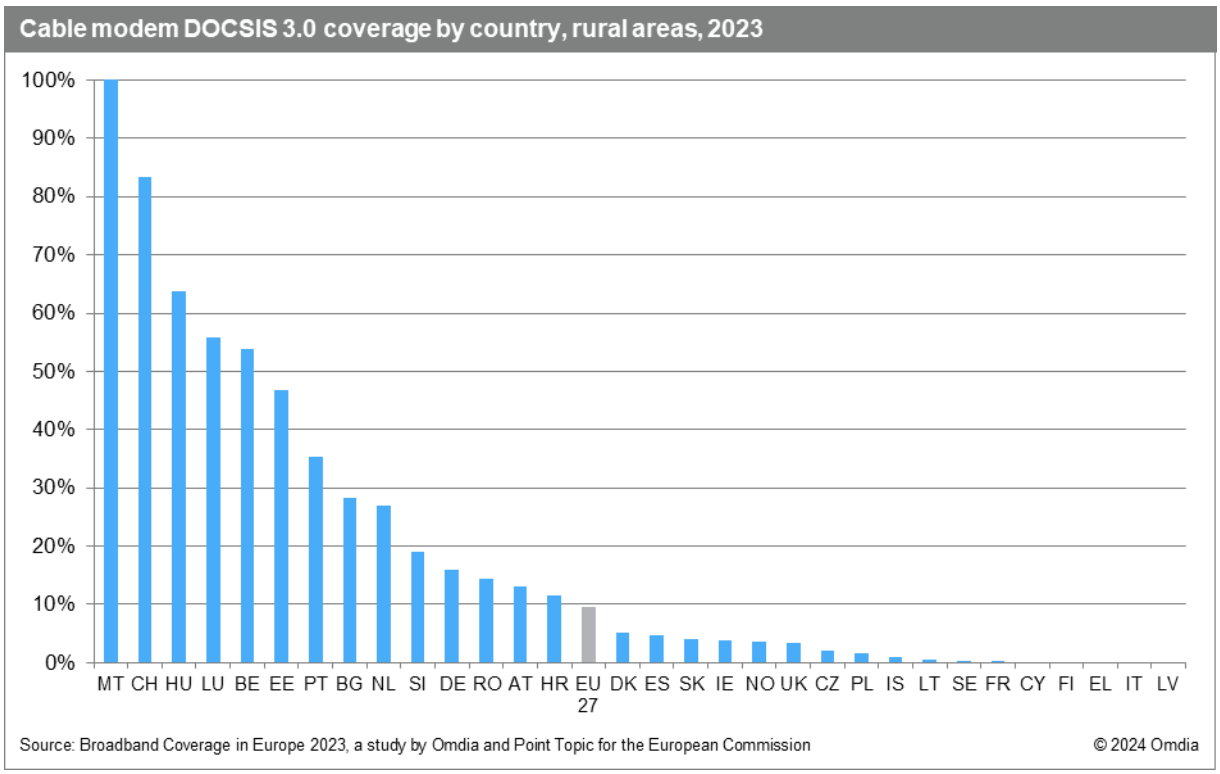


As of mid-2023, both Cyprus and Malta had achieved universal rural NGA coverage. Three other countries recorded rural NGA coverage exceeding 95%: Switzerland, the UK, and the Netherlands. Two countries reported double-digit increases in rural NGA availability, with Poland recording the largest increase, at 25.6 percentage points since mid-2022.

In total, fourteen countries recorded NGA availability below the EU average of 78.7%. Latvia is now the country with the lowest rural NGA availability levels (24.7%), due to the complete lack of rural cable coverage, the urban focus of FTTP rollouts, and the limited reach of the xDSL network in rural areas.

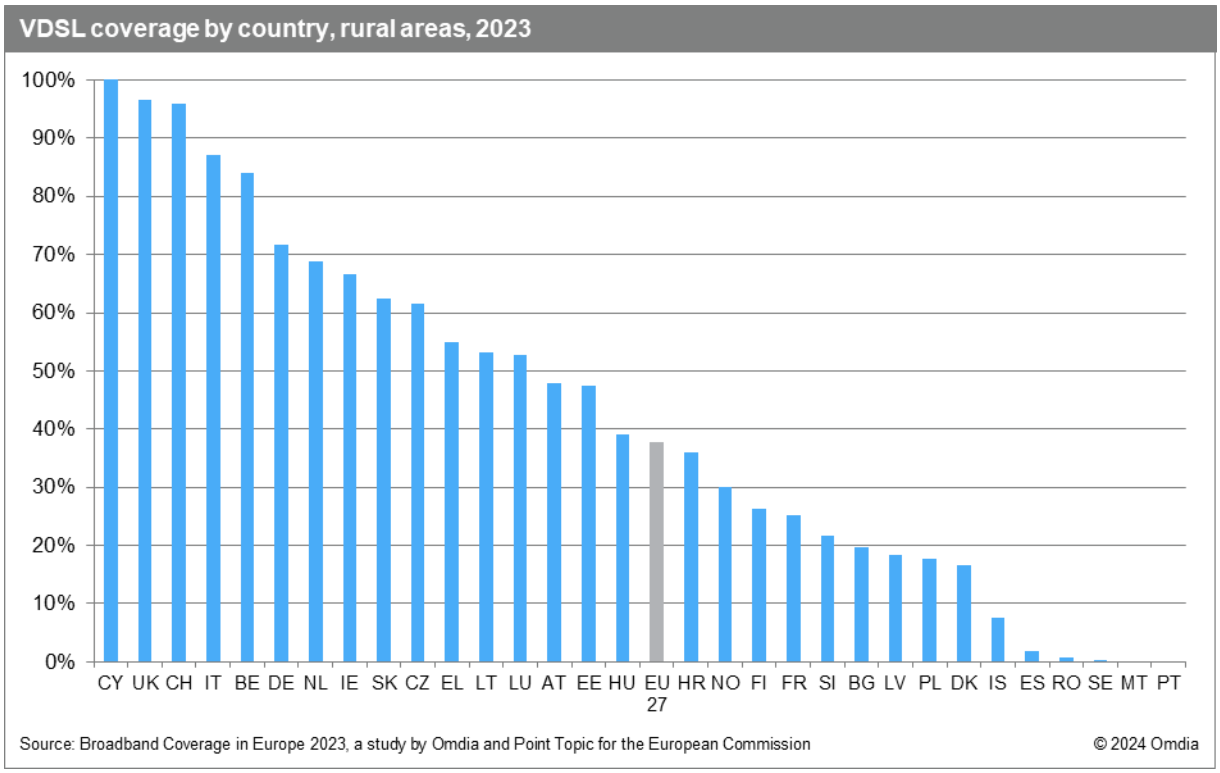
4.4.2.1 Rural DOCSIS 3.0 coverage by country

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



4.4.2.2 Rural VDSL coverage by country

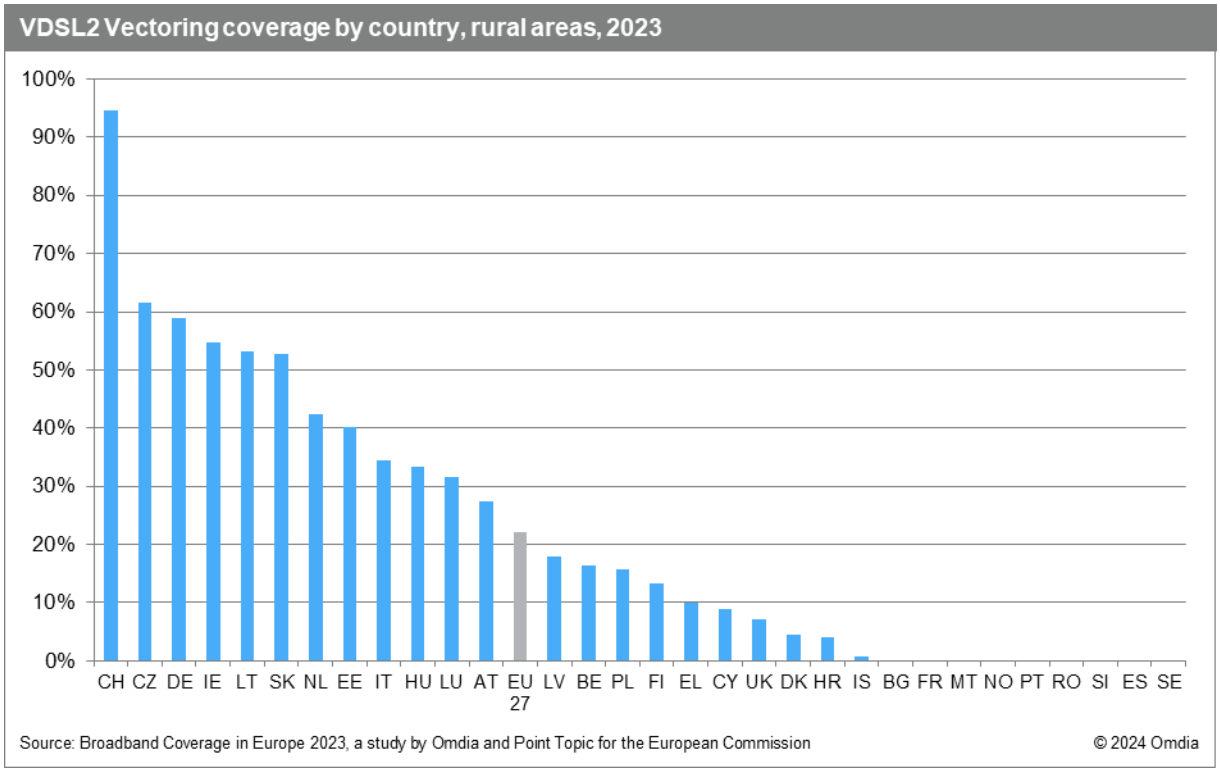
Historically, VDSL has been by far the most widespread rural NGA technology, but by 2023 rural coverage of FTTP surpassed VDSL by a clear margin. Rural VDSL networks passed 37.8% of rural homes in the EU, a 3.2 percentage point decrease during the twelve months to mid-2023, whereas FTTP reached 52.8% of rural households.



Cyprus was the only country to record universal rural VDSL coverage, whilst in four other countries (the UK, Switzerland, Italy, and Belgium) VDSL services were available to more than 80% of rural households. On the other hand, VDSL remained absent from rural regions of Malta and Portugal. Several countries reported significant falls in rural VDSL coverage as networks were upgraded to FTTP, notably Ireland (down by 20.2 p.p.), and Germany (down by 17.9 p.p.)

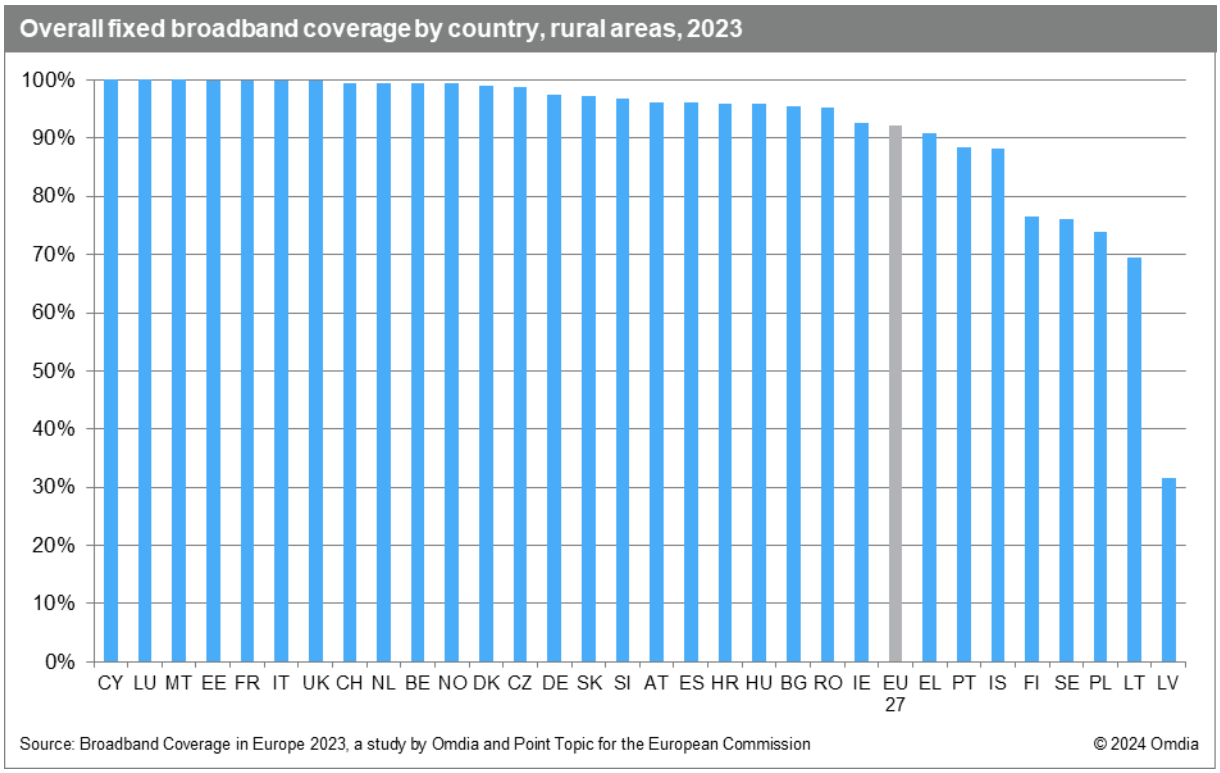
4.4.2.3 Rural VDSL2 Vectoring coverage by country

At the end of June 2023, VDSL2 Vectoring remained absent from rural regions of nine study countries. The EU27 average stood at 22.0%, with Switzerland recording the highest coverage level, at 94.6%. It was followed by Czechia, where 61.5% 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.



4.4.3 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-2023, rural fixed broadband coverage reached 92.2% of rural households compared to national coverage of 97.7%.



However, the gap between total fixed coverage and rural fixed coverage continues to close at 5.6 percentage points compared to 6.3 percentage points in mid-2022. Moreover, in mid-2018, the recorded gap between total and rural fixed broadband coverage at the EU level was 9.4 percentage points.

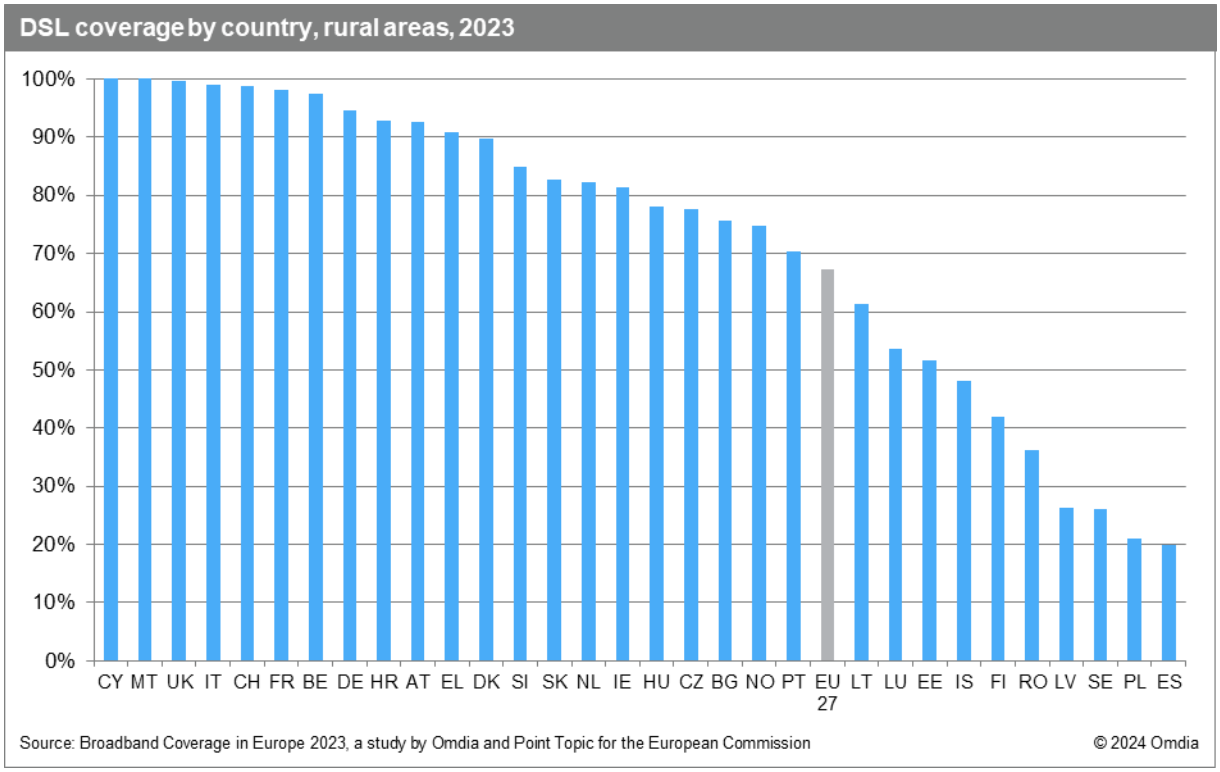
Eight countries reported rural fixed broadband coverage below the EU average, with five countries (Finland, Sweden, Poland, Lithuania, and Latvia) recording levels below 80%. Latvia recorded the lowest rural fixed broadband coverage of the study, with only 31.6% of rural homes passed, as DSL and FWA services are limited and FTTP deployments have been mostly focused on urban areas. 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 roll-out of a new technology will be focussed on urban and sub-urban areas first before rural roll-out gets underway.

4.4.3.1 Rural DSL coverage by country

DSL continued to be the most pervasive fixed broadband technology in terms of the number of rural homes passed, reaching two thirds of rural EU households (67.4%). When compared to the total EU27 DSL coverage, rural DSL coverage was 12.4 percentage points lower and the difference between total and rural DSL coverage remained considerable in some countries, such as Iceland and Sweden (41.0 p.p. and 51.5 p.p. respectively).

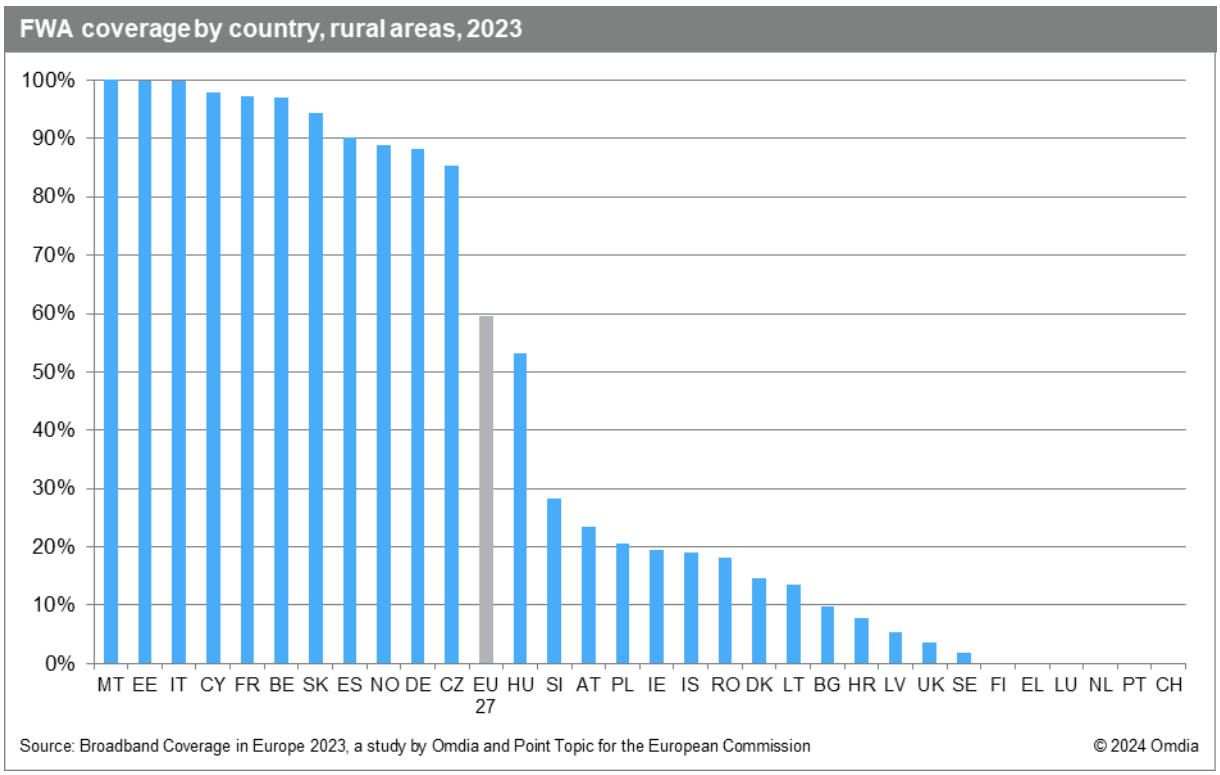
In mid-2023, ten countries recorded rural DSL coverage levels below the EU average. Decommissioning of legacy copper lines is under way in many places, and Spain had the lowest rural coverage of DSL following a 34.6 p.p. fall as its copper switch-off gathered pace. In eight study countries (Denmark, Finland, France, Hungary, Latvia, Luxembourg, the Netherlands, and Slovakia) rural DSL coverage now 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 a key technology in rural areas.



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, Estonia recorded below-average rural DSL coverage at 51.6% but almost universal FWA coverage of rural areas, at 99.9% of rural homes passed.

4.4.3.2 Rural FWA coverage by country

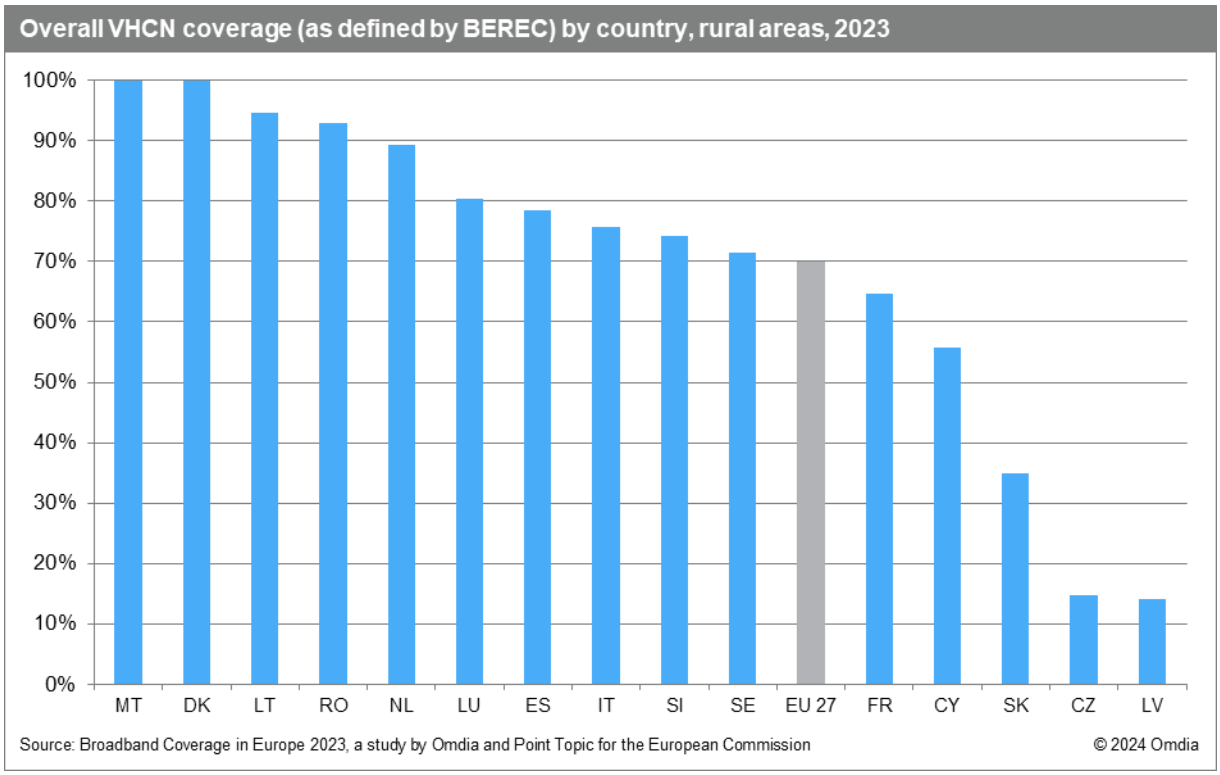
In some countries, Fixed Wireless Access (FWA) services provide a significant boost to rural connectivity, especially in areas where deployment of other fixed technologies is challenging from both a technical and an economic perspective.



4.4.4 Rural BEREC-defined VHCN coverage by country

Data on rural VHCN coverage as defined by BEREC rules was reported by 15 NRAs. Malta and Denmark reported universal rural VHCN coverage levels at the end of June 2023. On average, 70.0% of rural EU households were passed by broadband networks falling within the criteria of the BEREC definition.

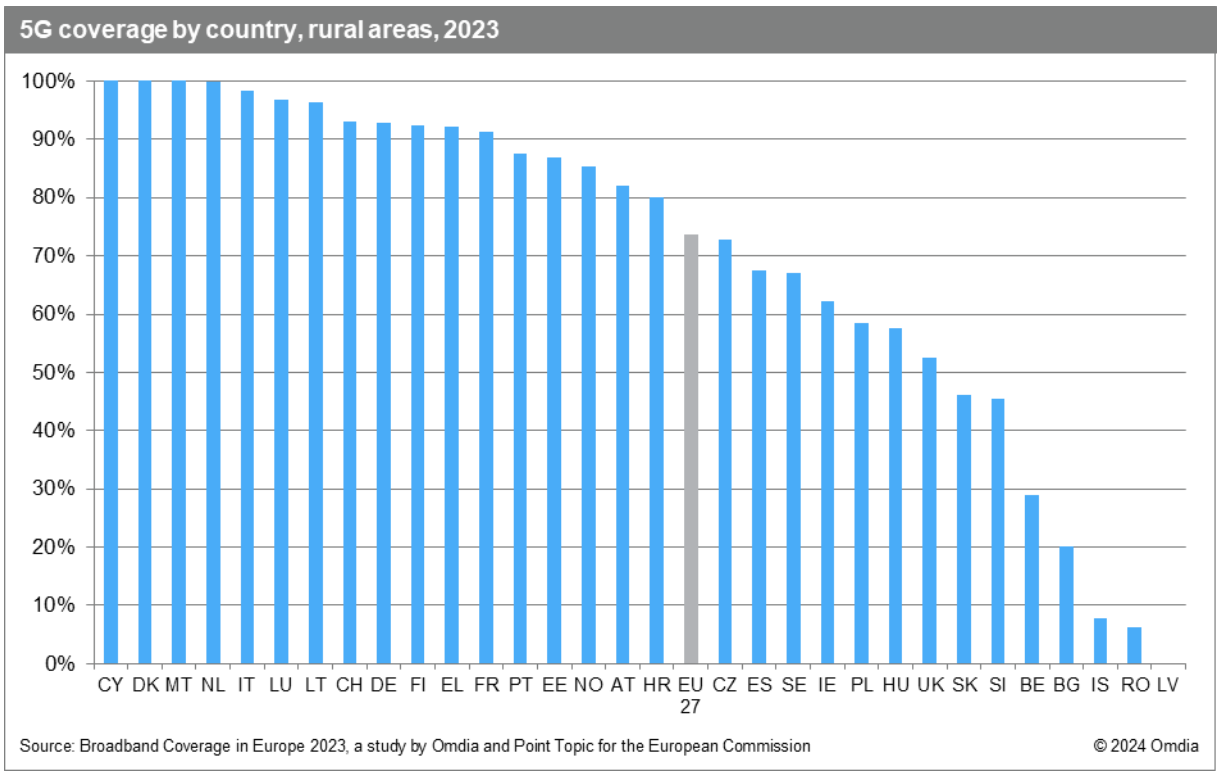
As was the case with national level data, the broad scope of the definition resulted in the VHCN coverage levels varying greatly among countries, with Czechia and Latvia reporting less than 15% rural VHCN coverage. However, this variation is likely to be a result of the different interpretations of the BEREC definition, rather than an actual difference in like-for-like metric comparison.



4.4.5 Rural mobile broadband coverage by country

4.4.5.1 Rural 5G coverage by country

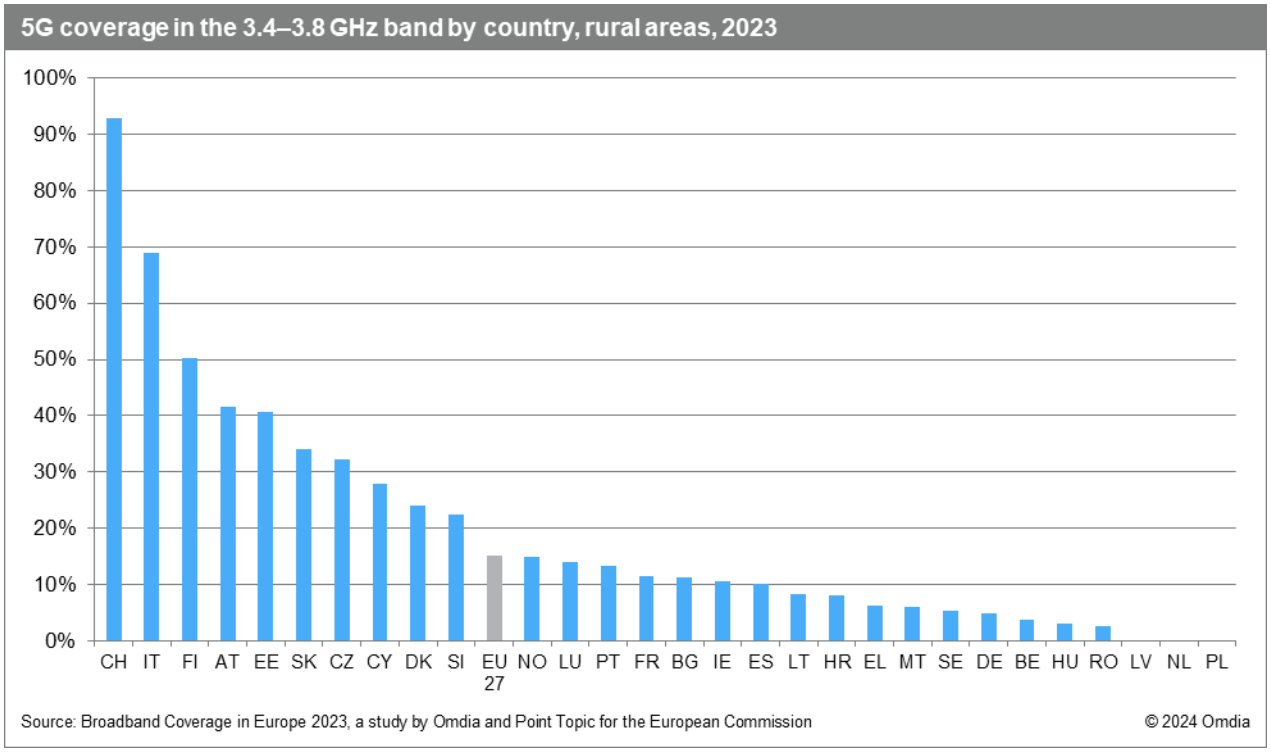
By using Dynamic Spectrum Sharing technology (DSS), operators in some countries have been able to achieve very high levels of rural 5G coverage, helping to increase the rural 5G coverage to 73.7% at EU level, an increase of 22.7 p.p. on the previous year. In the year to June 2023, Denmark achieved universal rural 5G coverage, joining Cyprus, Malta, and the Netherlands at 100% rural coverage. Conversely, three countries recorded rural 5G coverage below 10% of households.



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

4.4.5.2 Rural 5G coverage in the 3.4–3.8 GHz band by country

5G coverage in the 3.4–3.8 GHz band reached only 15.2% of rural households in the EU as of June 2023. The relatively high frequency of the 3.4–3.8 GHz band makes it more suitable for providing high-capacity services in urban and suburban areas, whereas the 700 MHz band is a better fit for rural coverage, due to its superior propagation characteristics over long distances. Most countries recorded coverage lower than the EU total, with three recording zero coverage for this metric (Latvia, the Netherlands, and Poland). Only Switzerland, Italy, and Finland recorded coverage greater than 50%, though Switzerland's leading figure of 93.0% does not contribute to the EU average.



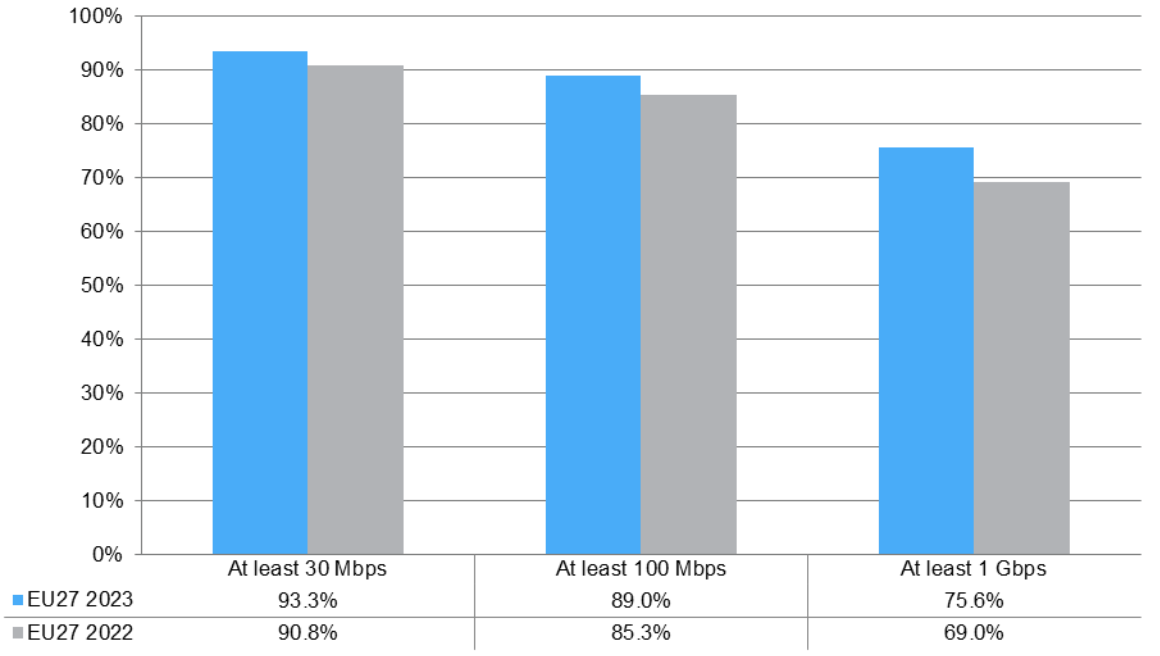
Note: Data on 5G coverage in the 3.4–3.8 GHz band is not available for Iceland and the UK

4.5 Coverage by speed categories

4.5.1 Europe-wide coverage by speed categories

In 2021 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 remains unavailable for some countries, it has again not been possible to calculate the EU27 average coverage value and data is presented for individual countries later on in this chapter.

EU27: Coverage by speed categories, 2022 & 2023



	At least 30 Mbps	At least 100 Mbps	At least 1 Gbps
EU27 2023	93.3%	89.0%	75.6%
EU27 2022	90.8%	85.3%	69.0%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

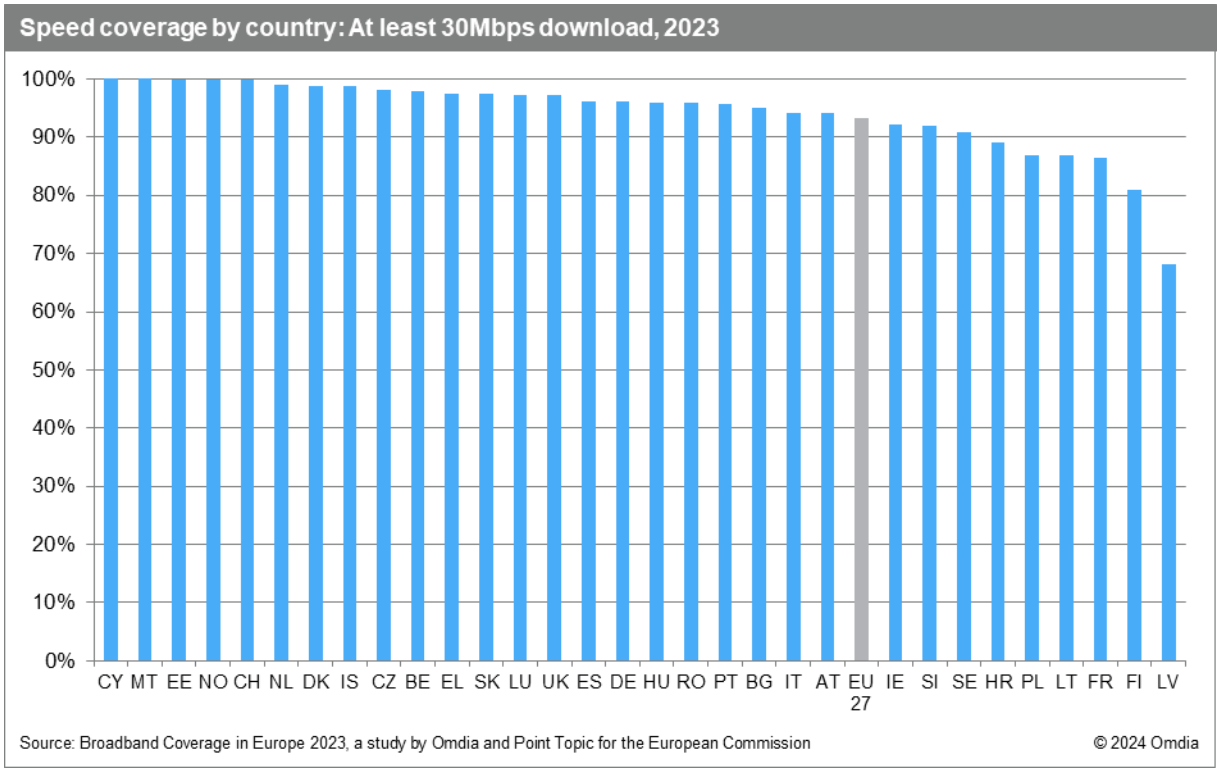
By mid-2023, 93.3% of EU households had access to at least one fixed broadband service that provided actual download speeds of at least 30Mbps, a 2.5 percentage point increase since mid-2022. This increase was driven by the overall growth in NGA coverage as well as the technological advancements that resulted in a higher number of VDSL networks being capable of supporting 30Mbps download speeds.

Coverage of networks supporting at least 100Mbps grew by 3.7 percentage points year-on-year. This is a result of growth in FTTP coverage across the continent. At the end of June 2023, 89.0% of EU households had access to broadband services capable of providing at least 100Mbps actual download speeds.

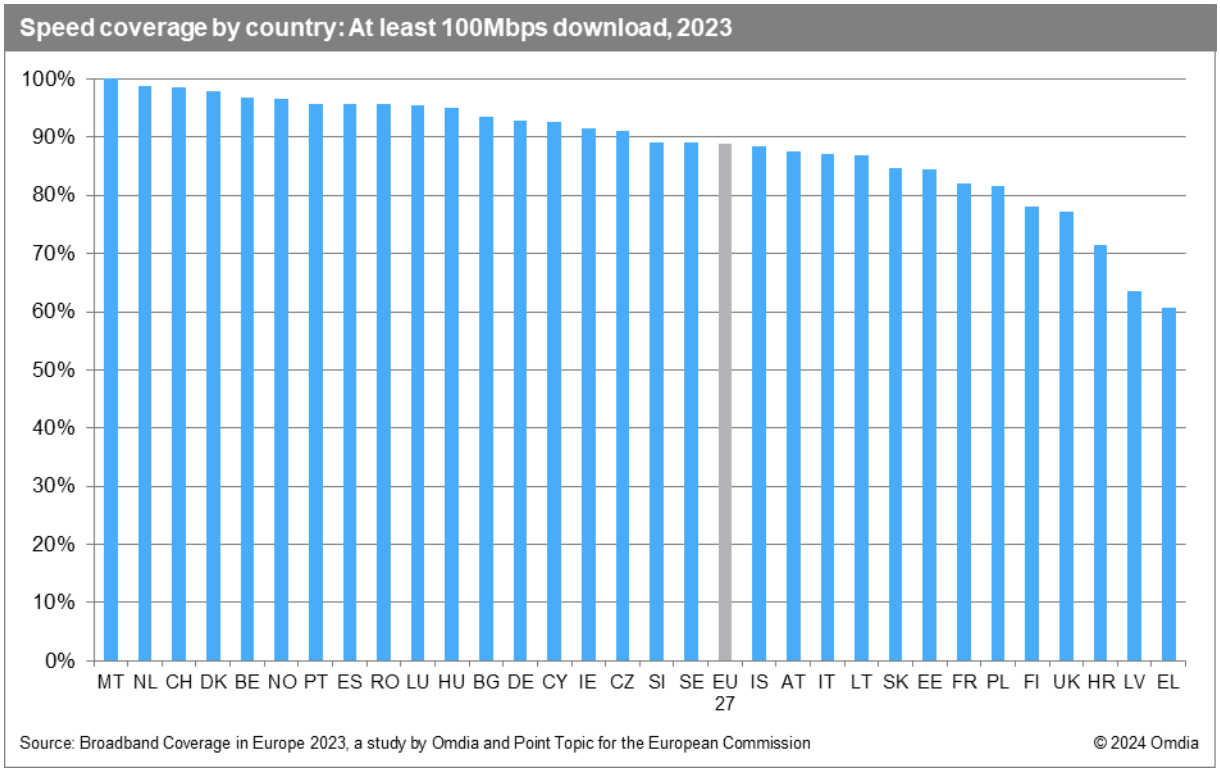
At the end of June 2023, more than three quarters of EU households (75.6%) had access to broadband services capable of providing at least 1Gbps actual download speeds, following a further significant 6.6 percentage point growth again driven by progress in FTTP deployments.

4.5.2 Country comparison of coverage by speed categories

At the end of June 2023, fixed broadband services capable of at least 30Mbps download speeds passed more than 80% of households in all study countries except Latvia. Malta and Cyprus recorded universal at least 30Mbps coverage and in seven other countries (Estonia, Norway, Switzerland, the Netherlands, Denmark, Iceland, and Czechia), high-speed broadband service capable of delivering at least 30Mbps download speeds were available to more than 98% of households. Slovakia registered the highest growth with at least 30Mbps coverage expanding by 14.6 percentage points in the twelve-month period to the end of June 2023.



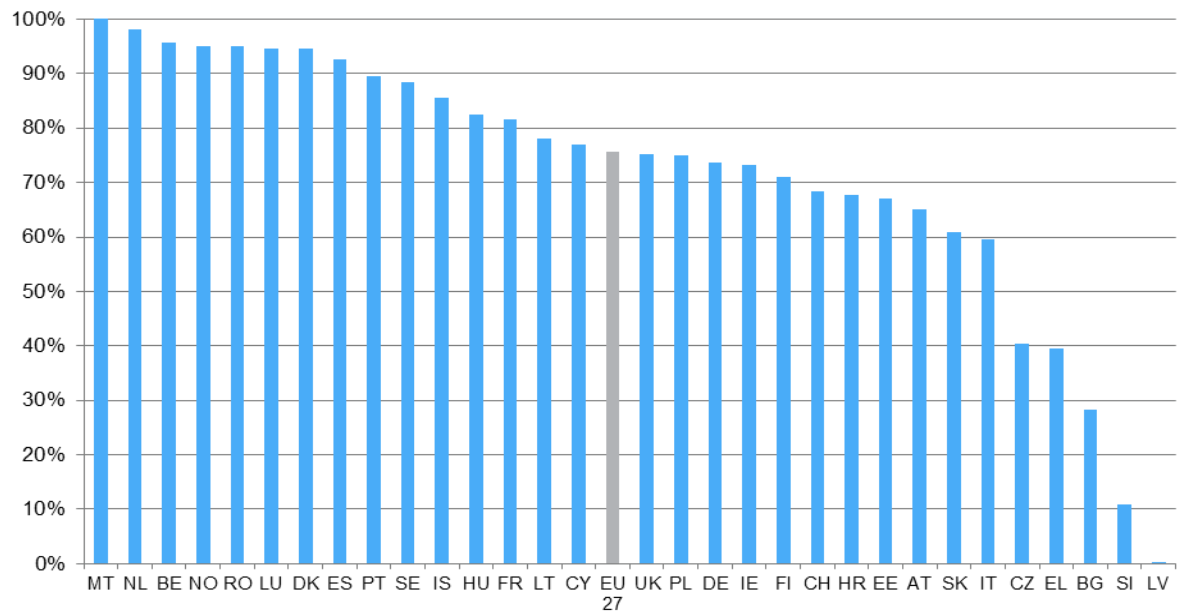
Whilst significant improvements have been made in high-speed broadband connectivity in recent years, examining availability of at least 100Mbps speeds shows that achieving universal coverage by 2025 will be challenging. At the end of June 2023, 89.0% of EU households had access to broadband services capable of providing at least 100Mbps actual download speeds.



Some considerable differences remain among individual countries. By mid-2023, over 95% of homes in eleven study countries were passed with a fixed broadband service capable of reaching at least 100Mbps actual download speeds, four of which achieved coverage of 98% or more (Malta, the Netherlands, Switzerland and Denmark). Moreover, five countries (France, Poland, the UK, Finland, and Cyprus) recorded an increase of more than 5 p.p. in availability of at least 100Mbps speed coverage over the year. Conversely, only 60.7% 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 2023, Malta remained the only study country to record universal coverage by broadband services capable of providing at least 1Gbps. The Netherlands recorded 98.2% coverage, and a further six countries (Belgium, Norway, Romania, Luxembourg, Denmark, and Spain) surpassed 90%. Services capable of offering at least 1Gbps were available in all study countries, albeit only 0.05% of Latvian household had access to these. In two other countries (Bulgaria, and Slovenia) less than 30% of households had access to at least 1Gbps broadband services. A number of study countries recorded significant increases in gigabit coverage over the course of the year, with nine countries recording double-digit growth. Slovakia recorded the highest increase (+20.6 p.p.), ahead of Belgium (+17.7 p.p.), Cyprus (+17.1 p.p.), and Poland (+12.9 p.p.).

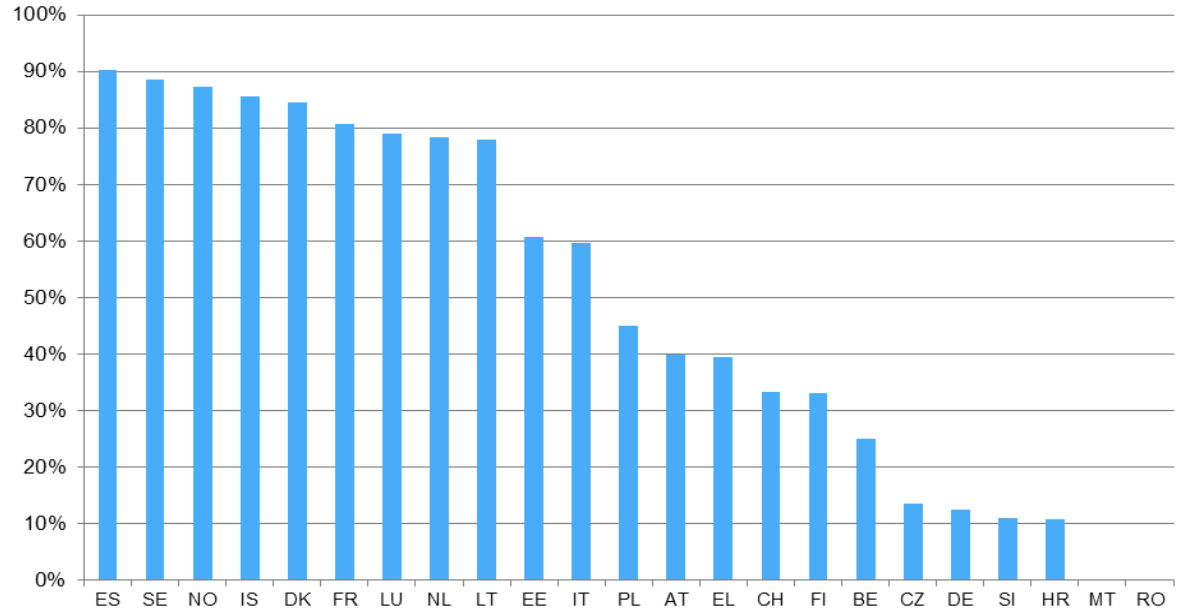
Speed coverage by country: At least 1Gbps download, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission © 2024 Omdia

As in the previous year's study, this year the BCE research team included the 'At least 1Gbps upload and download' speed category in the survey questionnaire. For 2023, the team received responses from twenty-three NRAs, an increase from twenty in last year's study. However, we have again 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.

Speed coverage by country: At least 1Gbps upload and download, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission © 2024 Omdia

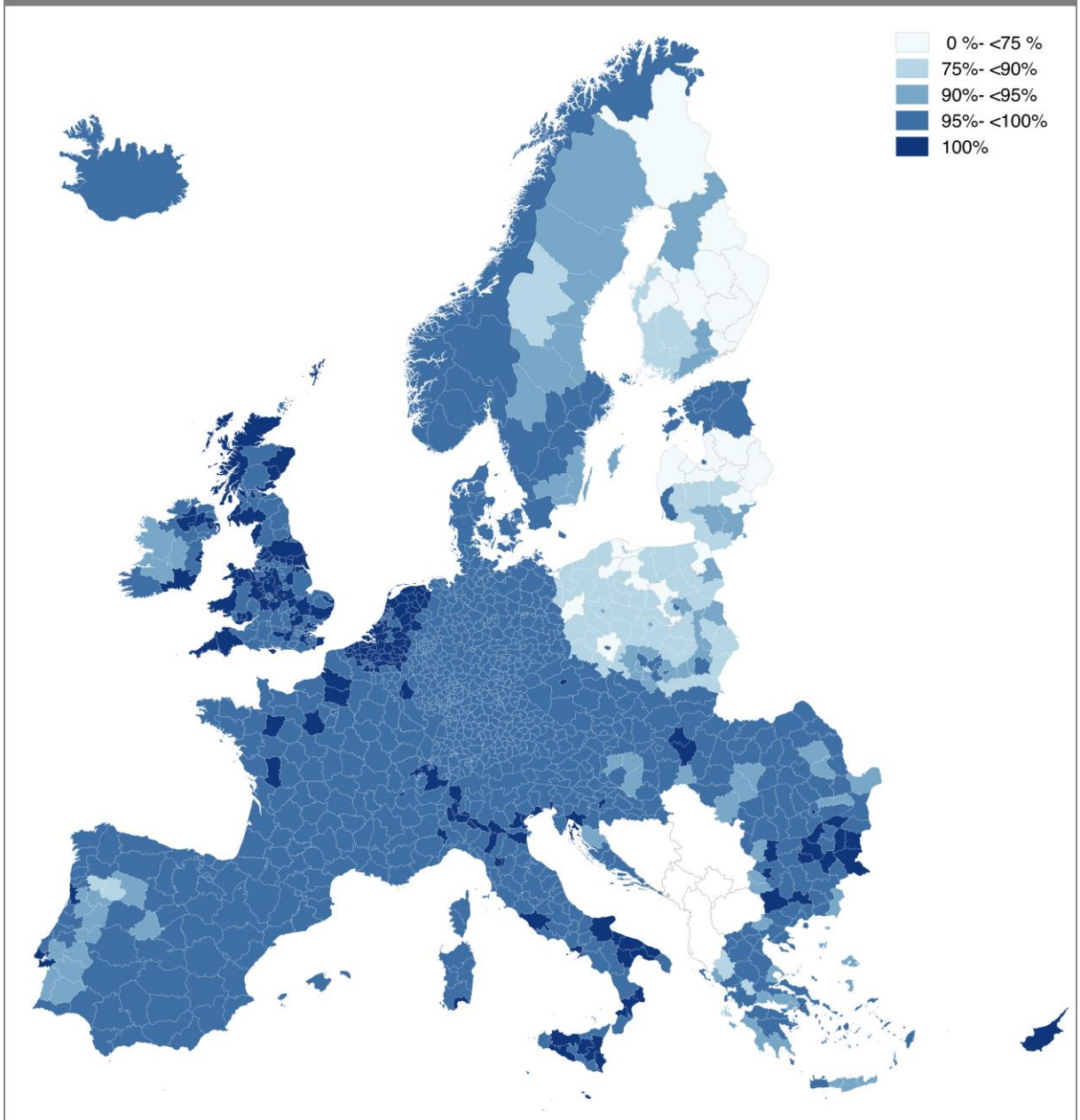
Among the twenty countries, Spain reported the highest number of households having access to broadband services capable of delivering actual upload and download speeds of at least 1Gbps – 90.2% of households at the end of June 2023. In Malta and Romania, NRAs again reported no available gigabit upload and download residential coverage available in mid-2023.

4.6 NUTS 3 level coverage

The maps included in this chapter indicate the distribution of broadband coverage across Europe's regions and demonstrate the study results discussed in the previous chapters of this report. Five maps are presented, for three metrics – total fixed broadband (total and rural coverage); fixed VHCN, i.e. FTTP & DOCSIS 3.1 (total and rural coverage); and FTTP (total coverage).

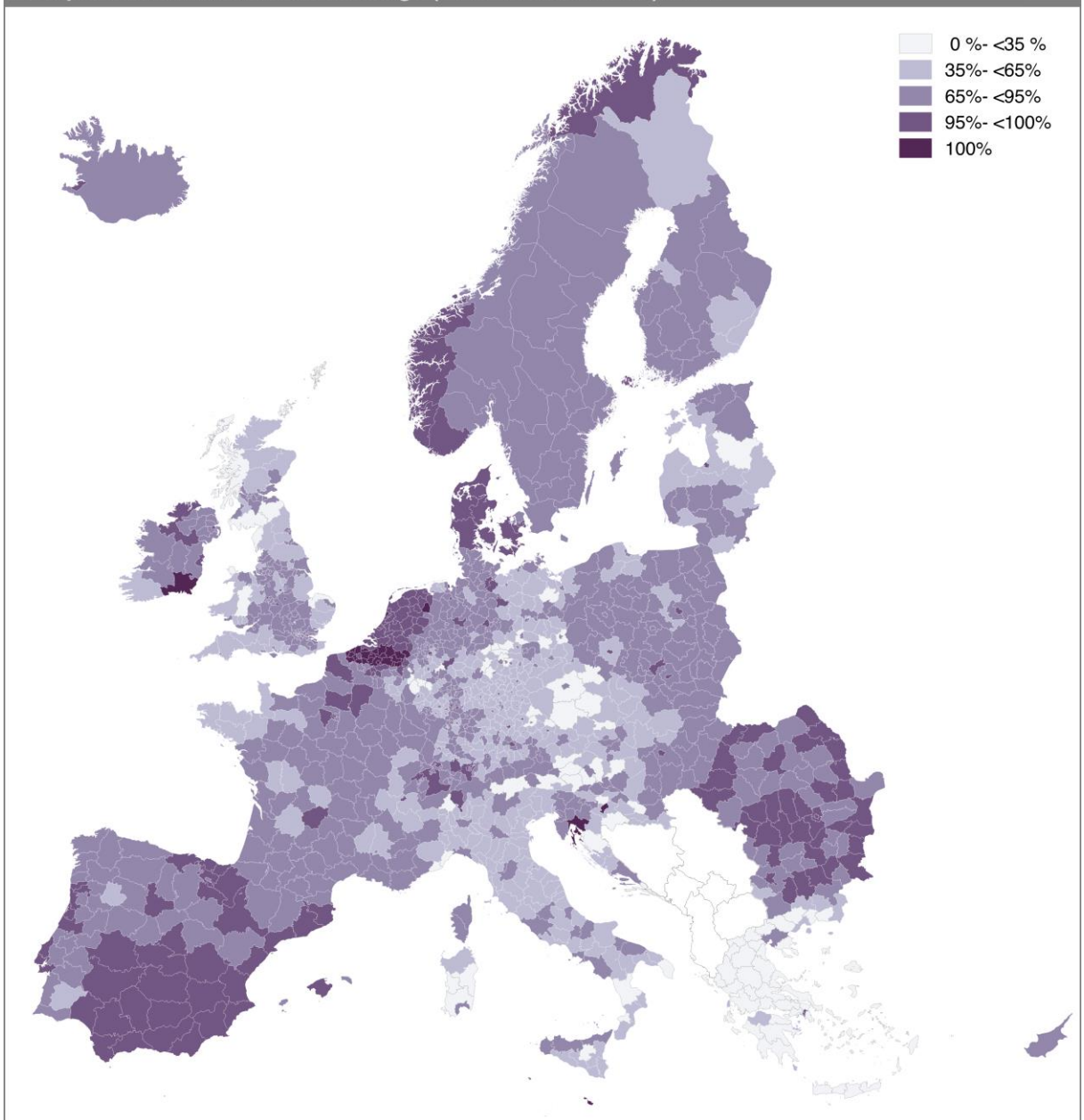
4.6.1 Total fixed broadband coverage at NUTS 3 level

Europe: Overall fixed broadband coverage, 2023



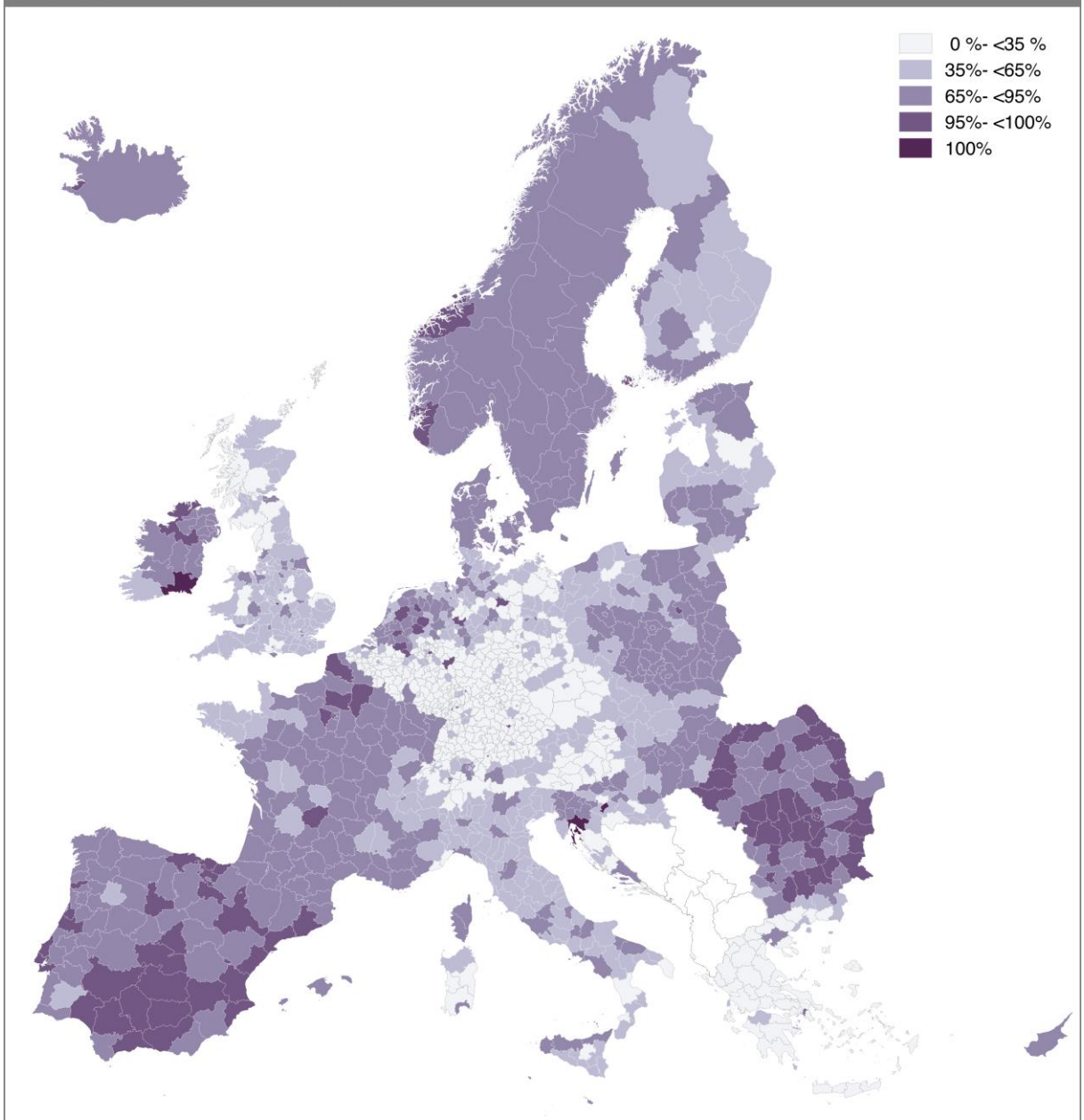
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Europe: Overall fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Europe: Overall FTTP coverage, 2023

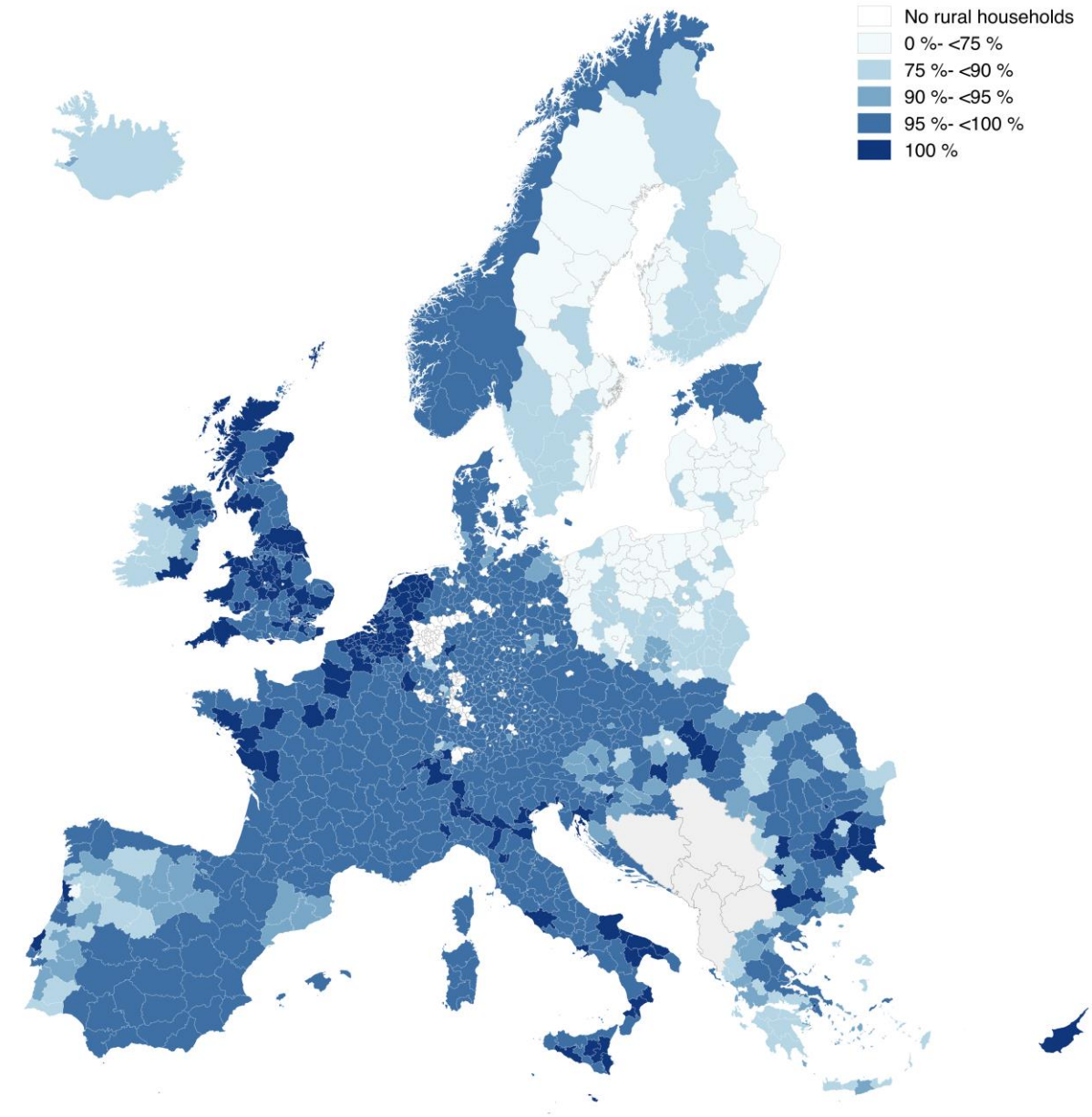


Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

4.6.2 Rural fixed broadband coverage at NUTS 3 level

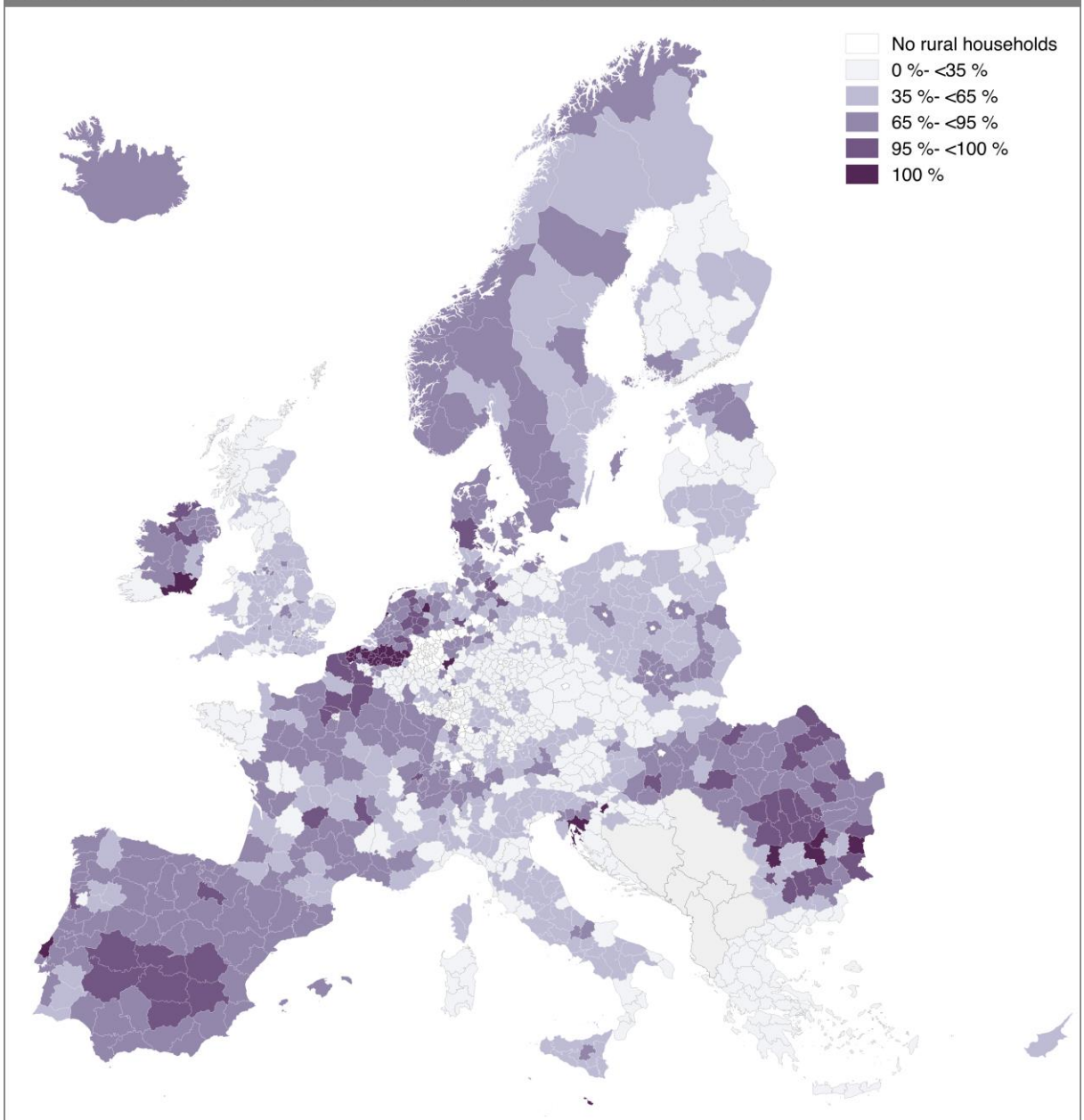
It is important to note that Czechia, Germany, Hungary, Poland, Switzerland, and the UK all have some NUTS 3 regions which do not have any rural households. These NUTS 3 regions are represented by the white areas on the rural coverage maps.

Europe: Overall fixed rural broadband coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Europe: Overall rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

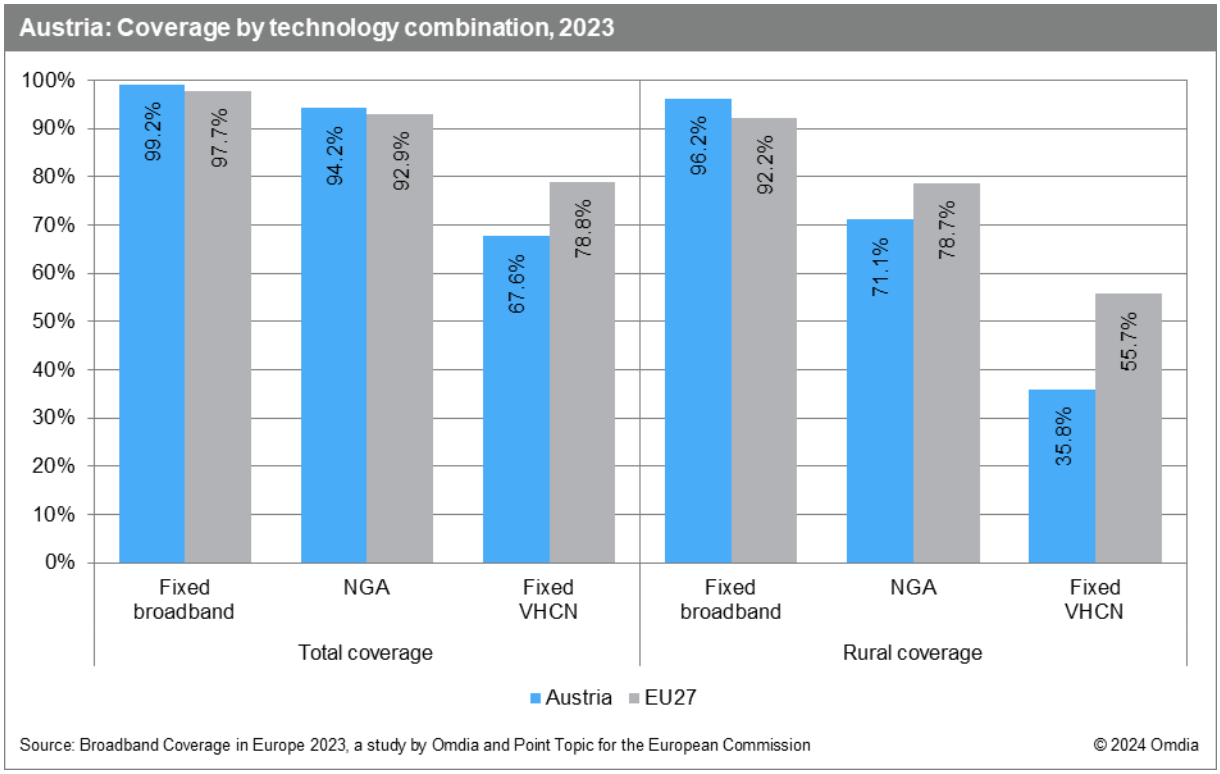
5. Coverage by Country

5.1 Austria

5.1.1 National coverage by broadband technology

Fixed broadband networks were available to 99.2% of Austrian households by the end of June 2023, while 94.2% of households were covered by NGA networks. In rural Austria, fixed broadband and NGA coverage stood at 96.2% and 71.1%, respectively.

The availability of fixed Very High Capacity networks (FTTP & DOSIS 3.1) increased by 12.8 percentage points at national and 8.4 percentage points at rural level. Despite good growth momentum, Austria remained below the EU average, with a gap of 20 percentage points in rural areas.

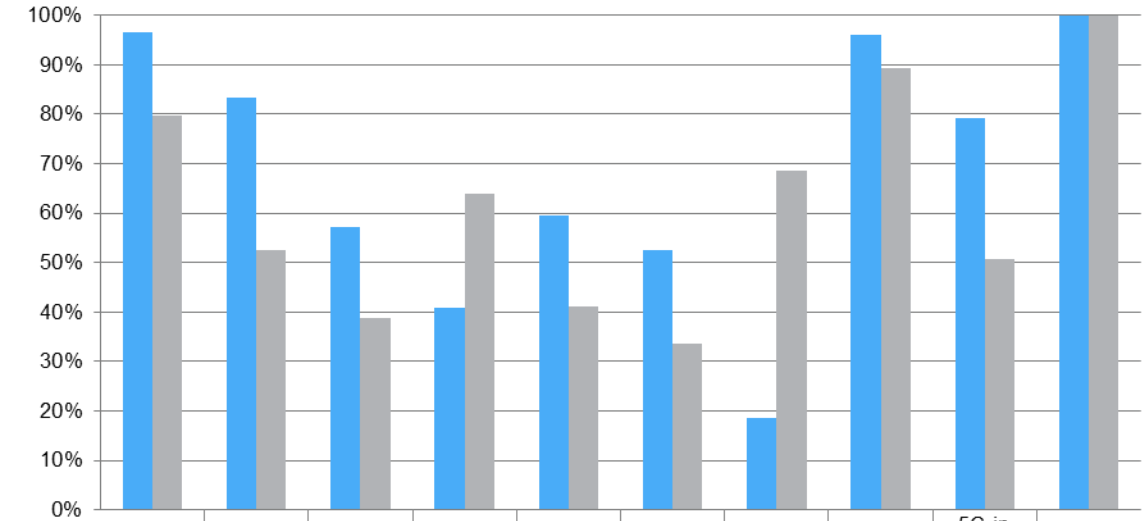


Looking at individual broadband technologies, DSL remained the most prevalent broadband technology, with 96.5% homes passed. VDSL and VDSL2 Vectoring coverage increased by 1.7 and 1.8 percentage points, respectively, over the 12-month period. Austria scored well above the EU average across the three copper categories.

Austrian operators made significant progress in upgrading to the DOCSIS 3.1 standard which was available across 88% of the cable network by mid-2023, up from 67% in mid-2022. With a 13.0 percentage point growth, DOCSIS 3.1 recorded the strongest growth in coverage among broadband technologies in Austria. FTTP recorded the second strongest growth with 4.3 percentage points, but it maintained a large gap of 23.0 percentage points to the EU average.

Austria scored well above the EU average in both 5G categories, with 96.0% of households covered by mid-2023, up by 4.3 percentage points from mid-2022. 5G coverage in the 3.4–3.8 GHz band stood at 79.1%, up from 73.6% in the prior year.

Austria: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Austria	96.5%	83.4%	57.1%	41.0%	59.4%	52.6%	18.7%	96.0%	79.1%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

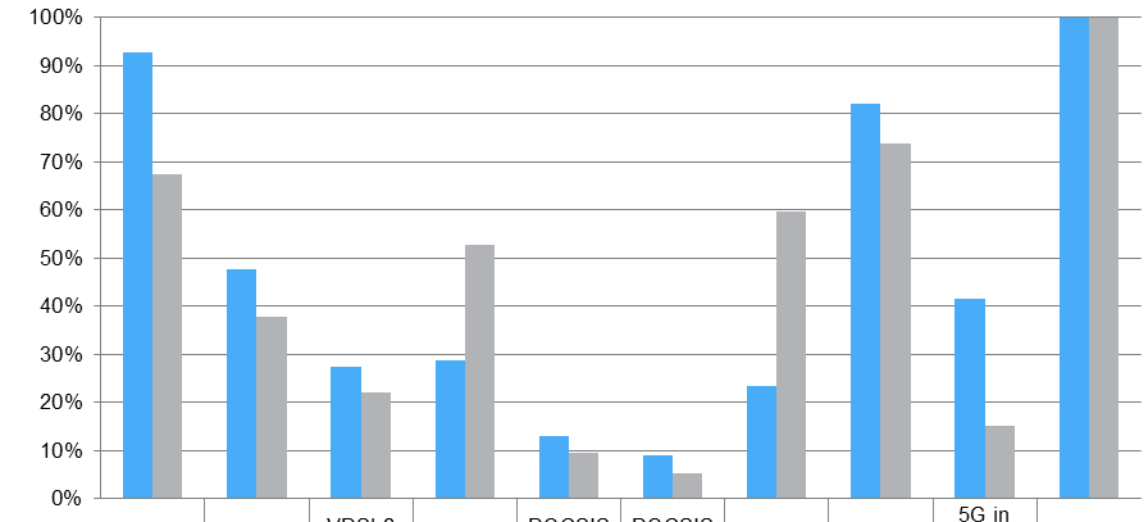
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Austria, FTTP recorded the strongest growth among broadband technologies, but despite an improvement of 6.1 percentage points, Austria remained 24.0 percentage points below the EU average. The pace of DOCSIS 3.1 upgrades also accelerated in rural areas, albeit at a slower rate than at national level. Coverage grew by 2.9 percentage points, with 9.1% rural homes passed by mid-2023.

DSL remained the largest broadband technology in rural Austria, with 92.7% of rural homes passed. VDSL and VDSL2 Vectoring was available to 47.8% and 27.4% of rural households, respectively.

5G coverage grew by 13.2 percentage points over the 12-month period and was available to 82.0% of rural households. Austria was the country with the fourth highest rural 5G coverage in the 3.4–3.8 GHz band, reflecting fast-paced rollouts which led to 10.2 percentage point growth in this category.

Austria: Coverage by technology, rural areas, 2023



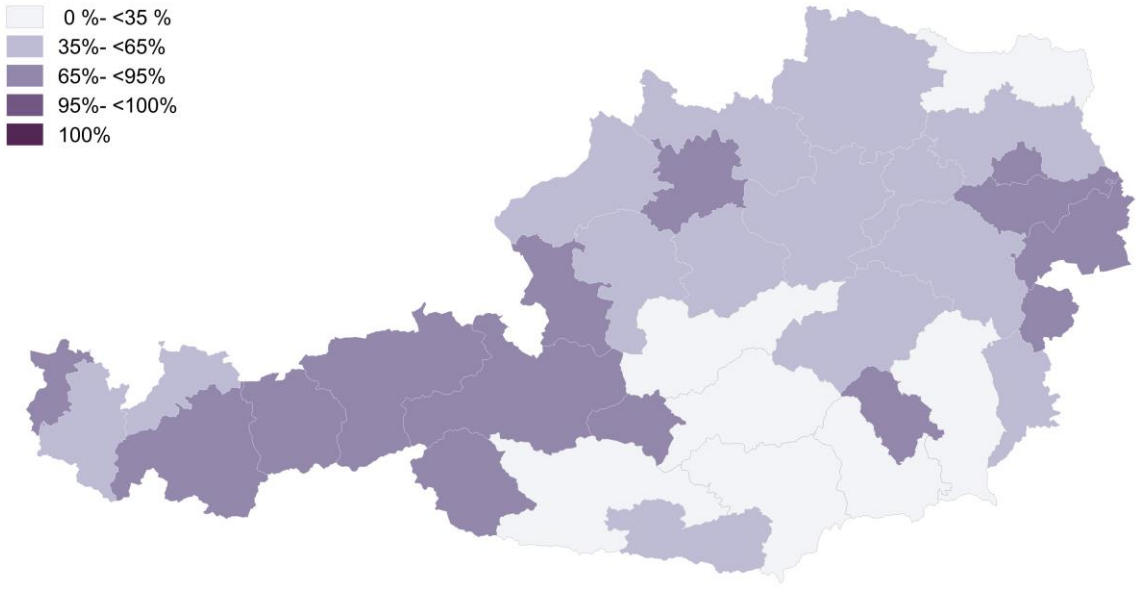
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Austria	92.7%	47.8%	27.4%	28.7%	13.1%	9.1%	23.5%	82.0%	41.5%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.1.2 Regional coverage by broadband technology

There is a wide range of fixed VHCN (FTTP & DOCSIS 3.1) coverage levels in Austria, ranging from 13.7% in Oberkärnten to 93.6% in Wien. There were 14 regions that exceeded the 65% coverage threshold, five more than in mid-2022. There was still no region that exceeded the 95% threshold.

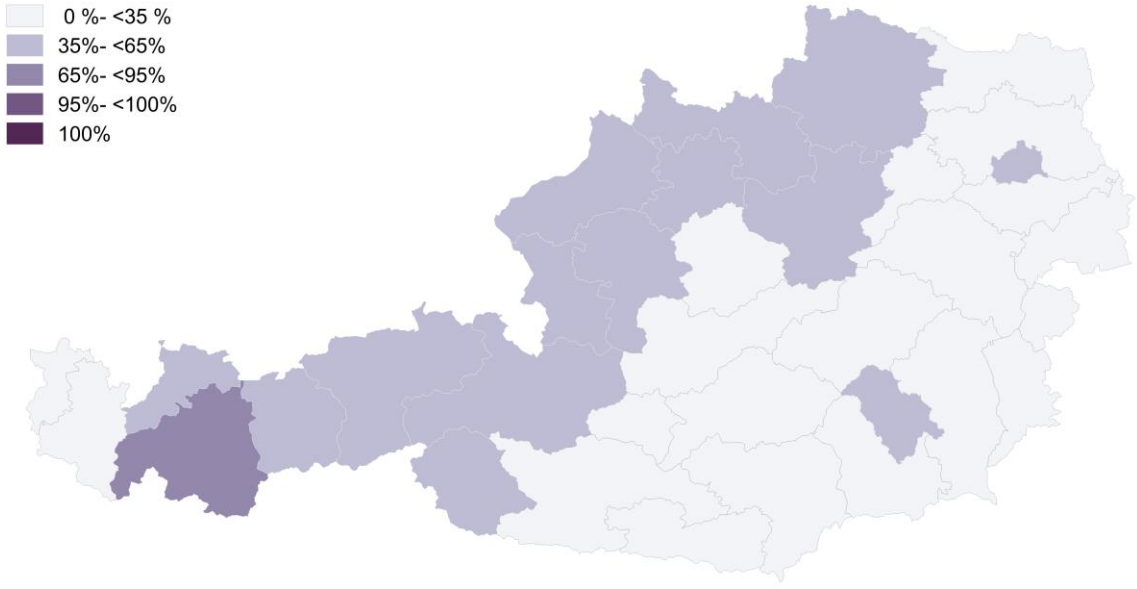
Austria: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Tiroler Oberland was the only region that exceeded the 65% threshold in terms of FTTP coverage with 67.5% but was closely followed by Wien with 64.2%. Südburgenland was the region with the lowest availability of FTTP, with just 6.5% of homes passed.

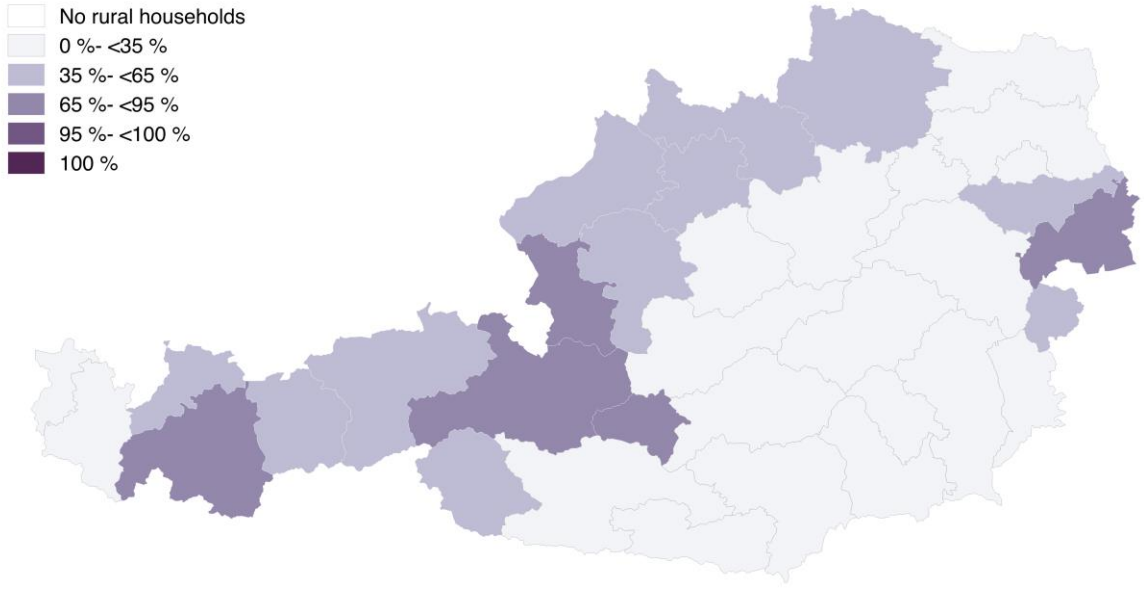
Austria: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Five Austrian regions (Nordburgenland, Lungau, Pinzgau-Pongau, Salzburg und Umgebung and Tiroler Oberland) exceeded the 65% threshold in terms of rural fixed VHCN (FTTP & DOCSIS 3.1) coverage, two more than in mid-2022. The lowest rural fixed VHCN coverage levels were reported in Östliche Obersteiermark (5.7%), Westliche Obersteiermark (7.9%) and Oberkärnten (8.6%).

Austria: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.1.3 Data tables for Austria

Statistic	National
Population	9,104,772
Persons per household	2.3
Rural proportion	14.6%

	Austria 2023		Austria 2022		Austria 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	96.5%	92.7%	97.0%	93.6%	97.3%	93.7%	79.7%	67.4%
VDSL	83.4%	47.8%	81.6%	49.6%	78.7%	43.0%	52.6%	37.8%
VDSL2 Vectoring	57.1%	27.4%	55.3%	26.1%	50.7%	24.2%	38.7%	22.0%
FTTP	41.0%	28.7%	36.6%	22.6%	26.6%	14.9%	64.0%	52.8%
Cable modem DOCSIS 3.0	59.4%	13.1%	59.3%	12.8%	59.3%	12.6%	41.1%	9.5%
Cable modem DOCSIS 3.1	52.6%	9.1%	39.5%	6.3%	32.0%	0.9%	33.6%	5.3%
FWA	18.7%	23.5%	20.7%	27.6%	19.9%	26.2%	68.5%	59.6%
5G	96.0%	82.0%	91.7%	68.9%	76.8%	36.3%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	79.1%	41.5%	73.6%	31.3%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.2%	96.2%	99.1%	96.0%	99.0%	95.6%	97.7%	92.2%
Overall NGA broadband	94.2%	71.1%	94.7%	74.2%	93.1%	67.7%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	67.6%	35.8%	54.8%	27.4%	45.4%	15.7%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	94.2%	-	94.8%	-	93.3%	-	93.3%	-
At least 100Mbps	87.5%	-	85.8%	-	82.8%	-	89.0%	-
At least 1Gbps	65.1%	-	54.8%	-	45.4%	-	75.6%	-
At least 1Gbps upload and download	39.9%	-	21.6%	-	*17.5%*	-	-	-

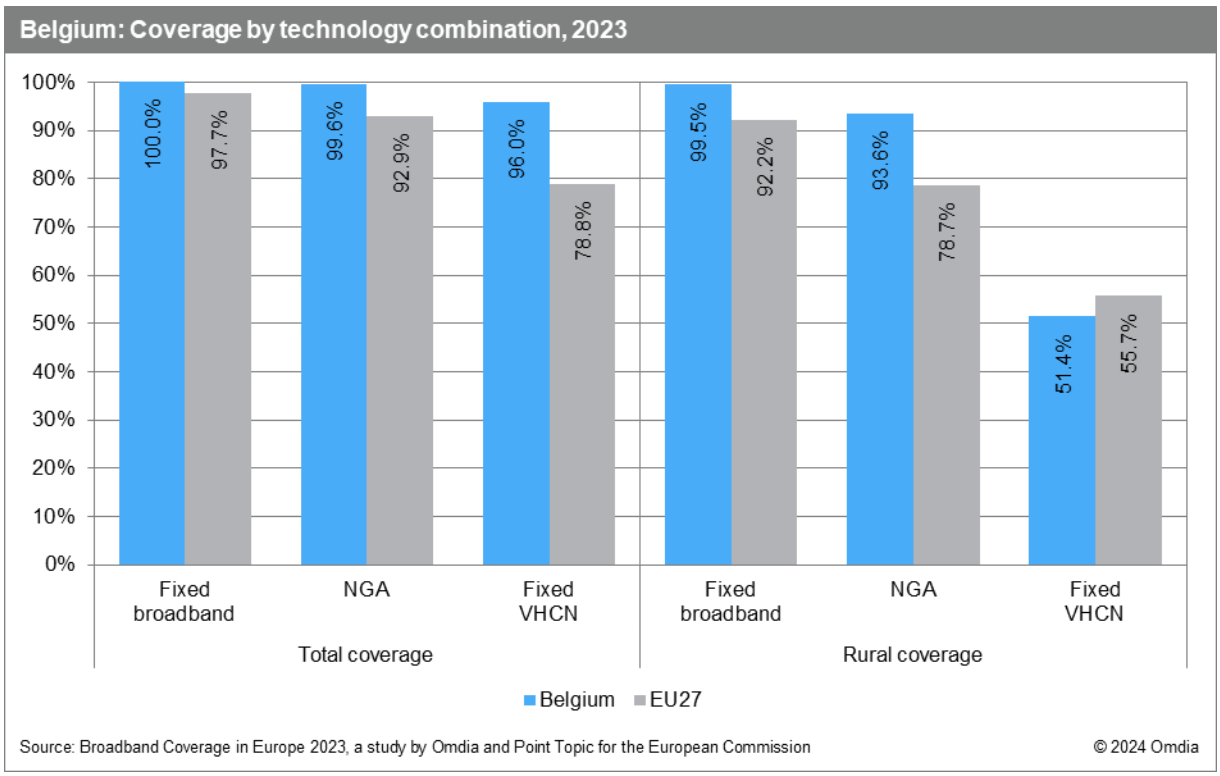
Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

5.2 Belgium

5.2.1 National coverage by broadband technology

As of mid-2023, all Belgian households had access to at least one fixed broadband service, and NGA coverage was near-universal, reaching 99.6% of total households, compared with the EU average of 92.9%, and 93.6% of rural households – well above the EU average of 78.7%. Additionally, 96.0% of Belgian homes were passed by fixed Very High Capacity networks (FTTP & DOCSIS 3.1), above the EU average (78.8%) and recording a 17.7 percentage point growth compared to mid-2022. Rural fixed VHCN coverage reached 51.4% of rural households, below the EU average of 55.7%.



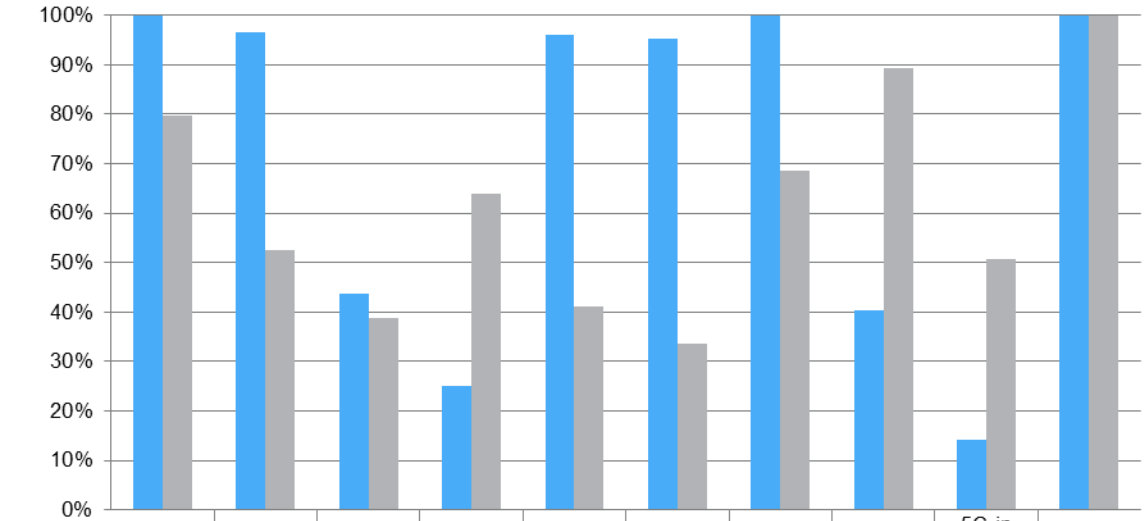
Regarding individual technology coverage at a national level, DSL availability remained near universal with 99.9% of homes passed by DSL networks. The Belgian incumbent operator has upgraded substantial portions of its legacy copper networks to new technology standards offering higher speeds, so that by mid-2023, VDSL and VDSL2 Vectoring technologies passed 96.5% and 43.8% of Belgian homes, respectively – representing much higher coverage levels than those observed in the EU, where VDSL services were available to 52.6% of total households while just 38.7% had access to VDSL2 Vectoring high-speed broadband services. However, the incumbent has begun the process of decommissioning its copper network as it ramps up its fibre deployments and in areas where fibre networks are rolled out, VDSL services are no longer available, leading to decreasing VDSL and VDSL2 Vectoring coverage trend.

As of mid-2023, cable modem DOCSIS 3.0 was the second most widely available fixed technology in Belgium, with services available to 95.6% 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-2023 nearly all of the cable networks were upgraded to the DOCSIS 3.1 standard and 95.4% of Belgian homes were passed by DOCSIS 3.1 networks, well above the EU average of 33.6%.

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 25.0% of homes at the end of June 2023, representing a coverage increase of 7.8 percentage points, since the previous study.

For mobile broadband coverage, 5G services were available to 40.4% of Belgians with all three leading mobile operators – Proximus, Telenet and Orange activating their 5G networks. Proximus, which launched Belgium's first 5G services in April 2020. Coverage of 5G networks in the 3.4–3.8 GHz frequency bands reached 14.2%, below the EU average of 50.6%.

Belgium: Coverage by technology, total, 2023

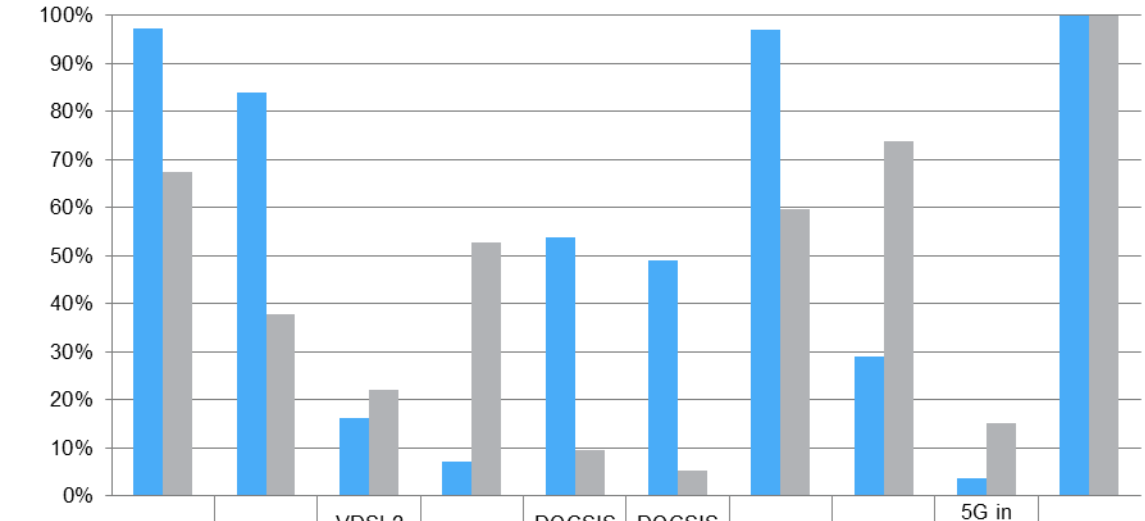


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Belgium	99.9%	96.5%	43.8%	25.0%	96.0%	95.4%	99.8%	40.4%	14.2%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Within the rural regions of Belgium, DSL remained the most widely deployed fixed broadband technology, with 97.4% of rural homes passed – 30 percentage points above the EU average of 67.4%. Moreover, VDSL coverage (84.1%) stood at more than double the average EU level (37.8%). Cable modem DOCSIS 3.0 was available to 53.9% of rural households – above the EU average of 9.5%. Most cable networks in rural areas have been upgraded to the DOCSIS 3.1 standard, with coverage of 49.0%, well ahead of the EU average for rural coverage (5.3%). There has been some progress in rural FTTP coverage, which grew by 7.0 percentage points, though FTTP coverage remains limited with just 7.3% of rural homes passed by FTTP networks at the end of June 2023.

Belgium: Coverage by technology, rural areas, 2023



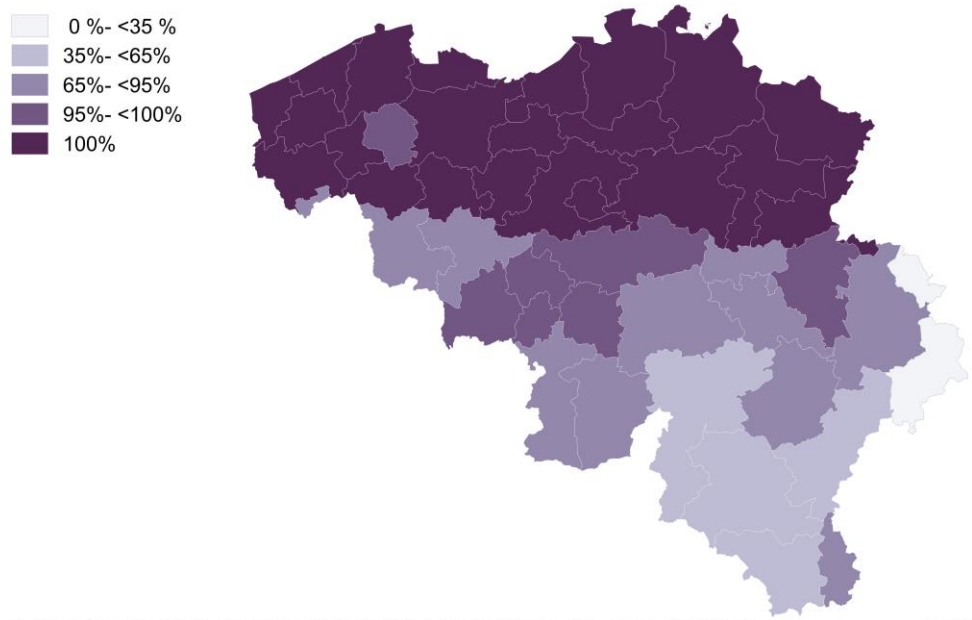
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Belgium	97.4%	84.1%	16.4%	7.3%	53.9%	49.0%	96.9%	28.9%	3.8%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.2.2 Regional coverage by broadband technology

There is a clear contrast in the availability of gigabit-capable fixed VHCN services along regional lines. While nearly all Flemish regions over 99%, availability across the various Walloon regions was much lower and more varied.

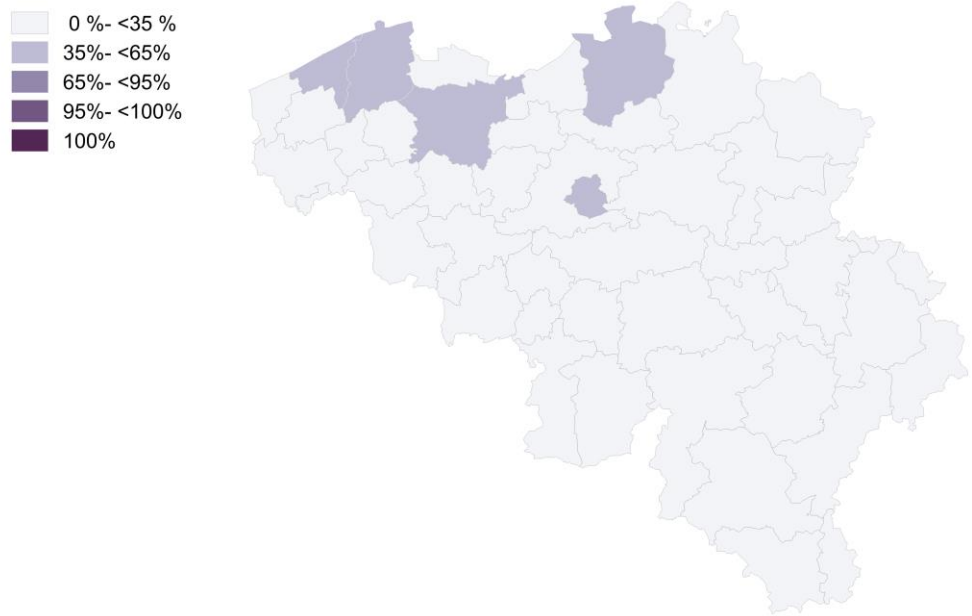
Belgium: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

FTTP coverage remains low across all Belgian regions, ranging from less than one percent to more than half (57.0%) in Brussels and 47% in the Brugge region. There were only three other regions (Antwerpen, Oostende, and Gent) where FTTP coverage reached more than 40% of households.

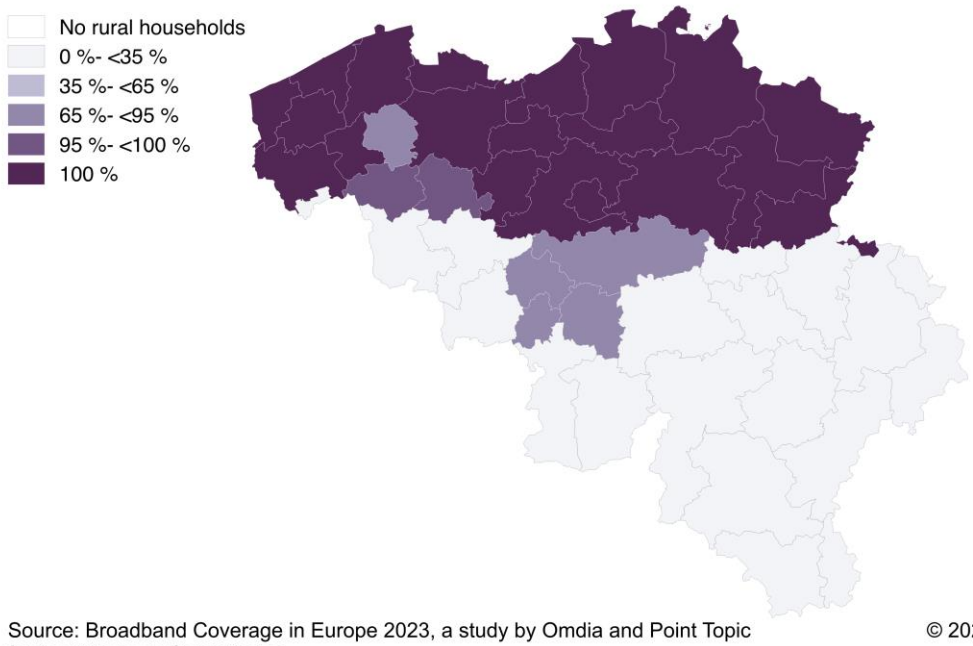
Belgium: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In terms of rural coverage of fixed VHCN networks, similar to the total coverage levels Flemish regions again record much higher coverage than Walloon regions, where coverage ranges from less than three percent coverage to 79.5% of rural households in the Nivelles region.

Belgium: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.2.3 Data tables for Belgium

Statistic	National
Population	11,617,623
Persons per household	2.4
Rural proportion	4.3%

	Belgium 2023		Belgium 2022		Belgium 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.9%	97.4%	99.9%	97.8%	99.8%	97.0%	79.7%	67.4%
VDSL	96.5%	84.1%	96.9%	84.6%	96.8%	80.1%	52.6%	37.8%
VDSL2 Vectoring	43.8%	16.4%	47.9%	29.5%	51.6%	31.9%	38.7%	22.0%
FTTP	25.0%	7.3%	17.2%	1.3%	10.1%	0.7%	64.0%	52.8%
Cable modem DOCSIS 3.0	96.0%	53.9%	95.7%	70.2%	96.5%	54.6%	41.1%	9.5%
Cable modem DOCSIS 3.1	95.4%	49.0%	74.4%	61.5%	67.7%	54.6%	33.6%	5.3%
FWA	99.8%	96.9%	99.8%	96.1%	97.7%	94.9%	68.5%	59.6%
5G	40.4%	28.9%	29.6%	21.2%	4.2%	0%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	14.2%	3.8%	5.6%	2.0%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	100.0%	99.5%	100.0%	99.6%	99.7%	97.7%	97.7%	92.2%
Overall NGA broadband	99.6%	93.6%	99.4%	95.3%	99.1%	91.4%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	96.0%	51.4%	78.3%	62.2%	68.9%	55.1%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	97.8%	-	97.8%	-	99.1%	-	93.3%	-
At least 100Mbps	96.9%	-	96.9%	-	97.2%	-	89.0%	-
At least 1Gbps	95.7%	-	*78.0%*	-	69.0%	-	75.6%	-
At least 1Gbps upload and download	25.0%	-	14.6%	-	*9.0%*	-	-	-

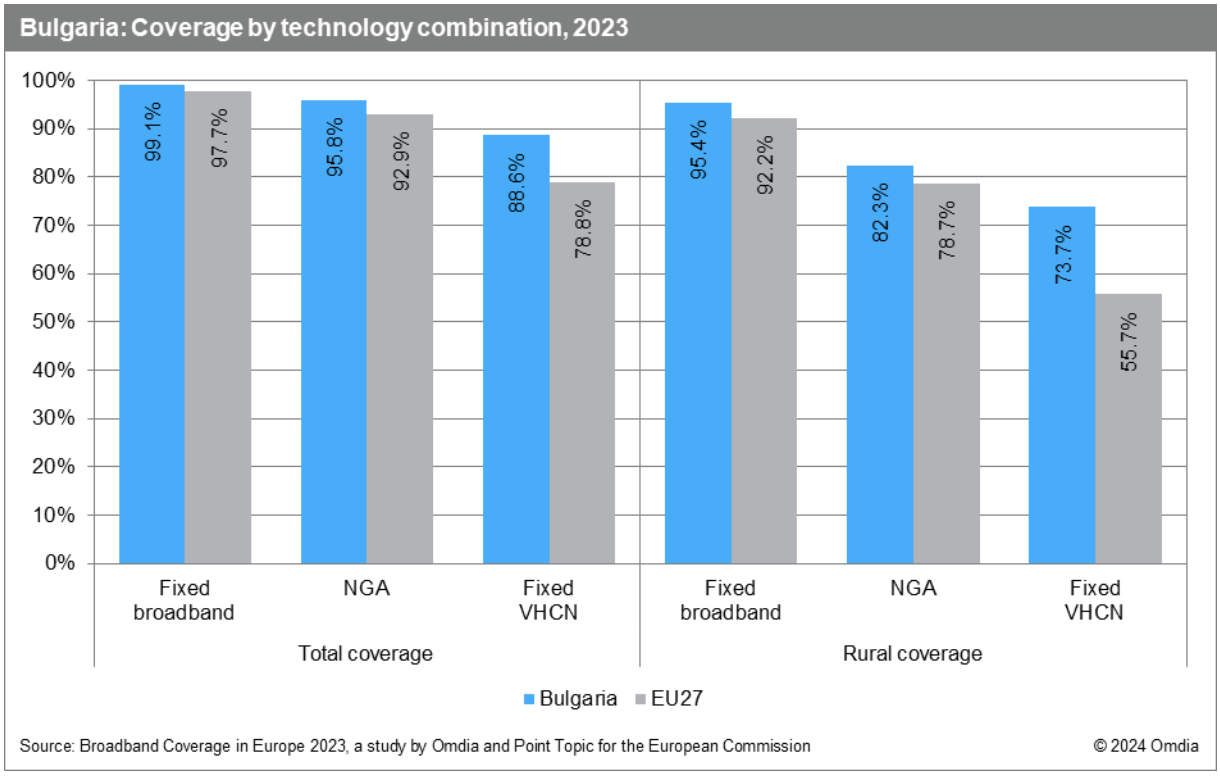
Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

5.3 Bulgaria

5.3.1 National coverage by broadband technology

Fixed broadband coverage in Bulgaria increased by 0.2 p.p. with 99.1% of national and 95.4% of rural households covered by the end of June 2023. As there were no DOCSIS 3.1 launches by mid-2023, Bulgaria's fixed VHCN coverage in the 1Gbps-capable network category (FTTP & DOCSIS 3.1) was identical to the FTTP coverage of 88.6%. Rural FTTP deployment continued to grow strongly, reaching 73.7% in June 2023, well ahead of the EU average (52.8%). An increase of 1.4 percentage points was recorded in terms of NGA coverage, enabling 95.8% of households to access high speed broadband services. In rural regions, NGA coverage increased by 6.5 percentage points and passed 82.3% of homes.

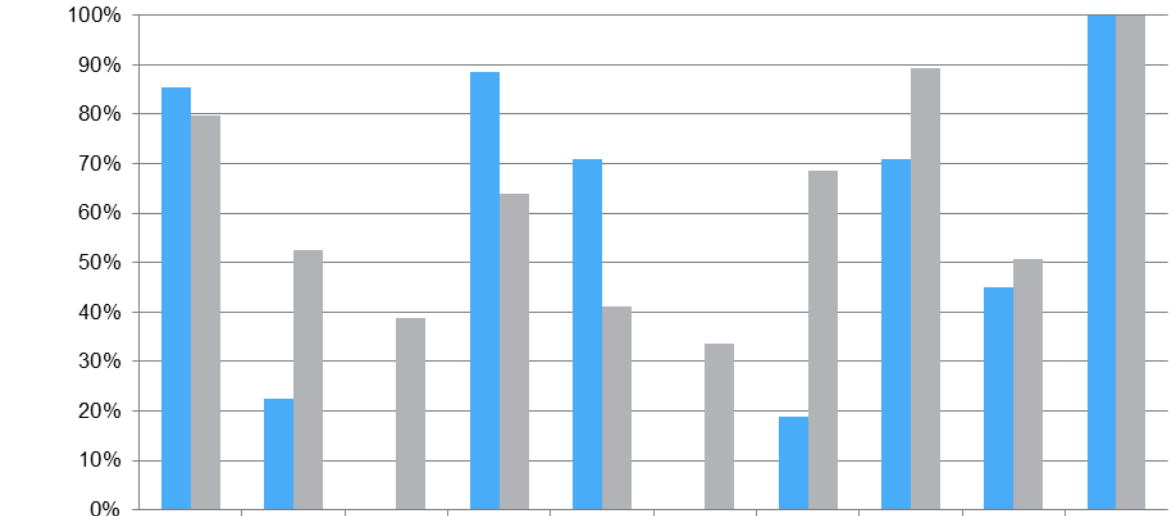


When looking at individual broadband technologies, FTTP is the most prevalent fixed broadband technology, with 88.6% of households covered (up by 3.0 p.p. since 2022), ahead of DSL on 85.5%. FTTP coverage in Bulgaria remains well ahead of the EU average (64.0%).

After a number of years of steady growth, coverage of cable modem DOCSIS 3.0 remained unchanged in this year's study, and covered 70.9% of households as of June 2023, exceeding the EU average by 30.0 percentage points. However, no advancement in terms of DOCSIS 3.1 upgrades were made yet. Meanwhile growth in VDSL coverage slowed markedly in 2023 as investments were re-focussed on FTTP rollout. VDSL coverage increased by just 0.6 p.p. with a total of 22.5% of homes passed by mid-2023. VDSL2 Vectoring remained absent from the Bulgarian market.

In terms of mobile broadband technologies, overall 5G coverage increased over the year from 67.2% in 2022 to 70.9% in 2023. This is 18.4 p.p. below the EU27 average of 89.3%, a gap which has grown from 14.0 p.p. in 2022. 5G coverage in the 3.4–3.8 GHz band reached 45.1% of the population, up from 36.7% in 2022, meaning that almost two thirds of the 5G coverage area is using the 3.4–3.8 GHz band. Spectrum in the 700 MHz and 800 MHz bands was awarded to all three Bulgarian MNOs in December 2023.

Bulgaria: Coverage by technology, total, 2023



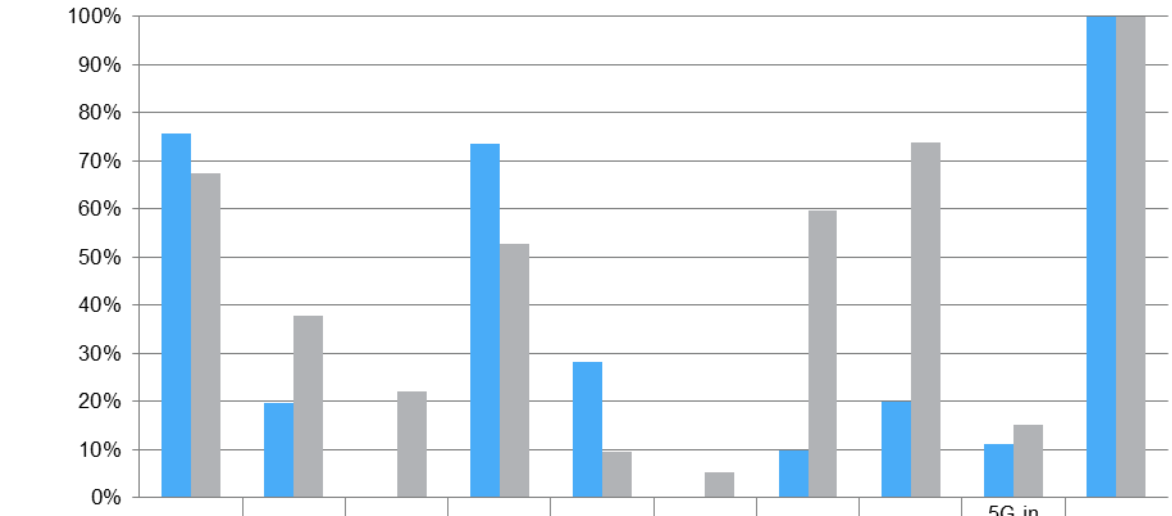
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Bulgaria	85.5%	22.5%	0%	88.6%	70.9%	0%	18.8%	70.9%	45.1%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural regions, DSL remained the leading technology with 75.7% of rural homes passed, in line with the previous year. VDSL deployments continue to progress in rural regions, and following an increase of 4.1 percentage points, 19.7% of rural households could access VDSL services. But rural FTTP coverage grew by 7.1 p.p., reaching 73.7% of rural households, only 2 p.p. short of rural DSL coverage. Bulgaria continued to sit well above the EU average in the cable DOCSIS 3.0 category, covering 28.3% of rural households.

5G deployments were primarily focussed on urban areas, and rural 5G coverage was estimated at 20.1%, well below the EU average of 73.7%. Around half of this coverage is believed to be using the 3.4–3.8 GHz frequency band, reaching 11.3% of rural premises.

Bulgaria: Coverage by technology, rural areas, 2023



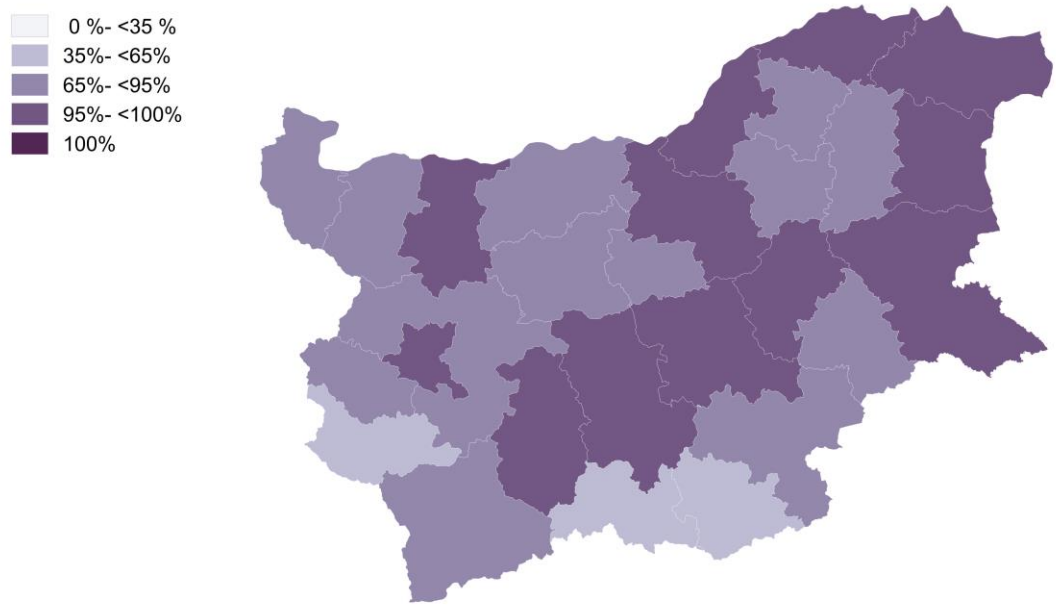
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Bulgaria	75.7%	19.7%	0%	73.7%	28.3%	0%	9.8%	20.1%	11.3%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.3.2 Regional coverage by broadband technology

Twelve Bulgarian provinces recorded fixed VHCN coverage of greater than 95%, while only three failed to reach 65% coverage (down from seven in 2022) – Kyustendil, Smolyan, and Kardzhali.

Bulgaria: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

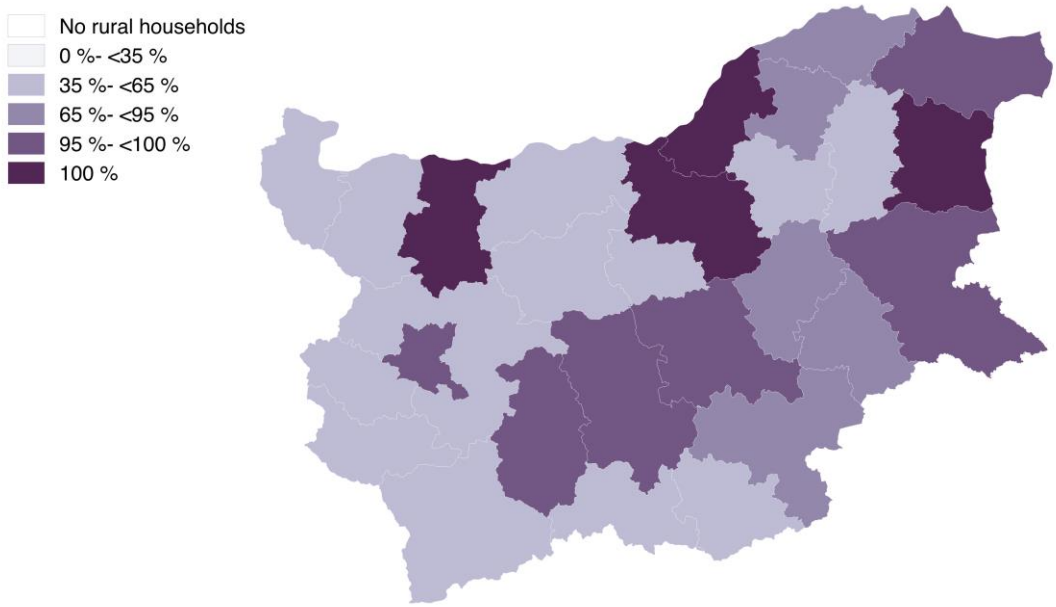


Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Since there are no DOCSIS 3.1 services in Bulgaria, the FTTP coverage is identical to coverage for the fixed VHCN (FTTP & DOCSIS 3.1 combined) category.

Rural FTTP coverage varies more widely. Four provinces recorded universal rural FTTP coverage (Vratsa, Veliko Tarnovo, Ruse, and Varnaabove), but of the remaining 24 provinces, only 11 recorded rural FTTP coverage above 65%, of which six surpassed 95% coverage.

Bulgaria: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.3.3 Data tables for Bulgaria

Statistic	National
Population	6,447,710
Persons per household	2.3
Rural proportion	18.8%

	Bulgaria 2023		Bulgaria 2022		Bulgaria 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	85.5%	75.7%	85.4%	75.7%	85.4%	75.7%	79.7%	67.4%
VDSL	22.5%	19.7%	21.9%	15.6%	18.2%	8.8%	52.6%	37.8%
VDSL2 Vectoring	0%	0%	0%	0%	0%	0%	38.7%	22.0%
FTTP	88.6%	73.7%	85.6%	66.6%	81.4%	57.6%	64.0%	52.8%
Cable modem DOCSIS 3.0	70.9%	28.3%	70.9%	27.6%	70.5%	26.5%	41.1%	9.5%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	33.6%	5.3%
FWA	18.8%	9.8%	18.8%	9.8%	18.8%	9.8%	68.5%	59.6%
5G	70.9%	20.1%	67.2%	18.4%	40.1%	8.6%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	45.1%	11.3%	36.7%	8.6%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.1%	95.4%	98.9%	93.9%	97.0%	91.8%	97.7%	92.2%
Overall NGA broadband	95.8%	82.3%	94.4%	75.9%	92.1%	69.0%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	88.6%	73.7%	85.6%	66.6%	81.4%	57.6%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	95.1%	-	93.9%	-	92.1%	-	93.3%	-
At least 100Mbps	93.6%	-	91.9%	-	89.4%	-	89.0%	-
At least 1Gbps	28.4%	-	21.4%	-	16.3%	-	75.6%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

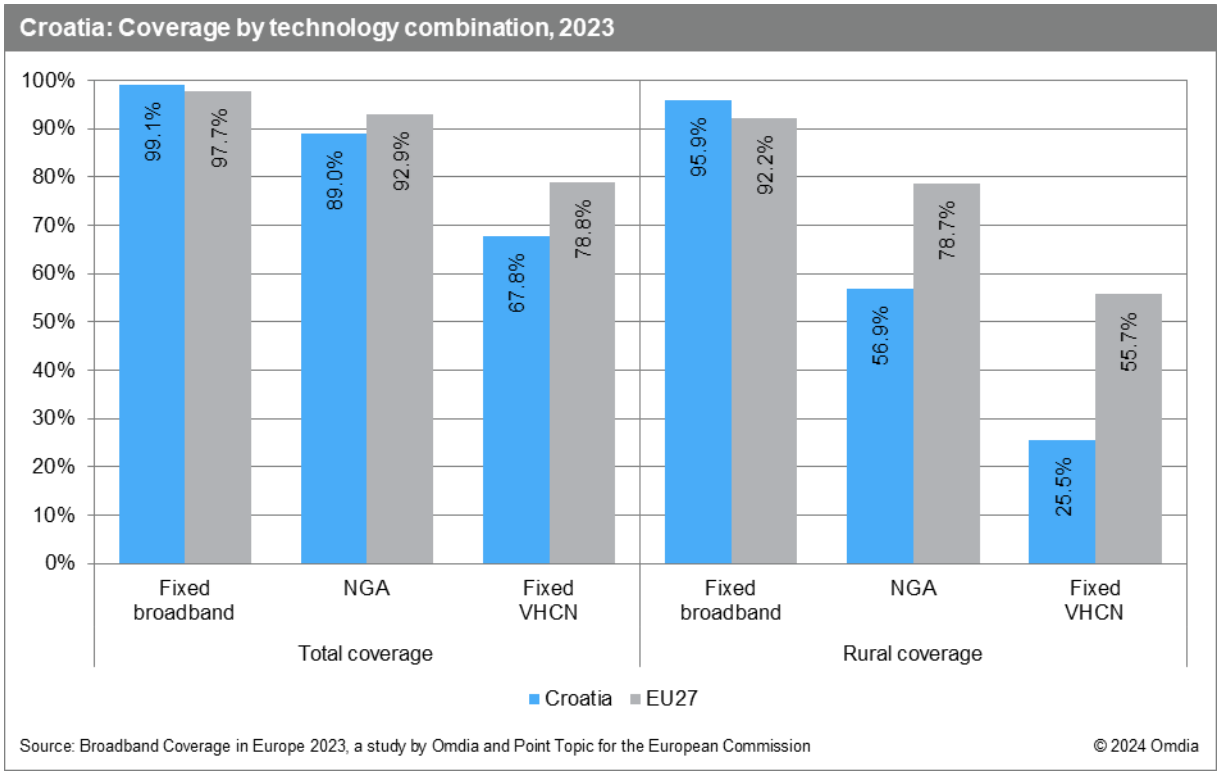
All restatements are highlighted in italics.

5.4 Croatia

5.4.1 National coverage by broadband technology

Croatia ranked above the EU average in overall fixed broadband coverage, with 99.1% of national and 95.9% of rural households covered by the end of June 2023, respectively. Rural NGA coverage increased by 6.9 percentage points over the 12-month period, with more moderate growth of 0.9 percentage points at national level. The fixed VHCN availability of 1Gbps-capable networks (FTTP & DOCSIS 3.1) grew by 6.3 percentage points and hit 67.8% at national and 25.5% at rural level.

Despite strong growth momentum across the NGA and fixed VHCN coverage categories, Croatia remained below the EU average, with a particularly large gap in rural NGA and rural fixed VHCN coverage.

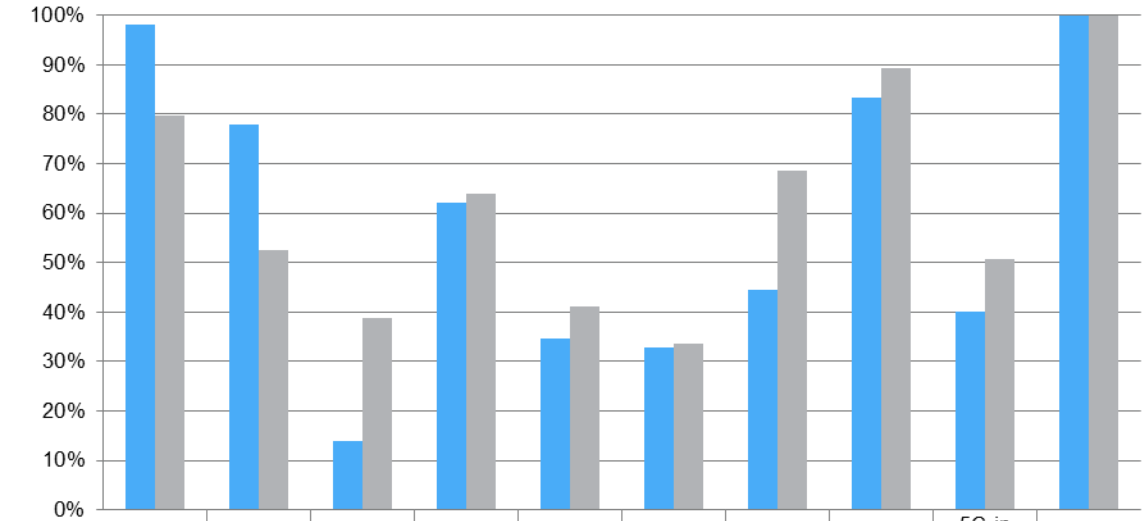


FTTP recorded the strongest growth among broadband technologies in Croatia which reflects fast-paced fibre deployments by operators. FTTP coverage grew by 8.1 percentage points and hit 62.1% by the end of June 2023. Despite strong growth, FTTP coverage remained just below the EU average of 64.0%. FWA coverage increased by 6.1 percentage points and was available to 44.5% of households but maintained a gap of 24.0 percentage points to the EU average.

DSL remained the largest broadband technology, which was available to 98.0% of households, unchanged from mid-2022. 77.9% and 13.9% of Croatian households were able to access VDSL and VDSL2 Vectoring networks, respectively. Almost the entire cable network has been upgraded to DOCSIS 3.1 standard by mid-2023 which covered one third (32.9%) of households.

Despite good growth momentum, Croatia remained below the EU average in terms of 5G coverage. Overall 5G coverage stood at 83.4%, while 5G in the 3.4–3.8 GHz band was available to 40.0% of Croatian households by mid-2023.

Croatia: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Croatia	98.0%	77.9%	13.9%	62.1%	34.6%	32.9%	44.5%	83.4%	40.0%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

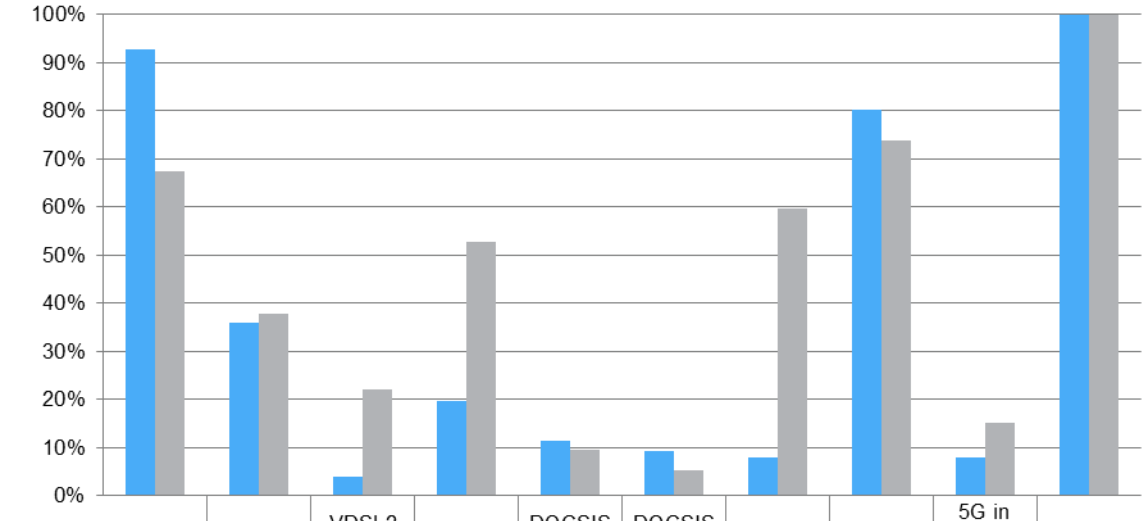
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Croatia, DSL remained the largest broadband technology, covering 92.8% of rural households by mid-2023 which was well above the EU average. VDSL and VDSL2 Vectoring were available to 35.9% and 4.1% of rural households, respectively, but remained below the EU average.

FTTP was the fastest growing technology in rural Croatia, up by 6.0 percentage points, but with just 19.7% of rural homes passed, it maintained a large gap of 33.0 percentage points to the EU average. DOCSIS 3.0 and DOCSIS 3.1 networks were available to 11.4% and 9.2% of rural households, respectively. FWA coverage increased by 1.4 percentage points over the 12-month period.

Unlike at national level, 5G coverage exceeded the EU average in rural areas, with 80.1% of rural households covered by the end of June 2023. 5G in the 3.4–3.8 GHz band was available to 8.0% rural households.

Croatia: Coverage by technology, rural areas, 2023



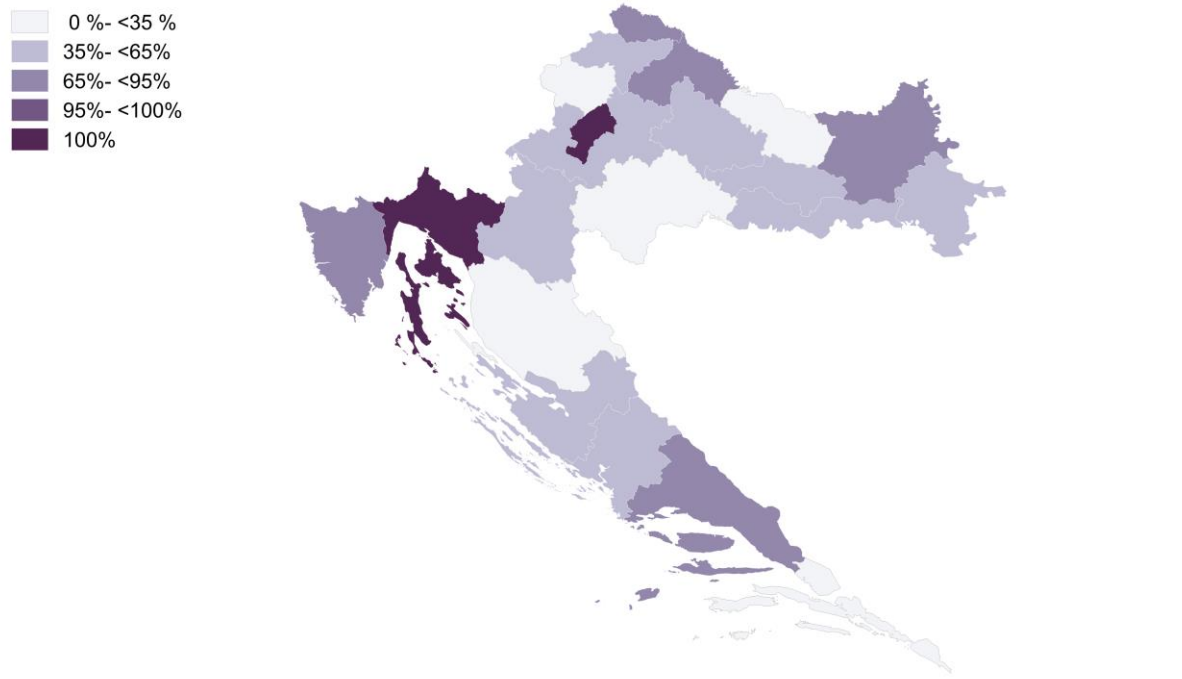
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Croatia	92.8%	35.9%	4.1%	19.7%	11.4%	9.2%	7.9%	80.1%	8.0%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.4.2 Regional coverage by broadband technology

Fixed VHCN (FTTP & DOCSIS 3.1) coverage in Croatia varied between 100% in Primorsko-goranska županija and Grad Zagreb to just 2.3% in Ličko-senjska županija. Out of the remaining 18 regions, 14 reported coverage levels of 65%-<95%.

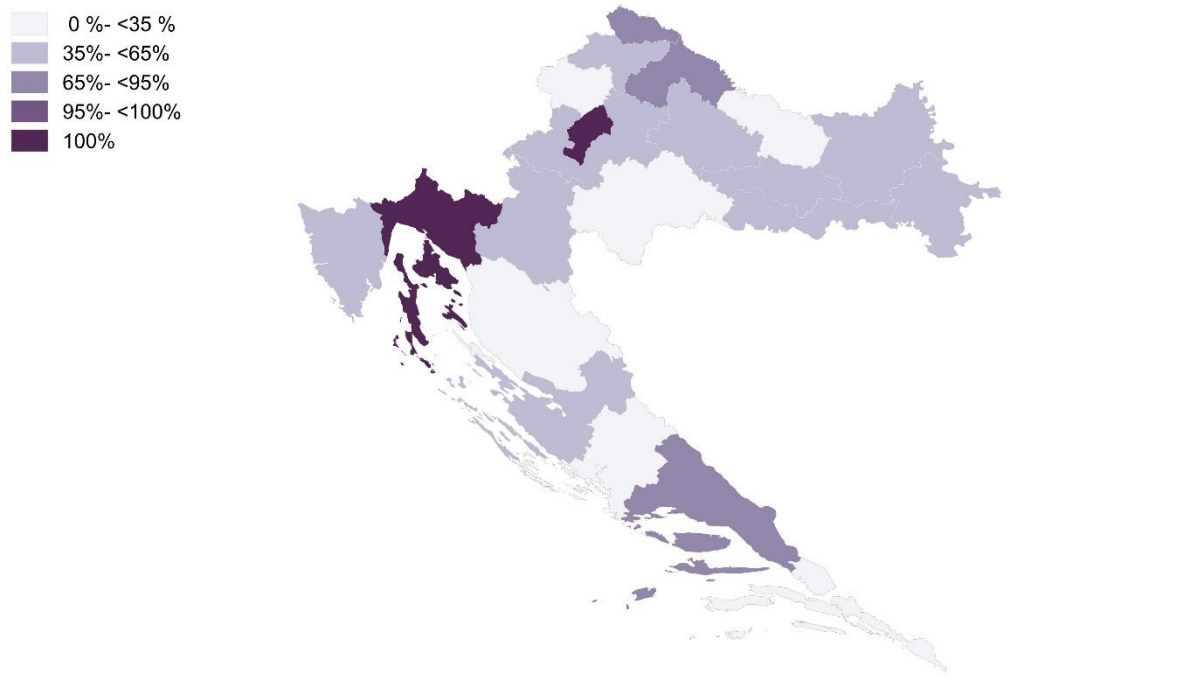
Croatia: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

FTTP coverage across six regions remained below 35%, with the lowest coverage in Ličko-senjska županija (2.3%), Krapinsko-zagorska županija (9.9%) and Dubrovačko-neretvanska županija (15.0%).

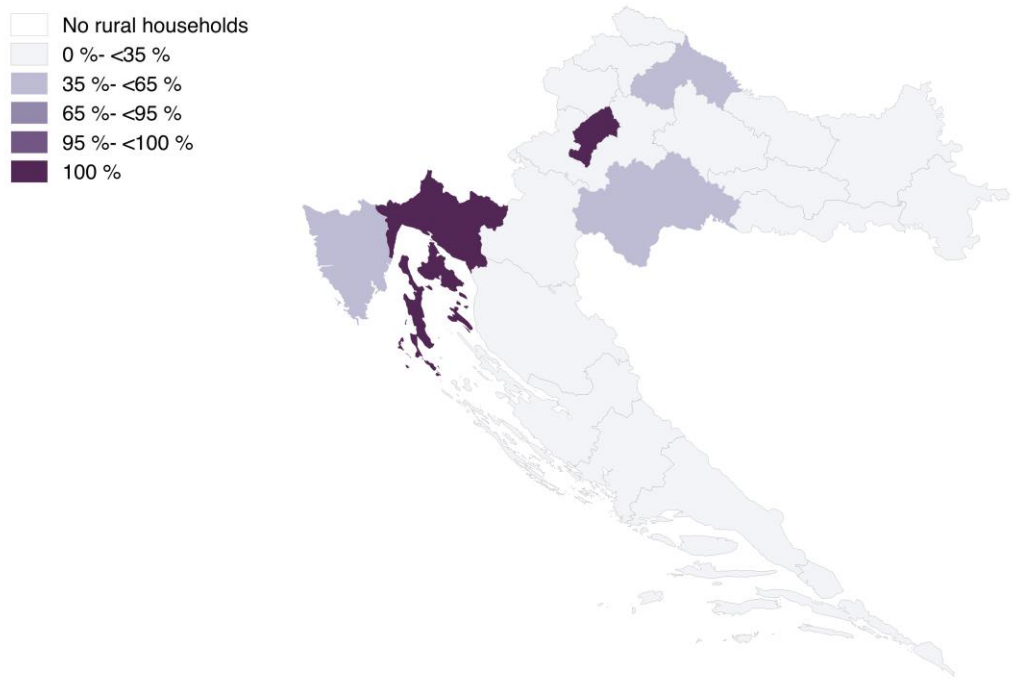
Croatia: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Rural fixed VHCN (FTTP & DOCSIS 3.1) coverage in Primorsko-goranska županija and Grad Zagreb stood at 100% reflecting completed FTTP deployment in these two regions. However, there is a large gap to the rest of the country; 16 regions recorded rural fixed VHCN coverage below 35%.

Croatia: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.4.3 Data tables for Croatia

Statistic	National
Population	3,829,989
Persons per household	2.7
Rural proportion	22.4%

	Croatia 2023		Croatia 2022		Croatia 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	98.0%	92.8%	98.1%	*91.9%*	99.7%	98.9%	79.7%	67.4%
VDSL	77.9%	35.9%	78.1%	36.0%	78.2%	28.2%	52.6%	37.8%
VDSL2 Vectoring	13.9%	4.1%	12.1%	*3.8%*	11.3%	2.7%	38.7%	22.0%
FTTP	62.1%	19.7%	53.9%	13.7%	38.7%	7.1%	64.0%	52.8%
Cable modem DOCSIS 3.0	34.6%	11.4%	35.1%	11.9%	36.3%	13.3%	41.1%	9.5%
Cable modem DOCSIS 3.1	32.9%	9.2%	33.3%	9.4%	34.5%	9.3%	33.6%	5.3%
FWA	44.5%	7.9%	38.4%	*6.5%*	4.4%	6.7%	68.5%	59.6%
5G	83.4%	80.1%	82.5%	73.5%	33.8%	9.3%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	40.0%	8.0%	37.2%	5.0%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.1%	95.9%	99.0%	*95.4%*	99.9%	99.4%	97.7%	92.2%
Overall NGA broadband	89.0%	56.9%	*88.1%*	*49.9%*	87.8%	39.0%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	67.8%	25.5%	61.5%	19.2%	*52.3%*	14.0%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	89.0%	-	88.0%	-	87.8%	-	93.3%	-
At least 100Mbps	71.5%	-	67.4%	-	62.1%	-	89.0%	-
At least 1Gbps	67.8%	-	57.6%	-	52.3%	-	75.6%	-
At least 1Gbps upload and download	10.7%	-	5.7%	-	-	-	-	-

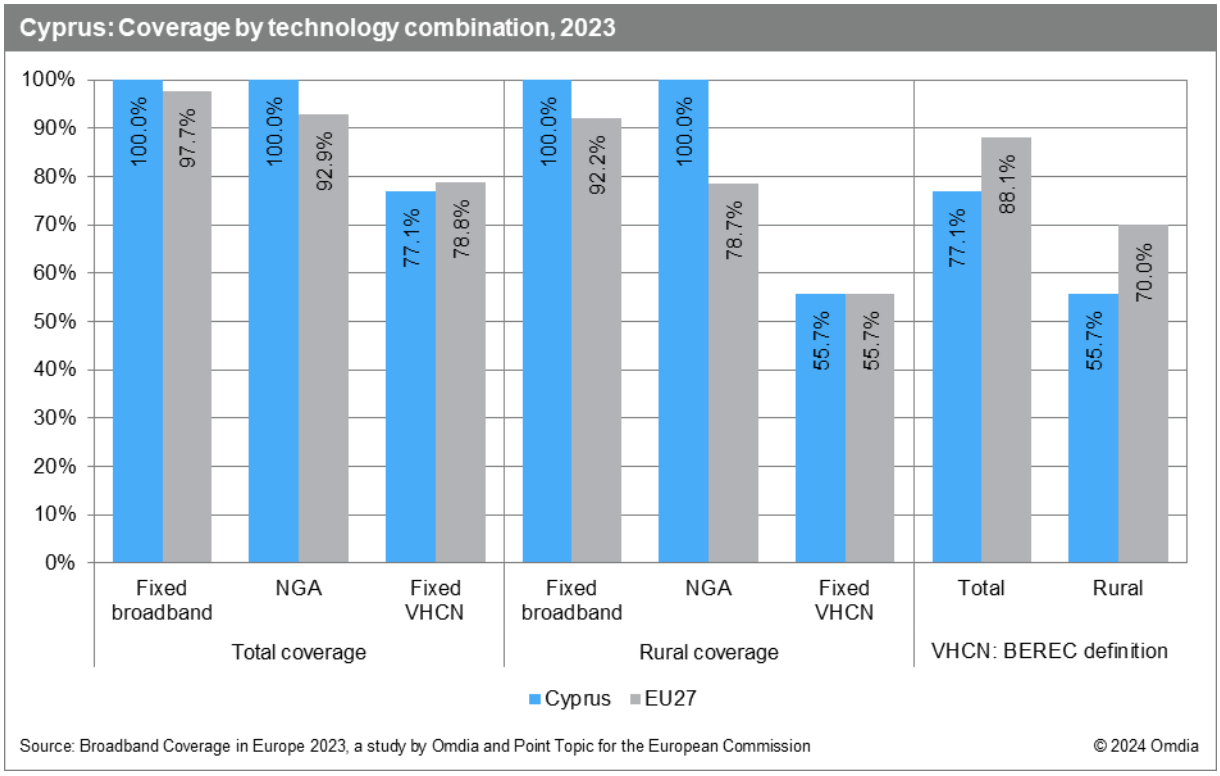
Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

5.5 Cyprus

5.5.1 National coverage by broadband technology

Coverage of 1Gbps-capable fixed VHCN networks (FTTP & DOCSIS 3.1) in Cyprus again grew strongly in 2023, reaching 77.1% of homes by mid-2023, up by 17.1 p.p. from 2022. Coverage of this metric has now almost reached the EU average of 78.8%. As there were no DOCSIS 3.1 deployments by mid-2023, gigabit-capable networks were limited to FTTP, and coverage of VHCN by the BEREC definition was reported at the same level. 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 twelve months.

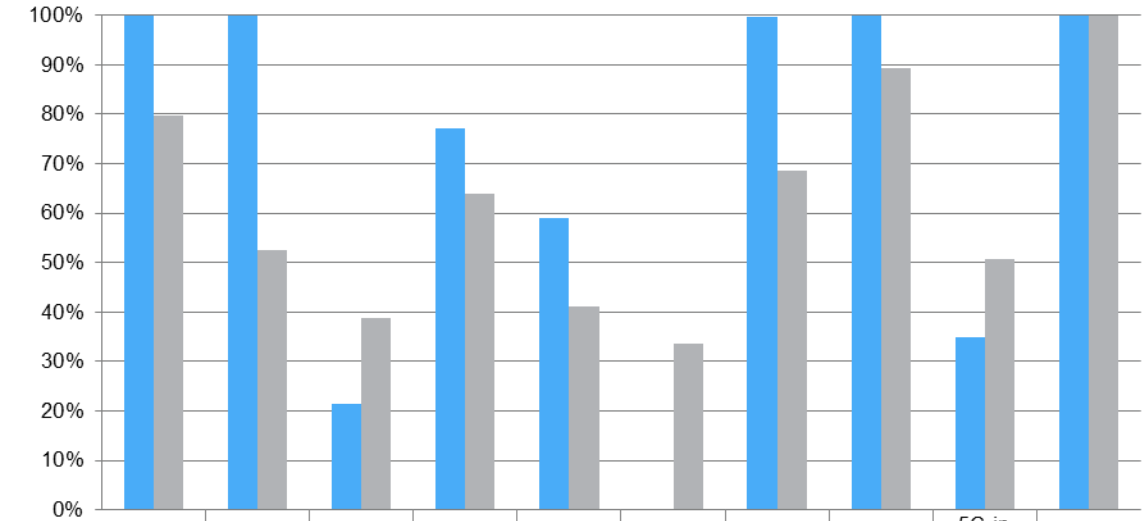


The strong growth in FTTP coverage over the year means that Cyprus is now well ahead of the EU27 average for FTTP coverage (77.1% versus 64.0%), having overtaken the EU average in last year's study. The 17.1 p.p. increase since 2022 is the highest of the countries in this year's study, for the second year in a row.

Cable modem DOCSIS 3.0 services are available to around six in ten homes (59.0%), but as of mid-2023 cable operators in Cyprus had not implemented any DOCSIS 3.1 upgrades. Thus, FTTP remains the only available technology capable of supporting gigabit speed services. VDSL services remain available to all households in Cyprus, with high-speed VDSL2 Vectoring services covering over one fifth (21.5%) of Cypriot households. Meanwhile Fixed Wireless Access coverage reached 99.6% of households nationally at the end of June 2023.

Cyprus saw its first 5G services in early 2021 and coverage reached 100.0% of households in Cyprus in 2022. Since then, investments have been focussed on increasing the quality of 5G services. 5G coverage in the 3.4–3.8 GHz band grew by 10 p.p. in the year to June 2023 to reach 35.0% of households, but remains well below the EU27 average (50.6%).

Cyprus: Coverage by technology, total, 2023



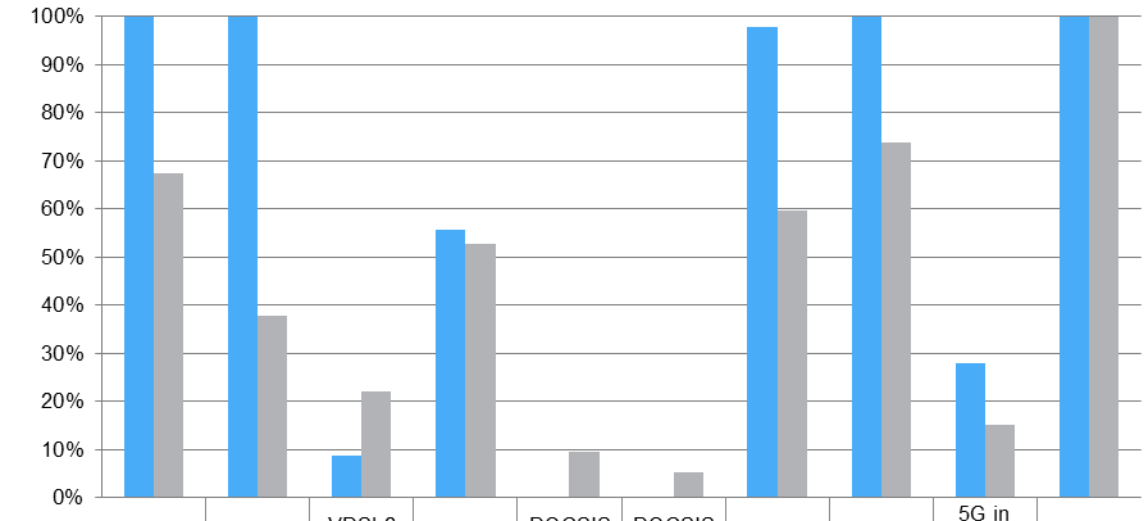
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Cyprus	100.0%	100.0%	21.5%	77.1%	59.0%	0%	99.6%	100.0%	35.0%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural areas, FTTP coverage also increased significantly in the year to June 2023 to reach 55.7% of households (+20.7 p.p.), overtaking the EU average for the first time (52.8%). DOCSIS 3.0 networks are limited to urban areas in Cyprus, with zero rural coverage, but DSL and VDSL broadband continued to provide universal rural coverage, while VDSL2 Vectoring coverage reduced as premises were upgraded to FTTP, reaching only 8.9% of rural homes (–11.0%). Rural FWA coverage is near-universal, with the technology reaching 97.9% of households.

Rural 5G coverage again reached 100% of households, while coverage of 5G using the 3.4–3.8 GHz band overtook the EU average to reach 28.0% of households. The large difference versus the total rural 5G coverage indicates a strong reliance on the 700 MHz band for rural 5G coverage in Cyprus.

Cyprus: Coverage by technology, rural areas, 2023

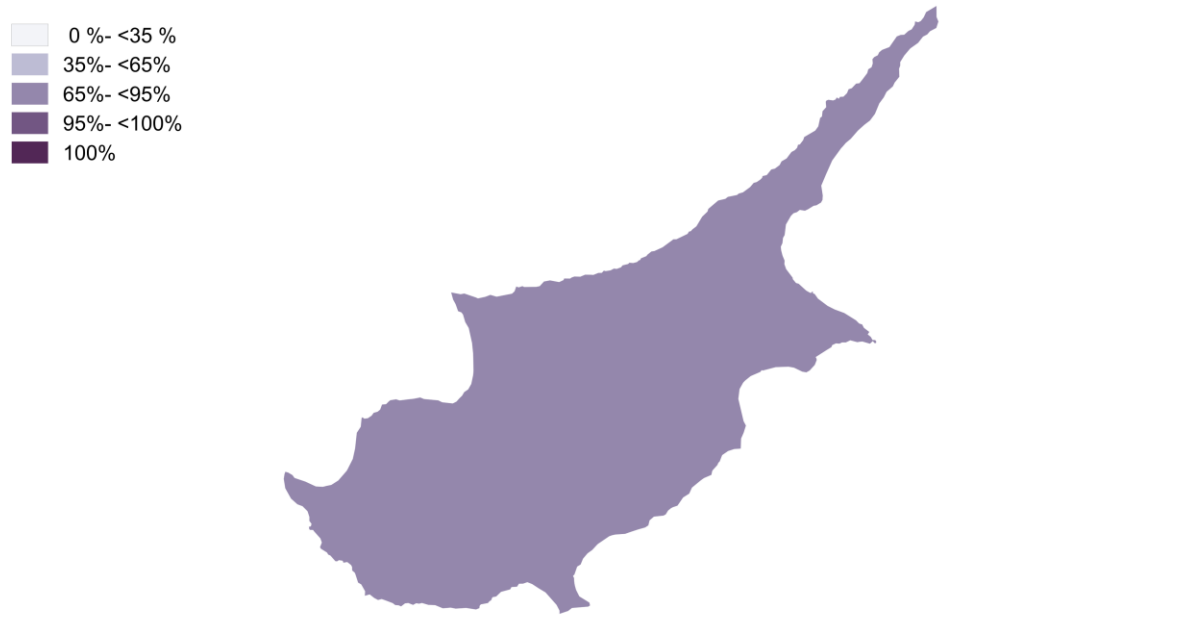


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Cyprus	100.0%	100.0%	8.9%	55.7%	0%	0%	97.9%	100.0%	28.0%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.5.2 Regional coverage by broadband technology[16]

Cyprus: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Since there are no DOCSIS 3.1 services in Cyprus, the FTTP coverage is identical to fixed VHCN (FTTP & DOCSIS 3.1) coverage category.

Cyprus: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

[16] 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	904,705
Persons per household	2.8
Rural proportion	11.2%

	Cyprus 2023		Cyprus 2022		Cyprus 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	79.7%	67.4%
VDSL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	52.6%	37.8%
VDSL2 Vectoring	21.5%	8.9%	32.6%	19.9%	43.5%	25.7%	38.7%	22.0%
FTTP	77.1%	55.7%	60.0%	35.0%	41.4%	22.4%	64.0%	52.8%
Cable modem DOCSIS 3.0	59.0%	0%	50.6%	0%	65.9%	0%	41.1%	9.5%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	33.6%	5.3%
FWA	99.6%	97.9%	99.7%	98.0%	88.8%	4.2%	68.5%	59.6%
5G	100.0%	100.0%	100.0%	100.0%	75.0%	32.2%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	35.0%	28.0%	25.0%	6.8%	-	-	50.6%	15.2%
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%	97.7%	92.2%
Overall NGA broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	77.1%	55.7%	60.0%	35.0%	41.4%	22.4%	78.8%	55.7%
VHCN (as defined by BEREC)	77.1%	55.7%	-	-	-	-	88.1%	70.0%
At least 30Mbps	100.0%	-	100.0%	-	100.0%	-	93.3%	-
At least 100Mbps	92.5%	-	*86.9%*	-	82.9%	-	89.0%	-
At least 1Gbps	77.1%	-	60.0%	-	41.4%	-	75.6%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

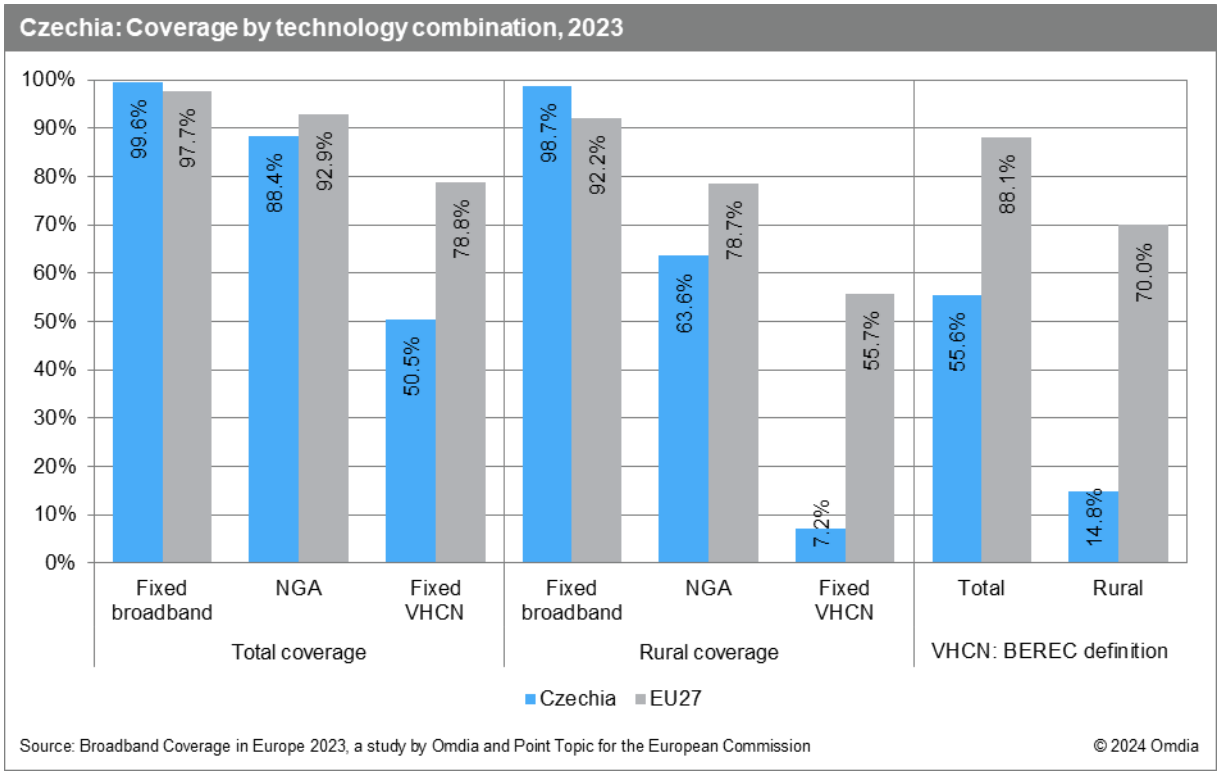
5.6 Czechia

5.6.1 National coverage by broadband technology

Almost all (99.6%) Czech households had access to at least one fixed broadband technology by mid-2023, while fixed broadband coverage also neared universal coverage (98.7%) in rural regions. NGA broadband services were available to 88.4% of households and 63.6% of rural households.

While Czechia outperformed the EU figure in fixed broadband and NGA categories, fixed VHCN availability of 1Gbps-capable networks (FTTP & DOCSIS 3.1) remained below the EU average, with little over a half of Czech homes (50.5%) passed. In rural areas, only 7.2% of homes were passed by either FTTP or DOCSIS 3.1 networks.

Czechia fared slightly better when looking at the BEREC-defined VHCN coverage, which includes criteria for both fixed and mobile networks. According to the BEREC definition, 55.8% of all Czech households and 14.8% of rural households were passed by the BEREC-defined Very High Capacity networks.



In terms of individual technologies, DSL remained the most widespread technology, passing a total of 91.0% 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-2023, VDSL and VDSL2 Vectoring networks passed 81.8% and 81.7% of Czech homes, respectively, outperforming the EU average in both categories.

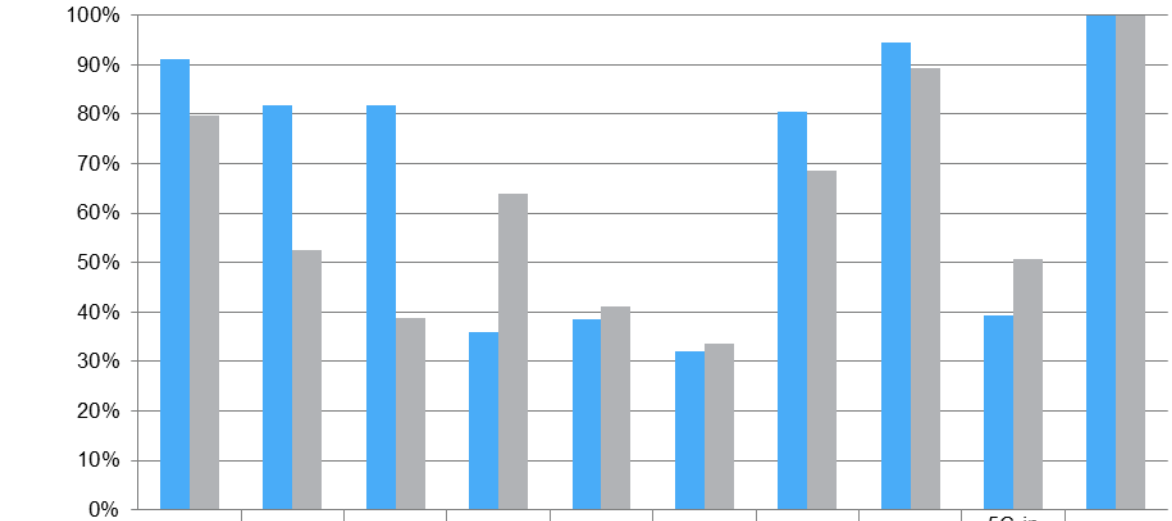
The Czech broadband market is characterized by a large number of small local fixed wireless providers, which is reflected in the high FWA coverage of 80.5%, compared to the EU average of 68.5%.

Cable modem DOCSIS 3.0 coverage reached 38.5% of Czech households at the end of June 2023. 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 by the end of June 2023, nearly a third (32.2%) of households had access to DOCSIS 3.1 broadband services.

FTTP networks passed 36.0% of Czech homes by the end of June 2023. While in the past most of the FTTP rollouts were attributed to smaller and local operators deploying these networks, leading players in the market have now also begun to invest significantly in fibre networks deployment.

More than nine in ten households (94.6%) in Czechia are covered by 5G networks and 5G networks utilizing the 3.4–3.8 GHz frequency band passed 39.3% of Czech homes at the end of June 2023.

Czechia: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Czechia	91.0%	81.8%	81.7%	36.0%	38.5%	32.2%	80.5%	94.6%	39.3%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

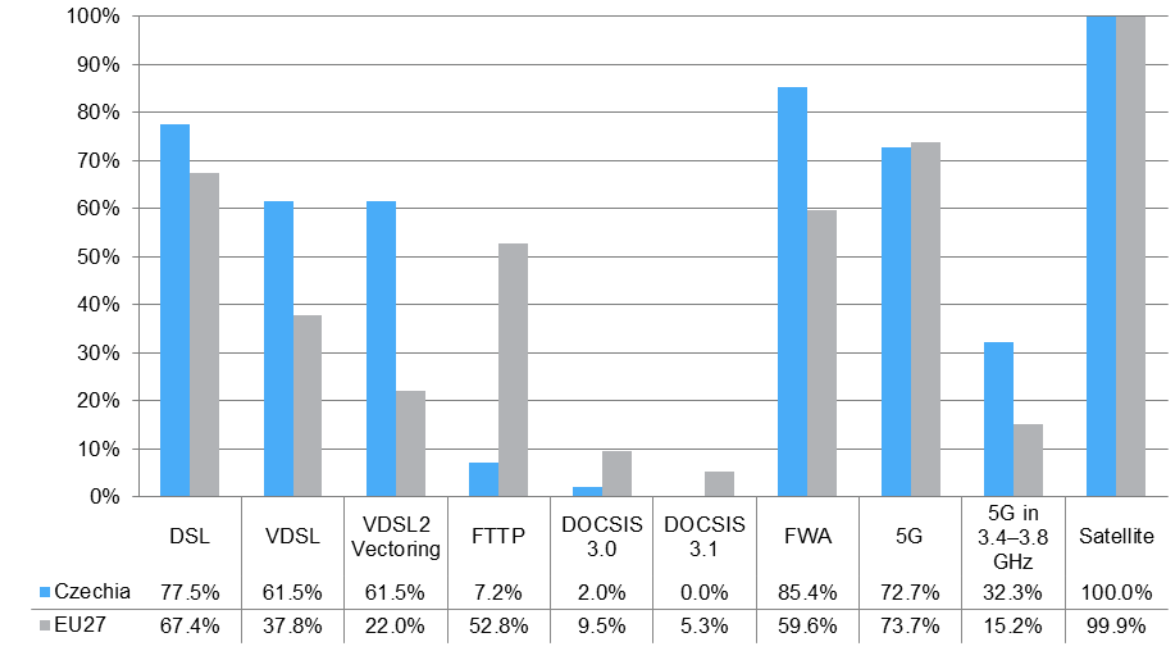
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural regions, DSL networks passed 77.5% of rural homes and DSL was the second most prevalent technology after FWA. Similar to national level, large proportion of the legacy networks have been upgraded to VDSL and VDSL2 Vectoring standards, covering 61.5% of Czech households (for both technologies).

DOCSIS 3.1 upgrades were focused on urban regions and no rural households were reported to be covered by mid-2023. FTTP services were available to 7.2% of rural households, while DOCSIS 3.0 passed 2.0% of rural homes. Czechia performed below the EU average across all three categories.

Fixed Wireless Access (FWA) networks passed 85.4% of rural Czech homes – well above the EU average (59.6%). 5G networks covered 72.7% of Czech rural households, very slightly below the EU average of 73.7%, while 5G coverage in the 3.4–3.8 GHz band was available to 32.3% of rural households, standing well above the EU average of 15.2%.

Czechia: Coverage by technology, rural areas, 2023



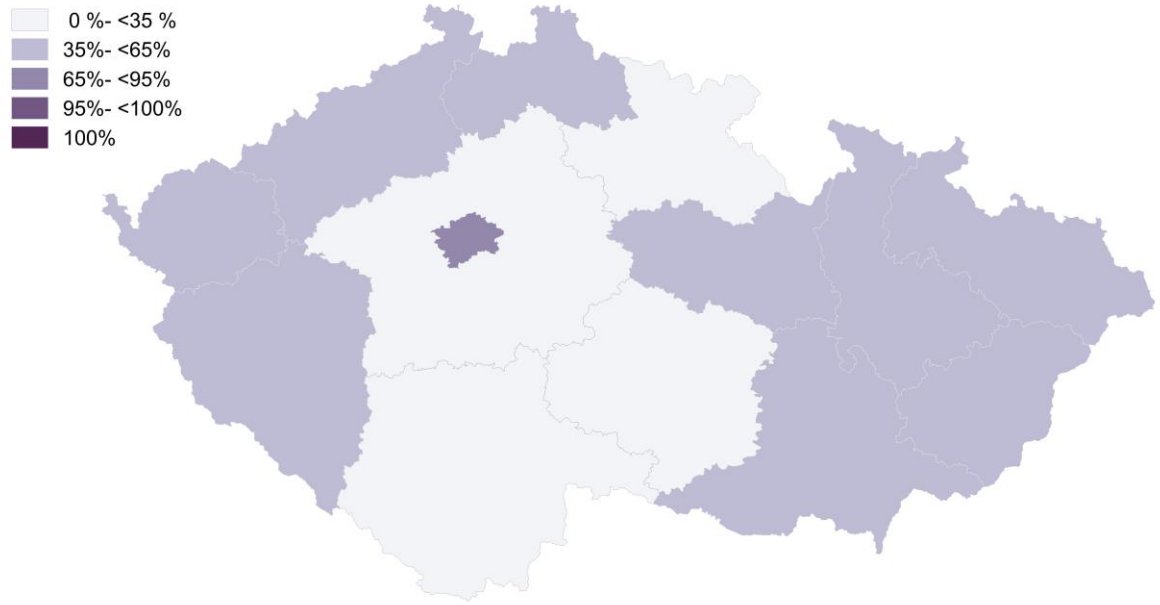
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Czechia	77.5%	61.5%	61.5%	7.2%	2.0%	0.0%	85.4%	72.7%	32.3%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.6.2 Regional coverage by broadband technology

The fixed VHCN (combined FTTP & DOCSIS 3.1) coverage recorded very varied levels, ranging from more than 90% coverage in the capital region Prague to 26.3% in Kraj Vysočina region.

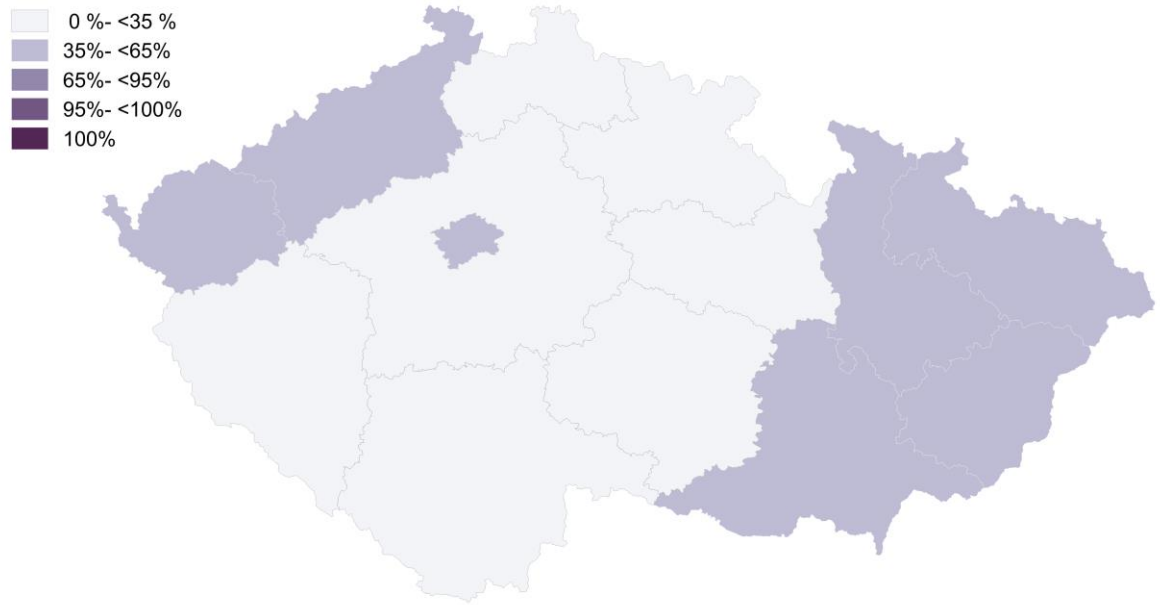
Czechia: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

FTTP coverage levels also vary quite significantly among regions ranging from nearly half of households in Karlovarský kraj region and the capital, Prague having access to FTTP broadband services to just 18.5% of households in Plzeňský kraj region having the same opportunity.

Czechia: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Fixed VHCN availability of gigabit-speed-capable services provided over FTTP & DOCSIS 3.1 networks in rural regions is very limited with highest coverage (19.8%) recorded in Karlovarský kraj region.

Czechia: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.6.3 Data tables for Czechia

Statistic	National
Population	10,827,529
Persons per household	2.2
Rural proportion	19.5%

	Czechia 2023		Czechia 2022		Czechia 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	91.0%	77.5%	97.6%	93.1%	97.6%	92.9%	79.7%	67.4%
VDSL	81.8%	61.5%	86.1%	64.2%	84.7%	63.2%	52.6%	37.8%
VDSL2 Vectoring	81.7%	61.5%	86.0%	64.2%	84.6%	63.2%	38.7%	22.0%
FTTP	36.0%	7.2%	37.4%	8.1%	35.8%	6.9%	64.0%	52.8%
Cable modem DOCSIS 3.0	38.5%	2.0%	42.1%	3.8%	41.9%	3.6%	41.1%	9.5%
Cable modem DOCSIS 3.1	32.2%	0.0%	34.9%	0.0%	33.3%	0.1%	33.6%	5.3%
FWA	80.5%	85.4%	85.1%	85.4%	81.4%	85.3%	68.5%	59.6%
5G	94.6%	72.7%	82.6%	78.0%	49.4%	43.3%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	39.3%	32.3%	42.3%	32.0%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.6%	98.7%	99.9%	99.8%	99.9%	99.6%	97.7%	92.2%
Overall NGA broadband	88.4%	63.6%	93.3%	70.1%	92.6%	68.5%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	50.5%	7.2%	53.2%	8.2%	52.5%	7.0%	78.8%	55.7%
VHCN (as defined by BEREC)	55.6%	14.8%	-	-	-	-	88.1%	70.0%
At least 30Mbps	98.2%	-	98.3%	-	98.1%	-	93.3%	-
At least 100Mbps	91.1%	-	90.2%	-	89.2%	-	89.0%	-
At least 1Gbps	40.3%	-	42.5%	-	38.1%	-	75.6%	-
At least 1Gbps upload and download	13.5%	-	-	-	-	-	-	-

Note: The data on premises passed (excluding 5G technology) reflects the situation as of 31 December 2022. The NRA, CTU, pointed out that while there was an increase in absolute value in the number of premises passed by individual technologies compared to data reported in BCE 2022 Survey, due to the significant increase in the number of households in municipalities in the Czech Republic reported by Czech Statistical Office's 2021 census data (increase of 437,993 total households and 67,183 in the case of rural households), there was mostly a decrease or stagnation in the percentage ratios of covered households compared to the BCE 2022 Survey.

FWA technology and development therein is 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. As the FWA technology provided at a fixed location represents about 1/3 of the market in Czechia and the non-inclusion of this technology leads to a noticeable decline in the indicator value.

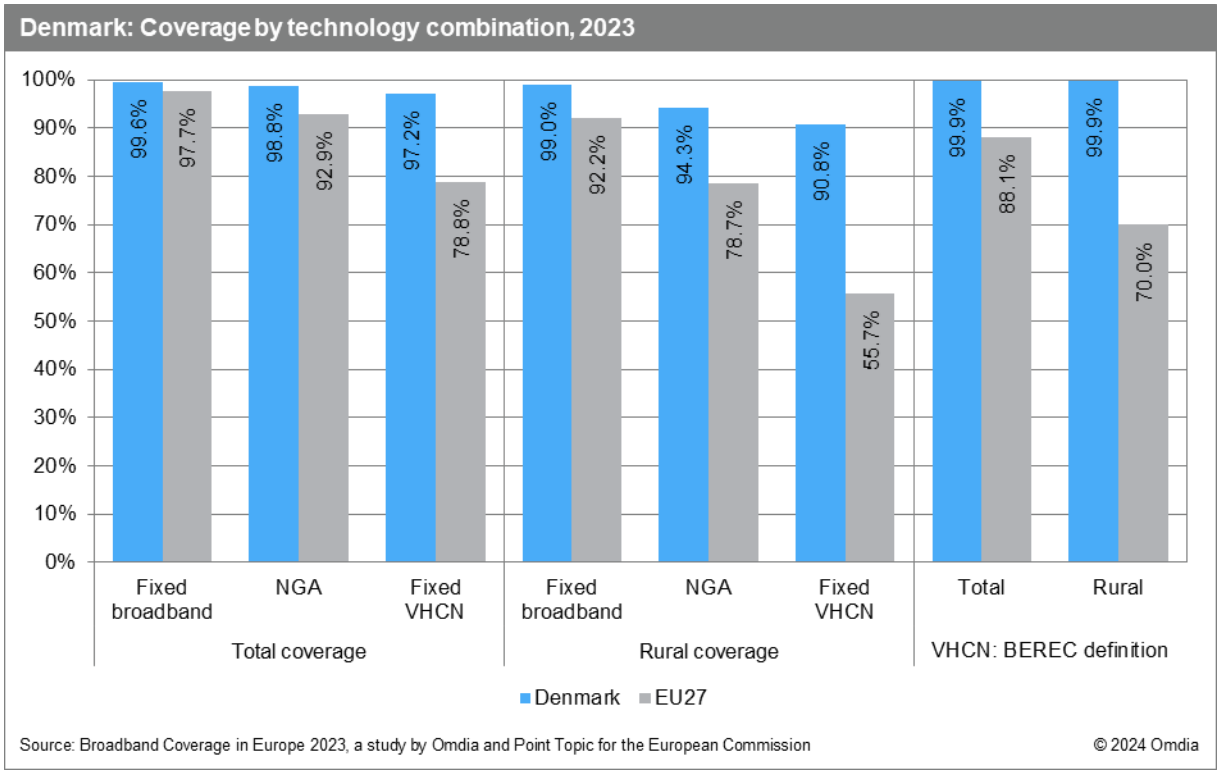
All restatements are highlighted in italics.

5.7 Denmark

5.7.1 National coverage by broadband technology

Denmark's availability of fixed broadband, NGA, and fixed VHCN (FTTP & DOCSIS 3.1) outperformed the EU average at national and rural level. Fixed broadband coverage has remained stable since it reached almost universal coverage in mid-2021. NGA coverage increased by 0.7%, enabling 98.8% of households to access high-speed connectivity. In rural areas, coverage stood at 94.3% by the end of June 2023, up by 2.6 percentage points.

In this year's study, Denmark was the country with the third highest fixed VHCN (FTTP & DOCSIS 3.1) coverage, with 97.2% and 90.8% of total and rural households covered, respectively. It also exceeded the EU average in the BEREC-defined VHCN category, with almost universal coverage on total and rural level.

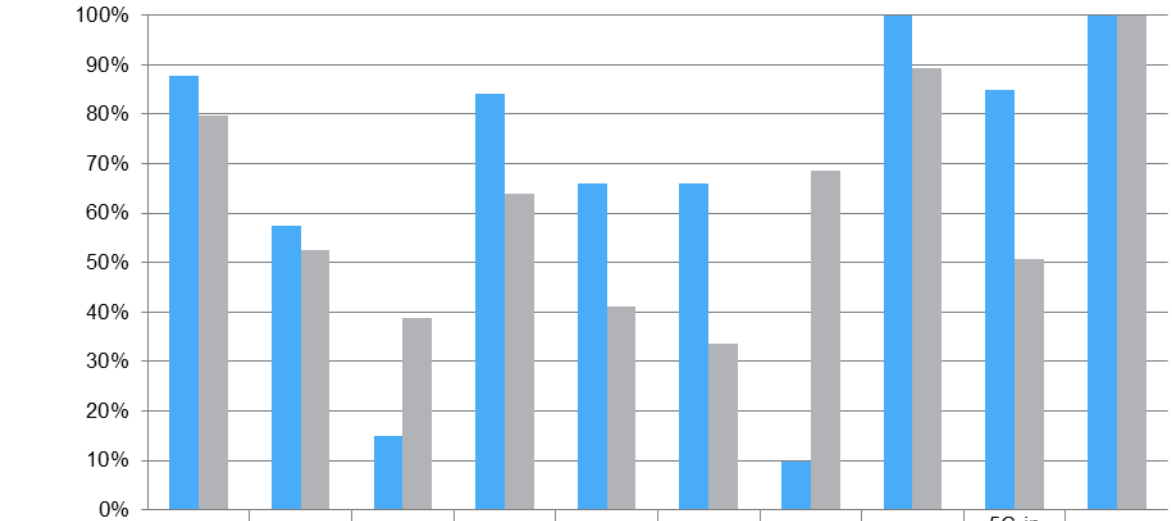


When looking at the individual broadband technologies, FTTP recorded the strongest growth (6.2 percentage points), covering 84.0% of Danish households by mid-2023. DSL remained the largest broadband technology, with 87.8% of homes passed, but the gap to FTTP has narrowed to just 3.8 percentage points, down from 11.4 percentage points in mid-2022. DSL continued its downward trend seen since 2015, and coverage declined by 1.4 percentage points over the 12-month period.

DOCSIS 3.0 coverage stood at 66.1% and almost the entire network had been upgraded to DOCSIS 3.1 by mid-2023. FWA was available to 9.9% of households.

Denmark was among the highest-ranking countries in the 5G categories. Overall 5G coverage hit 100% by mid-2023, up by 2.2 percentage points, while 5G via the 3.4–3.8 GHz band was estimated to stand at 85.0%, well above the EU average of 50.6%.

Denmark: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Denmark	87.8%	57.5%	14.9%	84.0%	66.1%	66.1%	9.9%	100.0%	85.0%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

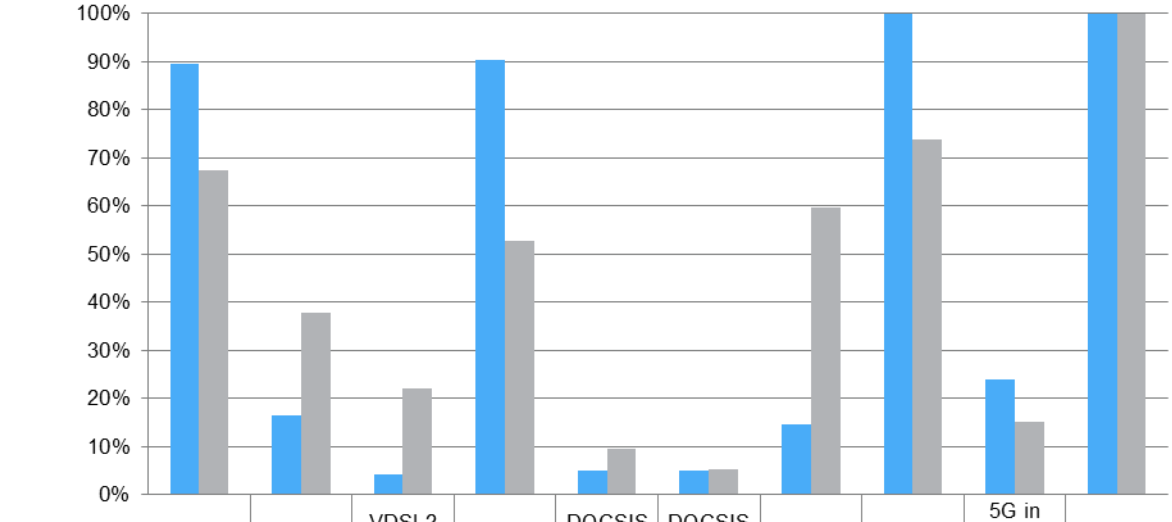
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural areas, FTTP grew by 3.3 percentage points to become the largest broadband technology, with 90.3% homes passed by mid-2023. Denmark recorded the second highest FTTP coverage among the study countries in 2023, just behind Romania. DSL was the second largest technology, with 89.7% of households covered, but as seen at national level, coverage declined over the 12-month period and was down by 1.0 percentage points.

In contrast to the widespread FTTP availability, Denmark performed below the EU average across most other broadband categories in rural areas, including VDSL, VDSL 2 Vectoring, DOCSIS 3.0, and FWA.

The availability of 5G grew by 0.8 percentage points and hit 100% by mid-2023, while 5G coverage in the 3.4–3.8 GHz band was estimated to stand at 24.0%.

Denmark: Coverage by technology, rural areas, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Denmark	89.7%	16.5%	4.4%	90.3%	5.1%	5.1%	14.7%	100.0%	24.0%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.7.2 Regional coverage by broadband technology

9 out of 11 regions in Denmark exceeded the 95% threshold in fixed VHCN (FTTP & DOCSIS 3.1) coverage which are two more regions than in mid-2022. None of the regions recorded coverage below 65% while Sydjylland achieved almost universal coverage.

Denmark: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

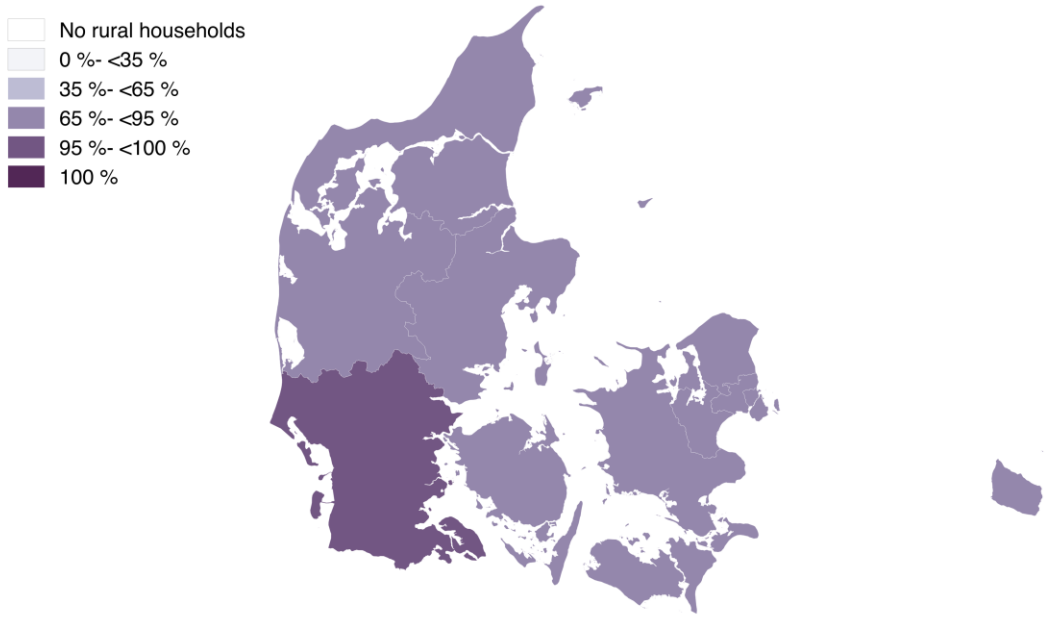
All Danish regions achieved FTTP coverage above 65%, but while none of the regions exceeded the 95% threshold, Sydjylland came close with 94.2% coverage.

Denmark: FTTP coverage, 2023

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Sydjylland was the only region that exceeded the 95% threshold in rural fixed VHCN (FTTP & DOCSIS 3.1) coverage.

Denmark: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.7.3 Data tables for Denmark

Statistic	National
Population	5,873,420
Persons per household	2.1
Rural proportion	10.2%

	Denmark 2023		Denmark 2022		Denmark 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	87.8%	89.7%	89.2%	90.6%	90.6%	90.2%	79.7%	67.4%
VDSL	57.5%	16.5%	58.5%	16.7%	59.4%	16.9%	52.6%	37.8%
VDSL2 Vectoring	14.9%	4.4%	15.1%	4.4%	15.3%	4.4%	38.7%	22.0%
FTTP	84.0%	90.3%	77.9%	87.0%	74.1%	77.8%	64.0%	52.8%
Cable modem DOCSIS 3.0	66.1%	5.1%	66.2%	5.3%	67.5%	5.3%	41.1%	9.5%
Cable modem DOCSIS 3.1	66.1%	5.1%	66.1%	5.3%	67.1%	5.3%	33.6%	5.3%
FWA	9.9%	14.7%	10.4%	17.0%	9.8%	15.6%	68.5%	59.6%
5G	100.0%	100.0%	97.8%	99.2%	98.0%	98.0%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	85.0%	24.0%	75.0%	21.1%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.6%	99.0%	99.5%	99.0%	99.6%	98.6%	97.7%	92.2%
Overall NGA broadband	98.8%	94.3%	98.0%	91.7%	97.7%	86.4%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	97.2%	90.8%	96.3%	88.0%	94.9%	79.1%	78.8%	55.7%
VHCN (as defined by BEREC)	99.9%	99.9%	-	-	-	-	88.1%	70.0%
At least 30Mbps	98.8%	-	98.4%	-	97.7%	-	93.3%	-
At least 100Mbps	98.0%	-	97.3%	-	96.3%	-	89.0%	-
At least 1Gbps	94.6%	-	91.6%	-	90.7%	-	75.6%	-
At least 1Gbps upload and download	84.6%	-	78.0%	-	*73.9%*	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

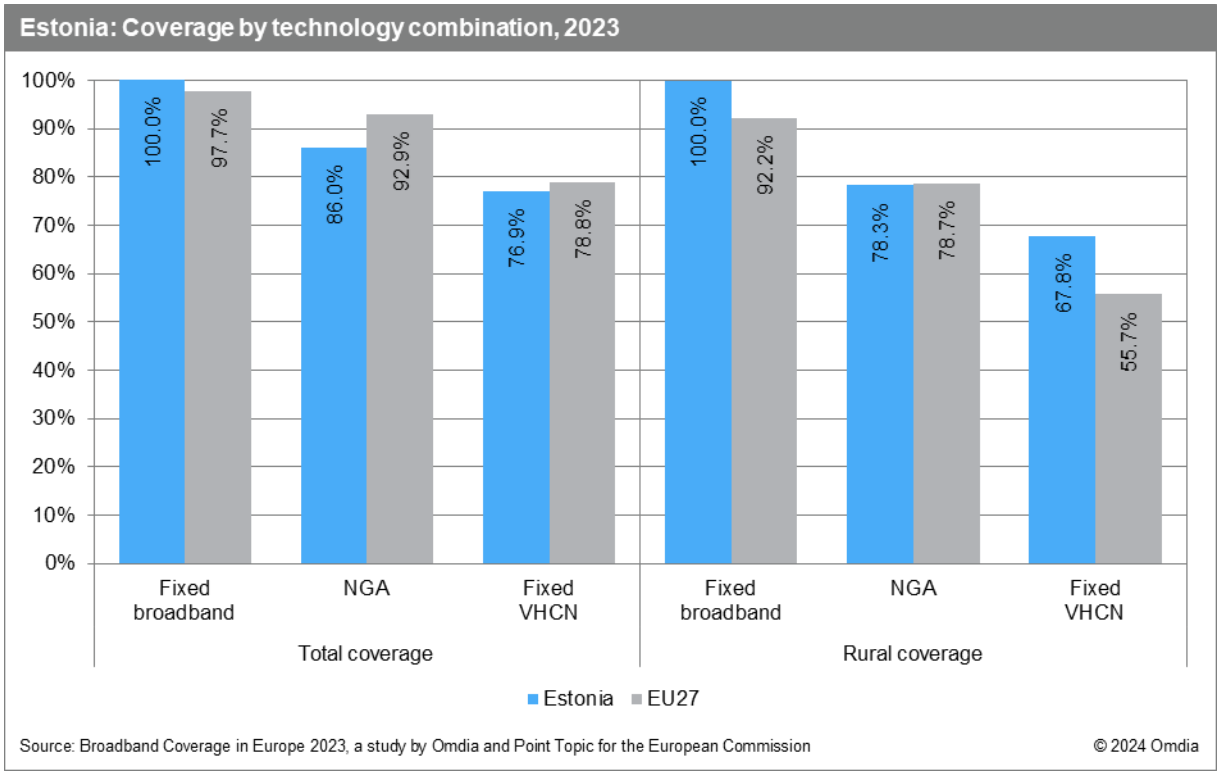
All restatements are highlighted in italics.

5.8 Estonia

5.8.1 National coverage by broadband technology

Estonia reached universal fixed broadband coverage at national and rural level by mid-2023, reflecting growth of 2.2 percentage points and 1.9 percentage points, respectively. Unlike total broadband coverage, NGA coverage remained below EU average, with 86.0% and 78.3% of total and rural households covered, respectively.

Fixed Very High Capacity networks (FTTP & DOCSIS 3.1) were available to 76.9% of Estonian households. In the absence of DOCSIS 3.1 networks, this coverage equals FTTP coverage. In rural Estonia, fixed VHCN (FTTP & DOCSIS 3.1) coverage increased significantly (33.9 percentage points), reflecting fast-paced rollouts which are supported by ongoing state aid projects.



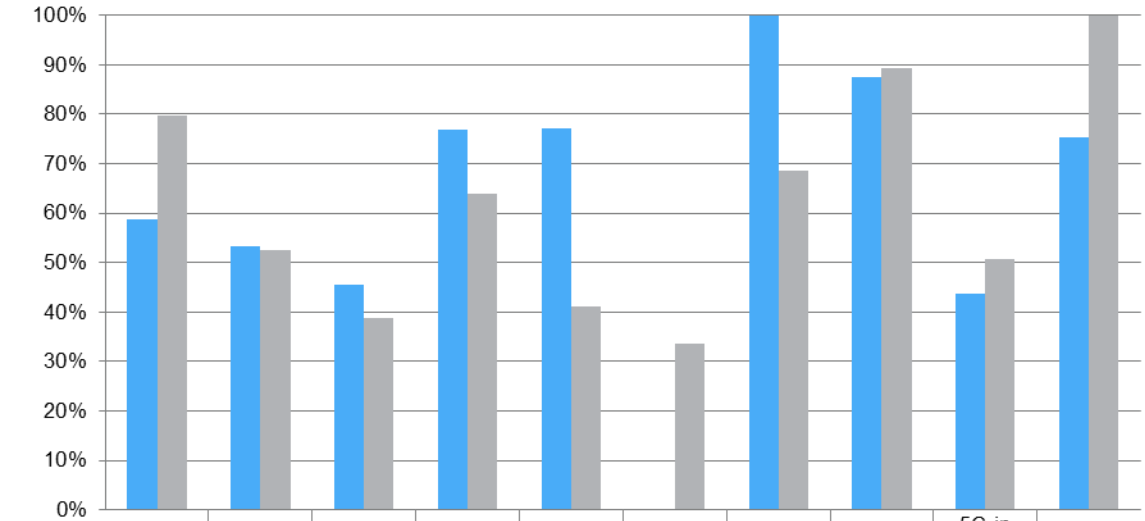
DOCSIS 3.0 remained the largest broadband technology in Estonia by mid-2023, but the gap to FTTP narrowed to just 0.4 percentage points. Estonia ranked above the EU average across both categories. With the primary focus on FTTP, Estonian operators had not deployed DOCSIS 3.1 by the end of June 2023.

The decommissioning of legacy copper networks further progressed in Estonia which led to a 2.6 percentage point decline in DSL coverage, with 58.8% of homes passed by mid-2023. VDSL and VDSL2 Vectoring was available to 53.3% and 45.4% of Estonian households, respectively.

FWA grew by 4.3 percentage points and reached universal coverage levels (99.9%) by mid-2023. Estonia was the country with the third highest FWA coverage in 2023, and well above the EU average of 68.5%. Satellite broadband coverage remained unchanged in 2023, reaching 75.4% of Estonia, due to technical requirements for larger dishes to receive the satellite signal in some areas.

Estonia remained below the EU average in all 5G categories, despite significant improvement of coverage levels. Overall 5G coverage increased by 44.2 percentage points, while coverage in the 3.4–3.8 GHz spectrum increased by 29.2 percentage points over the 12-month period.

Estonia: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Estonia	58.8%	53.3%	45.4%	76.9%	77.3%	0%	99.9%	87.5%	43.7%	75.4%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

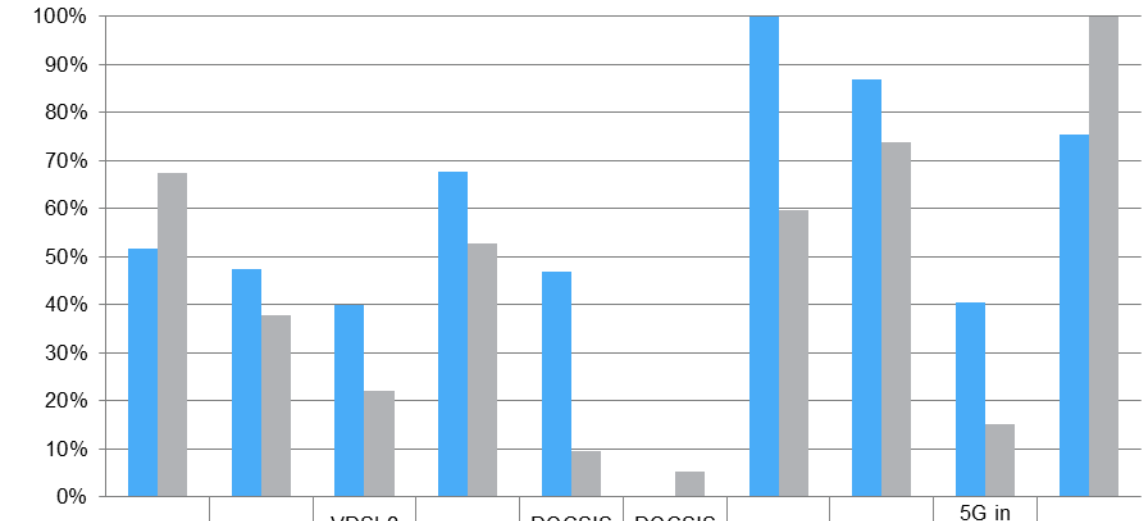
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Estonia, FTTP has become the largest broadband technology, reflecting fast-paced deployments which led to a 33.9 percentage point growth in FTTP coverage compared to mid-2022. The significant improvement of rural FTTP coverage enabled Estonia to exceed the EU average for the first time. Estonia also ranked well above the EU average in terms of DOCSIS 3.0 coverage, which increased by 16.2 percentage points, but no upgrade to DOCSIS 3.1 had taken place yet.

DSL coverage stood at 51.6% and large parts of the network have been upgraded to VDSL and VDSL2 Vectoring standard, which were available to 47.5% and 40.1% of rural households, respectively. FWA coverage increased by 3.9 percentage points and reached universal coverage levels by mid-2023.

5G coverage in rural areas increased significantly, and unlike at national level, Estonia performed above the EU average across all 5G categories. Overall 5G coverage increased by 54.5 percentage points, while 5G coverage in the 3.4–3.8 GHz spectrum band grew by 33.9 percentage points.

Estonia: Coverage by technology, rural areas, 2023



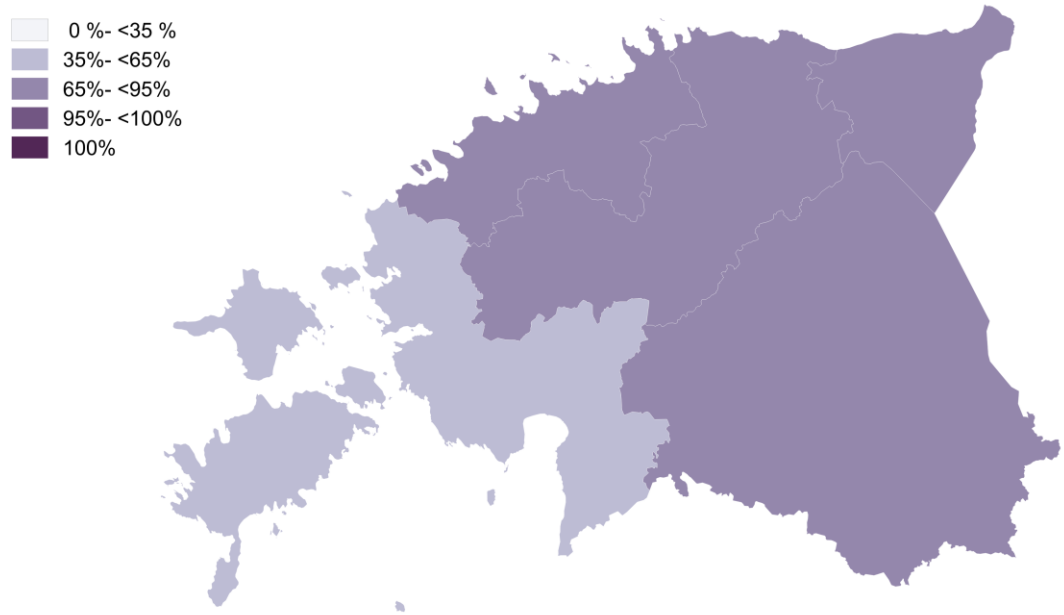
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Estonia	51.6%	47.5%	40.1%	67.8%	46.8%	0%	99.9%	87.0%	40.6%	75.4%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.8.2 Regional coverage by broadband technology

Lääne-Eesti was the only Estonian region with fixed VHCN (FTTP & DOCSIS 3.1) coverage below 65%, while Kirde-Eesti recorded the highest coverage at 82.0%. In the absence of DOCSIS 3.1 networks, FTTP coverage was identical to the fixed VHCN (combined FTTP & DOCSIS 3.1) category.

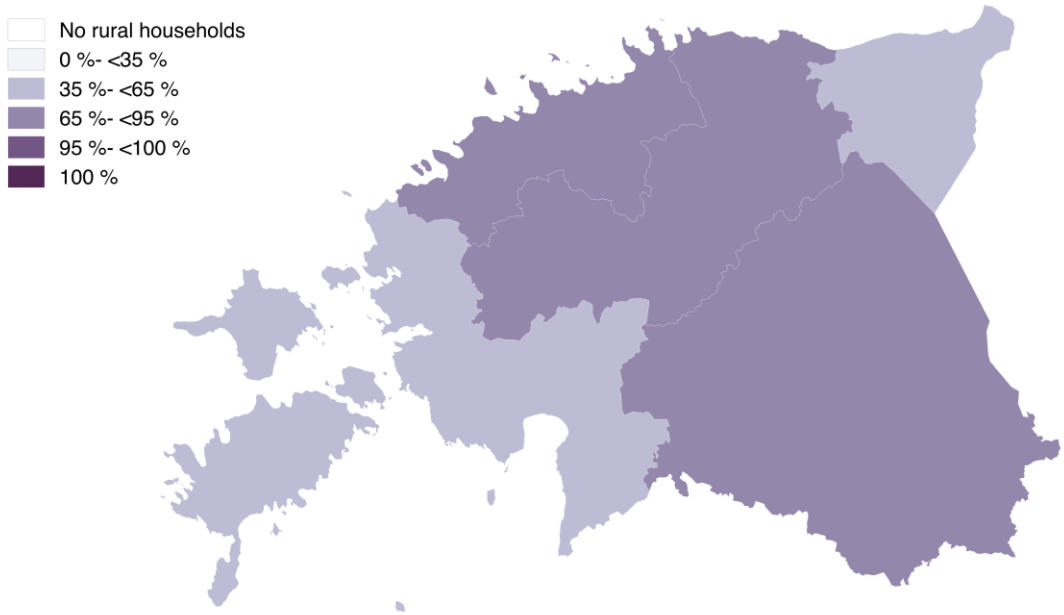
Estonia: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Three out of five Estonian regions exceeded the 65% threshold in rural fixed VHCN (FTTP & DOCSIS 3.1) coverage, while the other two remained just below 50%.

Estonia: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.8.3 Data tables for Estonia

Statistic	National
Population	1,331,796
Persons per household	2.4
Rural proportion	23.5%

	Estonia 2023		Estonia 2022		Estonia 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	58.8%	51.6%	61.4%	50.2%	65.4%	53.4%	79.7%	67.4%
VDSL	53.3%	47.5%	55.3%	42.1%	55.6%	40.9%	52.6%	37.8%
VDSL2 Vectoring	45.4%	40.1%	41.2%	19.6%	37.4%	13.4%	38.7%	22.0%
FTTP	76.9%	67.8%	*76.3%*	33.9%	73.4%	21.1%	64.0%	52.8%
Cable modem DOCSIS 3.0	77.3%	46.8%	79.0%	30.7%	78.5%	23.7%	41.1%	9.5%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	33.6%	5.3%
FWA	99.9%	99.9%	*95.6%*	*96.0%*	*92.9%*	*93.7%*	68.5%	59.6%
5G	87.5%	87.0%	43.3%	32.5%	18.3%	1.5%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	43.7%	40.6%	14.5%	6.7%	-	-	50.6%	15.2%
Satellite	75.4%	75.4%	75.4%	75.4%	75.4%	75.4%	99.9%	99.9%
Overall fixed broadband	100.0%	100.0%	*97.8%*	*98.0%*	93.0%	*97.0%*	97.7%	92.2%
Overall NGA broadband	86.0%	78.3%	89.9%	69.4%	90.2%	67.0%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	76.9%	67.8%	*76.3%*	33.9%	73.4%	21.1%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	100.0%	-	89.5%	-	89.2%	-	93.3%	-
At least 100Mbps	84.4%	-	*84.2%*	-	83.5%	-	89.0%	-
At least 1Gbps	67.0%	-	*56.5%*	-	36.7%	-	75.6%	-
At least 1Gbps upload and download	60.8%	-	*55.8%*	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

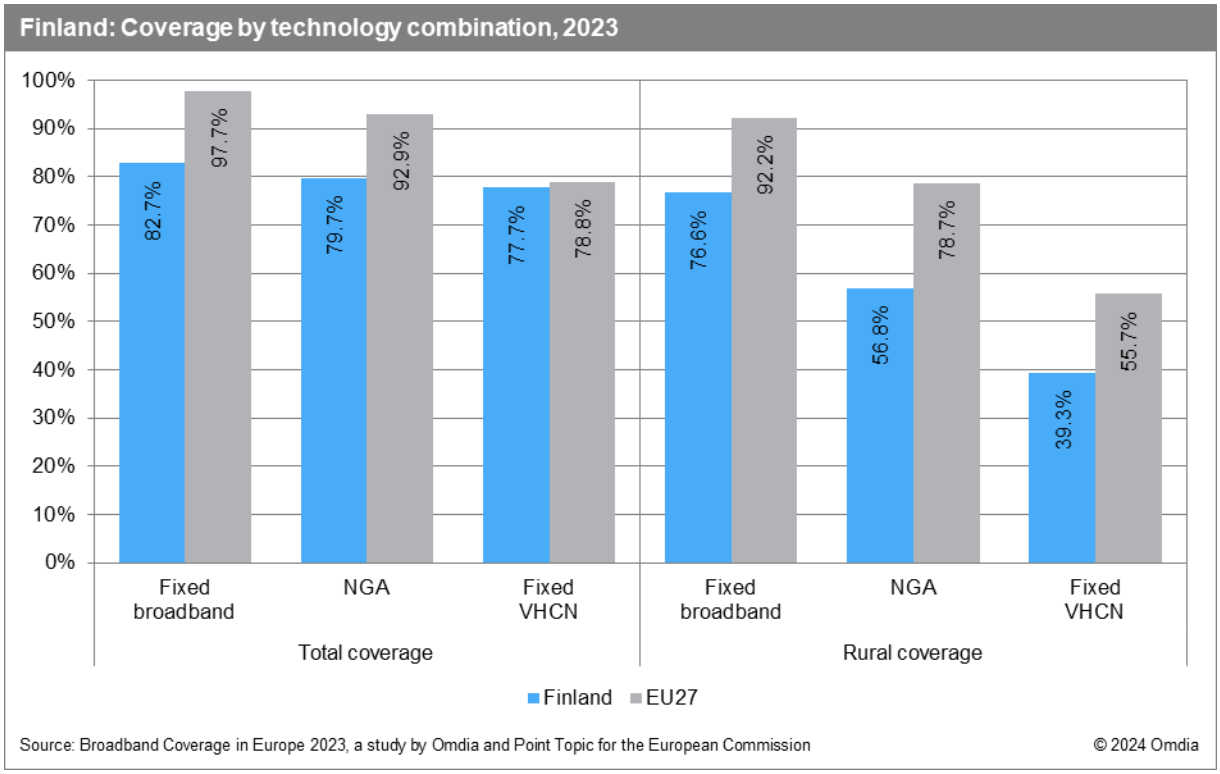
All restatements are highlighted in italics.

5.9 Finland

5.9.1 National coverage by broadband technology

Overall fixed broadband coverage in Finland stabilised in 2023 at 82.7%, after a number of years of decline as a result of continued DSL decommissioning. Total broadband coverage is now only 3 p.p. ahead of NGA coverage which increased by 4.8 p.p. in the year to June 2023, reaching 79.7% of households. At a rural level 76.6% of homes were passed by at least one fixed broadband network, a decrease of 3.5 percentage points.

The fixed VHCN (DOCSIS 3.1 & FTTP) coverage grew by 7.0 percentage points, passing 77.7% of homes. Finland remains slightly below the EU average (78.8%) on this metric, but the gap is closing. In rural areas the gap is wider, but coverage has been growing rapidly, increasing by 14.0 p.p. in the year to reach almost four in ten rural households (39.3%), 16.3 p.p. below the EU level (55.7%).



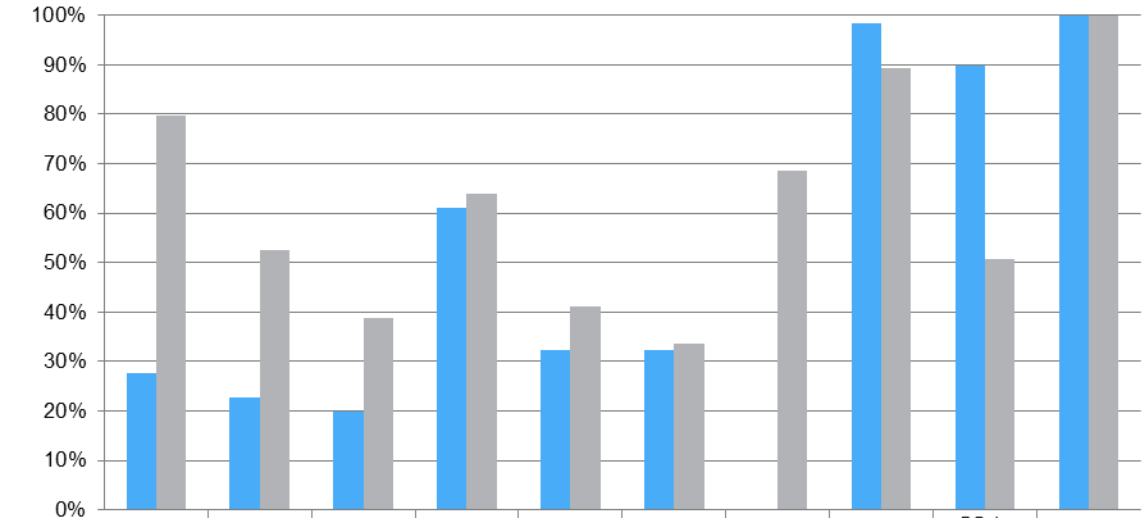
Among the individual fixed broadband technologies, FTTP coverage again grew strongly, up by 10.8 p.p. over the year following a 10.3 p.p. increase in 2022. Coverage now reaches six in ten households (61.1%) – closing the gap versus the EU to just 2.8 percentage points. FTTP is the most prevalent technology at national level by a large margin, as the DSL decommissioning programme has progressed rapidly. DSL coverage fell by 14.4 percentage points year-on-year, down to 27.5% of Finnish households – only Latvia and Luxembourg recorded lower DSL coverage.

Availability of Cable DOCSIS 3.1 technology decreased by 5.5 percentage points during the study period, covering 32.4% 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.

In line with the overall reduction in DSL coverage, availability of VDSL and VDSL2 Vectoring services fell in this year's study. VDSL was available to 22.6% of homes (a 11.4 p.p. decrease on the previous year), while VDSL2 Vectoring services were available to 19.9% of Finnish households.

Regarding mobile broadband coverage, 5G coverage reached 98.3%, up by 3.7 p.p. on the previous year. 5G coverage in the 3.4–3.8 GHz band was again the highest in this year's study at 89.7%, indicating the strength of Finland's mobile sector.

Finland: Coverage by technology, total, 2023

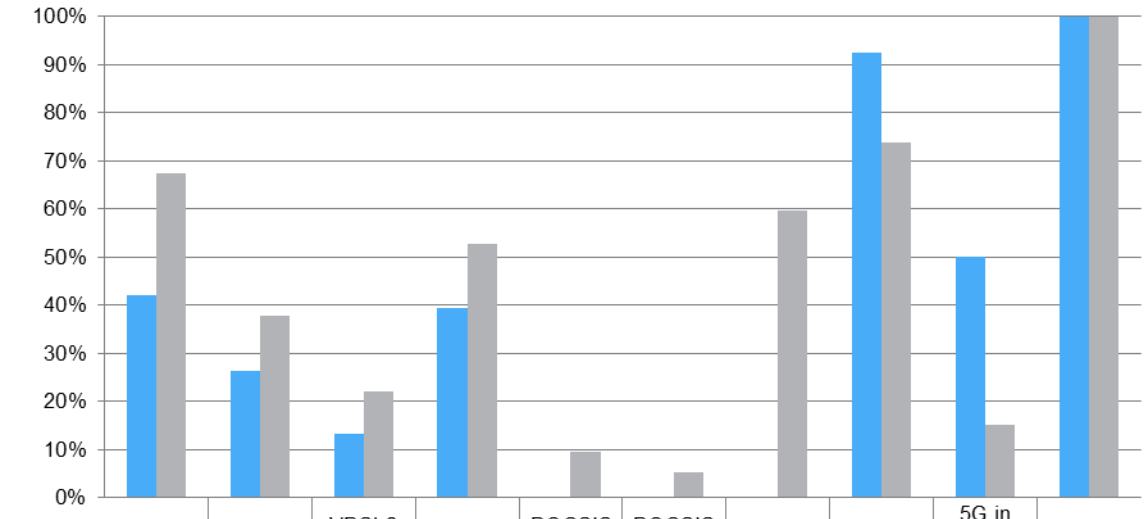


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Finland	27.5%	22.6%	19.9%	61.1%	32.4%	32.4%	0%	98.3%	89.7%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Rural broadband coverage in Finland saw a continued transition from DSL to FTTP during the study period. DSL covered 42.0% of households, down by 17.5 p.p., while rural FTTP coverage increased by 14.0 p.p. to reach 39.3% of rural homes. DOCSIS technologies remained absent in rural areas, but VDSL was available to 26.3% of rural households, and VDSL2 Vectoring to 13.3%. Meanwhile rural 5G rollouts accelerated during the year, with coverage reaching 92.4% of households. Over half (50.2%) of rural households had access to 5G using the 3.4–3.8 GHz band, one of the highest figures in this year's study.

Finland: Coverage by technology, rural areas, 2023



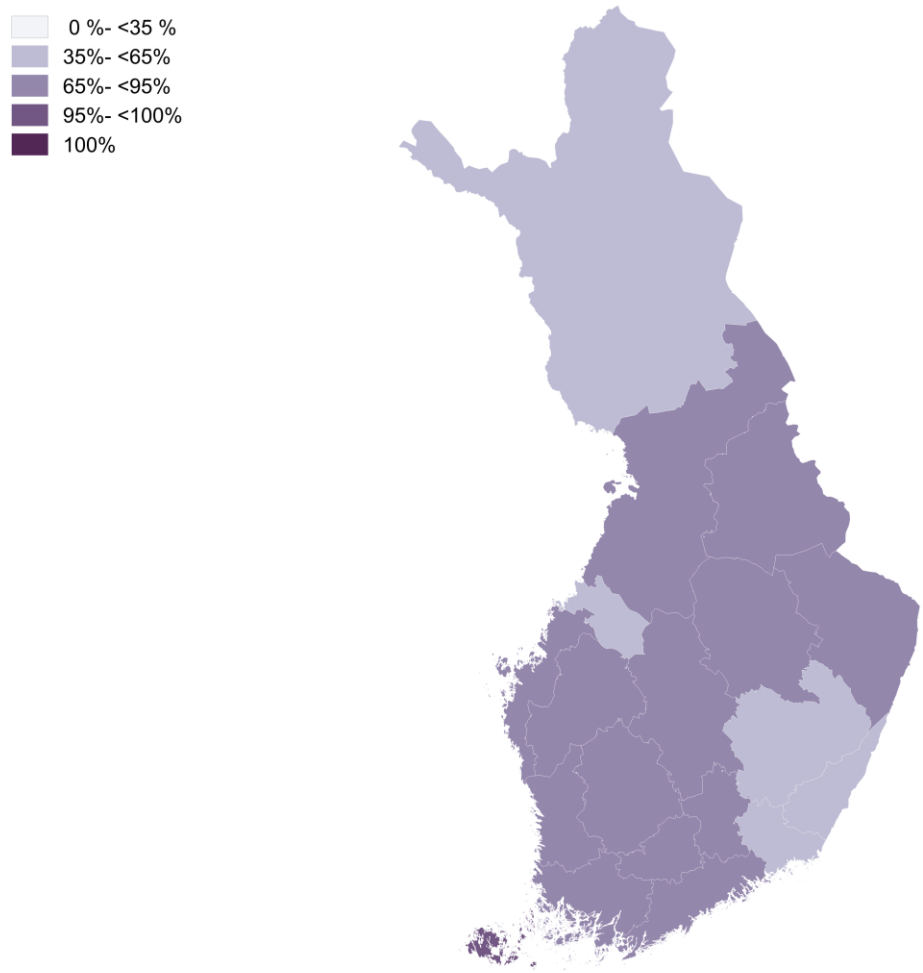
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Finland	42.0%	26.3%	13.3%	39.3%	0%	0%	0%	92.4%	50.2%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.9.2 Regional coverage by broadband technology

In this iteration of the study, only 1 Finnish region recorded fixed VHCN (FTTP & DOCSIS 3.1) coverage above 95% – the small autonomous island region of Åland. Most of the remaining 18 regions surpassed 65% coverage, with only five remaining below the 65% threshold (Kymenlaakso, Etelä-Karjala, Etelä-Savo, Keski-Pohjanmaa, and Lappi.

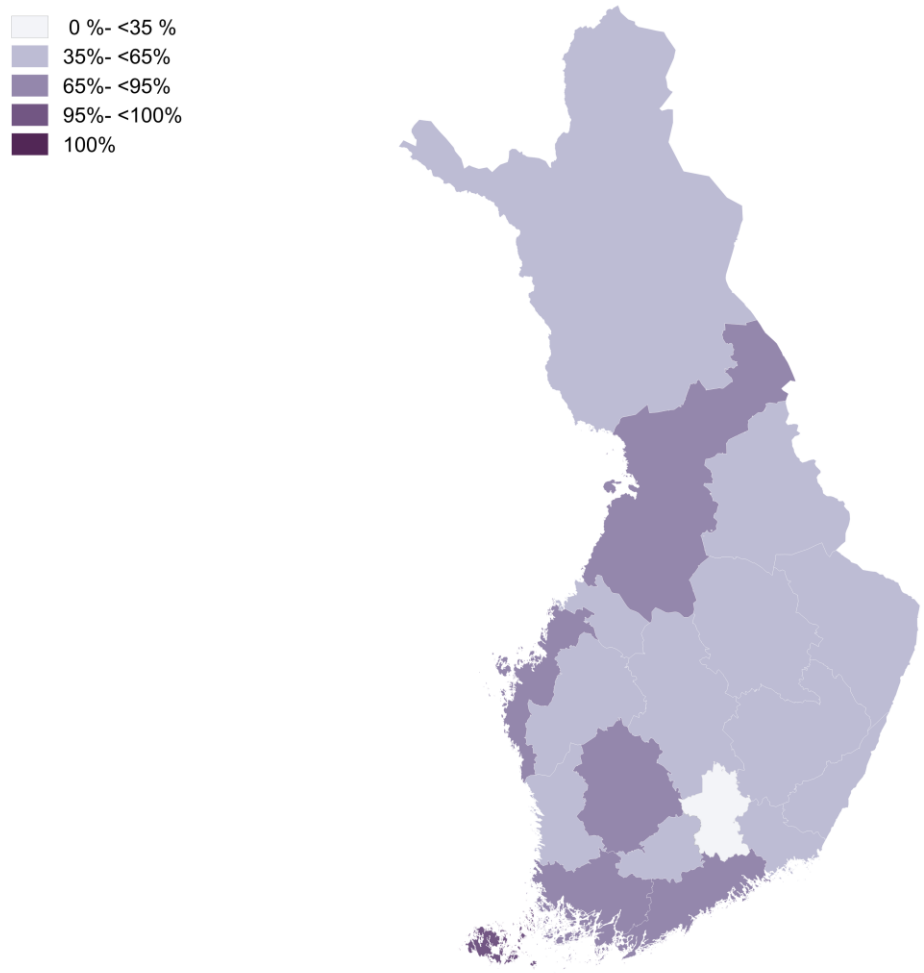
Finland: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Only one of Finland’s 19 regions has FTTP coverage below 35% (Päijät-Häme). Six regions now have FTTP coverage above 65%, up from only two in last year’s study.

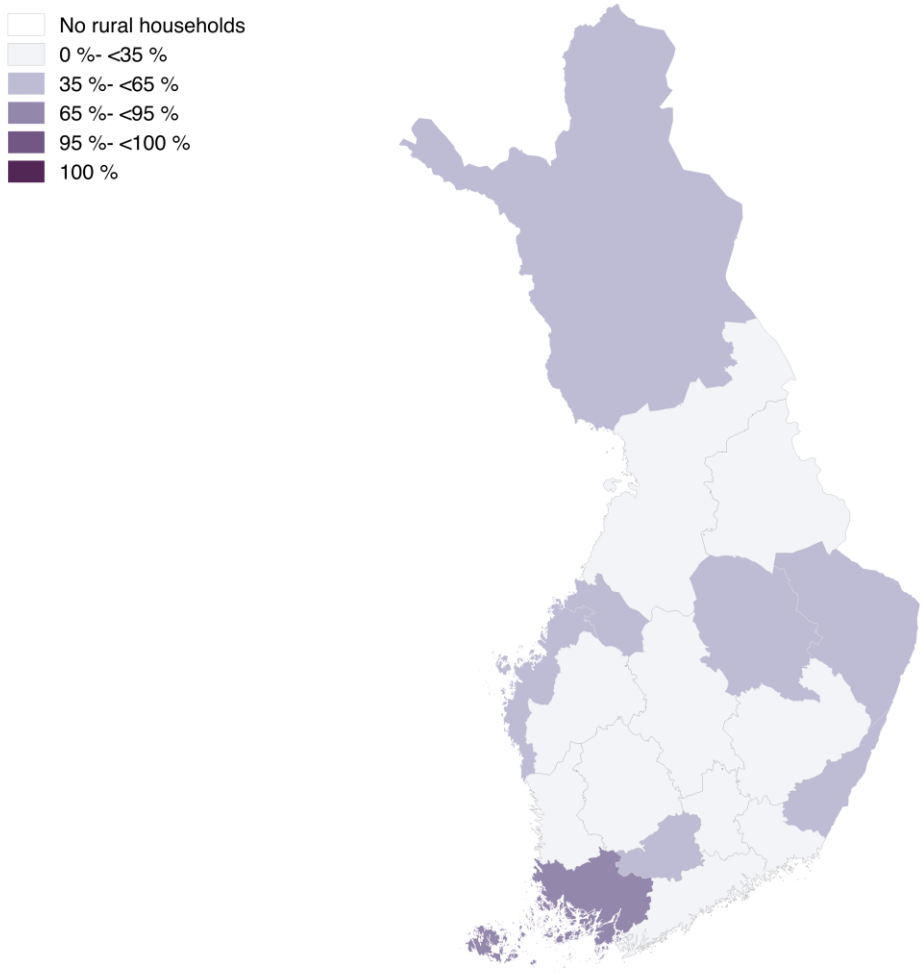
Finland: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

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.

Finland: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.9.3 Data tables for Finland

Statistic	National
Population	5,548,241
Persons per household	2.0
Rural proportion	17.5%

	Finland 2023		Finland 2022		Finland 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	27.5%	42.0%	42.0%	59.5%	60.2%	74.4%	79.7%	67.4%
VDSL	22.6%	26.3%	34.0%	35.6%	44.8%	40.7%	52.6%	37.8%
VDSL2 Vectoring	19.9%	13.3%	29.6%	16.5%	38.7%	14.4%	38.7%	22.0%
FTTP	61.1%	39.3%	50.3%	25.4%	40.0%	12.4%	64.0%	52.8%
Cable modem DOCSIS 3.0	32.4%	0%	37.9%	0%	36.9%	0%	41.1%	9.5%
Cable modem DOCSIS 3.1	32.4%	0%	37.9%	0%	36.9%	0%	33.6%	5.3%
FWA	0%	0%	0%	0%	0%	0%	68.5%	59.6%
5G	98.3%	92.4%	94.7%	77.6%	71.6%	18.9%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	89.7%	50.2%	83.9%	30.8%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	82.7%	76.6%	82.4%	80.1%	89.9%	82.4%	97.7%	92.2%
Overall NGA broadband	79.7%	56.8%	74.9%	51.1%	74.0%	52.9%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	77.7%	39.3%	70.8%	25.4%	68.0%	12.4%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	81.0%	-	78.0%	-	77.0%	-	93.3%	-
At least 100Mbps	78.0%	-	71.0%	-	65.0%	-	89.0%	-
At least 1Gbps	71.0%	-	60.0%	-	51.0%	-	75.6%	-
At least 1Gbps upload and download	33.0%	-	15.0%	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

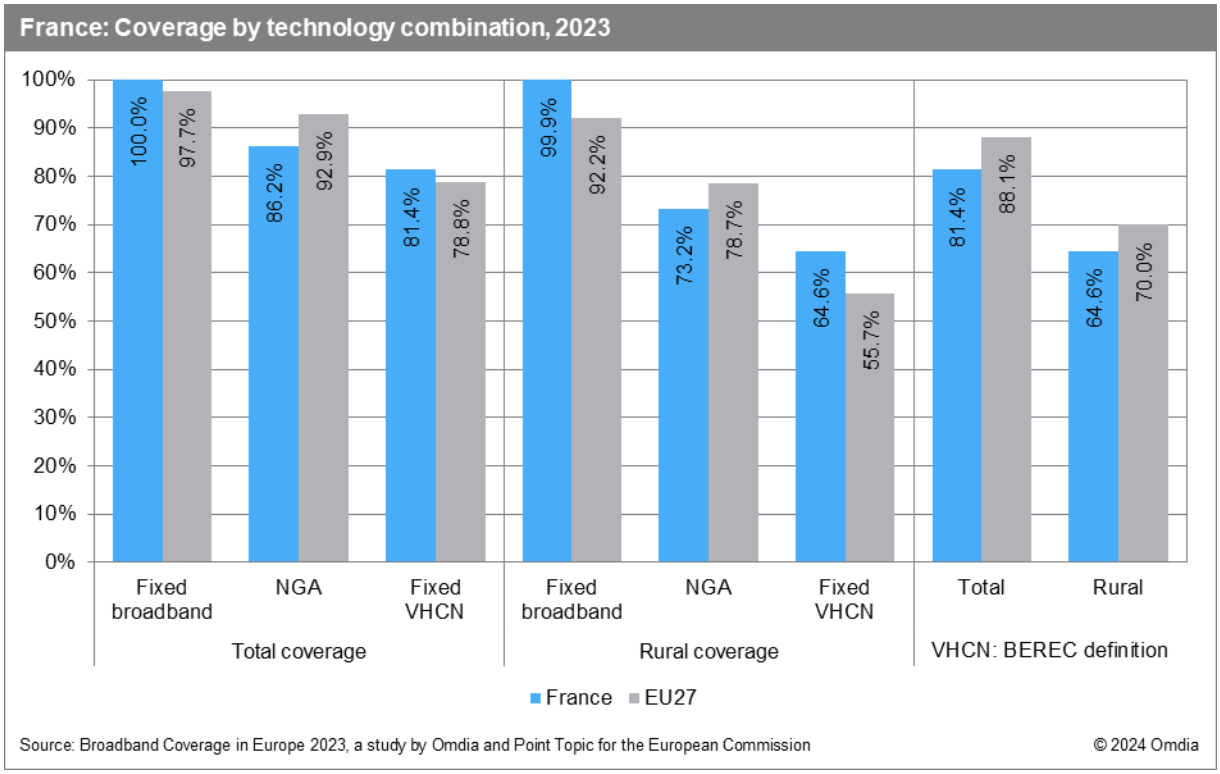
5.10 France

5.10.1 National coverage by broadband technology

Since achieving universal fixed broadband coverage at national and rural level in 2017, operators in France have focused on improving the availability of the faster broadband technologies. When considering fixed Very High Capacity networks which have a potential to deliver gigabit speeds (FTTP & DOCSIS 3.1), France has lagged below the EU average, but the gap has been narrowing and in 2023 France overtook the EU average. Overall coverage for this metric increased by 8.0 p.p. in the year to June 2023 to reach 81.4% of households, 2.6 p.p. ahead of the EU average. At rural level France also surpassed the EU average, with fixed VHCN coverage reaching 64.6%, driven by the government's national broadband plan. This is an increase of 18.7 p.p. since 2022, a figure surpassed only by Estonia, Poland and Cyprus.

There are no DOCSIS 3.1 service available in France, as SFR has elected to upgrade directly to FTTP instead. Therefore coverage of the fixed VHCN (FTTP & DOCSIS 3.1) category is equal to FTTP coverage. These figures are also equal to the reported BEREC-defined VHCN coverage, indicating that the only technology in France which conforms to the BEREC definition of VHCN is FTTP.

By the end of June 2023, NGA broadband services were available to 86.2% of French households, including 73.2% of rural homes.

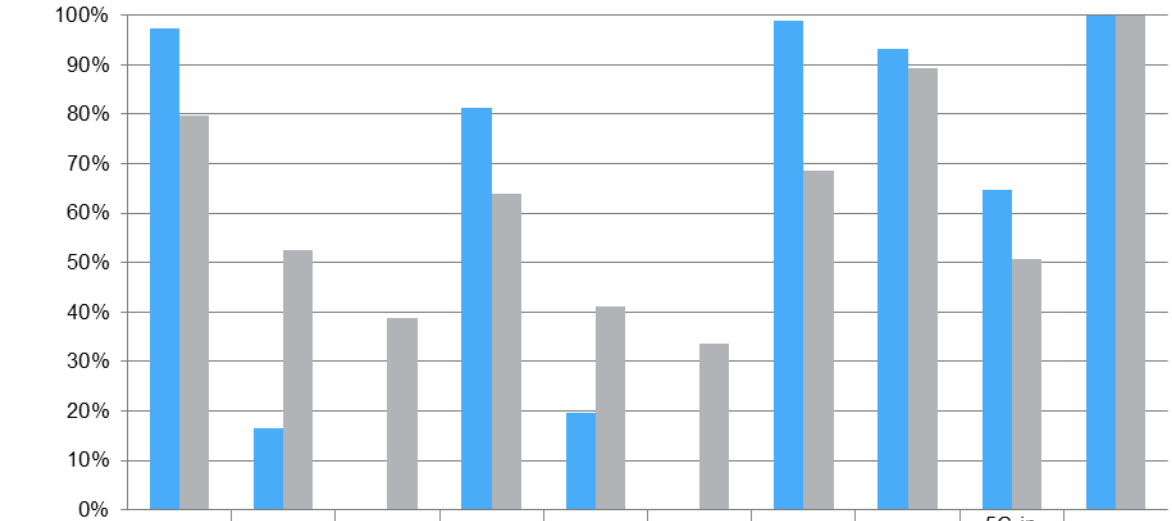


Among other technologies, DSL remained the most widespread service in France, with 97.3% of homes passed (down marginally from 2022), while VDSL coverage grew fractionally to 16.6% of households. Coverage of DOCSIS 3.0 also fell marginally, reaching 19.7% of homes passed. As French operators have focused on the deployment of FTTP rather than upgrading existing networks, DOCSIS 3.1 and VDSL2 Vectoring both remained absent from the French market as of mid-2023. Use of FWA technology is encouraged by the French government and offered by all four main French operators[17]. Coverage at mid-2023 was near-universal, reaching 99.0% of households.

The major mobile operators all launched 5G services in the fourth quarter of 2020, and by June 2023 coverage had reached 93.2% of households nationwide, an increase of 4.4 percentage points. 5G services using the 3.4–3.8 GHz band were available to almost two thirds of French households (64.8%).

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

France: Coverage by technology, total, 2023



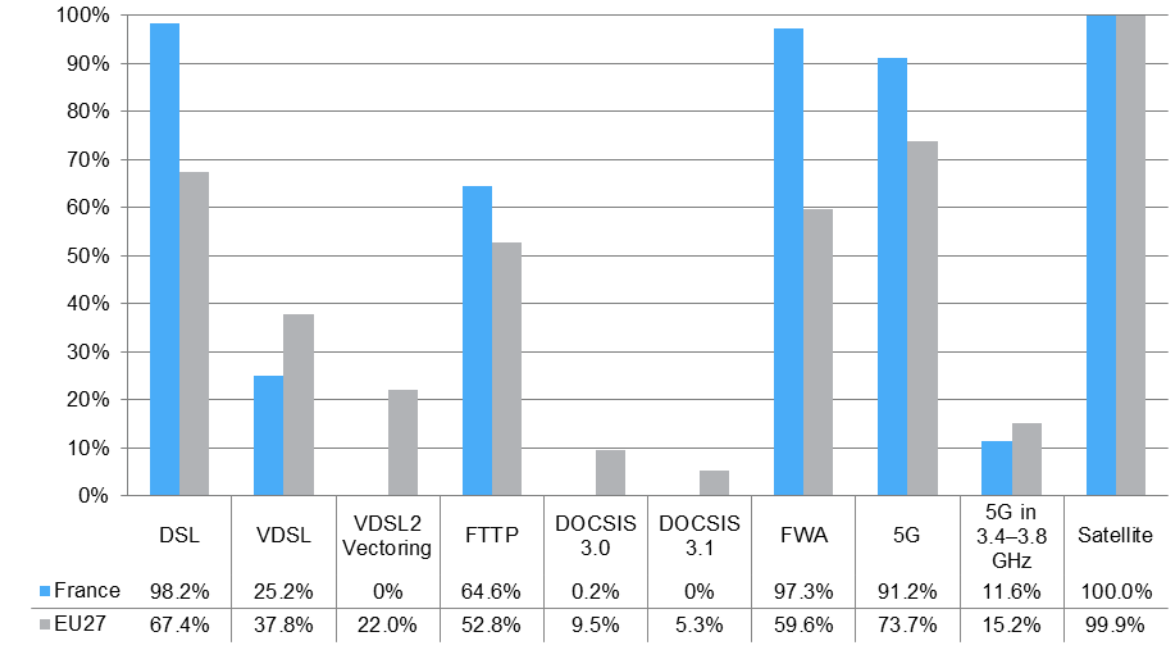
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
France	97.3%	16.6%	0%	81.4%	19.7%	0%	99.0%	93.2%	64.8%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

DSL remained the most widespread fixed broadband technology in rural areas, despite the strong growth of FTTP and a fall of 0.6 p.p. since the previous year. France recorded one of the highest rural DSL coverages in the study and performed 31.4 percentage points above the EU average. VDSL also remains an important technology, passing 25.2% of rural homes, up slightly from the previous year. Cable modem DOCSIS 3.0 coverage in rural areas is minimal, while rural areas are the main beneficiaries of the French state initiative promoting FWA, and coverage is thus much higher than the EU average, reaching 97.3% of households.

Since launch in 2020, 5G coverage has grown to reach over nine in ten (91.2%) of rural households, 17.5 p.p. ahead of the EU average. 5G coverage using the 3.4–3.8 GHz band also expanded in the year to 2023. Coverage reached 11.6% of rural households, compared with 3.5% the previous year, and 15.2% for the EU as a whole.

France: Coverage by technology, rural areas, 2023



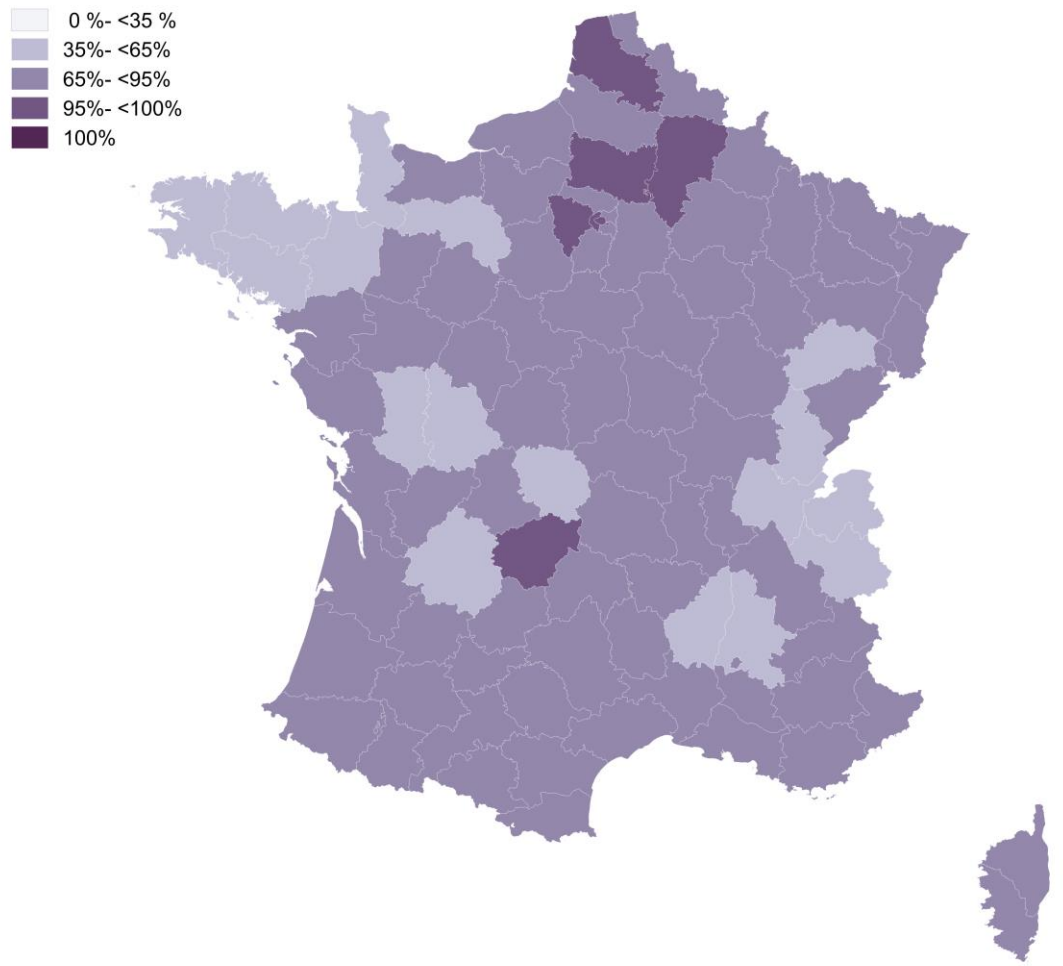
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
France	98.2%	25.2%	0%	64.6%	0.2%	0%	97.3%	91.2%	11.6%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.10.2 Regional coverage by broadband technology

Most parts of France achieved fixed VHCN (FTTP & DOCSIS 3.1) coverage of 65%–95% in 2022, with only seven departments surpassing this – Paris, Yvelines, Hauts-de-Seine, Pas-de-Calais, Aisne, Oise, and Corrèze. Only one department failed to reach the 35% threshold – the overseas department of Mayotte – and a further twenty failed to reach 65%.

France: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

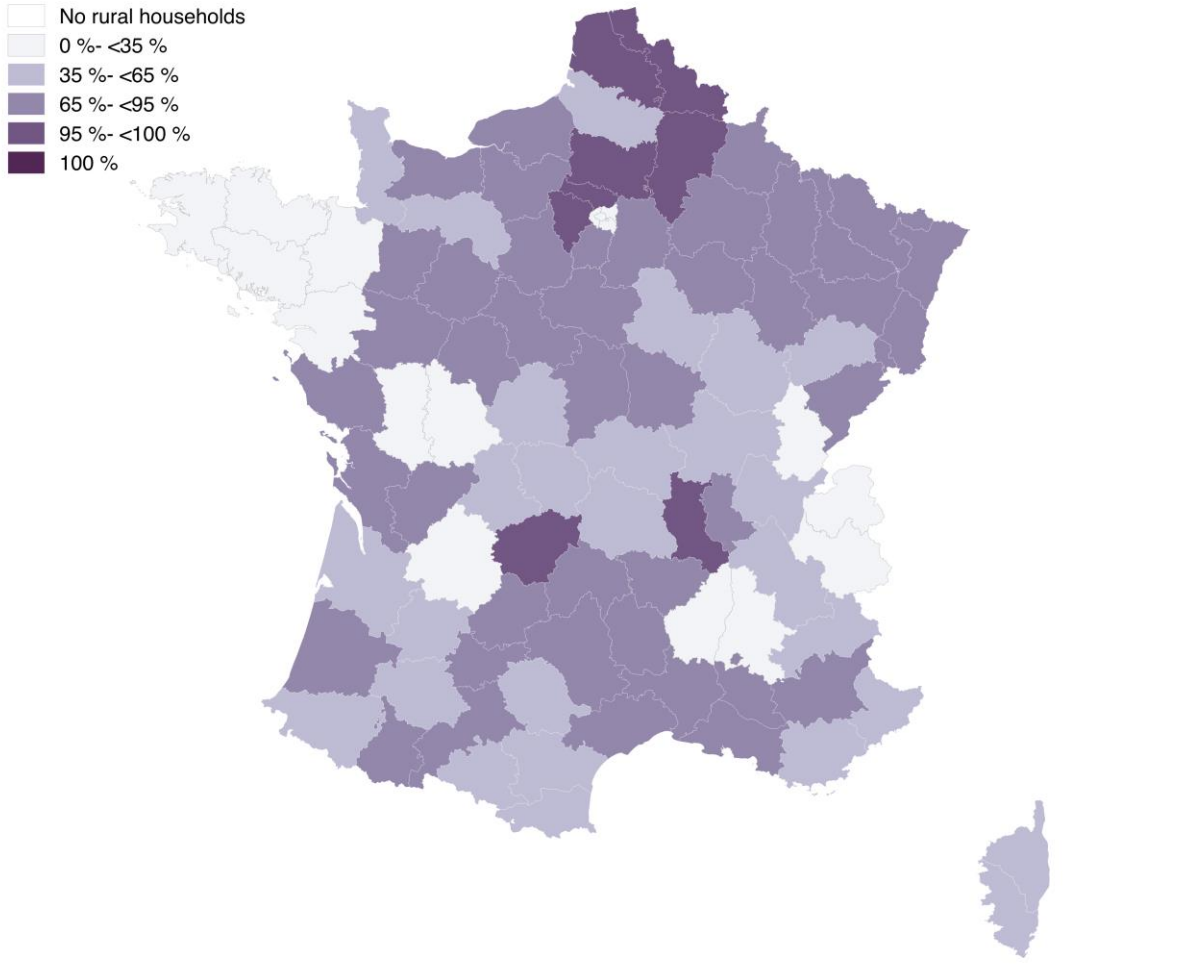


Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Since there are no DOCSIS 3.1 services in France, the FTTP coverage is identical to coverage for the fixed VHCN (FTTP & DOCSIS 3.1) combined category.

In rural areas, nine departments achieved fixed VHCN (FTTP & DOCSIS 3.1) coverage of greater than 95%, up from only four in the previous edition of the BCE study. Aided by the government's rural broadband programme, an additional 21 departments passed the 35% threshold during the year to June 2023.

France: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

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

Coverage data for French NUTS 3 areas outside mainland Europe

NUTS 3	Description	Total fixed VHCN (FTTP & DOCSIS 3.1)	Total FTTP	Rural fixed VHCN (FTTP & DOCSIS 3.1)
FRA10	Guadeloupe	35%-<65%	35%-<65%	35%-<65%
FRA20	Martinique	35%-<65%	35%-<65%	0%-<35%
FRA30	Guyane	35%-<65%	35%-<65%	0%-<35%
FRA40	La Réunion	65%-<95%	65%-<95%	95%-<100%
FRA50	Mayotte	0%-<35%	0%-<35%	0%-<35%

5.10.3 Data tables for France

Statistic	National
Population	67,871,925
Persons per household	2.3
Rural proportion	16.4%

	France 2023		France 2022		France 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	97.3%	98.2%	*97.5%*	*97.6%*	98.8%	98.3%	79.7%	67.4%
VDSL	16.6%	25.2%	15.9%	*24.9%*	15.7%	24.8%	52.6%	37.8%
VDSL2 Vectoring	0%	0%	0%	0%	0%	0%	38.7%	22.0%
FTTP	81.4%	64.6%	*73.4%*	*45.9%*	63.4%	28.8%	64.0%	52.8%
Cable modem DOCSIS 3.0	19.7%	0.2%	*20.0%*	0.3%	23.1%	0.3%	41.1%	9.5%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	33.6%	5.3%
FWA	99.0%	97.3%	*99.1%*	*98.4%*	58.1%	91.2%	68.5%	59.6%
5G	93.2%	91.2%	88.8%	73.5%	74.4%	48.2%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	64.8%	11.6%	52.3%	3.5%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	100.0%	99.9%	*100.0%*	*99.9%*	99.9%	99.9%	97.7%	92.2%
Overall NGA broadband	86.2%	73.2%	*80.4%*	*59.6%*	73.7%	47.2%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	81.4%	64.6%	*73.4%*	*45.9%*	63.4%	28.8%	78.8%	55.7%
VHCN (as defined by BEREC)	81.4%	64.6%	-	-	-	-	88.1%	70.0%
At least 30Mbps	86.5%	-	*81.6%*	-	74.4%	-	93.3%	-
At least 100Mbps	82.1%	-	*74.0%*	-	65.3%	-	89.0%	-
At least 1Gbps	81.7%	-	*73.2%*	-	63.8%	-	75.6%	-
At least 1Gbps upload and download	80.7%	-	*73.2%*	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

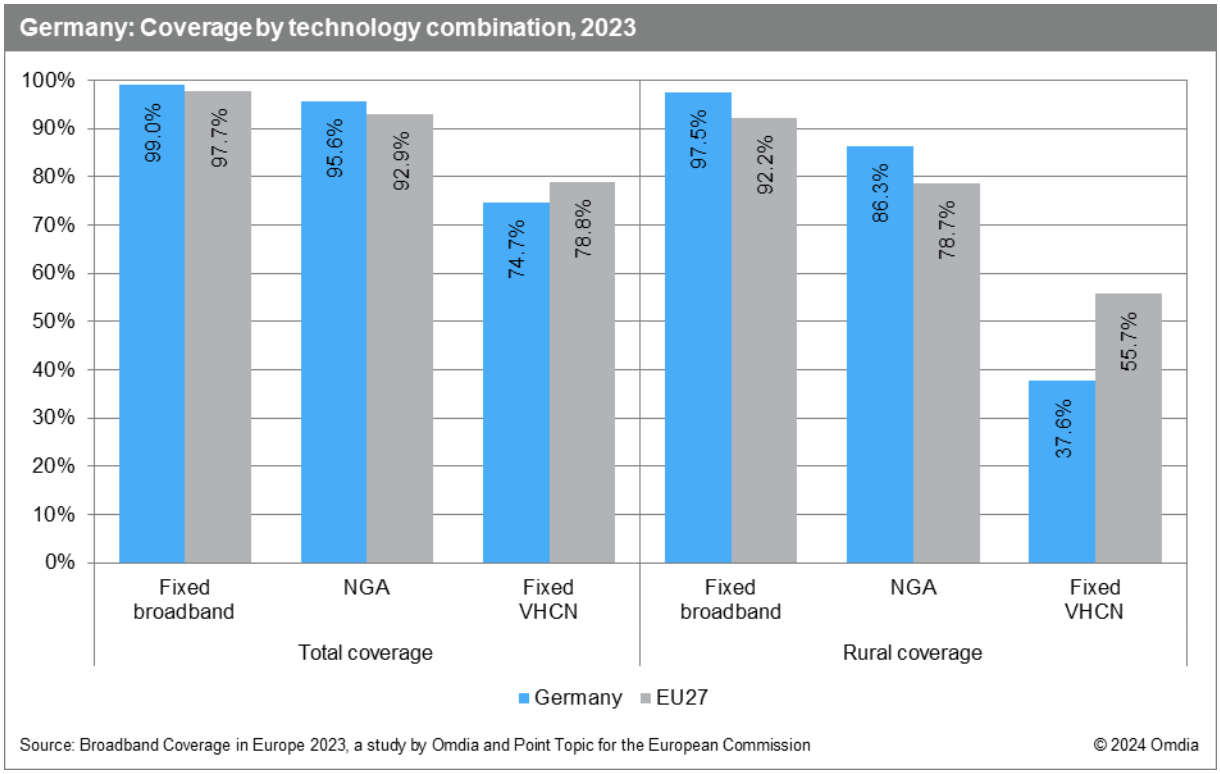
All restatements are highlighted in italics.

5.11 Germany

5.11.1 National coverage by broadband technology

By the end of June 2023, 99.0% of German households had access to at least one fixed broadband technology, while NGA coverage stood at 95.6%. In rural Germany, fixed broadband and NGA networks were available to 97.5% and 86.3% of rural households, respectively.

Like in previous years, Germany outperformed the EU average in the broadband and NGA categories, but the availability of fixed Very High Capacity networks (FTTP & DOCSIS 3.1) remained low, particularly in rural areas where the gap to the EU average stood at 18.0 percentage points by mid-2023.

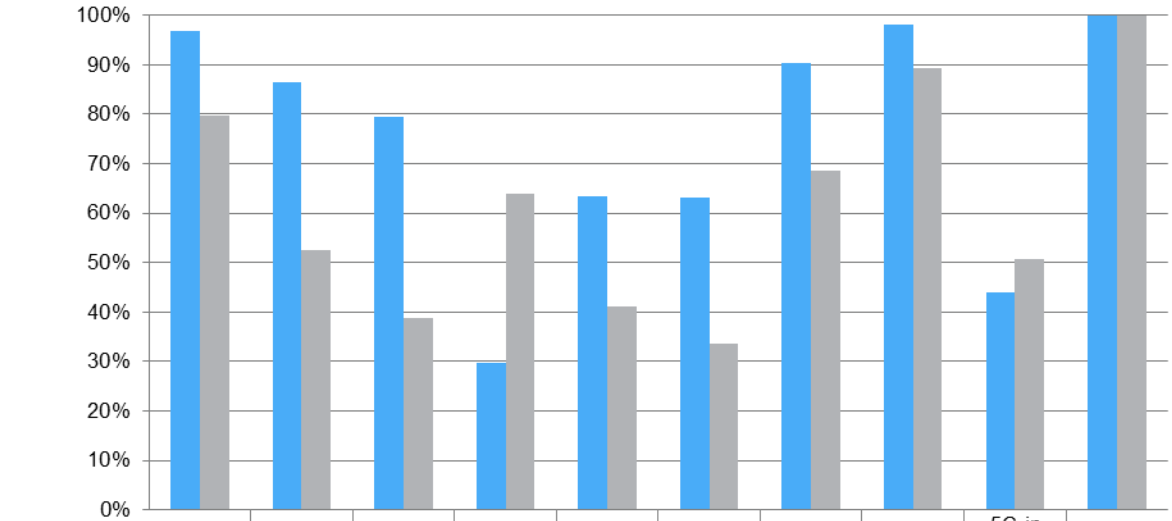


FTTP coverage improved by 10.5 percentage points over the 12-month period, but despite the strongest growth seen to-date, Germany remained the country with the second lowest FTTP coverage in this year's study. With just 29.8% of homes passed, Germany held a gap of 34.2 percentage points to the EU average. In contrast, Germany exceeded the EU average across all copper and cable-based technologies.

DSL remained the most prevalent broadband technology in Germany, despite a 1.0 percentage point decline, with 96.7% households covered by mid-2023. VDSL and VDSL2 Vectoring were available to 86.6% and 79.4% of households, respectively. Germany recorded the fourth highest coverage in the VDSL2 Vectoring category in this year's study. Coverage of DOSIS 3.0 grew by 0.7 percentage points, and 99.5% of the cable network had been upgraded to DOCSIS 3.1 standard by mid-2023.

5G coverage has become almost universal, with 98.1% of households covered, up by 5.0 percentage points compared to mid-2022. Operators also made progress in rolling out 5G in the C-band, and Germany recorded a 7.4 percentage point growth in 5G coverage in the 3.4–3.8 GHz band.

Germany: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Germany	96.7%	86.6%	79.4%	29.8%	63.5%	63.1%	90.3%	98.1%	43.8%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

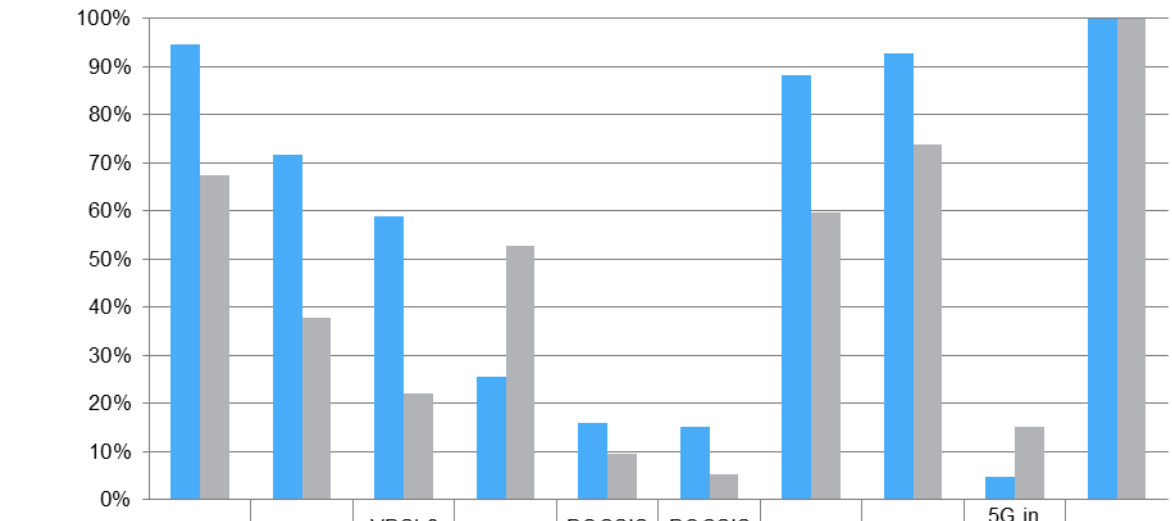
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Germany, DSL was available to 94.6% of rural households, up by 0.2 percentage points compared to mid-2022. VDSL and VDSL2 Vectoring coverage stood at 71.8% and 58.8%, respectively. Germany recorded the third highest coverage in rural VDSL2 Vectoring in this year's study, which reflects the 8.5 percentage point growth in the category.

The pace of FTTP deployment accelerated compared to mid-2022, and coverage grew by 8.6 percentage points to cover one quarter (25.6%) of rural households. However, the gap to the EU average remained large at 27.1 percentage points.

Rural 5G was available to 92.8% of rural households which was well above the EU average of 73.7%, and an 18.0 percentage point growth compared to mid-2022. 5G coverage in the 3.4–3.8 GHz band grew at a much slower pace (2.7 percentage points), with just 4.8% of rural households covered.

Germany: Coverage by technology, rural areas, 2023



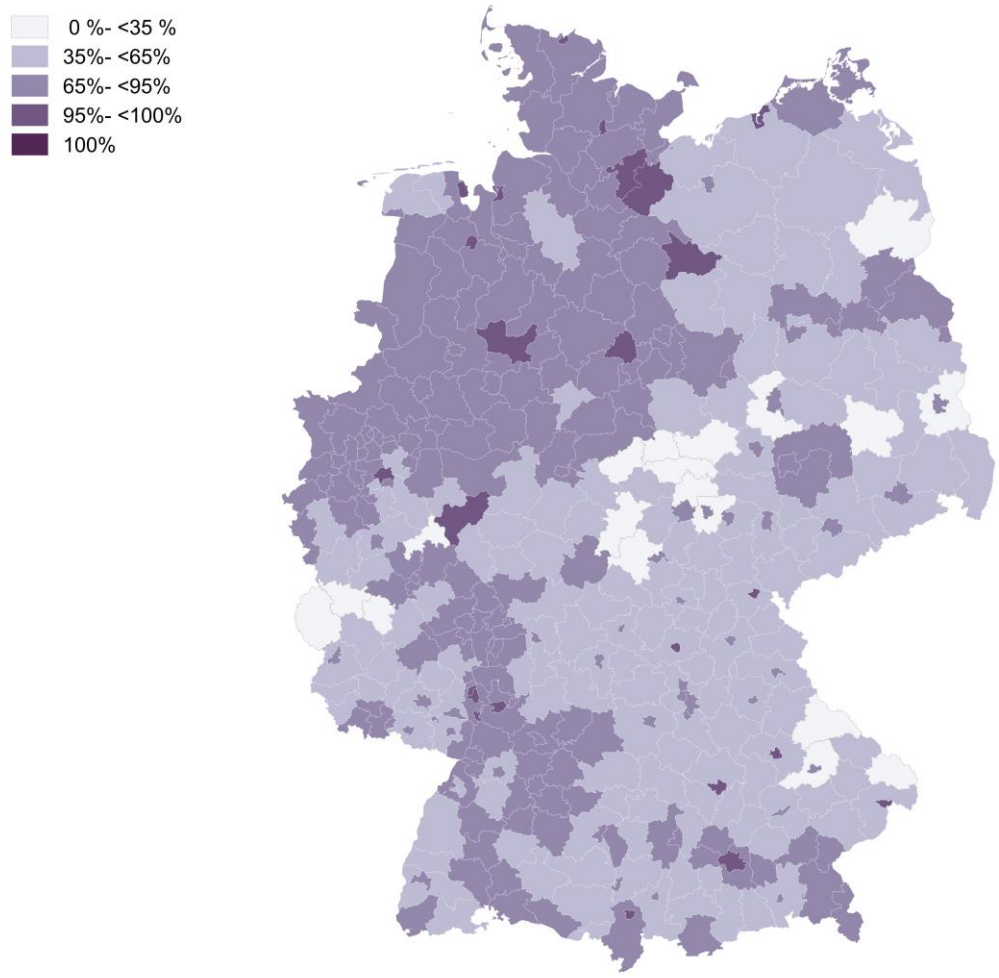
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Germany	94.6%	71.8%	58.8%	25.6%	16.0%	15.2%	88.1%	92.8%	4.8%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.11.2 Regional coverage by broadband technology

The number of regions that exceeded the 95% threshold in fixed VHCN (FTTP & DOCSIS 3.1) coverage more than doubled over the 12-month period and reached 24 regions by mid-2023. 19 regions recorded coverage below 35%, and the overall lowest coverage was recorded in Cochem-Zell (17.7%), Nordhausen (20.0%) and Eifelkreis Bitburg-Prüm (21.4%).

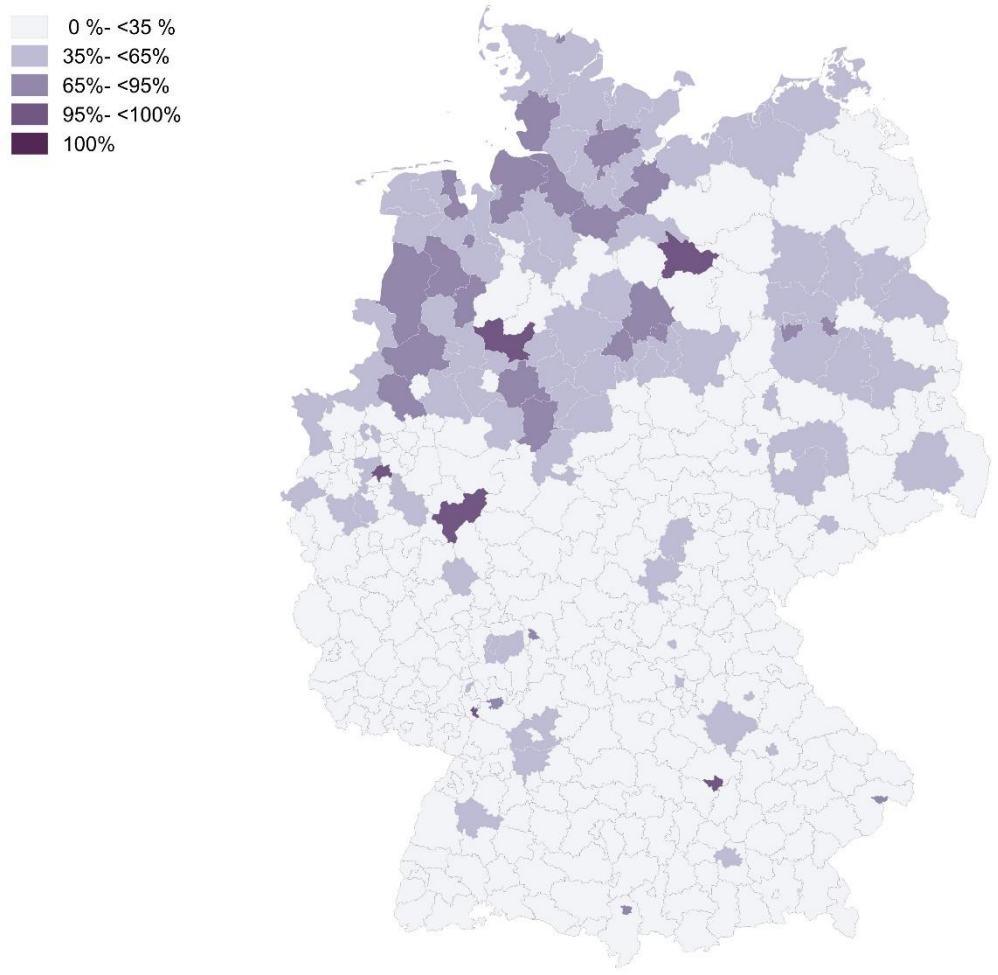
Germany: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

282 out of 400 regions in Germany recorded FTTP coverage below 35%, while six regions surpassed the 95% threshold.

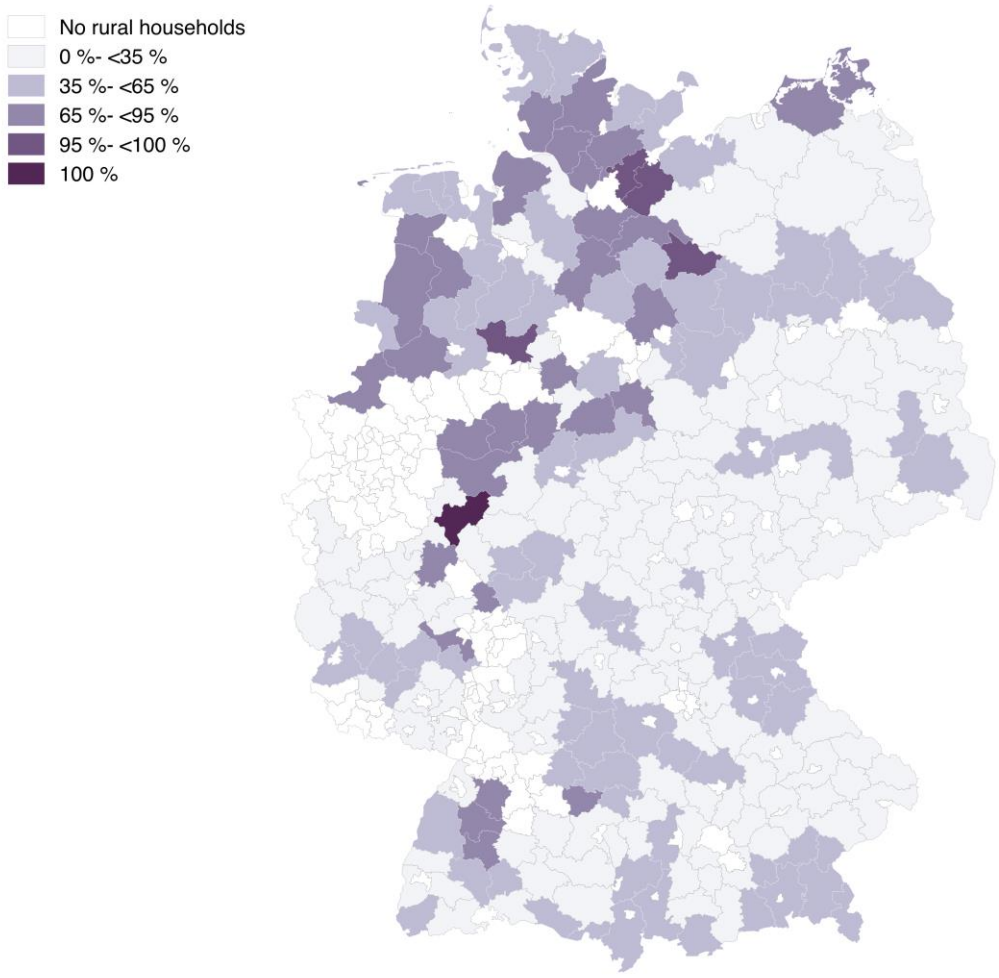
Germany: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Five regions (Siegen-Wittgenstein, Minden-Lübbecke, Lüchow-Dannenberg, Herzogtum Lauenburg, Stormarn) recorded more than 95% of rural households with fixed VHCN (FTTP & DOCSIS 3.1) coverage, while 137 regions remained below the 35% threshold.

Germany: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.11.3 Data tables for Germany

Statistic	National
Population	83,195,318
Persons per household	2.0
Rural proportion	10.3%

	Germany 2023		Germany 2022		Germany 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	96.7%	94.6%	97.7%	94.4%	99.4%	97.3%	79.7%	67.4%
VDSL	86.6%	71.8%	94.8%	89.7%	91.3%	79.3%	52.6%	37.8%
VDSL2 Vectoring	79.4%	58.8%	74.2%	50.3%	79.4%	59.3%	38.7%	22.0%
FTTP	29.8%	25.6%	19.3%	16.9%	15.4%	11.3%	64.0%	52.8%
Cable modem DOCSIS 3.0	63.5%	16.0%	62.8%	15.3%	67.9%	17.5%	41.1%	9.5%
Cable modem DOCSIS 3.1	63.1%	15.2%	62.3%	14.8%	67.2%	16.8%	33.6%	5.3%
FWA	90.3%	88.1%	89.8%	87.1%	90.0%	87.9%	68.5%	59.6%
5G	98.1%	92.8%	93.2%	74.8%	86.5%	49.4%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	43.8%	4.8%	36.5%	2.1%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.0%	97.5%	99.2%	97.0%	99.5%	97.5%	97.7%	92.2%
Overall NGA broadband	95.6%	86.3%	97.4%	92.8%	95.9%	85.3%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	74.7%	37.6%	70.1%	30.1%	74.9%	22.5%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	96.1%	-	94.2%	-	95.9%	-	93.3%	-
At least 100Mbps	92.9%	-	91.0%	-	89.6%	-	89.0%	-
At least 1Gbps	73.6%	-	68.6%	-	62.1%	-	75.6%	-
At least 1Gbps upload and download	12.4%	-	-	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

The decline in fixed VHCN (FTTP & DOCSIS 3.1) coverage in 2022 can be explained through major refinements in data collection in Germany: The requirements for data provision have been specified and deviate in part from the standards previously recorded. Furthermore, since 2022 data collection has been carried out on an address-by-address basis for the first time and includes a larger number of telecommunications companies.

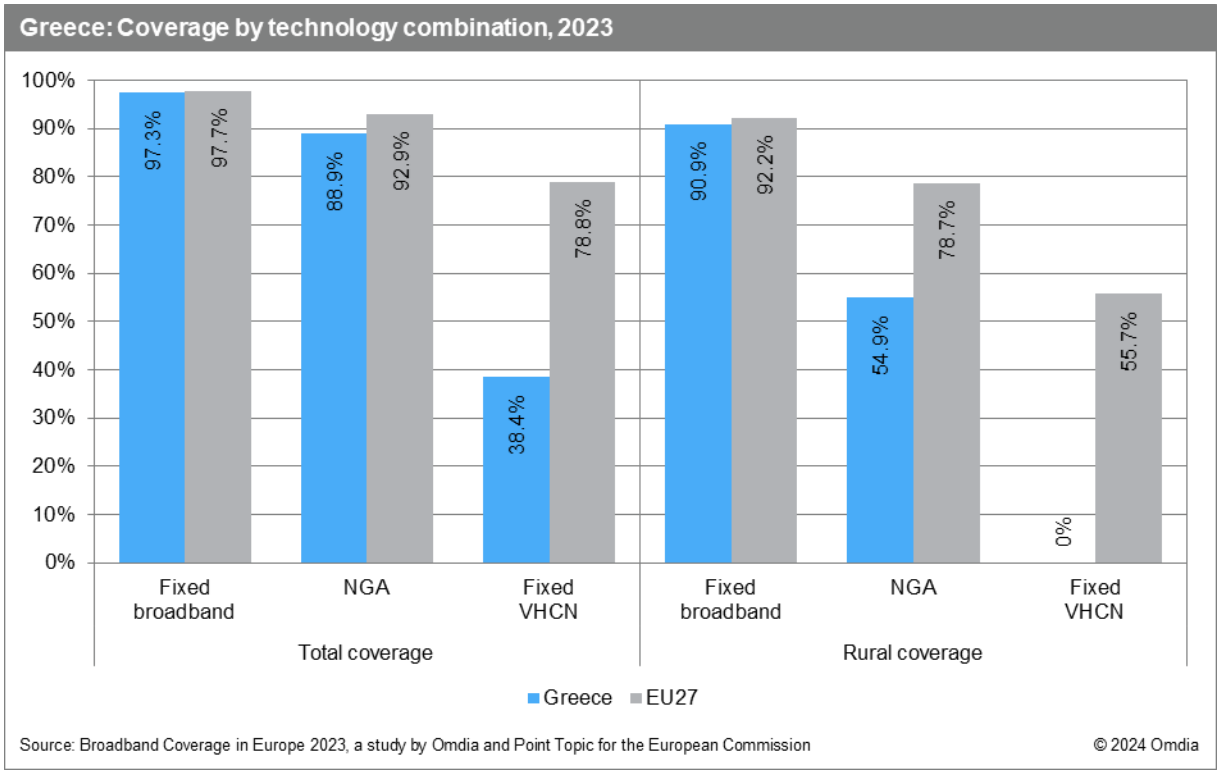
All restatements are highlighted in italics.

5.12 Greece

5.12.1 National coverage by broadband technology

Greece again recorded the lowest coverage among member states in the fixed VHCN (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. Despite an increase of 10.6 percentage points, by mid-2023, only 38.4% of Greek households had access to FTTP services, while rural coverage remained at 0.0%.

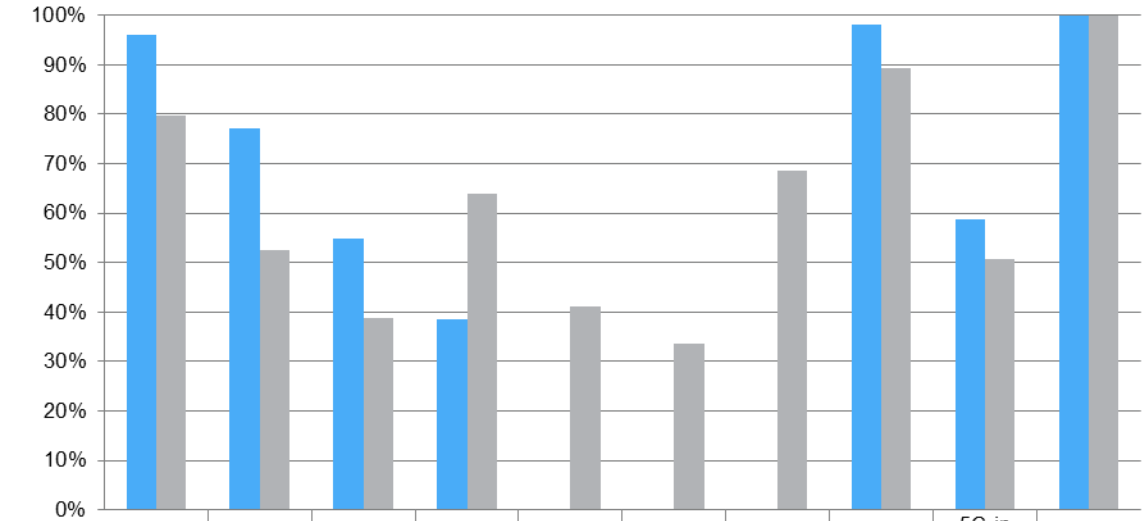
Greece also now lags the EU average on both national and rural levels in terms of total fixed broadband coverage, with 97.3% and 90.9% of households covered, respectively. In the NGA category 88.9% of Greek households had access to high-speed broadband services by mid-2023, including over half of rural homes (54.9%). Both these figures are below the EU average, especially at rural level.



Looking at individual technologies, coverage of FTTP continued to grow significantly in Greece, from 27.8% to 38.4%. But DSL remained the most prevalent fixed broadband technology, with 96.0% of households covered at the end of June 2023. In terms of NGA technologies, VDSL and VDSL2 Vectoring remained the most widely accessible services in Greece, with 77.1% and 54.9% of homes passed, respectively. Coverage of both these technologies increased only slightly, by 0.8 p.p. and 0.4 p.p. respectively, as operators turned their focus to FTTP rollout. No coverage of FWA was reported in this year's study.

Greece's three mobile network operators have all launched commercial 5G services, and overall coverage increased by 12.4 p.p. to reached 98.1% by June 2023, ahead of the EU average. 5G coverage using the 3.4–3.8 GHz band grew more strongly, by 22.0 p.p. and also outstrips the EU average, at 58.8% of households.

Greece: Coverage by technology, total, 2023



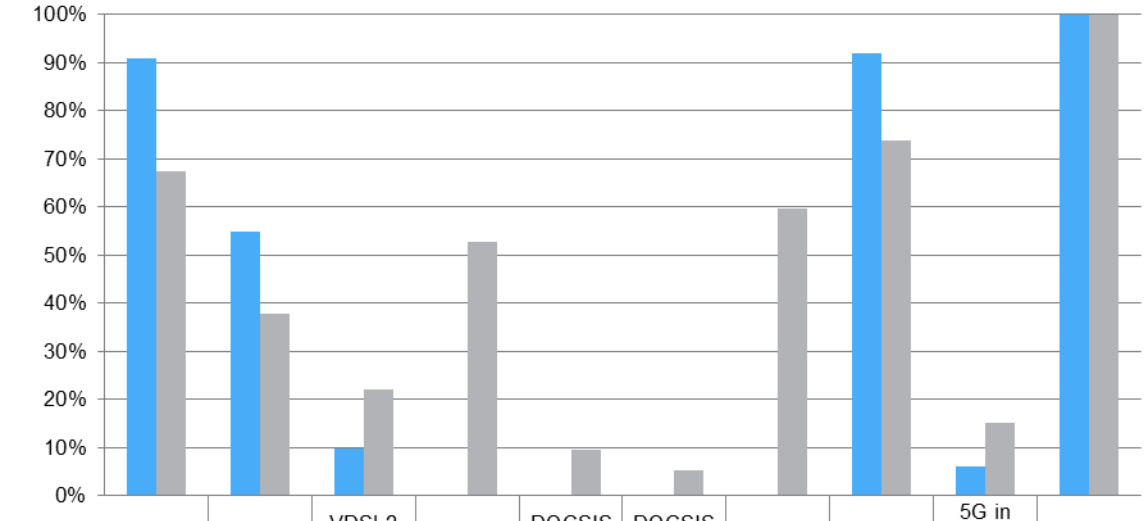
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Greece	96.0%	77.1%	54.9%	38.4%	0%	0%	0%	98.1%	58.8%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

As of June 2023, FTTP and cable (DOCSIS 3.0 and 3.1) remained absent from rural Greek regions, meaning that DSL services were the only available choice for wireline broadband. DSL coverage reached nine in ten rural households (90.9%), well ahead of the EU as a whole. Rural VDSL coverage increased by 3.7 p.p. in the year, and as of June 2023, over half (54.9%) of rural households were able to access VDSL services, while VDSL2 Vectoring coverage also grew fractionally and covered one tenth (10.0%) of rural households.

By June 2023 more than nine in ten rural households (92.1%) had access to 5G networks, ahead of the EU average figure (73.7%). But rural coverage of 5G using the 3.4–3.8 GHz band was well below the EU average, at 6.2%, up by only 2.0 p.p. since 2022.

Greece: Coverage by technology, rural areas, 2023

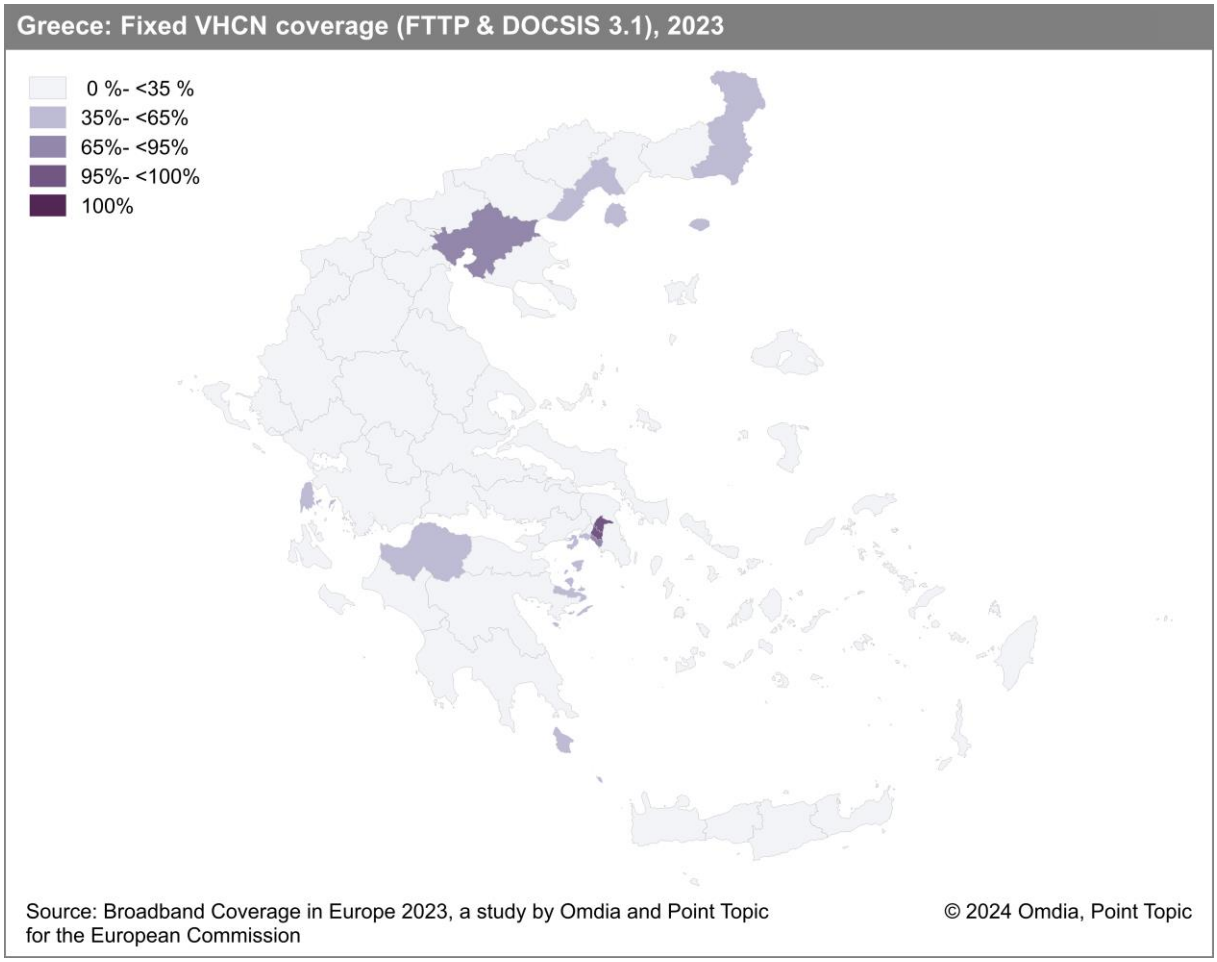


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Greece	90.9%	54.9%	10.0%	0%	0%	0%	0%	92.1%	6.2%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.12.2 Regional coverage by broadband technology

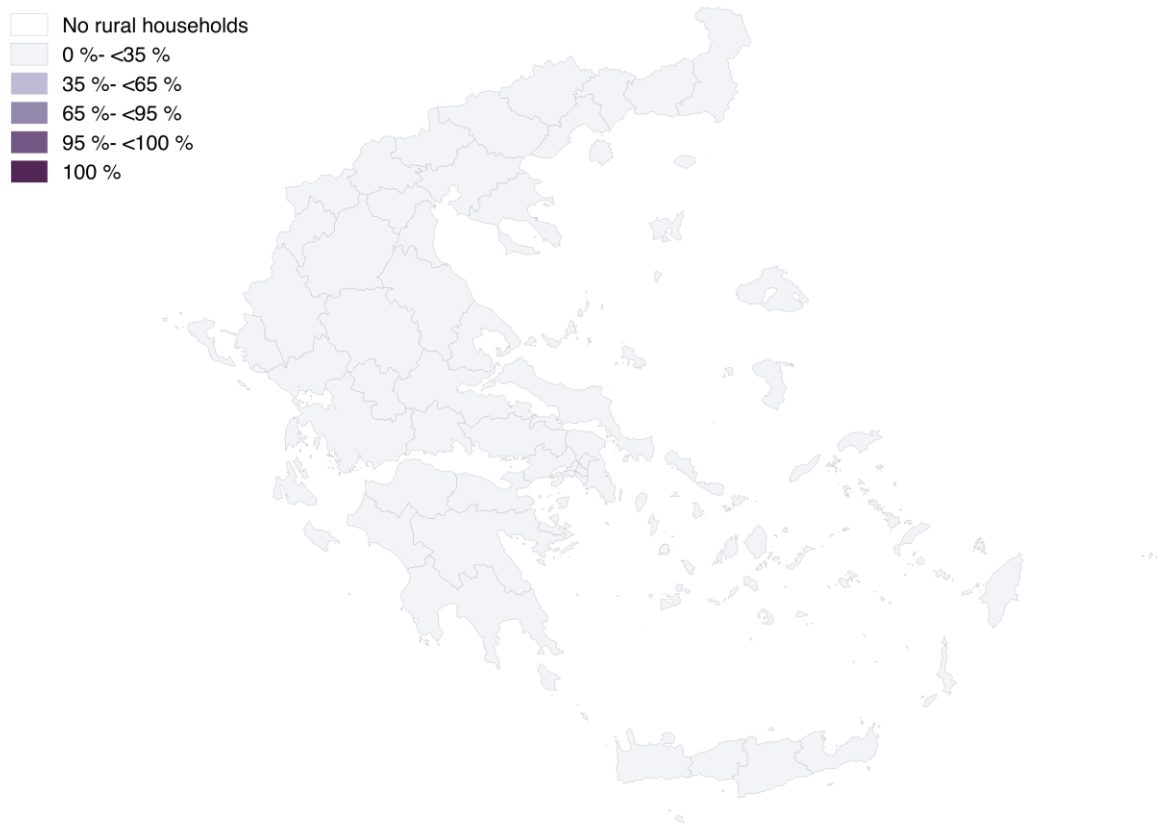
Looking at Greek regions, only four regions scored higher than 65% coverage of fixed VHCN (FTTP & DOCSIS 3.1) – Thessaloniki and parts of the capital, Athens. A further five regions surpassed the 35% threshold, but elsewhere the low coverage of FTTP and absence of any cable networks meant that coverage remained below 35%.



Since there are no DOCSIS 3.1 services in Greece, the FTTP coverage is identical to coverage for the fixed VHCN (FTTP & DOCSIS 3.1) combined category.

The absence of any rural fibre coverage meant that rural coverage for fixed VHCN (FTTP & DOCSIS 3.1) was zero for all regions of Greece in 2023.

Greece: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.12.3 Data tables for Greece

Statistic	National
Population	10,459,782
Persons per household	2.5
Rural proportion	20.9%

	Greece 2023		Greece 2022		Greece 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	96.0%	90.9%	97.9%	97.8%	98.8%	95.3%	79.7%	67.4%
VDSL	77.1%	54.9%	76.3%	51.1%	81.3%	65.9%	52.6%	37.8%
VDSL2 Vectoring	54.9%	10.0%	54.5%	9.3%	53.7%	10.0%	38.7%	22.0%
FTTP	38.4%	0%	27.8%	0%	19.8%	0%	64.0%	52.8%
Cable modem DOCSIS 3.0	0%	0%	0%	0%	0%	0%	41.1%	9.5%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	33.6%	5.3%
FWA	0%	0%	0.7%	3.5%	0.8%	3.9%	68.5%	59.6%
5G	98.1%	92.1%	85.7%	57.8%	66.1%	17.3%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	58.8%	6.2%	36.8%	4.2%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.3%	90.9%	99.0%	98.1%	99.4%	96.1%	97.7%	92.2%
Overall NGA broadband	88.9%	54.9%	86.3%	51.1%	91.7%	66.3%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	38.4%	0%	27.8%	0%	19.8%	0%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	97.5%	-	96.0%	-	96.6%	-	93.3%	-
At least 100Mbps	60.7%	-	63.9%	-	54.6%	-	89.0%	-
At least 1Gbps	39.5%	-	27.9%	-	19.0%	-	75.6%	-
At least 1Gbps upload and download	39.5%	-	26.1%	-	*18.6%*	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

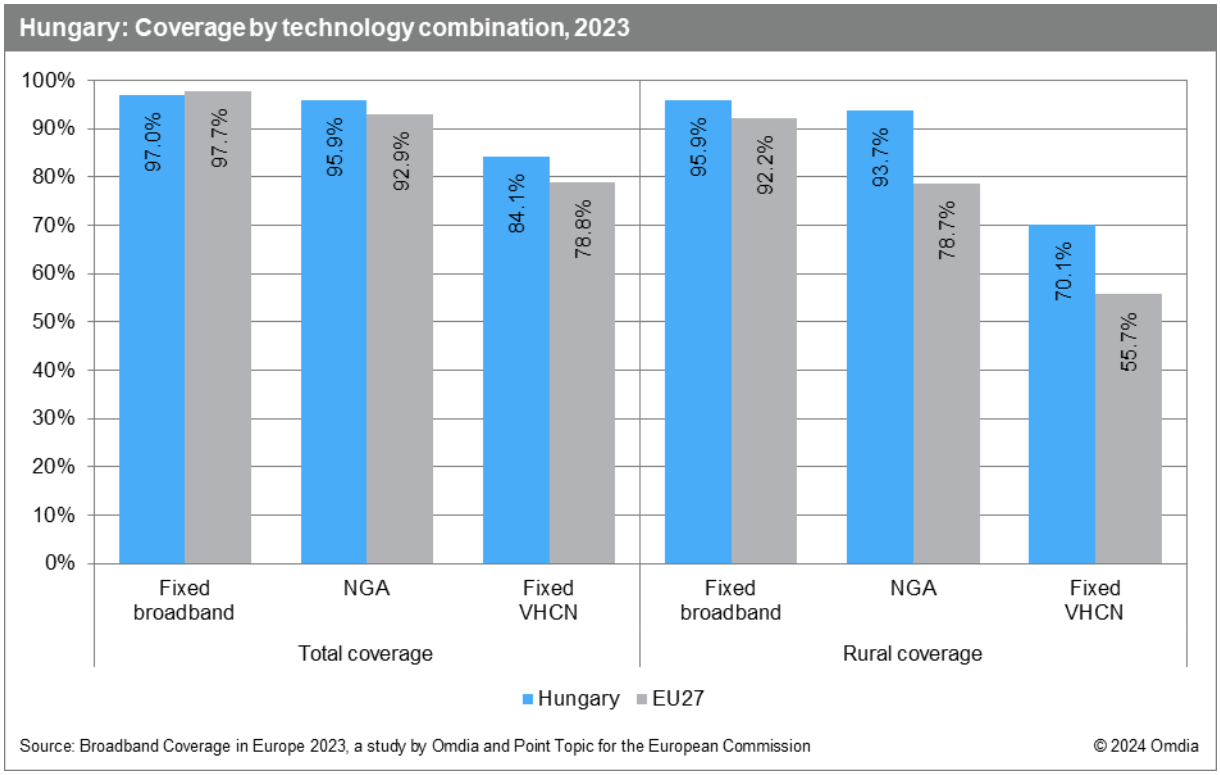
All restatements are highlighted in italics.

5.13 Hungary

5.13.1 National coverage by broadband technology

97.0% of Hungarian households were covered by at least one broadband technology by the end of June 2023, while fixed broadband coverage stood at 95.9% in rural Hungary.

95.9% of Hungarian households had access to NGA networks, including 93.7% of rural households. Fixed VHCN coverage of 1Gbps-capable networks (FTTP & DOCSIS 3.1) grew by 3.9 percentage points, with 84.1% of homes passed by mid-2023. In rural Hungary, fixed VHCN coverage grew by 11.0 percentage points and hit 70.1%. Hungary outperformed the EU average at both national and rural level across the NGA and fixed VHCN (FTTP & DOCSIS 3.1) categories.

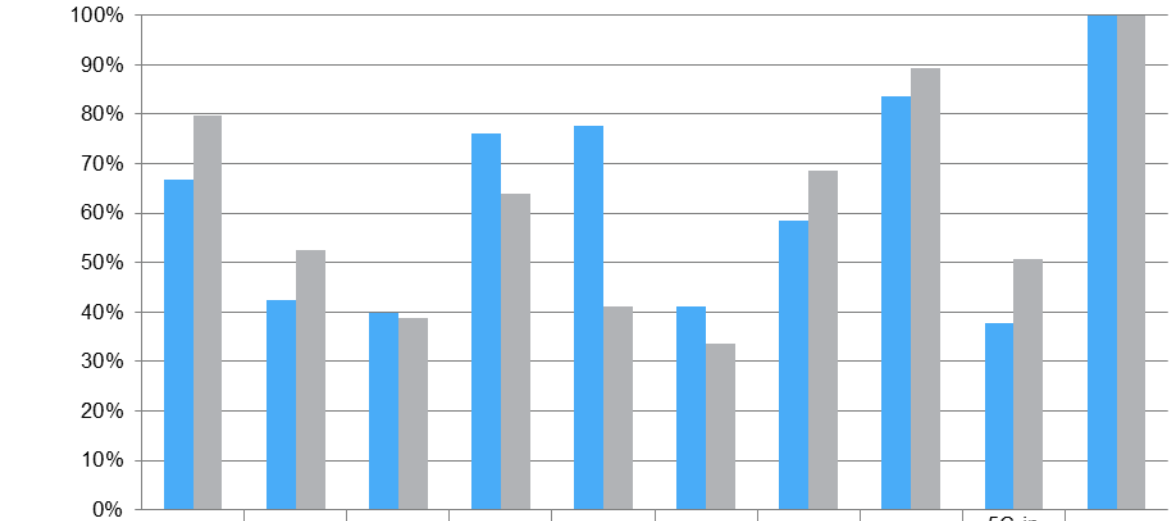


DOCSIS 3.0 remained the most prevalent technology in Hungary, covering 77.6% of households, closely followed by FTTP which was available to 76.2% of households by mid-2023. FTTP coverage increased by 6.1 percentage points and exceeded the EU average of 64.0%. More than half (53%) of the cable network had been upgraded to the DOCSIS 3.1 standard as of mid-2023, which enabled Hungary to outperform the EU average in the DOCSIS 3.1 category.

VDSL2 Vectoring coverage data was available for the first time in this year's study which stood at 39.7% by mid-2023. With the focus shifted to FTTP and DOCSIS networks, DSL coverage continued its downward trend and declined by 10.7 percentage points over the 12-month period. VDSL coverage declined by 6.0 percentage points. FWA was available to 58.6% of Hungarian households, up by 16.2 percentage points compared to mid-2022.

Overall 5G coverage increased by 25.8 percentage points, while 5G coverage in the 3.4–3.8 GHz band increased by 16.3 percentage points. However, despite significant growth in both categories, 5G coverage remained below the EU average.

Hungary: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Hungary	66.6%	42.4%	39.7%	76.2%	77.6%	41.1%	58.6%	83.7%	37.7%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

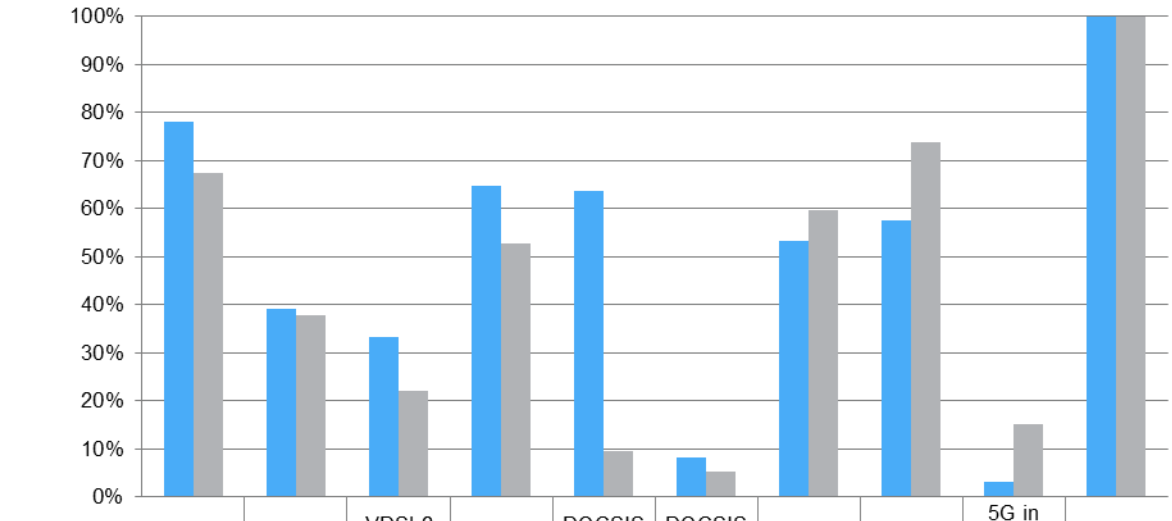
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Hungary, DSL remained the largest broadband technology, despite recording a decline of 13.7 percentage points over the 12-month period. VDSL and VDSL2 Vectoring were available to 39.1% and 33.3% of Hungarian households, respectively.

Hungary was the country with the third highest rural DOCSIS 3.0 coverage in this year's study, with 63.7% rural homes passed. The upgrade to DOCSIS 3.1 standard also progressed, with 8.2% of rural homes passed, which was above the EU average of 5.3%. FTTP coverage increased by 12.2 percentage points and was available to 64.7% of rural households.

As seen at national level, 5G coverage in rural areas remained below EU average, despite a 23.7 percentage point growth compared to mid-2022. 5G rollout in the 3.4–3.8 GHz band remained mostly focused on urban areas, with rural coverage up by only 1.1 percentage points. Due to the slow growth, Hungary ranked among the study countries with the lowest rural 5G coverage in the 3.4–3.8 GHz band.

Hungary: Coverage by technology, rural areas, 2023



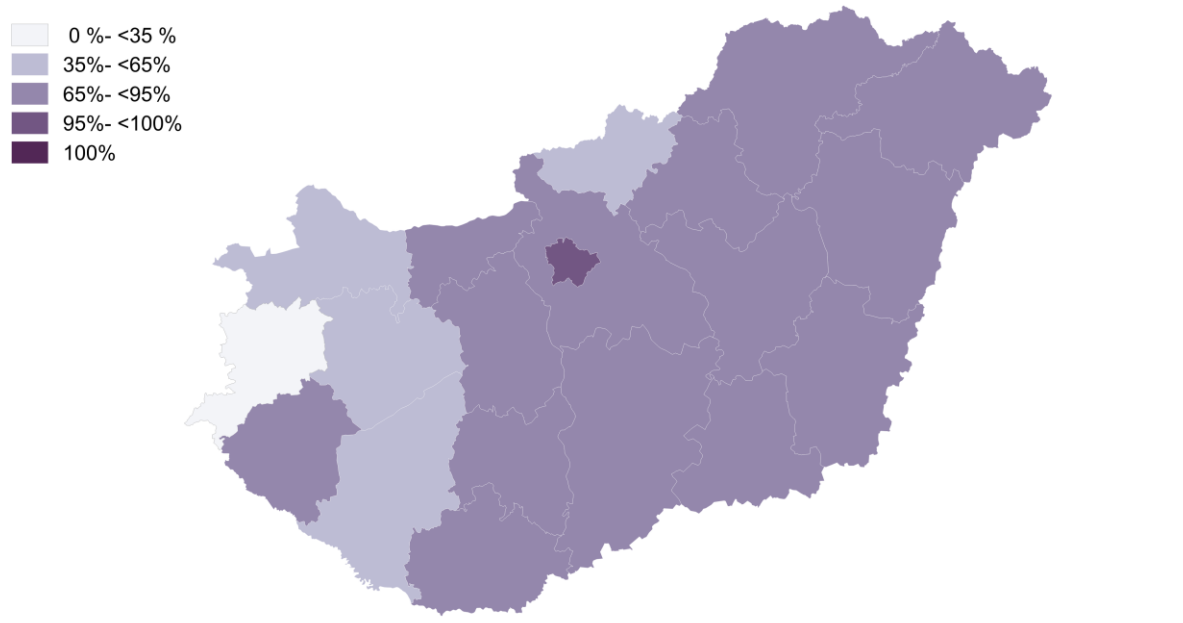
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Hungary	78.1%	39.1%	33.3%	64.7%	63.7%	8.2%	53.3%	57.5%	3.1%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.13.2 Regional coverage by broadband technology

The majority of Hungarian regions (14 out of 20) recorded fixed VHCN (FTTP & DOCSIS 3.1) coverage between 65%–95%, while Budapest was the only region that exceeded the 95% threshold. Vas recorded the lowest coverage at 30.9%.

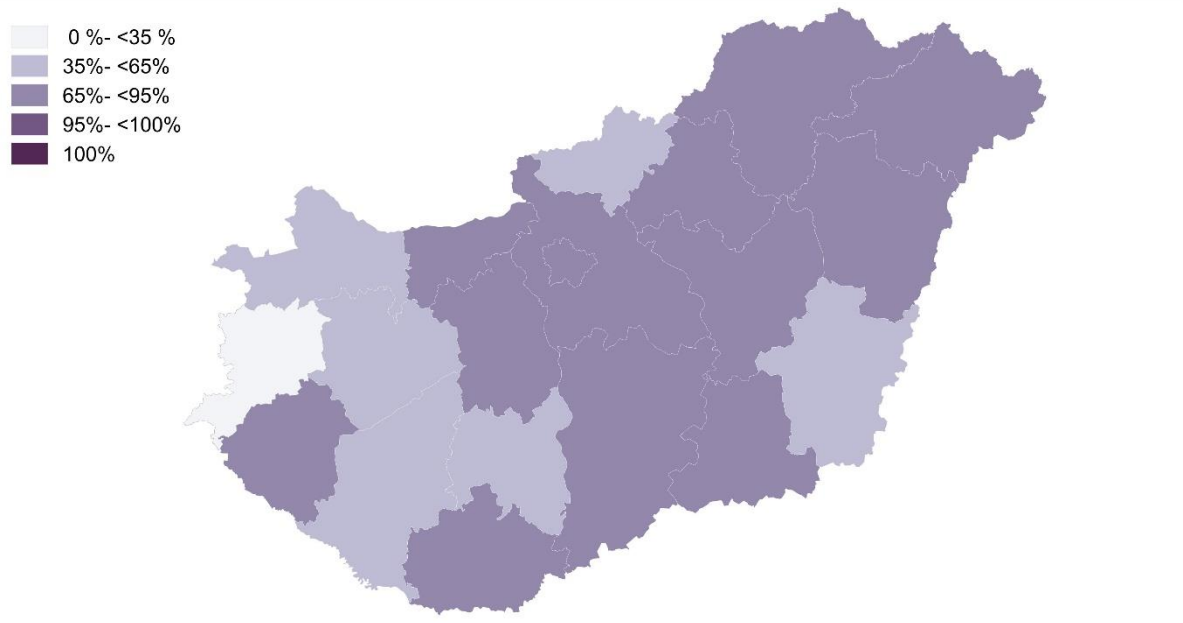
Hungary: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

FTTP coverage ranged from 90.5% in Budapest to 30.7% in Vas. None of the regions exceeded the 95% threshold.

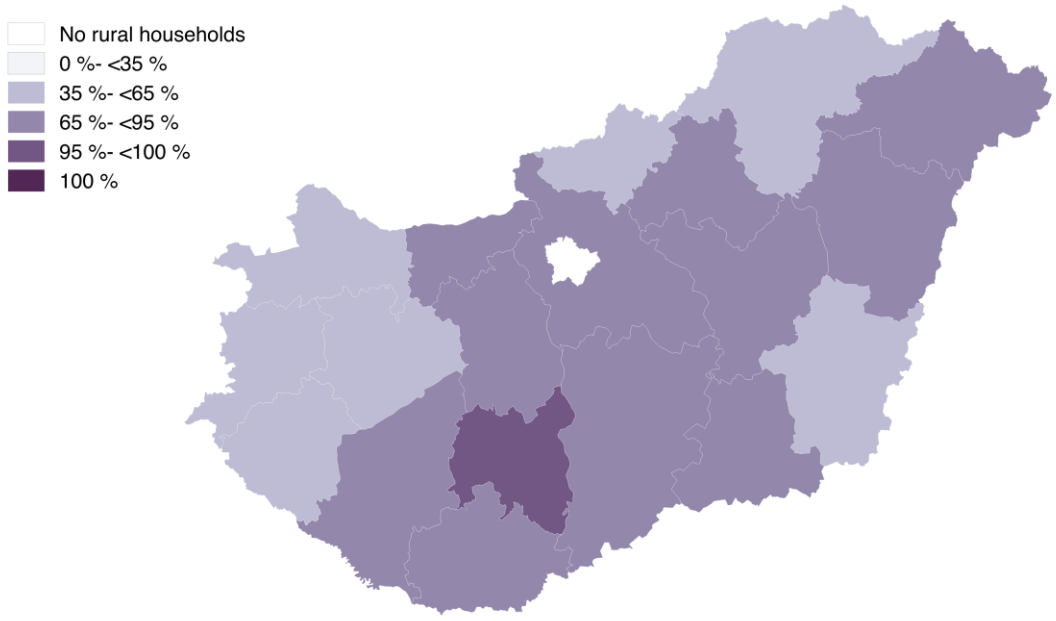
Hungary: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Eleven out of 20 Hungarian regions recorded rural fixed VHCN (FTTP & DOCSIS 3.1) coverage between 65%-95%, while seven regions remained below the 35% threshold. Budapest was excluded from this category due to the absence of rural households.

Hungary: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.13.3 Data tables for Hungary

Statistic	National
Population	9,599,744
Persons per household	2.1
Rural proportion	31.0%

	Hungary 2023		Hungary 2022		Hungary 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	66.6%	78.1%	77.3%	91.7%	84.2%	91.1%	79.7%	67.4%
VDSL	42.4%	39.1%	48.4%	48.2%	50.8%	48.4%	52.6%	37.8%
VDSL2 Vectoring	39.7%	33.3%	0%	0%	0%	0%	38.7%	22.0%
FTTP	76.2%	64.7%	70.1%	52.4%	64.2%	37.9%	64.0%	52.8%
Cable modem DOCSIS 3.0	77.6%	63.7%	81.2%	63.6%	78.2%	57.7%	41.1%	9.5%
Cable modem DOCSIS 3.1	41.1%	8.2%	38.6%	6.6%	21.7%	0.8%	33.6%	5.3%
FWA	58.6%	53.3%	42.3%	35.8%	0%	0%	68.5%	59.6%
5G	83.7%	57.5%	57.9%	33.8%	17.6%	7.0%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	37.7%	3.1%	21.4%	2.0%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.0%	95.9%	99.7%	99.2%	98.4%	96.2%	97.7%	92.2%
Overall NGA broadband	95.9%	93.7%	98.4%	96.2%	96.7%	92.1%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	84.1%	70.1%	80.3%	59.1%	71.8%	38.3%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	96.0%	-	*95.5%*	-	94.9%	-	93.3%	-
At least 100Mbps	95.1%	-	*91.9%*	-	88.7%	-	89.0%	-
At least 1Gbps	82.4%	-	81.9%	-	44.8%	-	75.6%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

Data provided by the Hungarian NRA is based on dwellings. VDSL2 Vectoring data was collected for the first time in 2023.

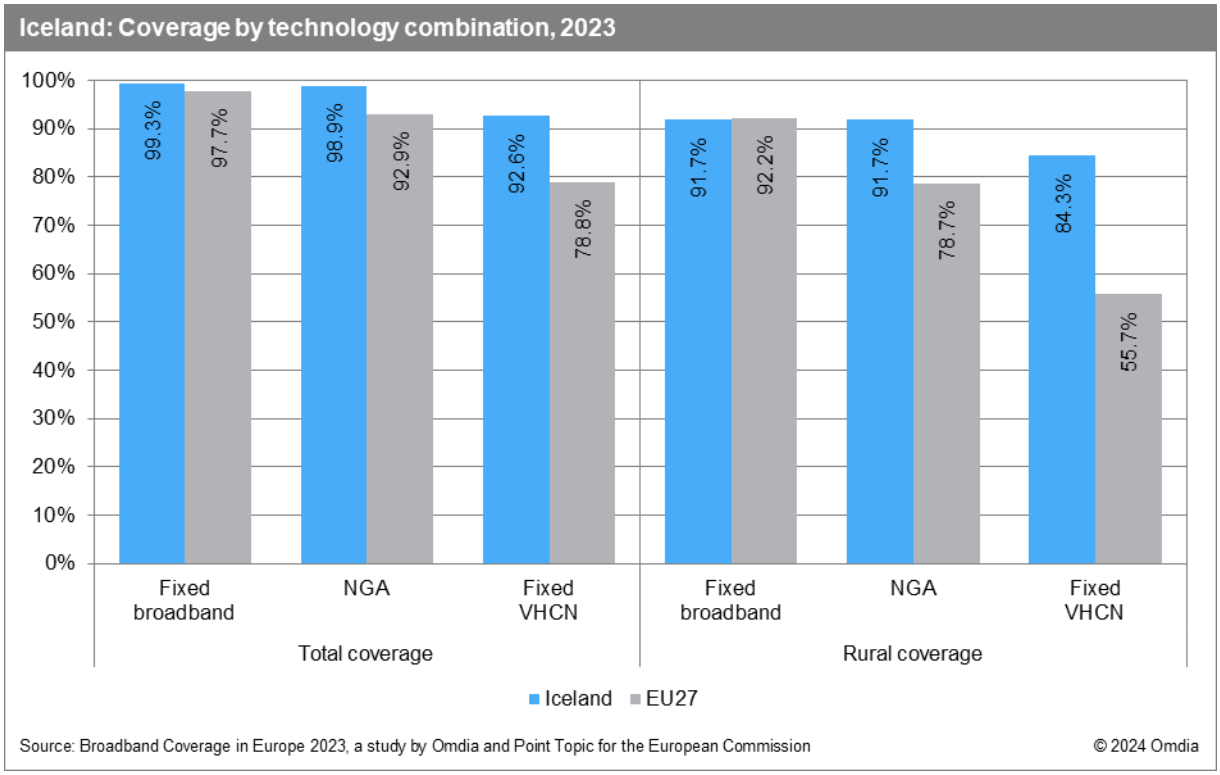
All restatements are highlighted in italics.

5.14 Iceland

5.14.1 National coverage by broadband technology

Overall fixed broadband coverage in Iceland remained stable and nearing universal coverage with 99.3% of Icelandic homes passed by at least one fixed broadband network. At a rural level, fixed broadband coverage reached 91.7% of rural homes. High-speed NGA broadband services were available to 98.9% of Icelandic households, and to 91.7% of rural households.

Due to the high proliferation of FTTP networks, Iceland ranked as one of the leaders in terms of fixed VHCN (FTTP & DOCSIS 3.1) coverage. At the end of June 2023, 92.6% of all households and 84.3% of rural households were passed by fixed networks capable of delivering gigabit speed connectivity.

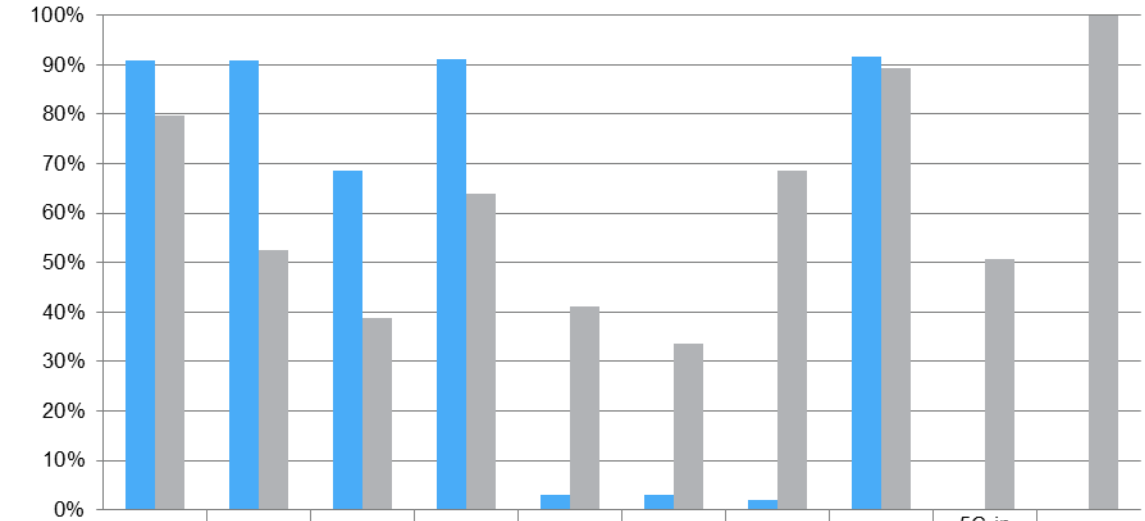


Looking at individual broadband technologies in Iceland, FTTP overtook DSL as the most prevalent fixed broadband technology available to Icelandic households, accessible to 91.0% of households and well ahead of the EU average (64.0%). It was closely followed by DSL, which reached 90.8% of Icelandic households. VDSL coverage remained high, with 90.8% of households having access to VDSL services at the end of June 2023. VDSL2 Vectoring was available to 68.6% of households.

Only a small number of homes (3.1%) 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 2.0% of households.

In terms of mobile broadband, commercial 5G services were launched in 2021, and by June 2023 coverage reached 91.6% of households.

Iceland: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Iceland	90.8%	90.8%	68.6%	91.0%	3.1%	3.1%	2.0%	91.6%	-	0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

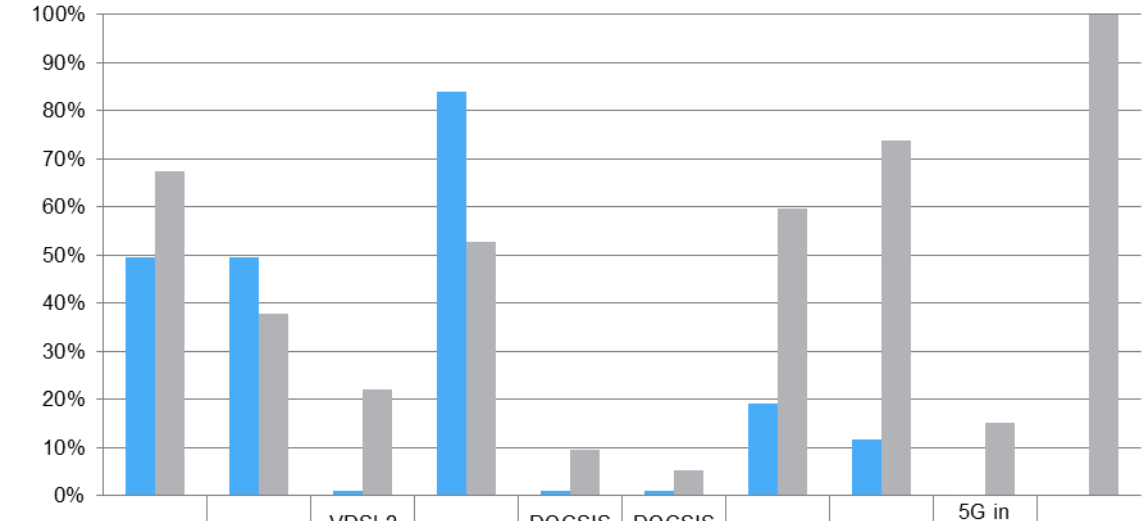
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

FTTP is also the leading technology in rural areas, with 83.9% of rural households passed, significantly above the EU average (52.8%). FTTP rollout has been accompanied by a limited availability of DSL services, which reached less than half of rural households (49.5%).

VDSL services were also available to 49.5% of rural households, whilst only 1.2% 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 0.9% coverage.

FWA was accessible to 19.1% 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, 2023



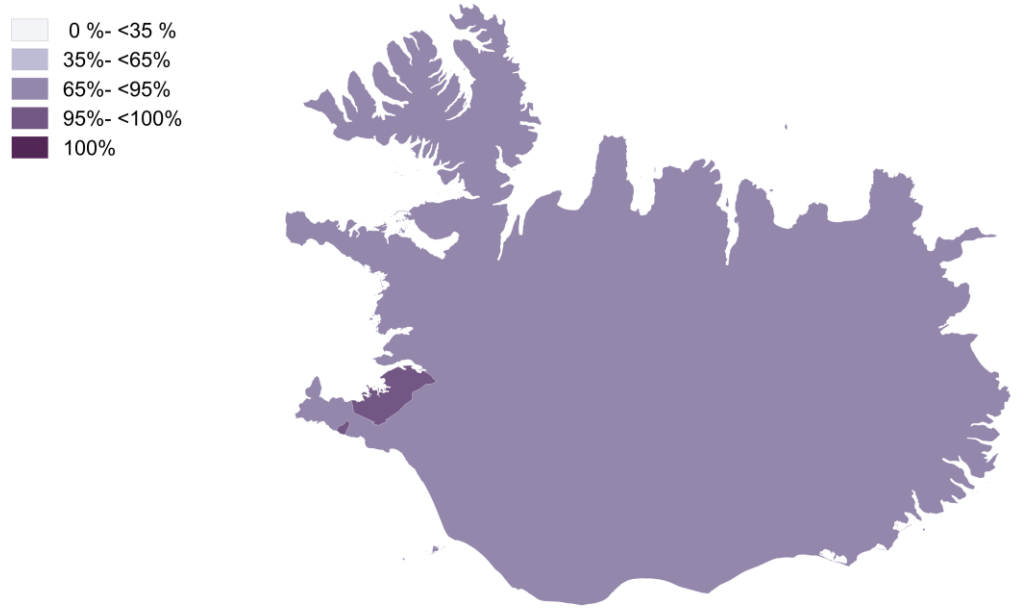
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Iceland	49.5%	49.5%	1.2%	83.9%	0.9%	0.9%	19.1%	11.8%	-	0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.14.2 Regional coverage by broadband technology

In this iteration of the study, fixed VHCN (FTTP & DOCSIS 3.1) coverage was nearly universally available in the Höfudborgarsvædi region, while fewer than 70% of households in the more sparsely populated Landsbyggd region were passed by these networks.

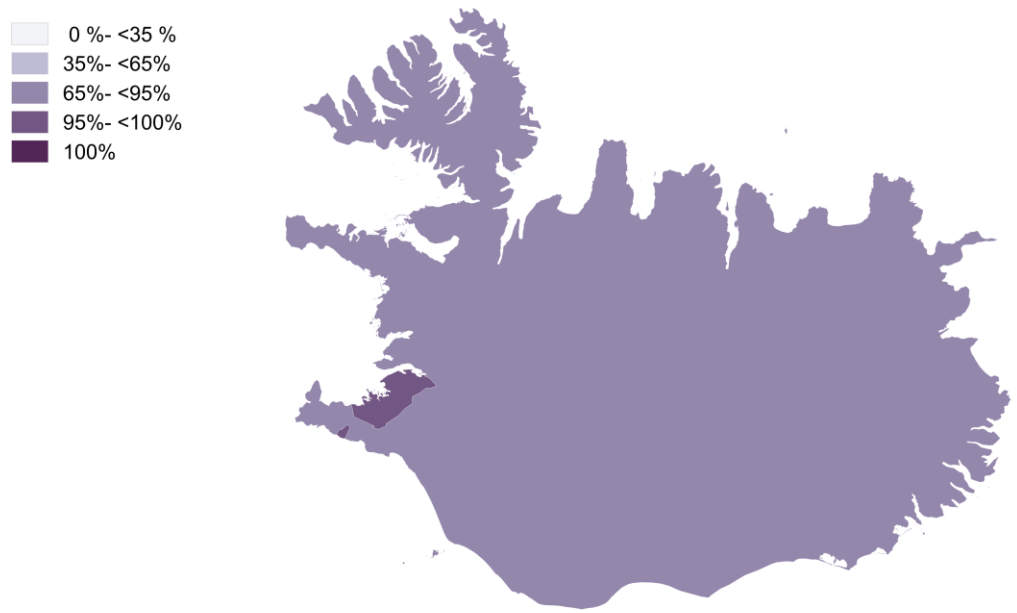
Iceland: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Given the limited reach of cable networks in Iceland, FTTP coverage regional levels mirror closely those of the fixed VHCN (FTTP & DOCSIS 3.1) category.

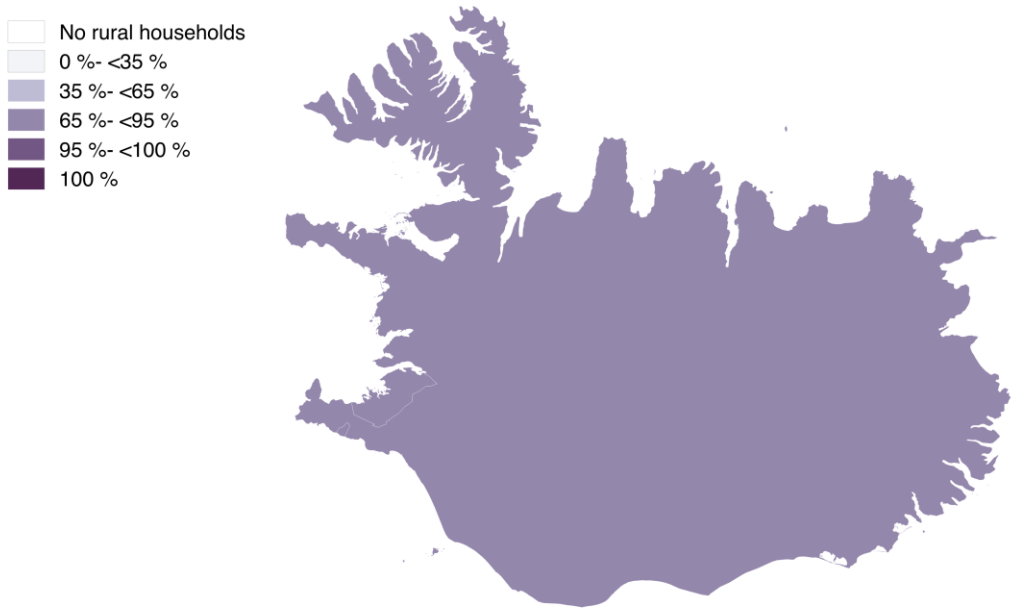
Iceland: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In terms of rural fixed VHCN (FTTP & DOCSIS 3.1) coverage, both Höfudborgarsvædi and Landsbyggd recorded coverage levels below 90%.

Iceland: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.14.3 Data tables for Iceland

Statistic	National
Population	376,248
Persons per household	2.7
Rural proportion	4.3%

	Iceland 2023		Iceland 2022		Iceland 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	90.8%	49.5%	89.0%	48.0%	89.0%	48.9%	79.7%	67.4%
VDSL	90.8%	49.5%	84.1%	7.6%	84.0%	7.6%	52.6%	37.8%
VDSL2 Vectoring	68.6%	1.2%	65.4%	0.8%	64.3%	0.7%	38.7%	22.0%
FTTP	91.0%	83.9%	88.2%	78.7%	87.6%	78.4%	64.0%	52.8%
Cable modem DOCSIS 3.0	3.1%	0.9%	3.1%	0.9%	3.3%	1.0%	41.1%	9.5%
Cable modem DOCSIS 3.1	3.1%	0.9%	3.1%	0.9%	3.3%	1.0%	33.6%	5.3%
FWA	2.0%	19.1%	2.0%	19.1%	2.1%	19.6%	68.5%	59.6%
5G	91.6%	11.8%	41.6%	7.9%	41.0%	6.7%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	-	-	-	-	-	-	50.6%	15.2%
Satellite	0%	0%	0%	0%	0%	0%	99.9%	99.9%
Overall fixed broadband	99.3%	91.7%	99.2%	88.1%	99.2%	88.0%	97.7%	92.2%
Overall NGA broadband	98.9%	91.7%	98.8%	82.3%	98.8%	82.1%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	92.6%	84.3%	89.2%	78.7%	88.7%	78.4%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	99.1%	-	98.8%	-	98.8%	-	93.3%	-
At least 100Mbps	89.3%	-	88.3%	-	88.3%	-	89.0%	-
At least 1Gbps	88.6%	-	85.6%	-	85.6%	-	75.6%	-
At least 1Gbps upload and download	88.6%	-	85.6%	-	*85.6%*	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

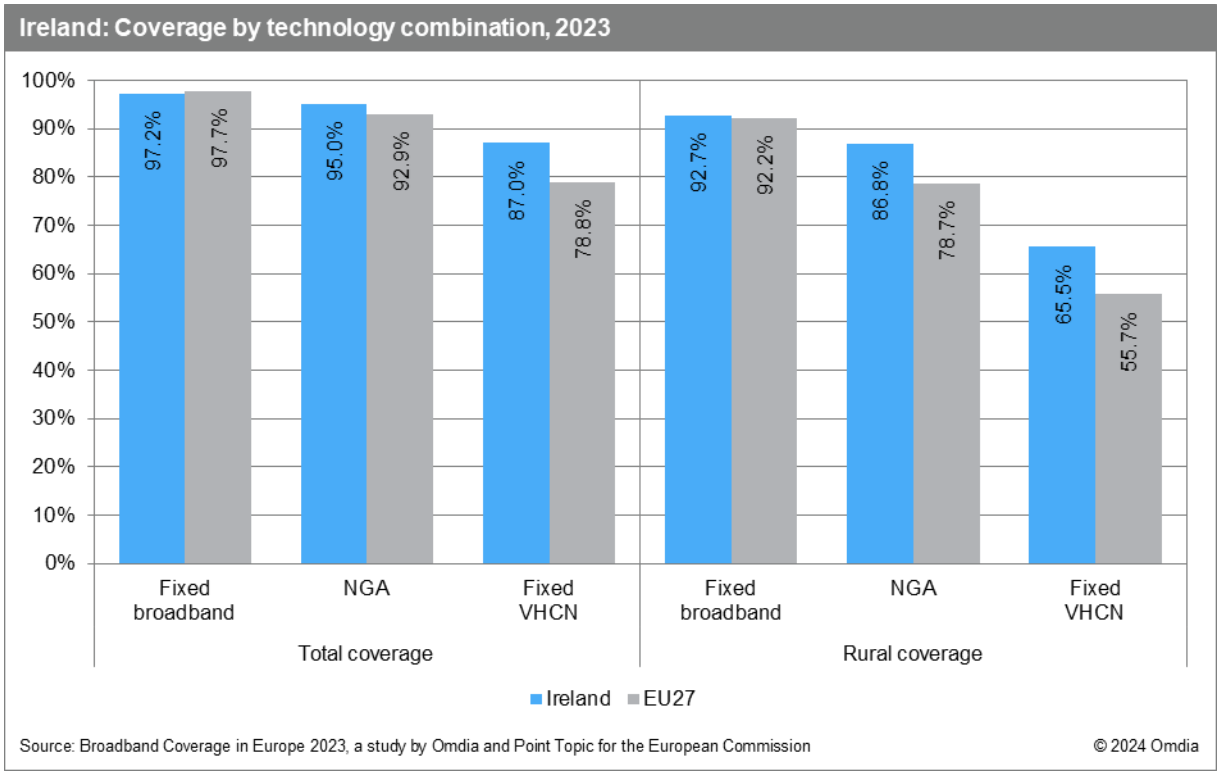
All restatements are highlighted in italics.

5.15 Ireland

5.15.1 National coverage by broadband technology

By the end of June 2023, 97.2% of Irish households had access to at least one fixed broadband network. Rural fixed broadband coverage reached 92.7% of rural households. NGA services were available to 95.0% of all Irish households and 86.8% of rural homes were passed by NGA networks.

Overall fixed VHCN (FTTP & DOCSIS 3.1) coverage reached 87.0% of households at a national level, 8.2 percentage points above the EU average. Due to a steady progression in FTTP rollouts, rural fixed VHCN (FTTP & DOCSIS 3.1) coverage grew by 9.8 percentage points, reaching 65.5% of rural households.



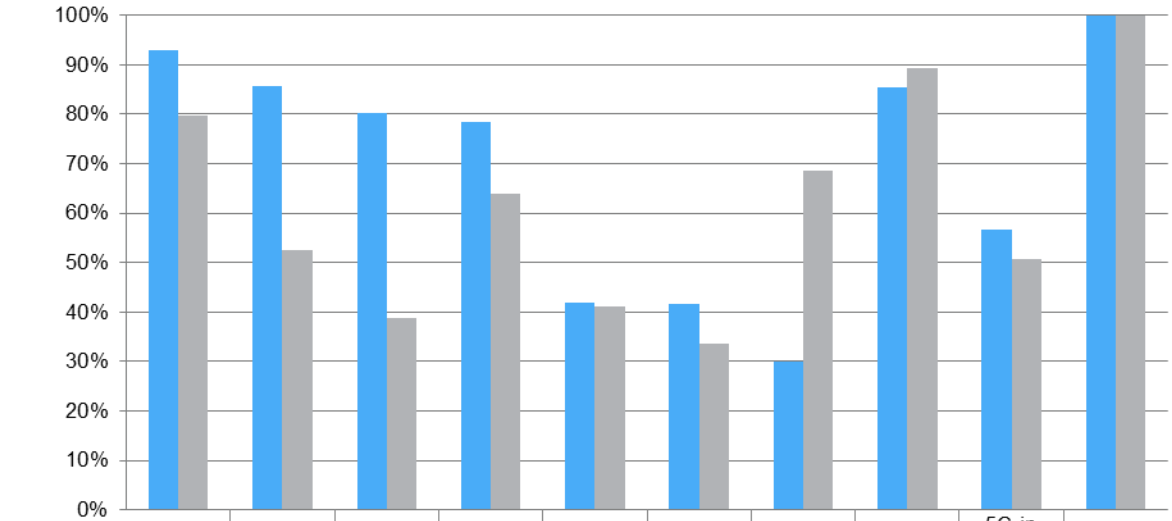
DSL remained the most prevalent fixed broadband technology, reaching 93.0% of households, while FWA was available to just under a third (30.0%) of Irish households. VDSL remains the most common NGA technology, with 85.7% of households covered, unchanged compared to mid-2022. VDSL2 Vectoring was available to 80.2% of Irish households, growing by 12.9 percentage points year-on-year.

However, the incumbent, eir, has begun a process of decommissioning of its legacy copper network as it focuses on FTTP network buildouts and in areas where FTTP networks become available, DSL and VDSL services are switched off.

Cable modem DOCSIS 3.0 coverage remained under a half (41.9%) of households, almost all of which supported DOCSIS 3.1. FTTP again recorded a significant increase in coverage (+6.4p.p.), to reach 78.5% of homes at the end of June 2023. 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, 5G coverage grew only slightly by 1.4 percentage points, hitting 85.3% in June 2023. 5G networks utilizing the 3.4–3.8 GHz frequency band passed 56.7% of Irish households.

Ireland: Coverage by technology, total, 2023

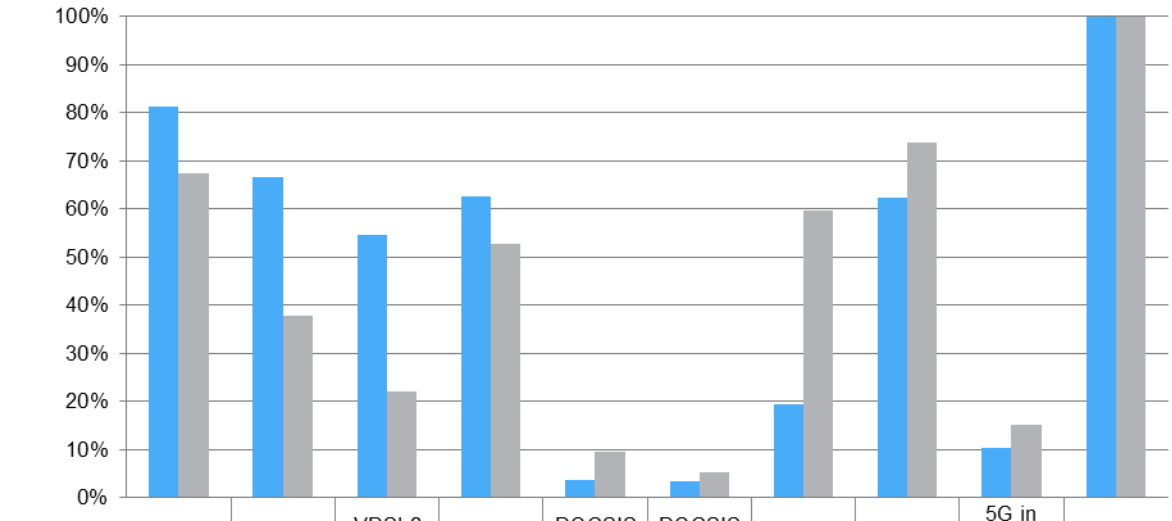


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Ireland	93.0%	85.7%	80.2%	78.5%	41.9%	41.7%	30.0%	85.3%	56.7%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural areas, DSL coverage remained stable, reaching 81.3% of households. VDSL services were available to 66.5% of households. The Irish government's National Broadband Plan continued to lead to significant growth in rural FTTP coverage over the year (+10.0 p.p.), with nearly two thirds (62.7%) of rural homes passed by FTTP networks at the end of June 2023. Rural cable DOCSIS 3.0 coverage remained limited at 3.8%. Rural 5G coverage was below the EU average, at 62.3% compared to 73.7%. 5G coverage in the 3.4–3.8 GHz band was available to 10.5% of rural Irish households.

Ireland: Coverage by technology, rural areas, 2023



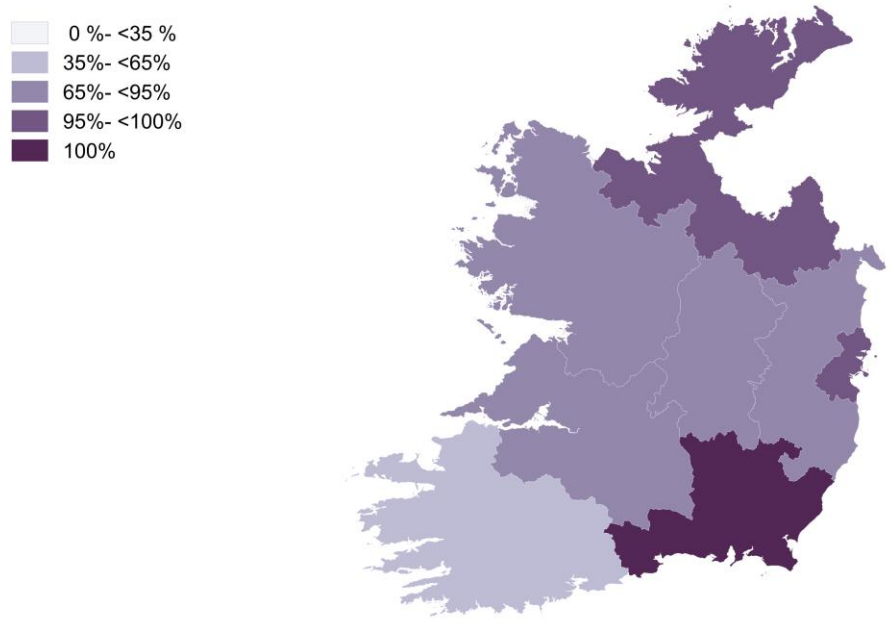
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Ireland	81.3%	66.5%	54.7%	62.7%	3.8%	3.4%	19.4%	62.3%	10.5%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.15.2 Regional coverage by broadband technology

Fixed VHCN (FTTP & DOCSIS 3.1) coverage in Ireland varies across regions, with South East and Dublin having universal and near-universal coverage and South-West Ireland recording the lowest fixed broadband coverage level, at 59.1%.

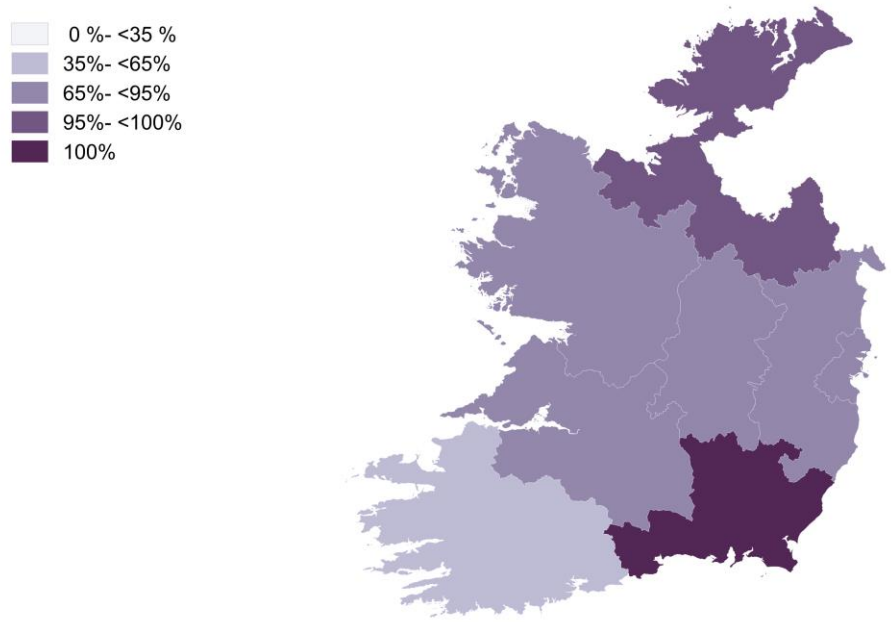
Ireland: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Equally, FTTP coverage also recorded varied regional levels, reaching over 99% coverage the Border and South-East regions and less than 60% coverage in the South-West region.

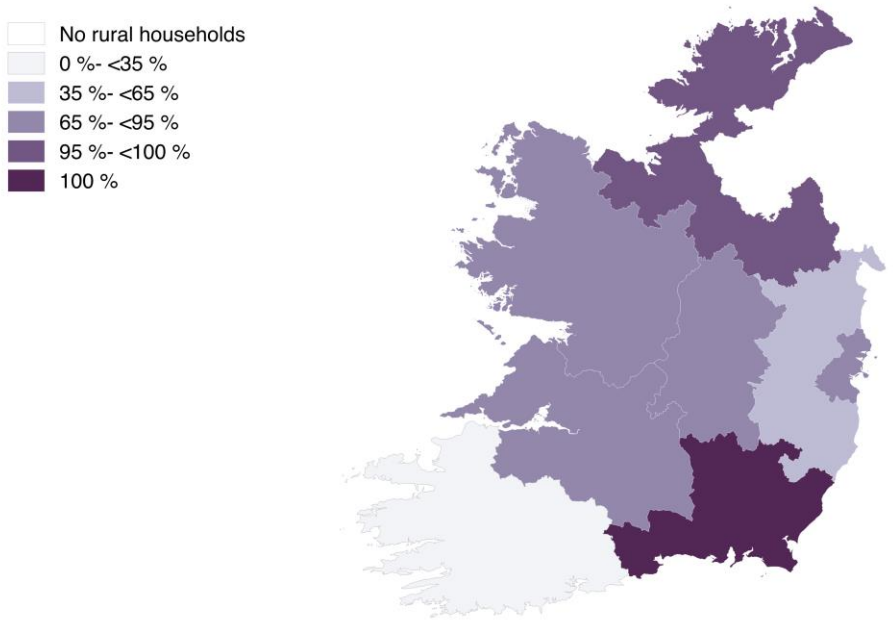
Ireland: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Rural fixed VHCN (FTTP & DOCSIS 3.1) coverage is even more varied than on a total level, with the South-West region recording coverage level below 10%. While in Dublin and South-East regions nearly all rural households had access to gigabit-speed-capable services.

Ireland: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.15.3 Data tables for Ireland

Statistic	National
Population	5,060,004
Persons per household	2.8
Rural proportion	37.7%

	Ireland 2023		Ireland 2022		Ireland 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	93.0%	81.3%	93.0%	92.3%	92.9%	92.3%	79.7%	67.4%
VDSL	85.7%	66.5%	85.7%	86.8%	85.7%	86.8%	52.6%	37.8%
VDSL2 Vectoring	80.2%	54.7%	67.3%	51.8%	64.1%	45.8%	38.7%	22.0%
FTTP	78.5%	62.7%	72.1%	54.3%	62.2%	43.1%	64.0%	52.8%
Cable modem DOCSIS 3.0	41.9%	3.8%	48.6%	3.8%	48.6%	3.8%	41.1%	9.5%
Cable modem DOCSIS 3.1	41.7%	3.4%	48.5%	3.7%	48.5%	3.4%	33.6%	5.3%
FWA	30.0%	19.4%	30.0%	19.4%	30.0%	19.4%	68.5%	59.6%
5G	85.3%	62.3%	83.9%	58.3%	72.1%	36.2%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	56.7%	10.5%	56.0%	8.8%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.2%	92.7%	99.0%	97.3%	97.6%	97.0%	97.7%	92.2%
Overall NGA broadband	95.0%	86.8%	97.8%	94.1%	96.4%	93.5%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	87.0%	65.5%	83.8%	57.2%	78.3%	45.8%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	92.1%	-	92.1%	-	90.1%	-	93.3%	-
At least 100Mbps	91.6%	-	90.7%	-	87.7%	-	89.0%	-
At least 1Gbps	73.2%	-	72.3%	-	67.4%	-	75.6%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

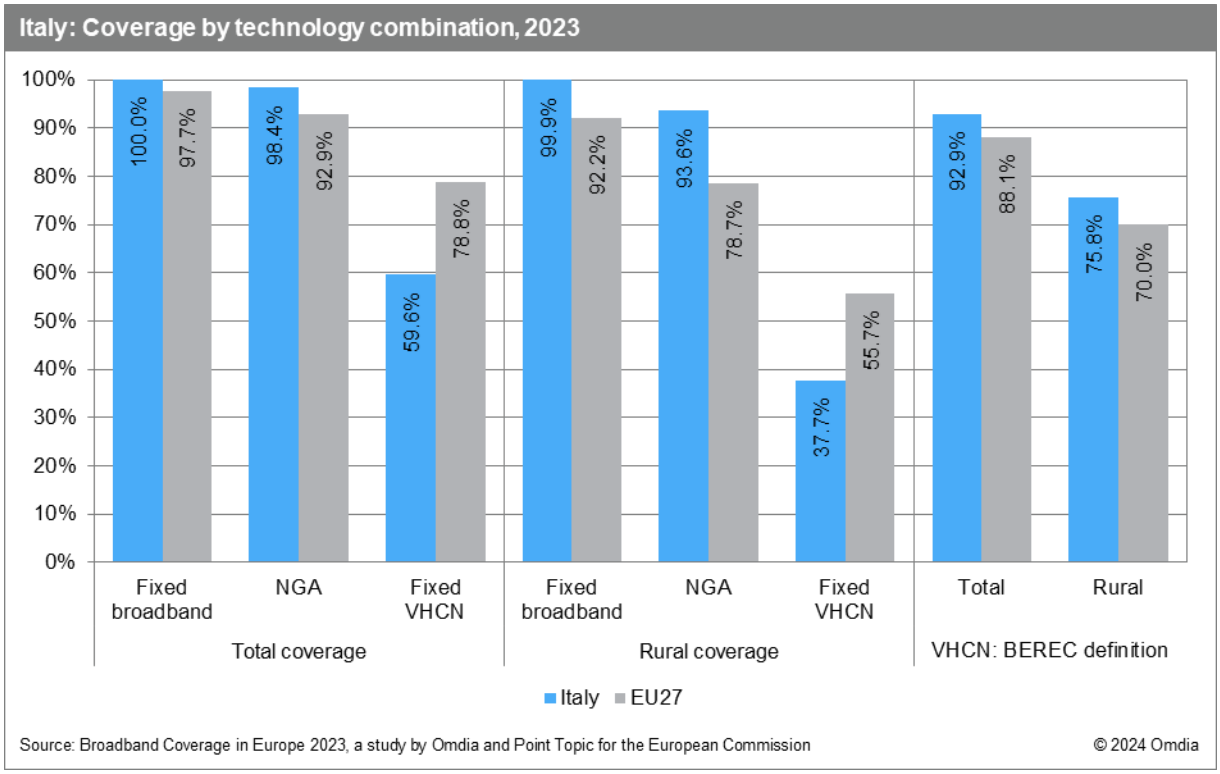
Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

5.16 Italy

5.16.1 National coverage by broadband technology

At the end of June 2023, very nearly all Italian households were covered by at least one fixed broadband network, with the exception of less than 0.1% of rural households to which fixed broadband connectivity was not available. In terms of NGA broadband, high speed broadband services based on NGA technologies were available to 98.4% of Italian households, and to 93.6% of rural Italian households. In both categories (fixed broadband and NGA), Italy recorded coverage levels above the EU average. Fixed Very High Capacity networks, i.e. FTTP & DOCSIS 3.1, passed 59.6% of Italian households at a national level, and 37.7% of rural households. In the absence of cable networks in Italy, this coverage equals FTTP coverage. VHCN coverage as defined by the BEREC rules reached 92.9% of all households and 75.8% of rural households, both categories acceding EU average levels.



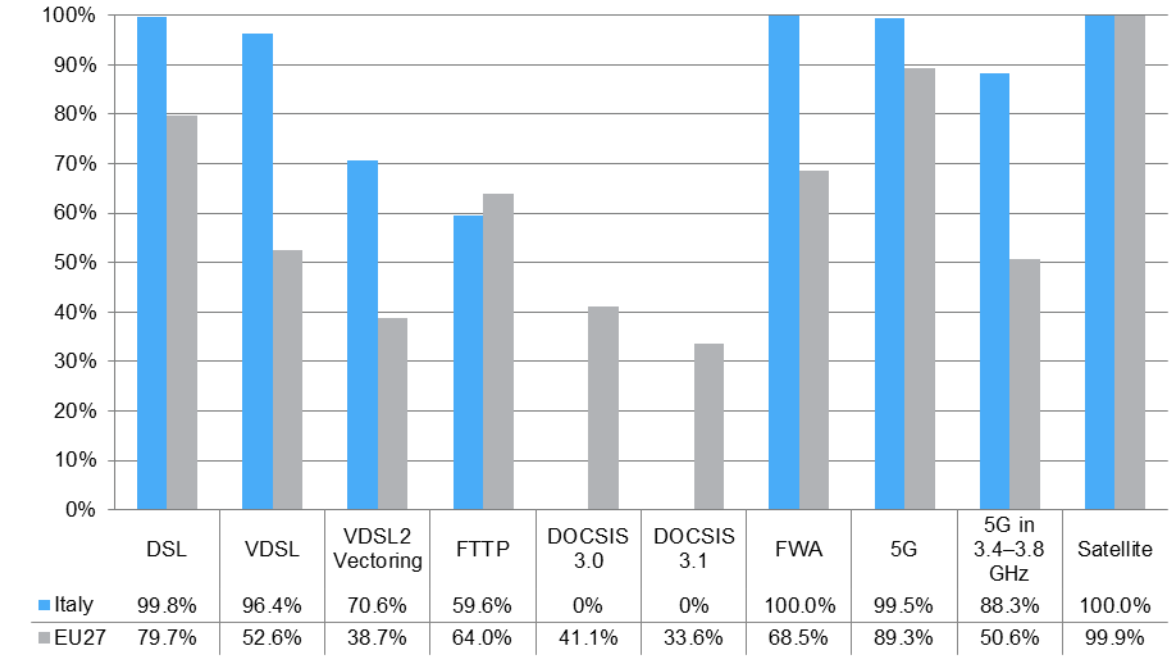
Looking at individual technologies, DSL remained the most widespread broadband technology in Italy, with an almost-universal coverage level (99.8% of households passed). Fixed Wireless Access (FWA) services were available universally across the country.

In terms of NGA broadband technologies, the Italian market remained largely dominated by VDSL, which was available to 96.4% of households, largely unchanged since mid-2022. 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 2023, these services were available to 70.6% of Italian households, again largely unchanged compared to previous year's study.

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 9.5 percentage points over the study period, reaching 59.6% of households. Despite this increase, FTTP coverage in Italy remained below the EU average of 64.0%.

In terms of mobile broadband coverage, 5G services were available to 99.5% of households. In terms of 5G coverage in the 3.4–3.8 GHz frequency band, Italy ranked second (behind Finland) with 88.3% homes passed.

Italy: Coverage by technology, total, 2023



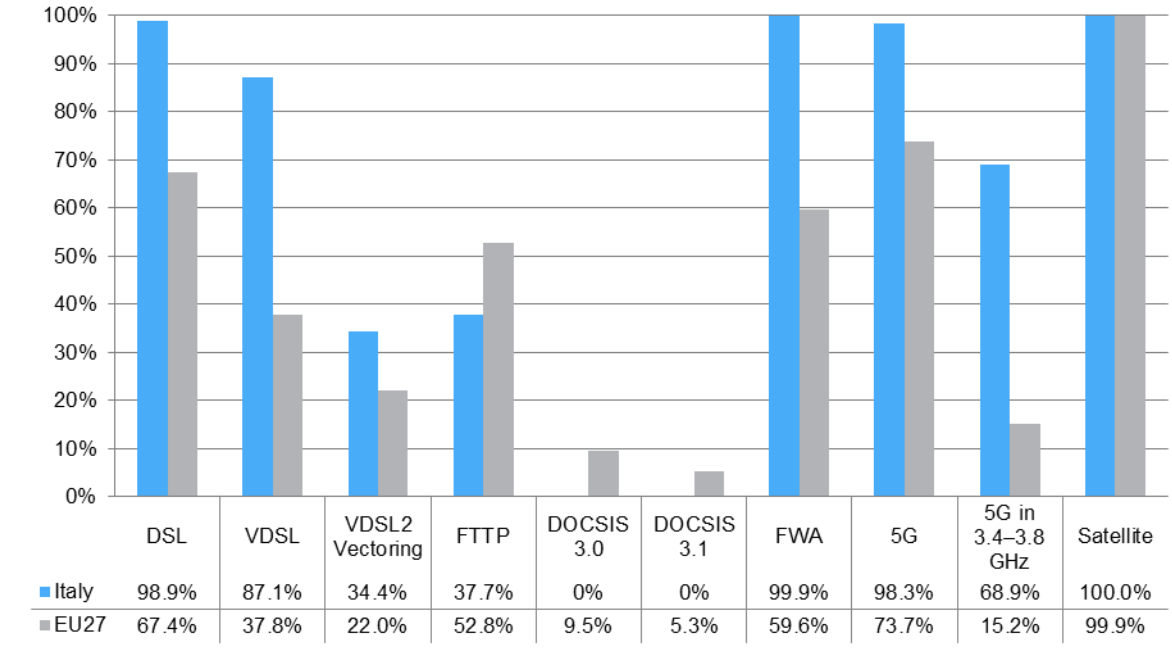
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Italy	99.8%	96.4%	70.6%	59.6%	0%	0%	100.0%	99.5%	88.3%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural areas, DSL remained the key technology providing fixed broadband access. At the end of June 2023, DSL was available to 98.9% of rural households, whereas FWA was accessible to 99.9% of rural households. VDSL remains the leading rural NGA technology reaching 87.1% of rural households, while VDSL2 Vectoring was available to 34.4% of rural households. Rural FTTP coverage increased by 11.3 percentage points over the study period. Yet, despite this increase rural FTTP coverage remained well below the EU average, with 37.7% of rural Italian homes passed.

Rural 5G coverage reached 98.3% of rural homes and more than two thirds (68.9%) of rural Italian households had access to 5G services utilizing the 3.4–3.8 GHz frequency band.

Italy: Coverage by technology, rural areas, 2023



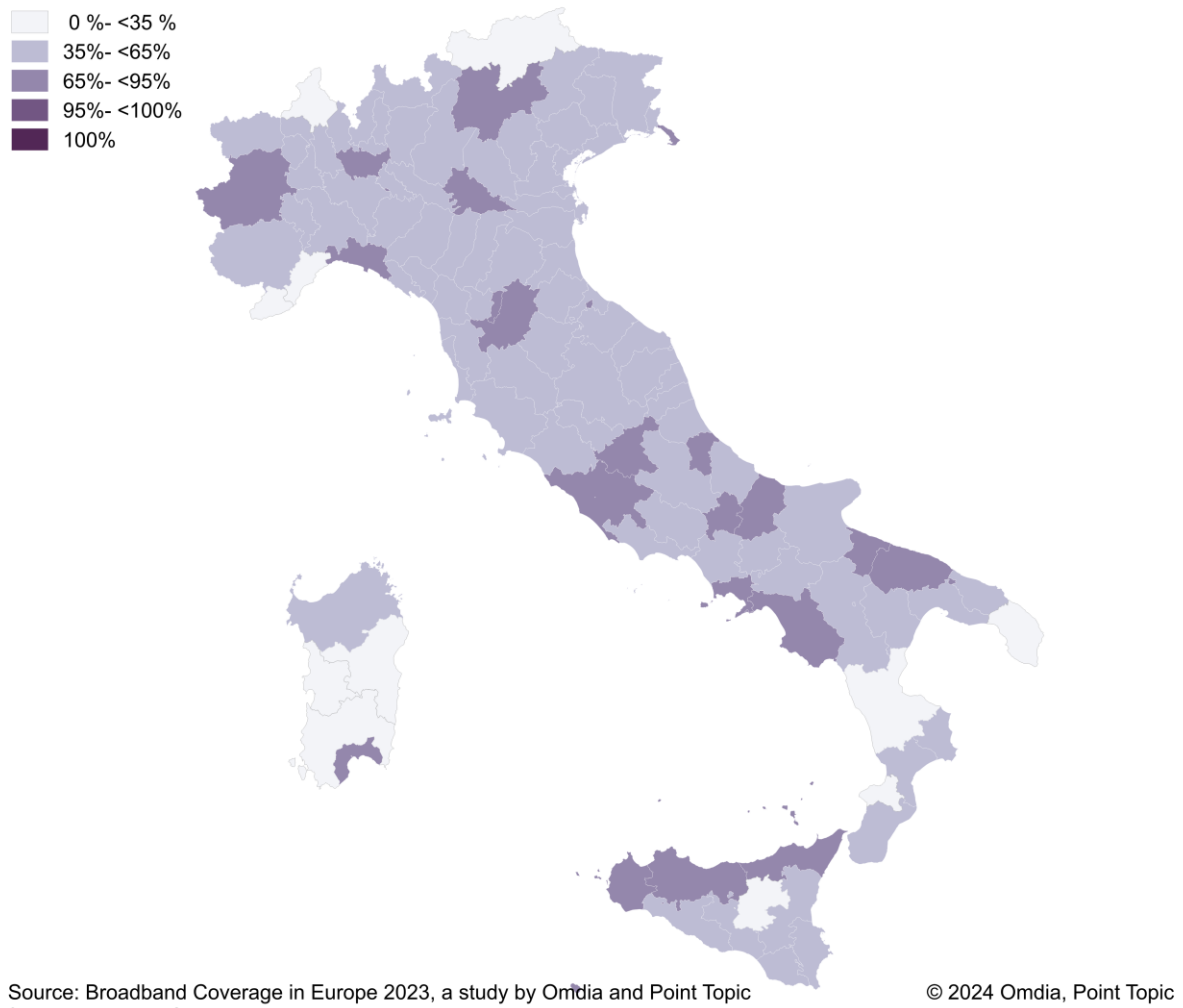
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Italy	98.9%	87.1%	34.4%	37.7%	0%	0%	99.9%	98.3%	68.9%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.16.2 Regional coverage by broadband technology

Looking at Italian regions, 21 regions (out of 108) scored higher than 65% fixed VHCN (FTTP & DOCSIS 3.1) coverage– an increase compared to just 13 regions in mid-2022. Most regions recorded coverage between 35–65%, but in 11 regions (particularly on the island of Sardinia) the low coverage of FTTP and absence of any cable networks meant that coverage remained below 35%.

Italy: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

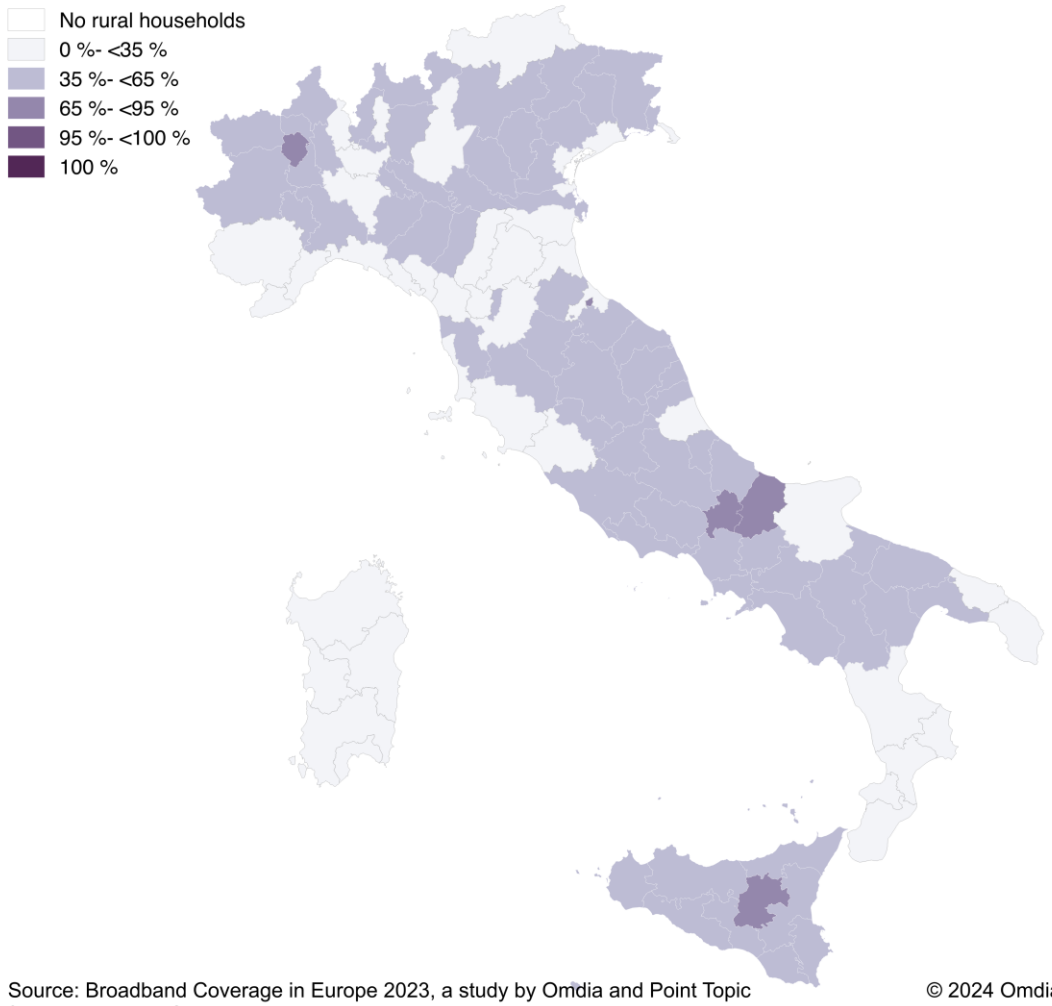


Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Since there are no DOCSIS 3.1 services in Italy, the FTTP coverage is identical to fixed VHCN (FTTP & DOCSIS 3.1) coverage category.

Rural fibre coverage improved considerably compared to mid-2022 and while at the end of June 2022 rural fixed VHCN coverage was below 35% in most Italian regions, in mid-2023 most regions recorded rural coverage levels higher than 35%.

Italy: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.16.3 Data tables for Italy

Statistic	National
Population	59,030,133
Persons per household	2.5
Rural proportion	12.3%

	Italy 2023		Italy 2022		Italy 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.8%	98.9%	99.8%	98.8%	99.8%	98.9%	79.7%	67.4%
VDSL	96.4%	87.1%	96.2%	86.8%	96.0%	85.7%	52.6%	37.8%
VDSL2 Vectoring	70.6%	34.4%	70.1%	33.9%	68.3%	28.0%	38.7%	22.0%
FTTP	59.6%	37.7%	53.7%	26.0%	44.2%	17.3%	64.0%	52.8%
Cable modem DOCSIS 3.0	0%	0%	0%	0%	0%	0%	41.1%	9.5%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	33.6%	5.3%
FWA	100.0%	99.9%	97.4%	96.8%	97.3%	97.2%	68.5%	59.6%
5G	99.5%	98.3%	99.7%	99.8%	99.7%	99.8%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	88.3%	68.9%	80.3%	53.3%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	100.0%	99.9%	99.8%	99.4%	99.8%	99.1%	97.7%	92.2%
Overall NGA broadband	98.4%	93.6%	97.6%	91.1%	97.0%	88.4%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	59.6%	37.7%	53.7%	26.0%	44.2%	17.3%	78.8%	55.7%
VHCN (as defined by BEREC)	92.9%	75.8%	-	-	-	-	88.1%	70.0%
At least 30Mbps	94.2%	-	92.3%	-	90.6%	-	93.3%	-
At least 100Mbps	87.1%	-	82.8%	-	77.6%	-	89.0%	-
At least 1Gbps	59.6%	-	53.5%	-	44.2%	-	75.6%	-
At least 1Gbps upload and download	59.6%	-	53.5%	-	*44.2%*	-	-	-

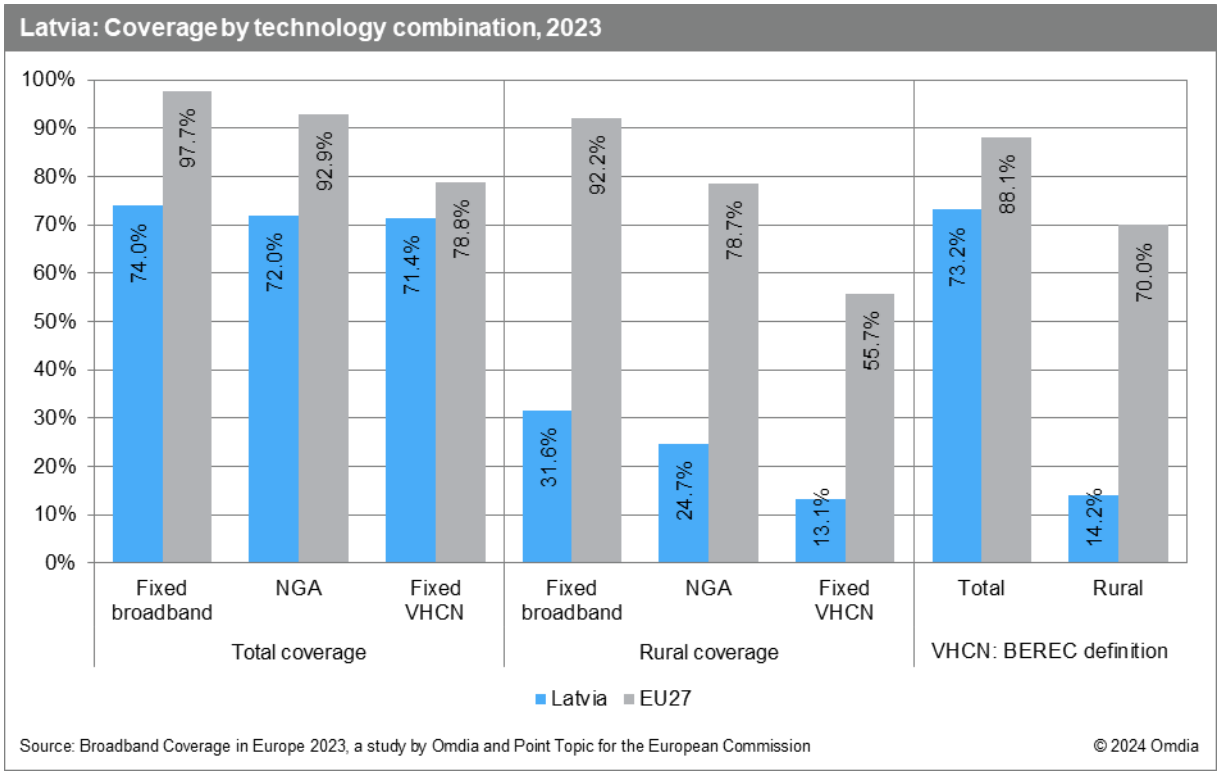
Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

5.17 Latvia

5.17.1 National coverage by broadband technology

By the end of June 2023, overall fixed broadband coverage in Latvia had reached 81.1% at a national level, and at 31.6% at a rural level, both below the EU average. The country also fell behind the EU average in terms of NGA broadband availability. NGA broadband was accessible to 72.0% of households at a national level, compared with the EU average of 92.9%, and 24.7% of rural households, 54 percentage points below the EU average of 78.7%. Overall fixed VHCN (FTTP & DOCSIS 3.1) availability at national level reached 71.4% of Latvian households, also lower than the EU average of 78.8%. Meanwhile rural fixed VHCN coverage reached 13.1% of rural Latvian households – more than four times fewer than the EU average for rural fixed VHCN (FTTP & DOCSIS 3.1) availability. In terms of coverage of BEREC-defined VHCN coverage, 73.2% of Latvian households were passed at a national level and 14.2% at a rural level.

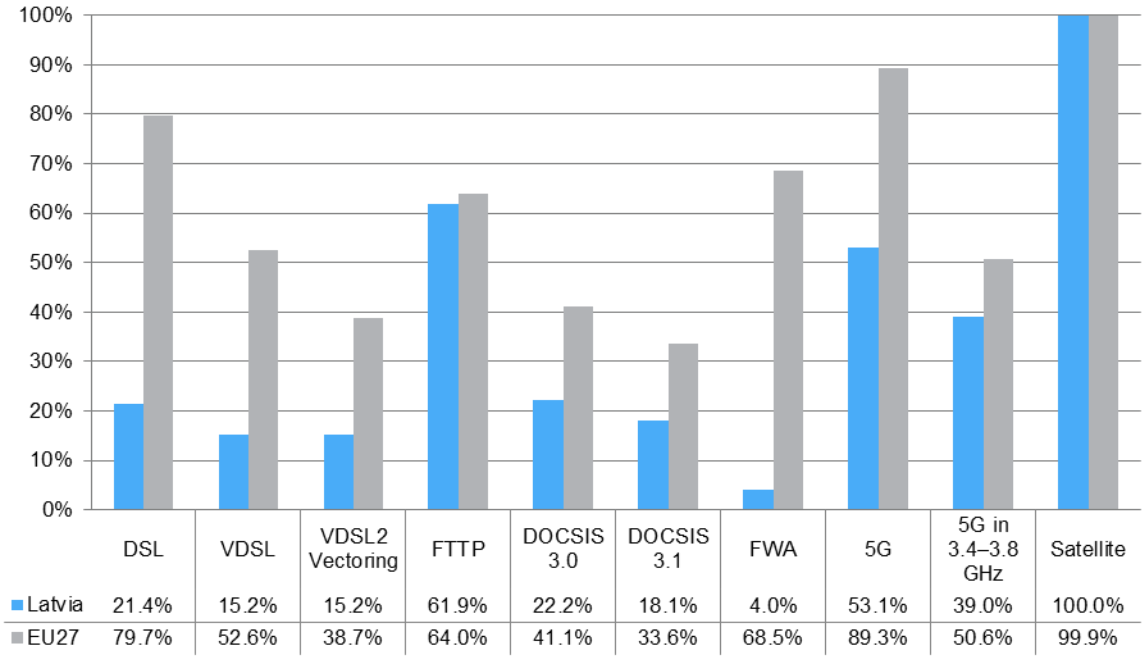


Looking at individual technologies, with only 21.4% of households having access to DSL broadband services, Latvia remained the study country having the lowest DSL availability. VDSL coverage reached 15.2% of households at the end of June 2023 and all VDSL networks in Latvia are enabled with VDSL2 Vectoring. FWA networks had a limited reach, covering just 4.0% of households.

FTTP services were available to 61.9% of all households, for the first time below the EU average, which stood at 64.0%. 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, so that just 22.2% of Latvian households had access to DOCSIS 3.0, while DOCSIS 3.1 was available to 18.1% as of mid-2023.

Within the mobile broadband category, commercial 5G services reached more than half (53.1%) of Latvian households with all spectrum bands and 39.0% were passed by 5G networks utilising the 3.4–3.8 GHz frequency band.

Latvia: Coverage by technology, total, 2023

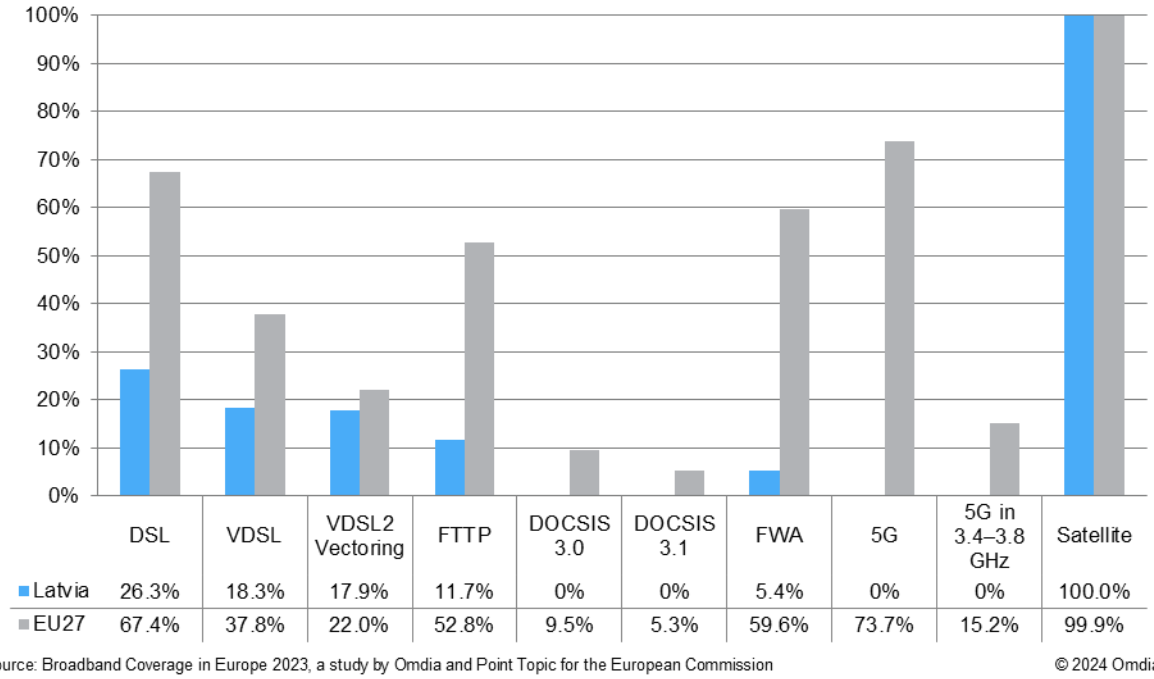


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Latvia	21.4%	15.2%	15.2%	61.9%	22.2%	18.1%	4.0%	53.1%	39.0%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

There were 26.3% of rural homes covered by DSL networks at the end of June 2023, including 18.3% covered by VDSL and 17.9% by VDSL2 Vectoring. Meanwhile FWA was available to 5.4% of rural households. FTTP services were available to 11.7% rural households, significantly below the EU average of 52.8%. Meanwhile, both cable modem DOCSIS 3.0 and DOCSIS 3.1 remained absent from Latvia's rural areas. By mid-2023, 5G networks roll-out continued to be limited to urban areas only.

Latvia: Coverage by technology, rural areas, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Latvia	26.3%	18.3%	17.9%	11.7%	0%	0%	5.4%	0%	0%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.17.2 Regional coverage by broadband technology

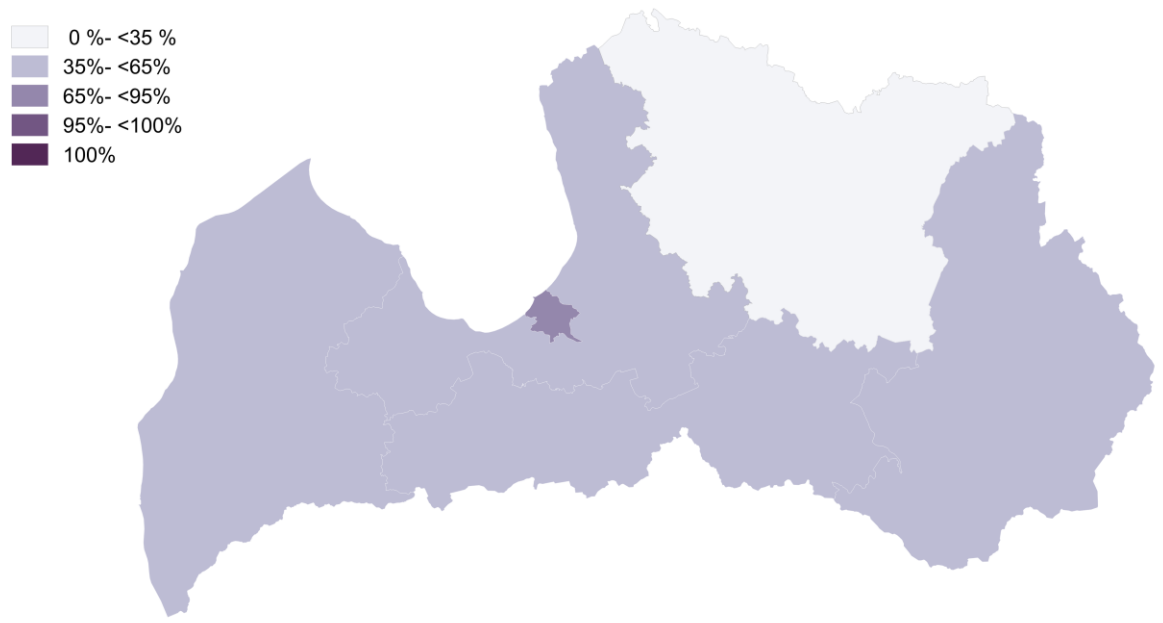
Fixed VHCN (FTTP & DOCSIS 3.1) coverage levels varied across the individual region from 32.0% of homes in the Vidzeme region being passed by the gigabit-speed-capable networks to nearly universal coverage in the capital region, Rīga.

Latvia: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Since cable broadband coverage remains limited in Latvia, regional FTTP coverage shows similar regional pattern to the fixed VHCN (FTTP & DOCSIS 3.1) coverage.

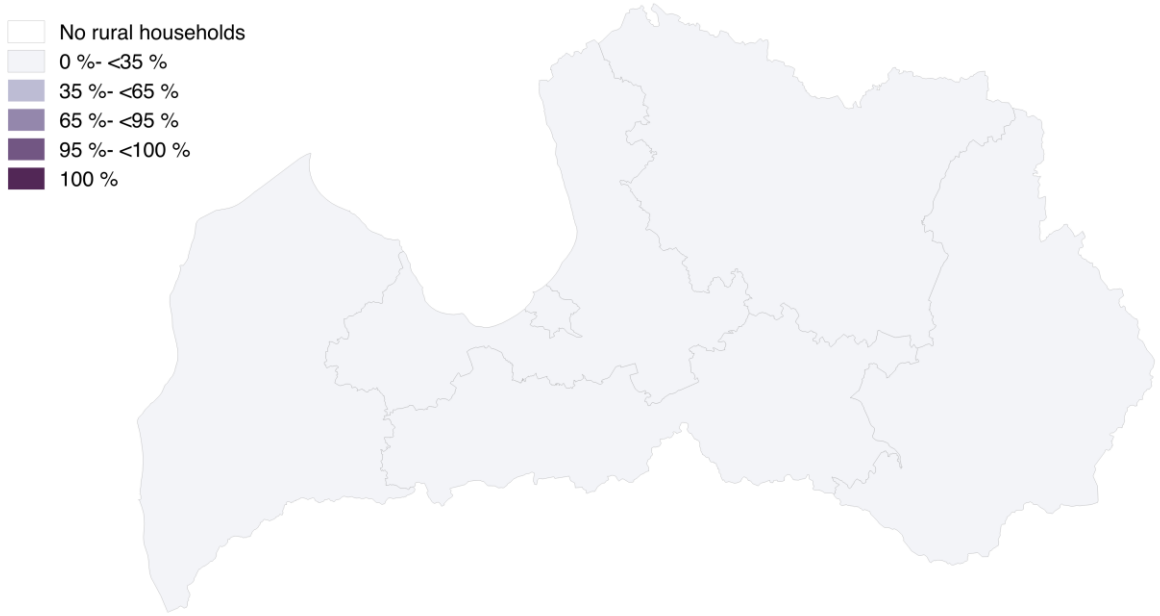
Latvia: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Given the limited reach of FTTP networks in Latvia's rural areas, none of the regions recorded fixed VHCN (FTTP & DOCSIS 3.1) coverage levels higher than 35.0%.

Latvia: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.17.3 Data tables for Latvia

Statistic	National
Population	1,875,757
Persons per household	2.6
Rural proportion	25.8%

	Latvia 2023		Latvia 2022		Latvia 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	21.4%	26.3%	*21.4%*	*26.7%*	*21.6%*	*26.9%*	79.7%	67.4%
VDSL	15.2%	18.3%	*16.5%*	*19.8%*	*14.2%*	*17.0%*	52.6%	37.8%
VDSL2 Vectoring	15.2%	17.9%	*16.5%*	*19.8%*	*14.1%*	*17.0%*	38.7%	22.0%
FTTP	61.9%	11.7%	*60.9%*	*11.2%*	*60.7%*	*11.0%*	64.0%	52.8%
Cable modem DOCSIS 3.0	22.2%	0%	*22.3%*	0%	*22.5%*	0%	41.1%	9.5%
Cable modem DOCSIS 3.1	18.1%	0%	*18.2%*	0%	*18.4%*	0%	33.6%	5.3%
FWA	4.0%	5.4%	*3.9%*	*5.4%*	*3.9%*	*5.4%*	68.5%	59.6%
5G	53.1%	0%	42.0%	0%	0%	0%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	39.0%	0%	20.6%	0%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	74.0%	31.6%	*73.0%*	*35.0%*	*72.9%*	*35.1%*	97.7%	92.2%
Overall NGA broadband	72.0%	24.7%	*69.3%*	*25.4%*	*68.1%*	*22.5%*	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	71.4%	13.1%	*62.7%*	*11.2%*	*62.5%*	*11.0%*	78.8%	55.7%
VHCN (as defined by BEREC)	73.2%	14.2%	-	-	-	-	88.1%	70.0%
At least 30Mbps	68.3%	-	*67.6%*	-	*66.7%*	-	93.3%	-
At least 100Mbps	63.6%	-	*62.6%*	-	*62.4%*	-	89.0%	-
At least 1Gbps	0.0%	-	*0%*	-	*0%*	-	75.6%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

In 2023, the Latvian NRA, SPRK, began providing data on fixed broadband coverage. SPRK calculated coverage based on data collected from internet service providers regarding the availability of fixed broadband internet access at the address level (the first data collection was in 2023). The data collection revealed that previous reports had overstated coverage levels, as they were based on data provided by the incumbent and other institutions. As a result, a decision was made to restate all previous years' values.

All restatements are highlighted in italics.

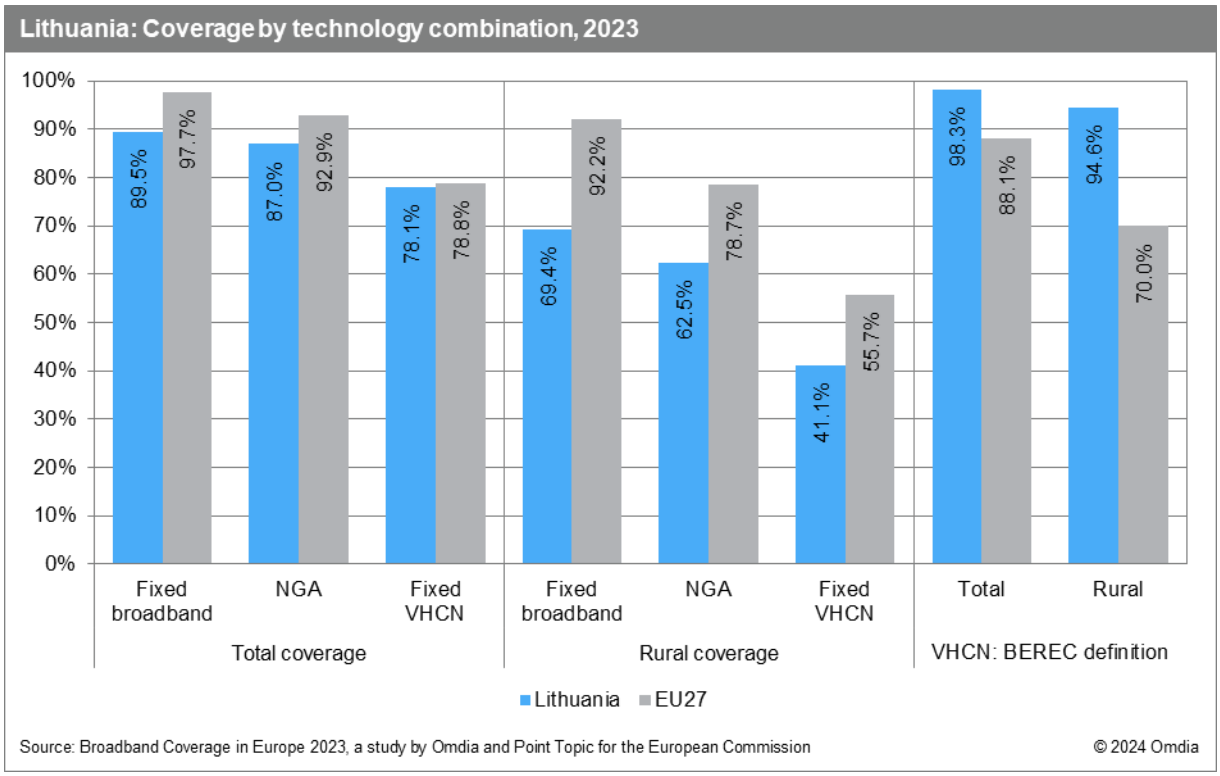
5.18 Lithuania

5.18.1 National coverage by broadband technology

Overall fixed broadband in Lithuania reached 89.5% of Lithuanian households at a national level, and 69.4% of households at a rural level at the end of June 2023, 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-2023, 87.0% of homes were passed by at least one NGA network, while 62.5% of rural households had access to high-speed broadband services.

Fixed VHCN (FTTP & DOCSIS 3.1) coverage remained stable with over three quarters (78.1%) of households covered by networks capable of delivering gigabit speeds owing to the country's widely deployed FTTP network. However, as fibre deployments progress in many study countries, Lithuania's fixed VHCN (FTTP & DOCSIS 3.1) coverage levels fell just below the EU average for the first time.

In terms of the BEREC-defined VHCN coverage, other networks in Lithuania met the required criteria, meaning that 98.3% of Lithuanian households were reported to be covered at a national level and 94.6% at a rural level.

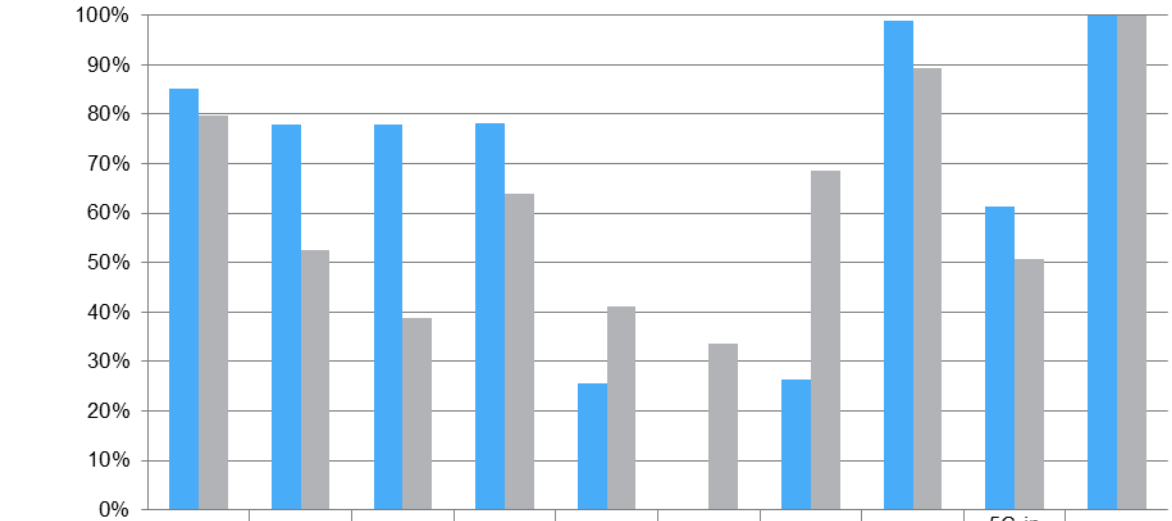


Among the individual broadband technologies, DSL remained the most prevalent, being available to 85.2% of Lithuanian households. Meanwhile FTTP remained by far the dominant NGA technology in Lithuania, with 78.1% of homes passed at the end of June 2023, well ahead of the EU average. More than 50 service providers offered FWA services in June 2023, but the total coverage was limited to 26.3% of households nationwide.

VDSL coverage remained stable in the twelve months to mid-2023 and reached 78.0% of households at the end of June 2023. VDSL2 Vectoring has been deployed across the whole VDSL footprint. No new cable modem DOCSIS 3.0 deployments were recorded and given the increase in the number of total households, the proportionate DOCSIS 3.0 coverage decreased by 0.9 percentage point, with services available to 25.6% of Lithuanian households. As in previous years, DOCSIS 3.1 has not been deployed in Lithuania, yet.

Regarding mobile broadband, commercial 5G services grew by 8.8 p.p. year on year with 98.9% of households covered by mid-2023. Nearly two thirds (61.4%) of homes were passed by 5G networks utilising the 3.4–3.8 GHz frequency band after recording a 25.6 p.p. growth compared to mid-2022.

Lithuania: Coverage by technology, total, 2023



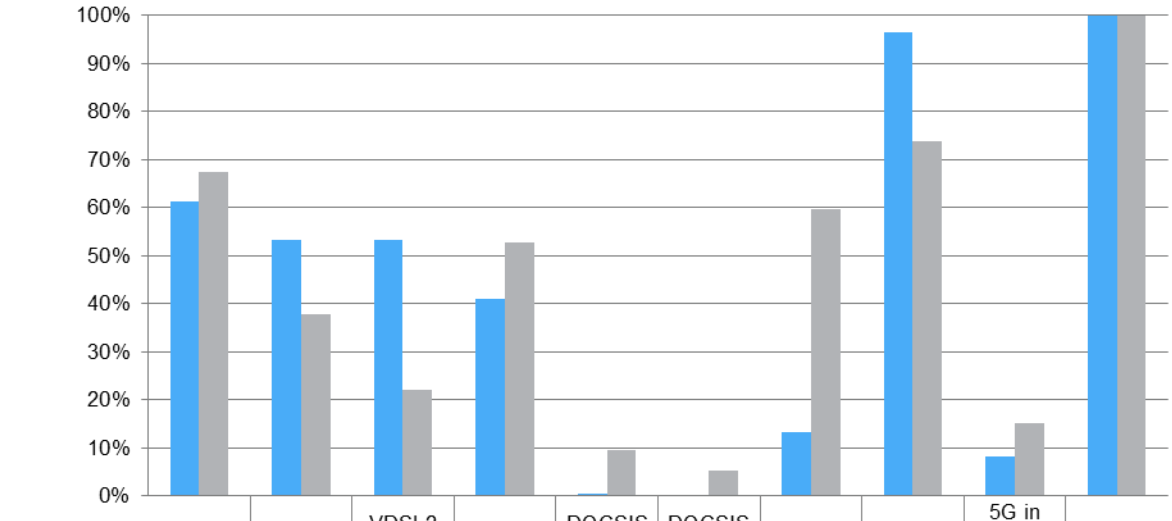
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Lithuania	85.2%	78.0%	78.0%	78.1%	25.6%	0%	26.3%	98.9%	61.4%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Within Lithuania's rural areas, DSL remained the most widely available technology over the study period, although the technology was available to just 61.4% of the country's rural households. VDSL and VDSL 2 Vectoring are now the leading rural NGA technologies, covering 53.3% of rural households, followed by FTTP with 41.1% of households covered. Cable DOCSIS 3.0 coverage in rural areas remained minimal, passing just 0.5% of rural households at the end of June 2023. Rural FWA coverage was well below the EU average, at 13.4% of households.

By mid-2023, 96.4% of rural homes were passed by 5G networks. Yet only 8.2% of rural households had access to 5G in the 3.4–3.8 GHz band.

Lithuania: Coverage by technology, rural areas, 2023



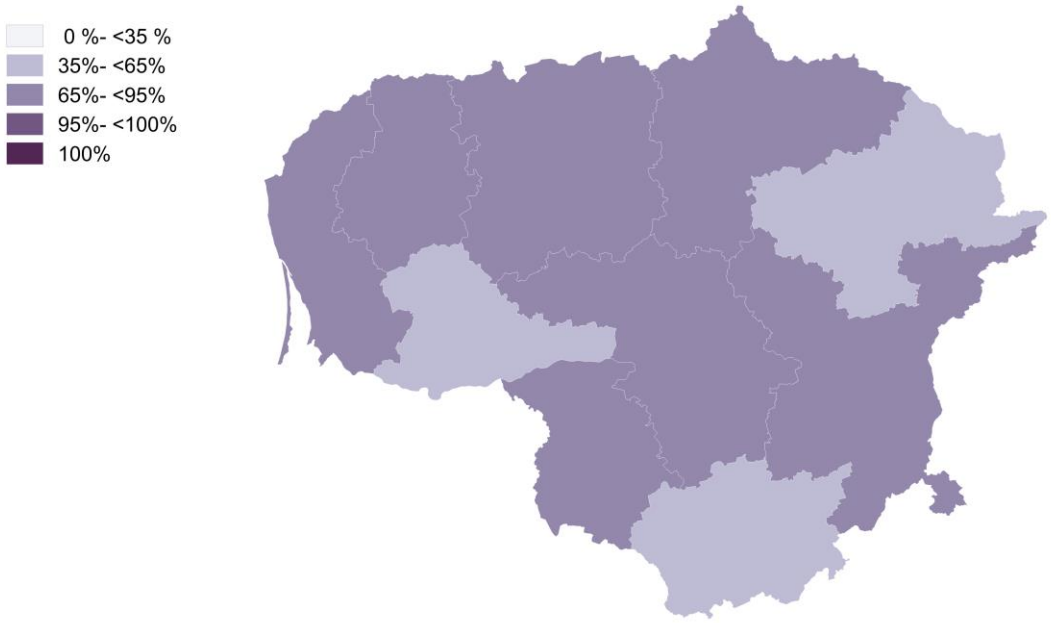
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Lithuania	61.4%	53.3%	53.3%	41.1%	0.5%	0%	13.4%	96.4%	8.2%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.18.2 Regional coverage by broadband technology

There is significant variation in the fixed VHCN (FTTP & DOCSIS 3.1) coverage among the different regions of Lithuania. Coverage was the lowest in the Utenos county with 58.6% of homes covered, and highest in the capital Vilniaus, Kauno and Klaipedas counties, with 84% and more of households covered in each.

Lithuania: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

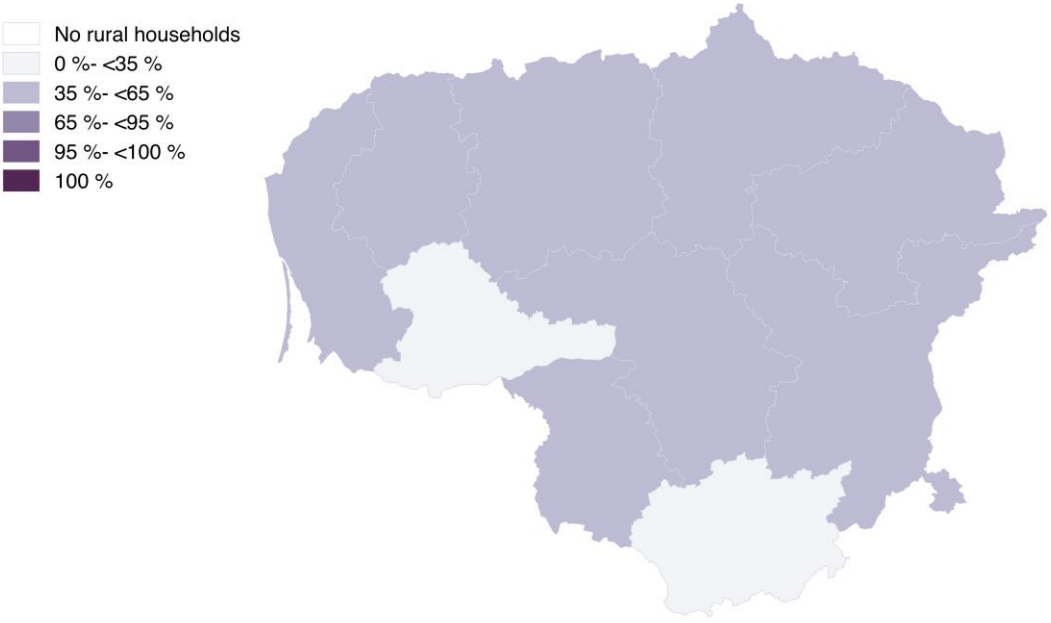


Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Since there are no DOCSIS 3.1 services in Lithuania, the FTTP coverage is identical to the fixed VHCN (FTTP & DOCSIS 3.1) coverage category.

Rural fixed VHCN (FTTP & DOCSIS 3.1) coverage is limited to coverage of FTTP networks which ranged from fewer than 32% of rural households in the Alytaus and Utenos counties to more than a half of rural households in the Kauno county.

Lithuania: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.18.3 Data tables for Lithuania

Statistic	National
Population	2,805,998
Persons per household	2.6
Rural proportion	31.3%

	Lithuania 2023		Lithuania 2022		Lithuania 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	85.2%	61.4%	85.2%	61.3%	85.5%	62.6%	79.7%	67.4%
VDSL	78.0%	53.3%	77.7%	52.6%	40.1%	38.5%	52.6%	37.8%
VDSL2 Vectoring	78.0%	53.3%	77.7%	52.6%	0%	0%	38.7%	22.0%
FTTP	78.1%	41.1%	78.0%	39.5%	78.2%	37.5%	64.0%	52.8%
Cable modem DOCSIS 3.0	25.6%	0.5%	26.5%	0.5%	27.1%	0.5%	41.1%	9.5%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	33.6%	5.3%
FWA	26.3%	13.4%	14.7%	6.9%	0%	0%	68.5%	59.6%
5G	98.9%	96.4%	90.1%	75.6%	33.3%	0.8%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	61.4%	8.2%	35.9%	5.6%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	89.5%	69.4%	89.2%	68.4%	88.8%	64.0%	97.7%	92.2%
Overall NGA broadband	87.0%	62.5%	86.9%	62.1%	84.8%	51.8%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	78.1%	41.1%	78.0%	39.5%	78.2%	37.1%	78.8%	55.7%
VHCN (as defined by BEREC)	98.3%	94.6%	-	-	-	-	88.1%	70.0%
At least 30Mbps	86.9%	-	86.7%	-	84.6%	-	93.3%	-
At least 100Mbps	86.9%	-	86.7%	-	78.1%	-	89.0%	-
At least 1Gbps	78.0%	-	77.8%	-	*78.0%*	-	75.6%	-
At least 1Gbps upload and download	78.0%	-	77.8%	-	*78.0%*	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

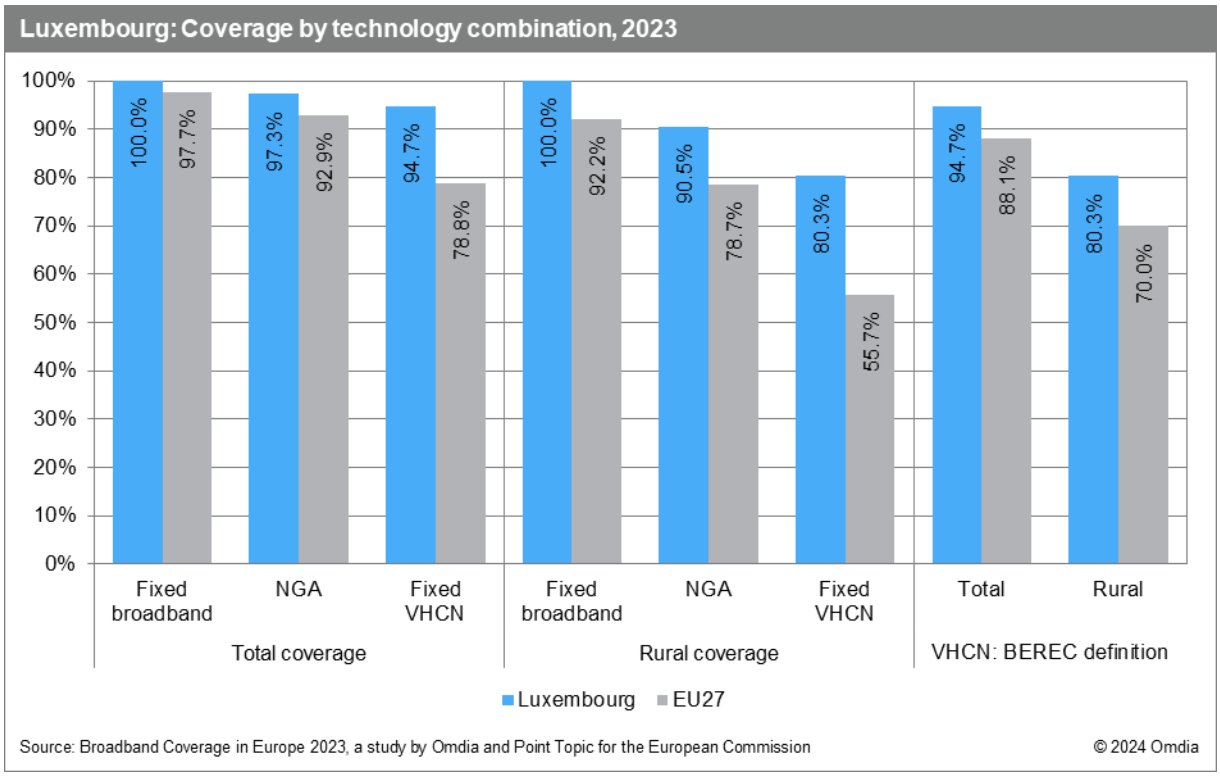
5.19 Luxembourg

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 2023, fixed VHCN, i.e. FTTP & DOCSIS 3.1 networks, passed 94.7% of all Luxembourg homes and 80.3% 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.

BEREC-defined VHCN coverage at national and rural level was reported equal to the fixed VHCN (FTTP & DOCSIS 3.1) category, indicating that these are the only technologies in Luxembourg which conform to the BEREC definition of VHCN.

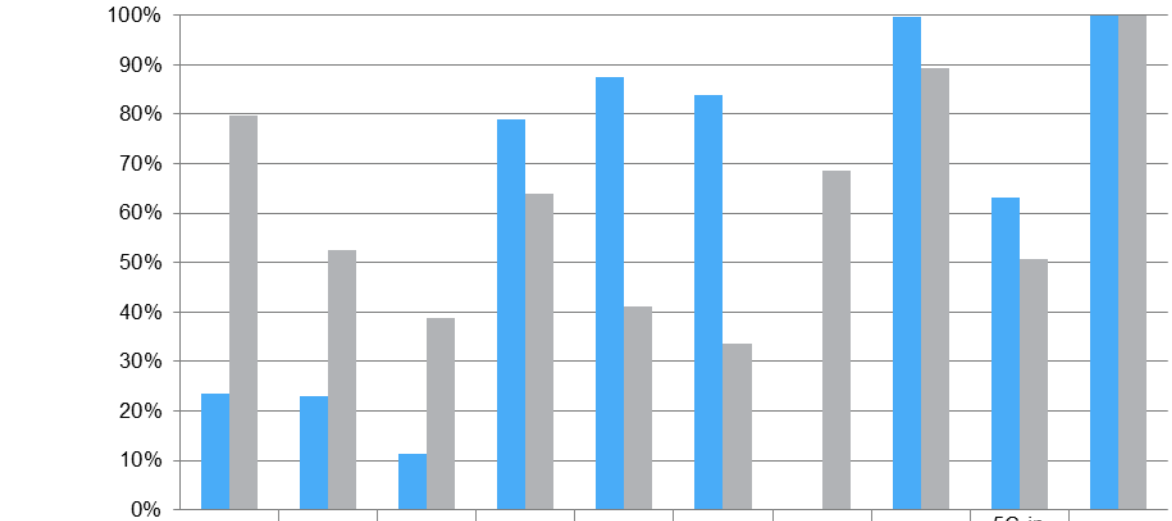


Looking at individual technologies, FTTP coverage continued to improve and gained 2.7 points of coverage. As a result, 78.9% of Luxembourg households had access to FTTP broadband services at the end of June 2023. As was the case in previous years, cable remained the most prevalent NGA technology, accessible to 87.6% of Luxembourgish households, with 96% of this coverage using DOCSIS 3.1.

DSL and VDSL switch-offs accelerated in 2023 with DSL coverage dropping by 36.1 percentage points, down to just 23.6% of households, the second-lowest in this year's study, after Latvia. VDSL recorded a 31.5 percentage point decrease in coverage with VDSL services available to 23.0% of households. In addition, 11.3% of households had access to services running on VDSL2 Vectoring and capable of delivering at least 100Mbps download speeds.

Commercial 5G services were launched by all three network operators in late 2020, and by mid-2023 coverage had reached 99.6% of households, ahead of the EU average (89.3%). 5G services using the 3.4–3.8 GHz band were available to 63.1% of households, up by 11.8 p.p. since 2022.

Luxembourg: Coverage by technology, total, 2023

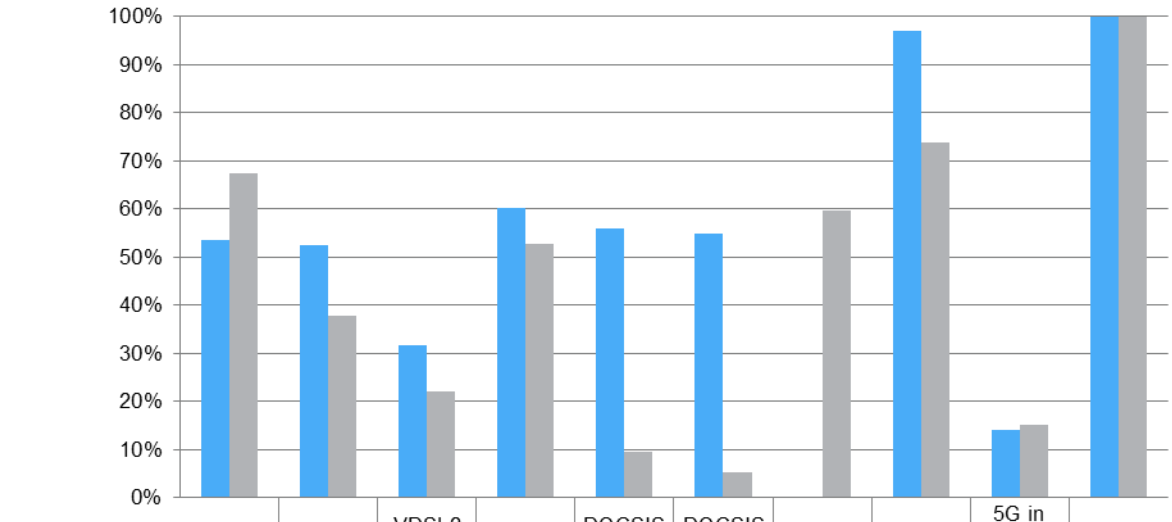


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Luxembourg	23.6%	23.0%	11.3%	78.9%	87.6%	84.0%	0%	99.6%	63.1%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In terms of rural broadband availability, FTTP coverage increased by 2.1 p.p. to reach 60.3% of rural households, overtaking rural DSL coverage for the first time. Cable modem DOCSIS 3.0 services were available to 55.9% of rural households, well ahead of the EU average, with 98% of this coverage capable of supporting DOCSIS 3.1. As was the case at a national level, DSL technology recorded a sharp decrease in coverage, owing to operators' focus on upgrading copper lines to fibre optic networks. DSL decreased by 12.7 percentage points to 53.7%. VDSL coverage also decreased, by 10.5 percentage points, and VDSL services were available to 52.6% 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 31.7% of rural homes.

Luxembourg: Coverage by technology, rural areas, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Luxembourg	53.7%	52.6%	31.7%	60.3%	55.9%	54.8%	0%	96.9%	14.1%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

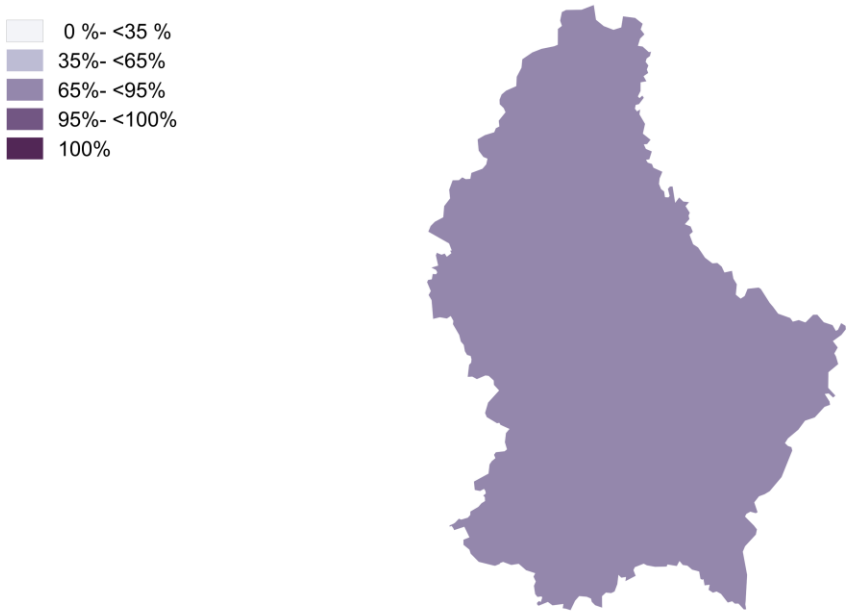
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Rural 5G coverage in Luxembourg now exceeds the EU average, after a 50.2 p.p. increase in the year to June 2023, 96.9% of rural households having access to 5G, one of the highest levels in this year's

study. But 5G coverage of rural areas using the 3.4–3.8 GHz band lagged the EU average, at 14.1%, almost unchanged from the previous year, indicating that rural 5G rollouts have been focussed on the lower-frequency 700 MHz band, which is better suited to providing widescale rural coverage.

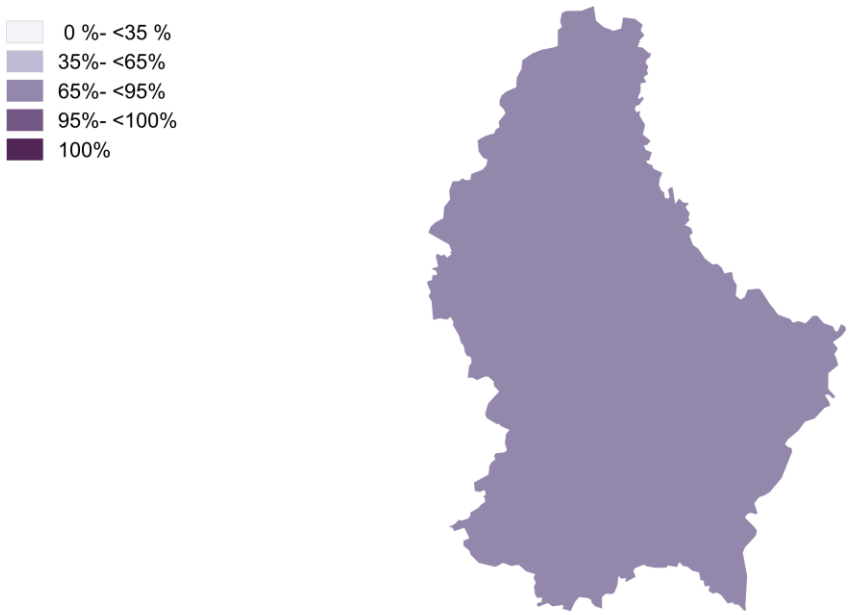
5.19.2 Regional coverage by broadband technology

Luxembourg: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Luxembourg: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Luxembourg: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.19.3 Data tables for Luxembourg

Statistic	National
Population	645,397
Persons per household	2.5
Rural proportion	11.0%

	Luxembourg 2023		Luxembourg 2022		Luxembourg 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	23.6%	53.7%	59.7%	66.5%	65.6%	82.8%	79.7%	67.4%
VDSL	23.0%	52.6%	54.5%	63.2%	59.8%	79.6%	52.6%	37.8%
VDSL2 Vectoring	11.3%	31.7%	15.2%	28.7%	13.1%	21.2%	38.7%	22.0%
FTTP	78.9%	60.3%	76.2%	58.2%	75.2%	51.1%	64.0%	52.8%
Cable modem DOCSIS 3.0	87.6%	55.9%	*88.3%*	*57.3%*	90.2%	60.1%	41.1%	9.5%
Cable modem DOCSIS 3.1	84.0%	54.8%	82.5%	54.5%	90.2%	60.1%	33.6%	5.3%
FWA	0%	0%	0%	0%	0%	0%	68.5%	59.6%
5G	99.6%	96.9%	93.2%	46.7%	12.7%	6.7%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	63.1%	14.1%	51.3%	14.0%	-	-	50.6%	15.2%
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%	97.7%	92.2%
Overall NGA broadband	97.3%	90.5%	97.5%	95.3%	97.0%	95.3%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	94.7%	80.3%	93.3%	79.1%	92.6%	78.6%	78.8%	55.7%
VHCN (as defined by BEREC)	94.7%	80.3%	-	-	-	-	88.1%	70.0%
At least 30Mbps	97.3%	-	97.5%	-	99.8%	-	93.3%	-
At least 100Mbps	95.4%	-	95.1%	-	99.4%	-	89.0%	-
At least 1Gbps	94.7%	-	93.3%	-	*92.6%*	-	75.6%	-
At least 1Gbps upload and download	78.9%	-	-	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

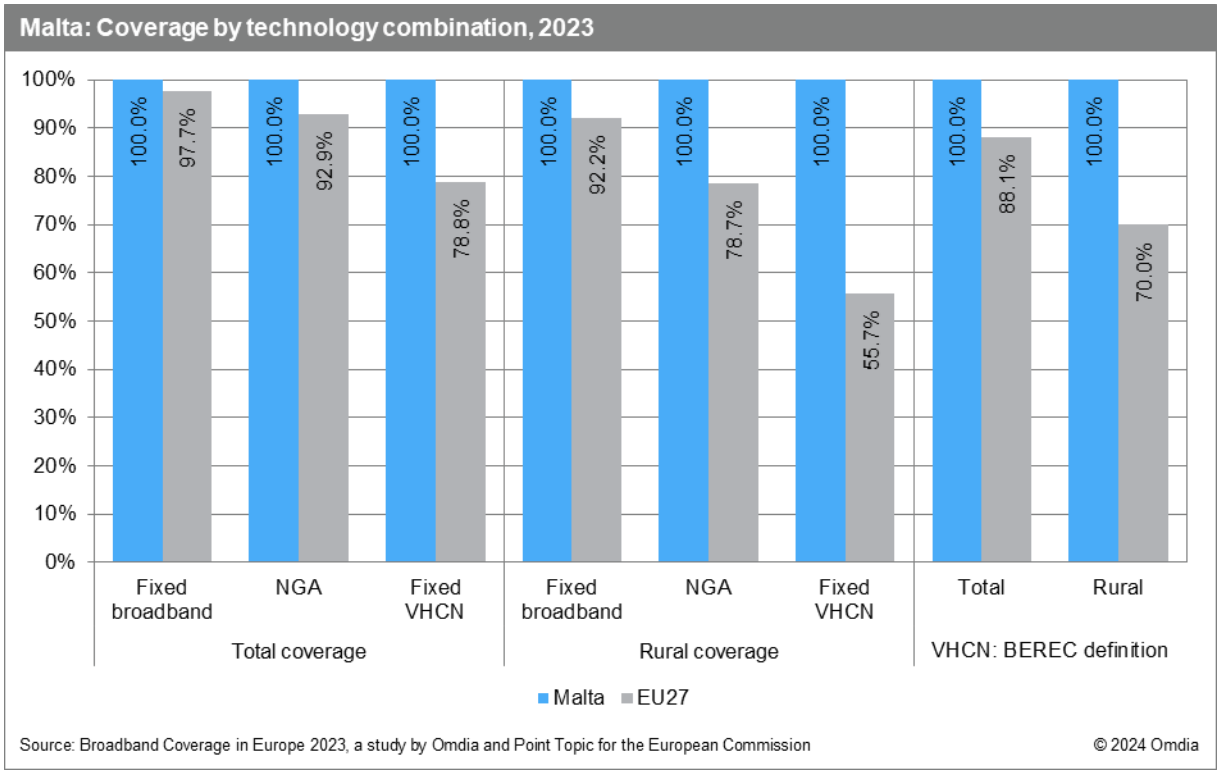
All restatements are highlighted in italics.

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 2023, Malta remains the only country in the study to have recorded universal fixed VHCN (FTTP & DOCSIS 3.1) coverage, and also reported universal coverage of BEREC-defined VHCN at both national and rural level.

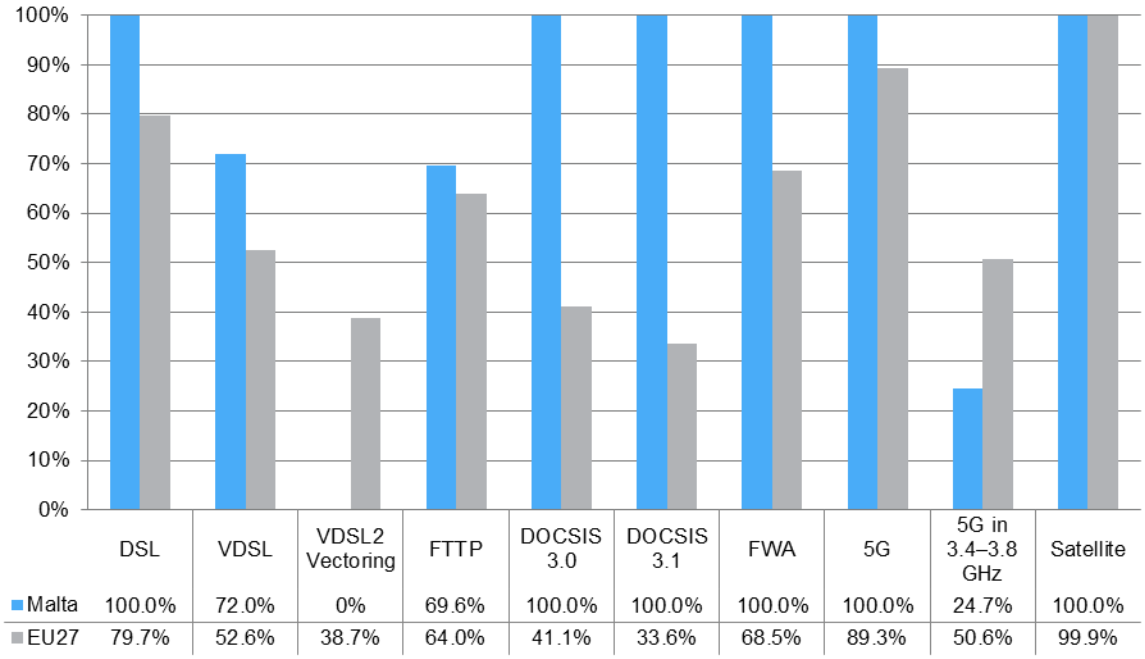
As is the case with a number of countries covering a geographically small area, achieving universal broadband coverage has been somewhat easier in Malta than in other, larger European countries. Indeed, Malta is a small, very densely populated island nation with limited rural population (only 0.6% of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



Examining individual technologies, 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-2023, FTTP coverage grew by 13.4 percentage points, to reach seven in ten households (69.6%), continuing the strong growth recorded in 2021 and 2022. Meanwhile 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, but there are no deployments of VDSL2 Vectoring.

In terms of mobile technologies, commercial 5G services first became available in May 2021, and coverage reached 100.0% by June 2022, making Malta one of four countries to achieve this milestone. But the 5G coverage is highly reliant on the 700 MHz spectrum band – coverage of 5G services using the 3.4–3.8 GHz band was less than half the EU average, at 24.7%.

Malta: Coverage by technology, total, 2023

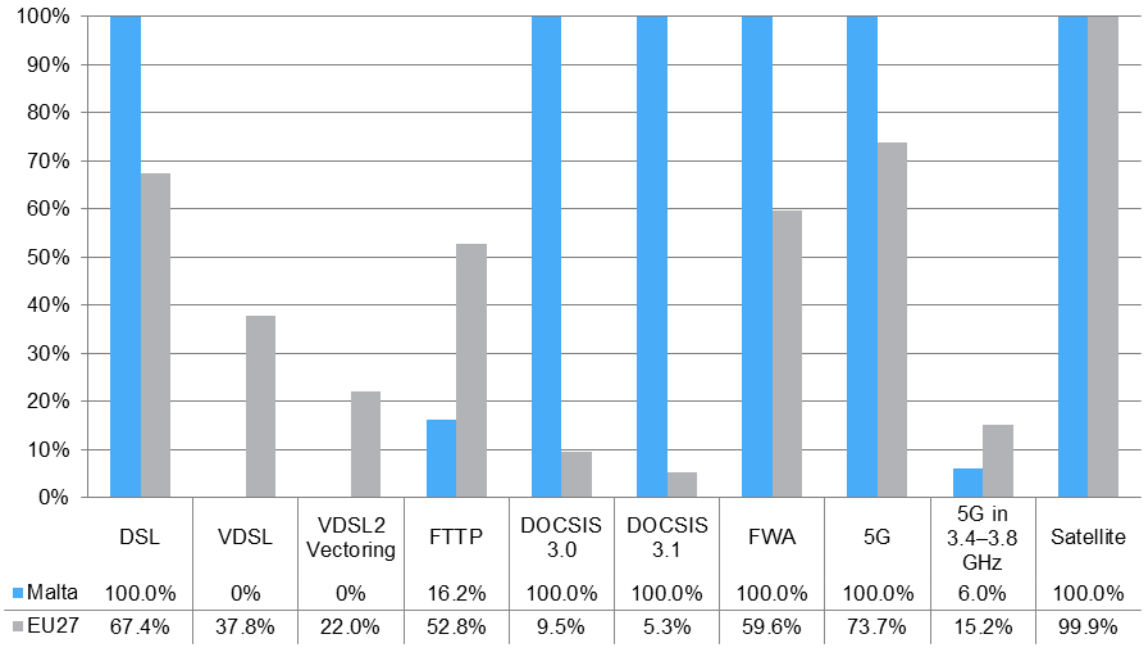


	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Malta	100.0%	72.0%	0%	69.6%	100.0%	100.0%	100.0%	100.0%	24.7%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

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 fixed VHCN (FTTP & DOCSIS 3.1) coverage. VDSL and VDSL2 Vectoring were absent in rural areas, but rural rollouts of FTTP have now commenced, and coverage stood at 16.2% of rural premises in June 2023. Rural 5G coverage is universal, but 5G deployments in the 3.4–3.8 GHz band reached just 6.0% of rural households as of June 2023, up by only 1.2 p.p. since the previous year.

Malta: Coverage by technology, rural areas, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Malta	100.0%	0%	0%	16.2%	100.0%	100.0%	100.0%	100.0%	6.0%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

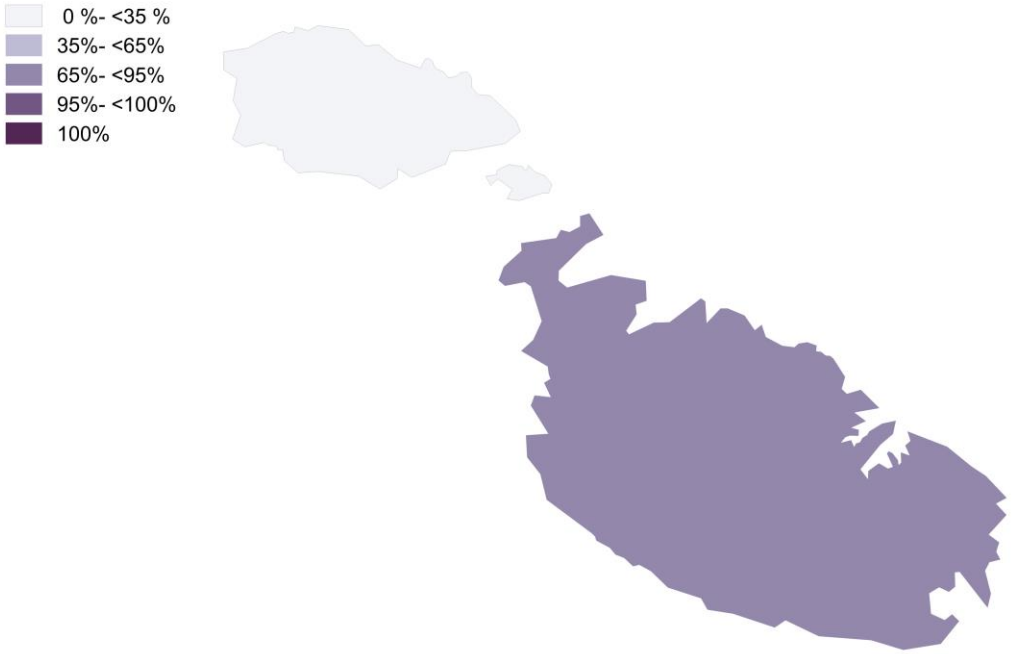
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.20.2 Regional coverage by broadband technology

Malta: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Malta: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Malta: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.20.3 Data tables for Malta

Statistic	National
Population	520,971
Persons per household	2.7
Rural proportion	0.6%

	Malta 2023		Malta 2022		Malta 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	79.7%	67.4%
VDSL	72.0%	0%	72.0%	0%	72.0%	0%	52.6%	37.8%
VDSL2 Vectoring	0%	0%	0%	0%	0%	0%	38.7%	22.0%
FTTP	69.6%	16.2%	56.2%	0%	48.0%	0%	64.0%	52.8%
Cable modem DOCSIS 3.0	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	41.1%	9.5%
Cable modem DOCSIS 3.1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	33.6%	5.3%
FWA	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	68.5%	59.6%
5G	100.0%	100.0%	100.0%	100.0%	20.0%	0%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	24.7%	6.0%	20.0%	4.9%	-	-	50.6%	15.2%
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%	97.7%	92.2%
Overall NGA broadband	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	78.8%	55.7%
VHCN (as defined by BEREC)	100.0%	100.0%	-	-	-	-	88.1%	70.0%
At least 30Mbps	100.0%	-	100.0%	-	100.0%	-	93.3%	-
At least 100Mbps	100.0%	-	100.0%	-	100.0%	-	89.0%	-
At least 1Gbps	100.0%	-	100.0%	-	100.0%	-	75.6%	-
At least 1Gbps upload and download	0%	-	0%	-	0%	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

5.21 Netherlands

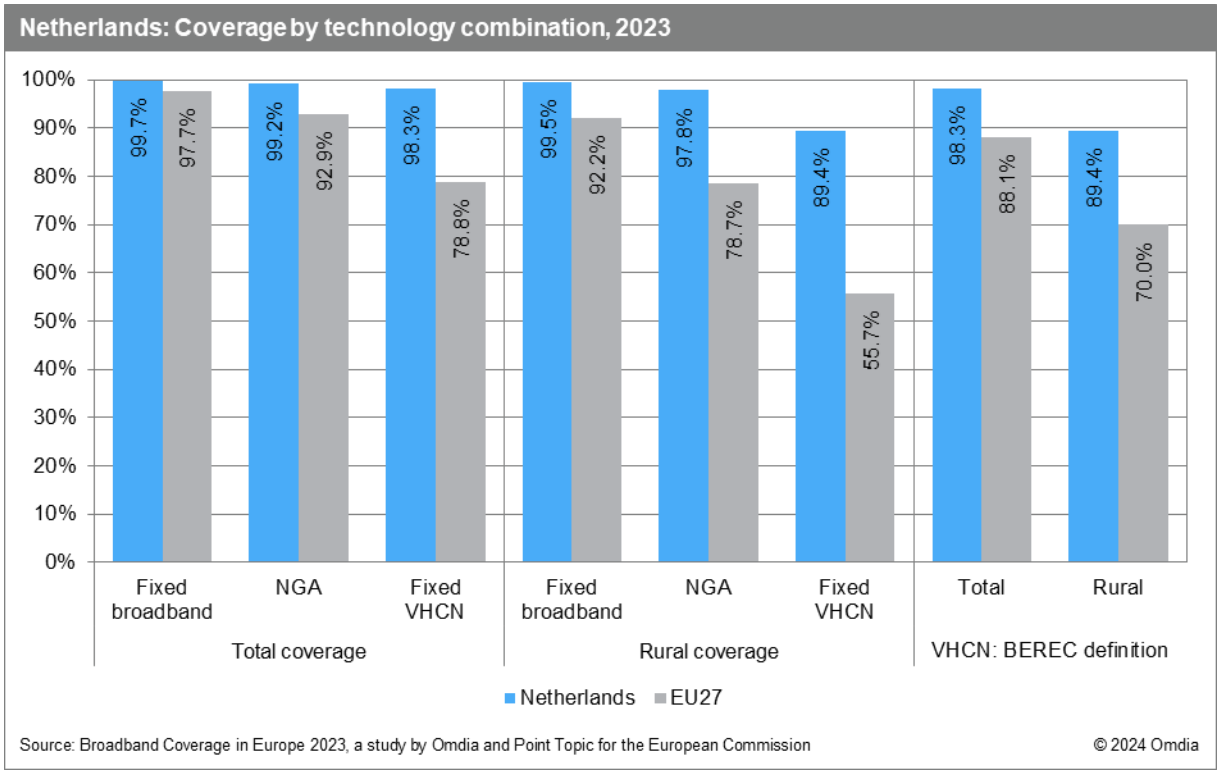
5.21.1 National coverage by broadband technology

Almost all Dutch households (99.7%) could access at least one fixed broadband technology by mid-2023, while NGA networks passed 99.2% of Dutch homes – scoring well above the EU averages of 97.7% and 92.9%, respectively. Fixed broadband coverage also neared universal coverage in rural regions (99.5%). The availability of rural NGA networks reached 97.8% by the end of June 2023.

In terms of fixed VHCN (FTTP & DOCSIS 3.1) coverage, the Netherlands continued to record impressive coverage levels, with 98.3% of all households and 89.4% of rural homes passed by networks capable of delivering gigabit speeds.

BEREC-defined VHCN coverage at national and rural level was reported equal to the fixed VHCN (FTTP & DOCSIS 3.1) category, indicating that these are the only technologies in the Netherlands which conform to the BEREC definition of VHCN.

Similar to previous years, the Netherlands ranked among the leading countries across all combination categories.



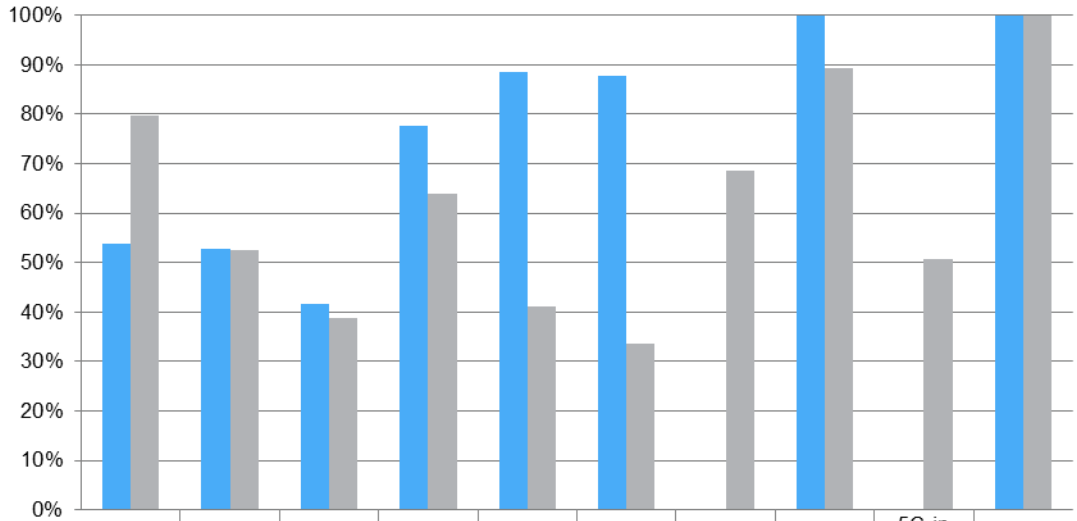
DOCSIS 3.0 remained the prevalent individual broadband technology in the Dutch market, providing coverage for 88.6% of households. In this year's study, the Netherlands recorded the third highest DOCSIS 3.0 coverage among study countries. Vast majority of cable networks has now been upgraded to the DOCSIS 3.1 standard which was available to 87.8% of households at the end of June 2023.

As was the case in previous iterations of this study, DSL coverage continued a declining trend. By mid-2023, 53.8% of Dutch homes were covered by DSL networks, down by 3.8 percentage points. VDSL coverage declined by 3.0 percentage points. VDSL2 Vectoring standard passed a total of 41.6% of homes.

FTTP availability grew by 14.3 percentage points since the end of June 2022 and passed 77.7% of Dutch homes, exceeding the EU average in this category.

The Netherlands was one of four countries (Cyprus, Denmark and Malta being the other three) reaching universal 5G coverage by mid-2023. Dutch operators already reached high 5G coverage levels by mid-2020, however, they have not yet launched 5G services in the 3.4–3.8 GHz spectrum band.

Netherlands: Coverage by technology, total, 2023



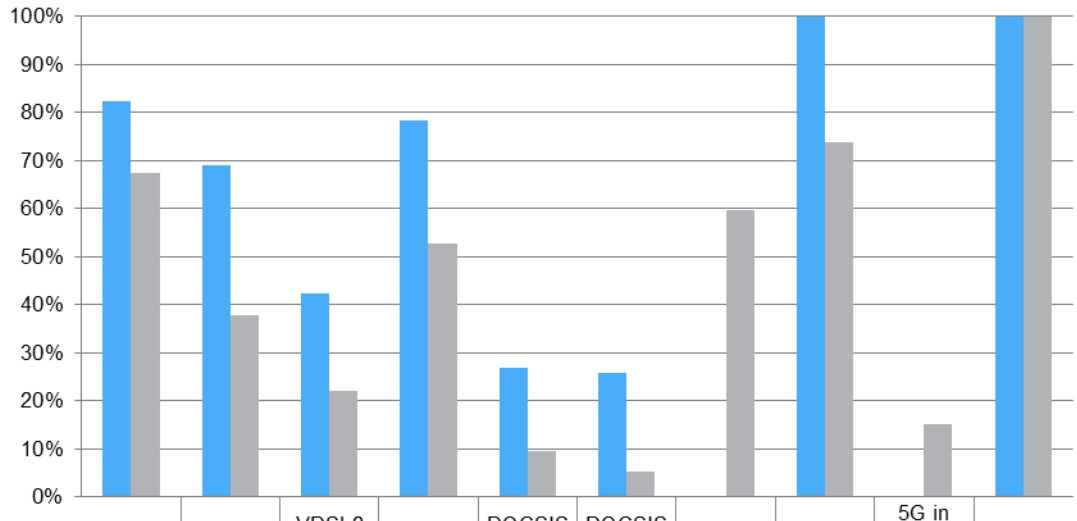
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Netherlands	53.8%	52.8%	41.6%	77.7%	88.6%	87.8%	0%	100.0%	0%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural regions, DSL recorded the highest coverage levels, with 82.3% of rural homes passed by mid-2023. Growth in rural FTTP coverage slowed downed compared to previous years, increasing by 2.0 p.p. with FTTP networks covering more than three quarters (78.4%) of rural Dutch homes.

Cable DOCSIS 3.0 and DOCSIS 3.1 broadband services were available to little over a quarter of rural households, reaching 26.9% and 26.0%, respectively.

Netherlands: Coverage by technology, rural areas, 2023



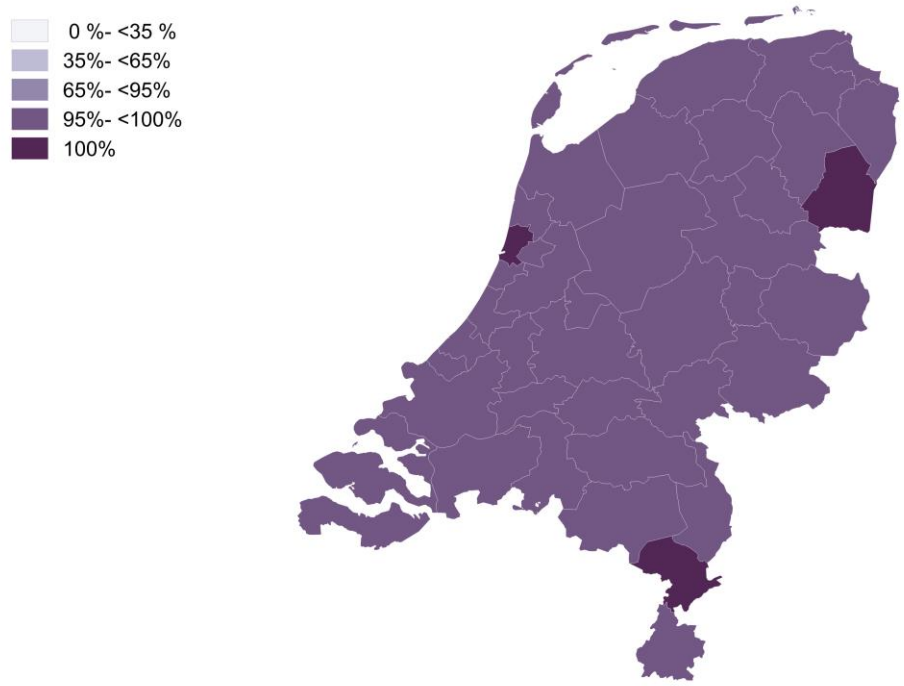
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Netherlands	82.3%	68.9%	42.3%	78.4%	26.9%	26.0%	0%	100.0%	0%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.21.2 Regional coverage by broadband technology

All regions recorded fixed VHCN (FTTP & DOCSIS 3.1) coverage levels higher than 95% with three regions - Zuidoost-Drenthe, IJmond, and Midden-Limburg – reaching universal coverage.

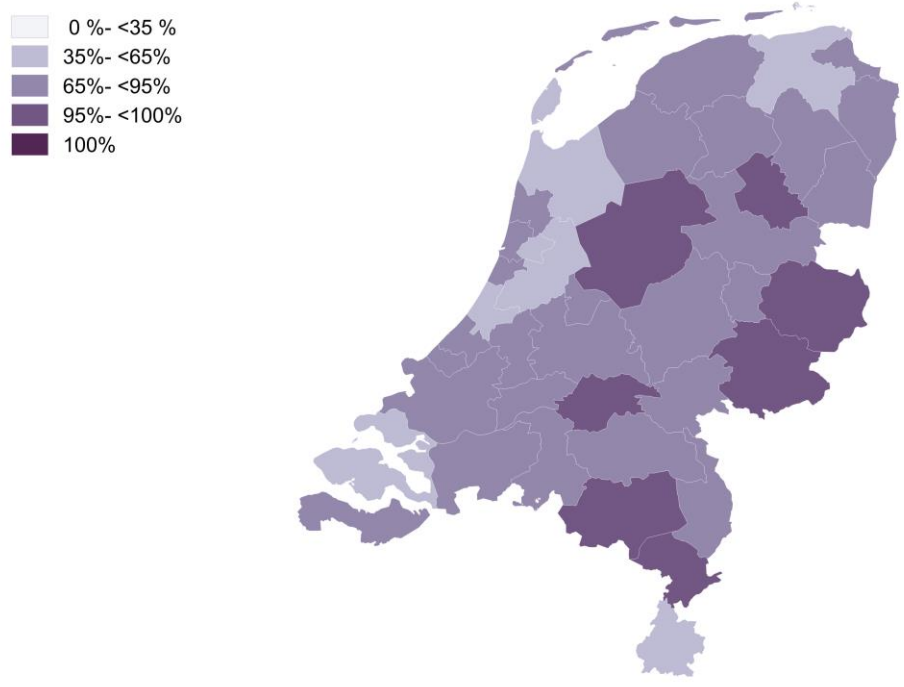
Netherlands: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Regional coverage levels are much more varied in terms of FTTP coverage, which ranged from 97.3% in Flevoland to 50.0% in Kop van Noord-Holland.

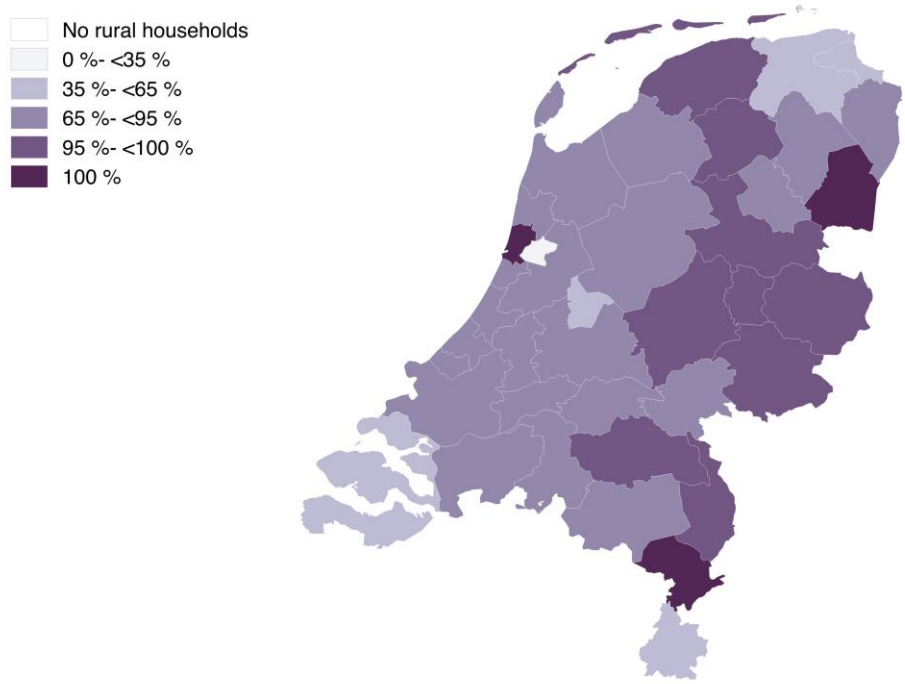
Netherlands: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Similarly, the rural fixed VHCN (FTTP & DOCSIS 3.1) coverage category recorded much more varied levels with the lowest coverage (9.8%) recorded in Zaanstreek.

Netherlands: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.21.3 Data tables for Netherlands

Statistic	National
Population	17,590,672
Persons per household	2.2
Rural proportion	3.9%

	Netherlands 2023		Netherlands 2022		Netherlands 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	53.8%	82.3%	57.6%	*83.6%*	61.1%	82.5%	79.7%	67.4%
VDSL	52.8%	68.9%	55.8%	*64.3%*	59.5%	63.1%	52.6%	37.8%
VDSL2 Vectoring	41.6%	42.3%	43.5%	*39.8%*	44.9%	39.1%	38.7%	22.0%
FTTP	77.7%	78.4%	63.4%	*76.4%*	51.9%	54.5%	64.0%	52.8%
Cable modem DOCSIS 3.0	88.6%	26.9%	*94.1%*	*28.5%*	94.2%	*28.5%*	41.1%	9.5%
Cable modem DOCSIS 3.1	87.8%	26.0%	88.9%	*26.3%*	*79.8%*	*26.3%*	33.6%	5.3%
FWA	0%	0%	86.7%	*87.8%*	86.7%	87.3%	68.5%	59.6%
5G	100.0%	100.0%	100.0%	100.0%	97.0%	96.8%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	0%	0%	0%	0%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.7%	99.5%	99.3%	*98.6%*	99.3%	99.6%	97.7%	92.2%
Overall NGA broadband	99.2%	97.8%	99.2%	*96.3%*	99.2%	*81.5%*	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	98.3%	89.4%	97.8%	*88.3%*	90.6%	*67.6%*	78.8%	55.7%
VHCN (as defined by BEREC)	98.3%	89.4%	-	-	-	-	88.1%	70.0%
At least 30Mbps	98.9%	-	*98.9%*	-	*98.9%*	-	93.3%	-
At least 100Mbps	98.7%	-	98.7%	-	98.5%	-	89.0%	-
At least 1Gbps	98.2%	-	97.8%	-	88.8%	-	75.6%	-
At least 1Gbps upload and download	78.4%	-	63.4%	-	*19.3%*	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

Rural DSL, VDSL, VDSL2 Vectoring and Cable DOCSIS 3.0 and 3.1 data was restated based on data provided by the NRA.

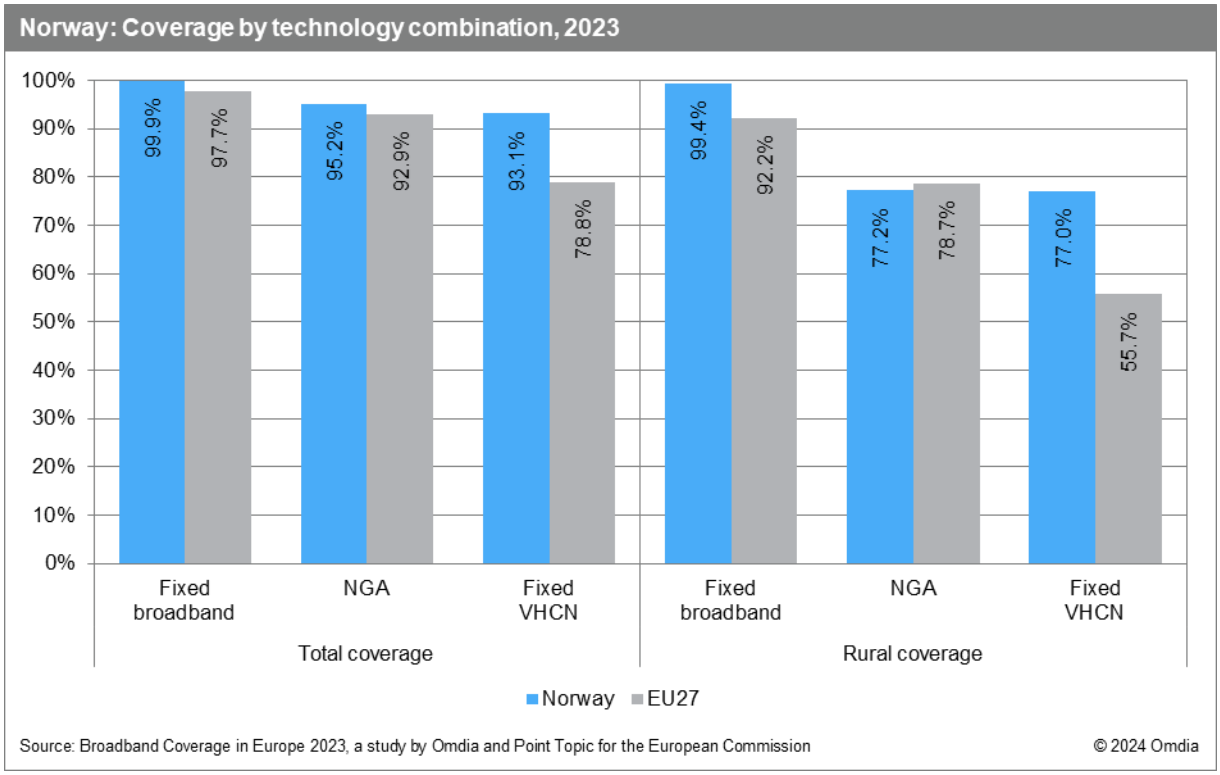
All restatements are highlighted in italics.

5.22 Norway

5.22.1 National coverage by broadband technology

Coverage of fixed VHCN (FTTP & DOCSIS 3.1) reached 93.1% of Norwegian households by mid-2023, 14.3% ahead of the EU, and up by 11.2 percentage points over the year. In rural areas the difference was even more pronounced – 77.0% of rural households in Norway had access to these networks, compared with only 55.7% in the EU.

Total NGA coverage reached 95.2% of homes at national level (up by 1.1 p.p.) and 77.2% in rural areas (up by 3.5 p.p.), approximately in line with the EU on both counts. Overall fixed broadband coverage is near-universal, even in rural areas which reached 99.4% coverage.

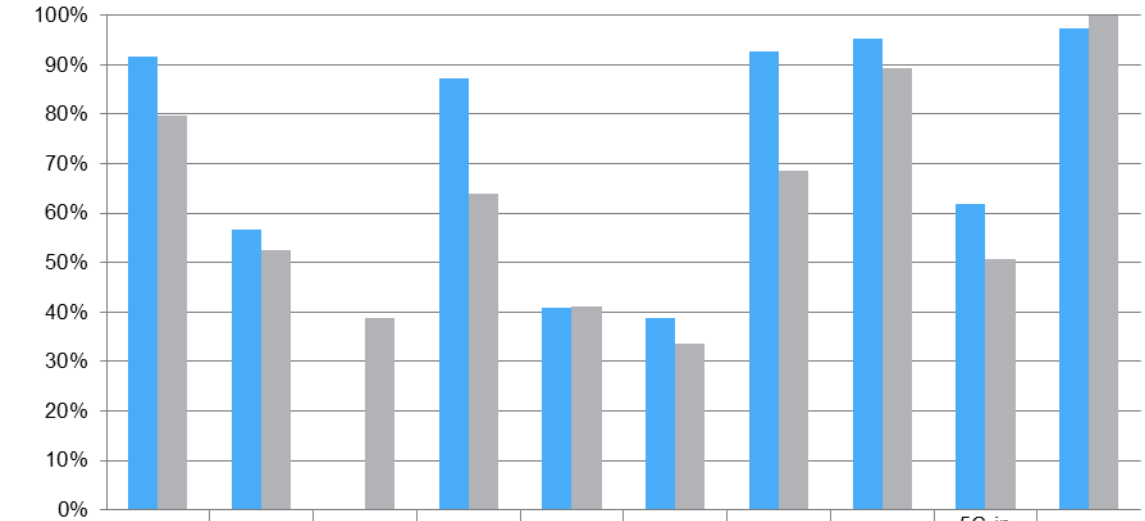


In terms of individual fixed broadband technologies, FTTP rollout continued rapidly, with 87.2% of homes passed as of June 2023, a 5.3 p.p. increase. FTTP coverage in Norway maintained a gap of more than 23 percentage points ahead of the EU. But DSL is still the most prevalent broadband technology, with 91.6% of households covered, unchanged from the previous year. VDSL coverage was also unchanged at 56.6% of households. VDSL2 Vectoring had not been deployed in Norway as of mid-2023.

Coverage of cable modem DOCSIS 3.0 networks remained flat and in line with the EU at 40.8%. Most cable networks in Norway have been upgraded to DOCSIS 3.1, which covered 38.8% of Norwegian households as of June 2023. Meanwhile FWA coverage increased to 92.6% of households by June 2023.

In terms of mobile broadband coverage, 5G coverage is now available across Norway, and reached 95.3% coverage by mid-2023, slightly ahead of the EU (89.3%). 5G coverage using the 3.4–3.8 GHz band increased by 16.2 p.p. to reach over six in ten households (61.9%).

Norway: Coverage by technology, total, 2023



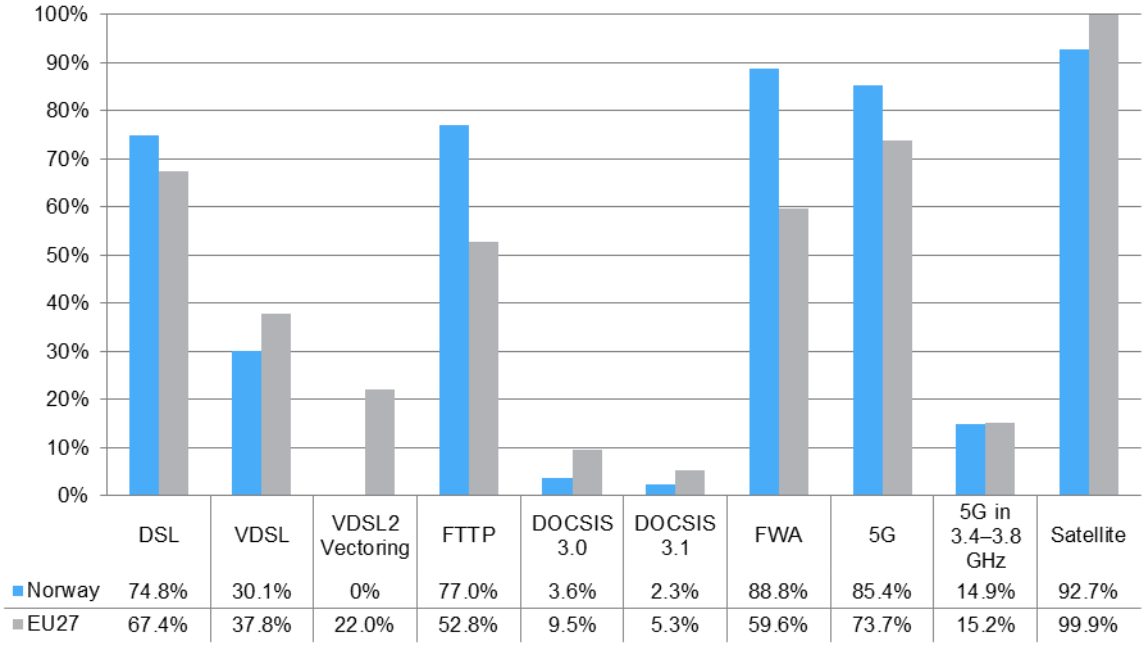
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Norway	91.6%	56.6%	0%	87.2%	40.8%	38.8%	92.6%	95.3%	61.9%	97.2%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Looking at rural regions of Norway, rural FTTP coverage once again saw a significant coverage increase, going from 70.4% to reach 77.0% of rural homes, making it the most prevalent fixed wireline technology in rural areas for the first time. Rural FTTP availability was also well ahead of the EU average, which stood at 52.8%. DSL coverage remained flat, reaching 74.8% of rural households, while VDSL coverage increased fractionally to 30.1%. Cable modem DOCSIS 3.0 coverage remained limited in rural areas, with only 3.6% of rural Norwegian homes passed, while DOCSIS 3.1 reached 2.3% of rural households.

Early 5G deployments were focussed on urban areas, but rural coverage again grew markedly over the year, to reach 85.4% of rural households in June 2023, up from 59.8% the previous year. But 5G coverage using the 3.4–3.8 GHz band remains low, at 14.9% of rural households.

Norway: Coverage by technology, rural areas, 2023



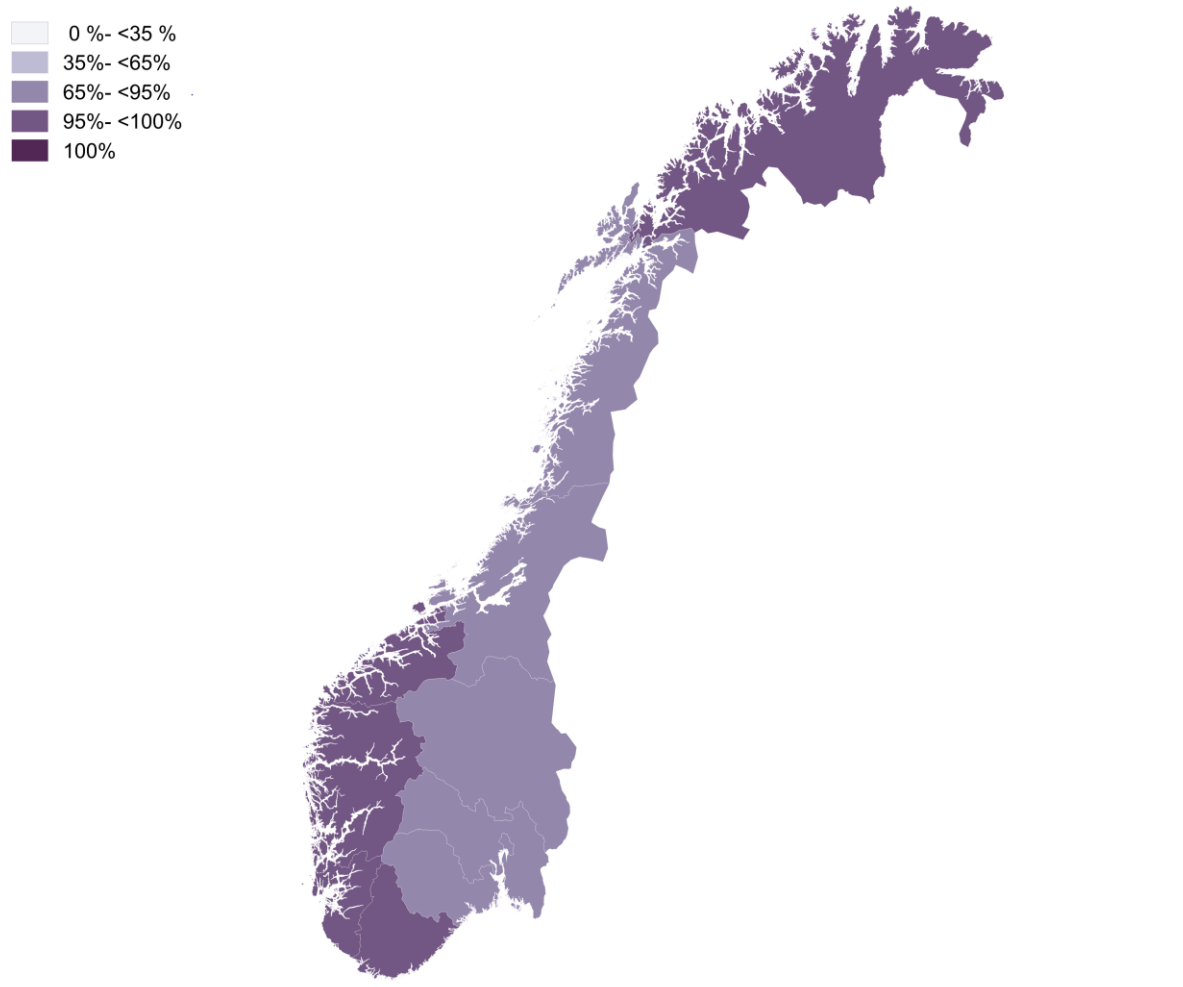
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Norway	74.8%	30.1%	0%	77.0%	3.6%	2.3%	88.8%	85.4%	14.9%	92.7%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.22.2 Regional coverage by broadband technology

Overall fixed VHCN (FTTP & DOCSIS 3.1) coverage surpassed 65% for all regions of Norway in June 2023, while five regions surpassed 95% (Troms og Finnmark, Agder, Rogaland, Vestland, and Møre og Romsdal).

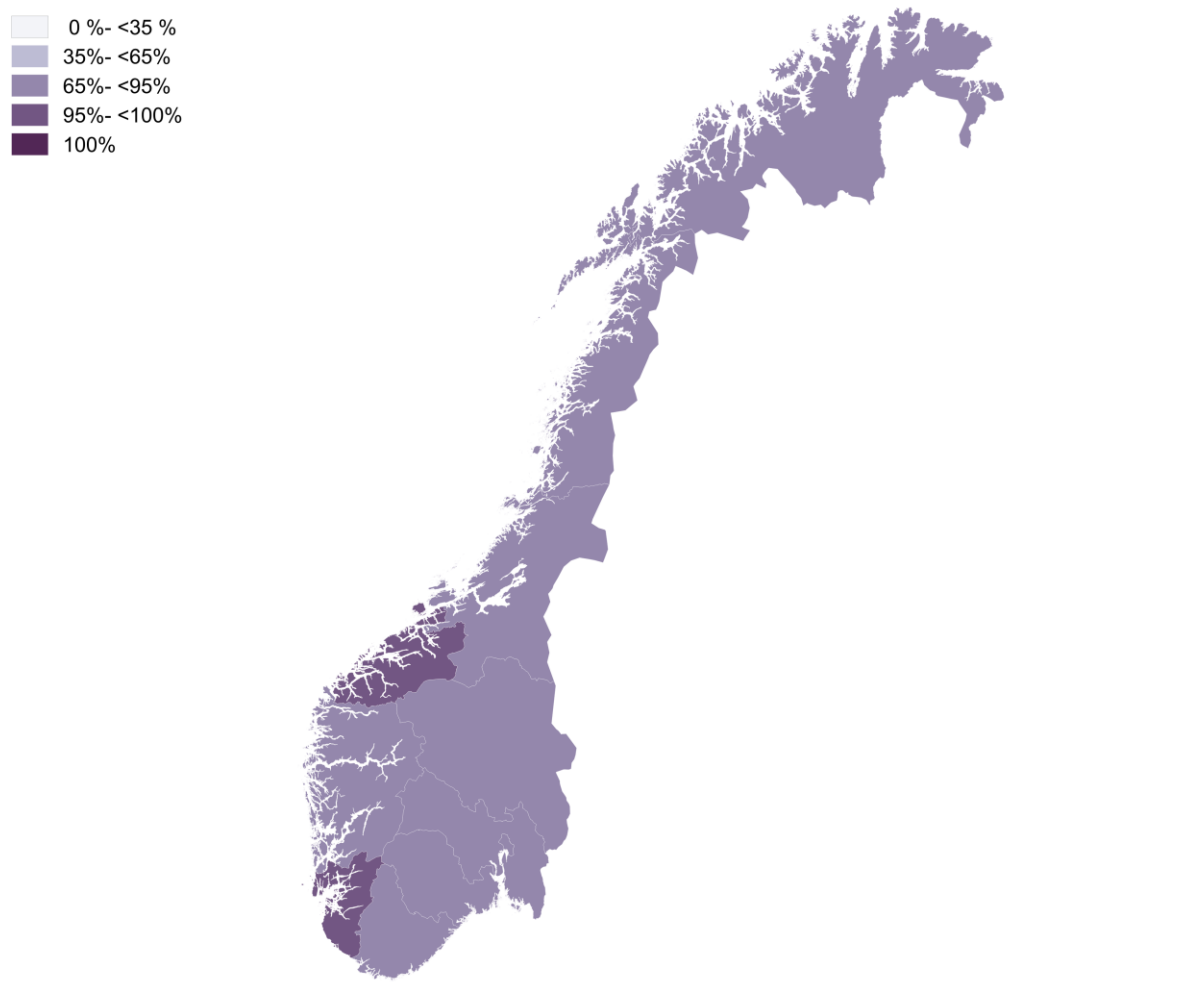
Norway: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Similarly, while all regions exceeded 65% coverage of FTTP, only two surpassed 95% (Rogaland, and Møre og Romsdal).

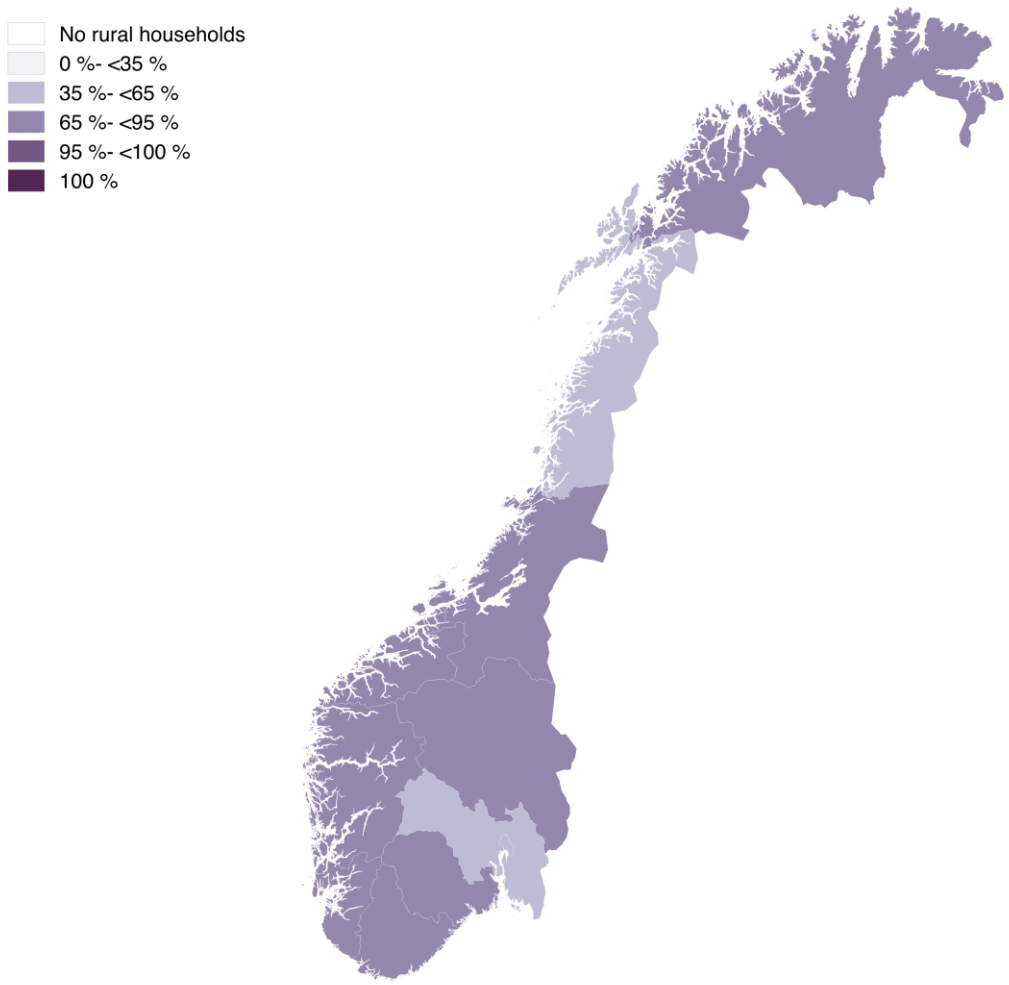
Norway: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural areas, three out of eleven regions failed to reach 65% coverage of fixed VHCN (FTTP & DOCSIS 3.1) services (Nordland, Viken, and the capital, Oslo). Møre og Romsdal recorded the highest coverage, at 89.8%.

Norway: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.22.3 Data tables for Norway

Statistic	National
Population	5,427,570
Persons per household	2.1
Rural proportion	16.4%

	Norway 2023		Norway 2022		Norway 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	91.6%	74.8%	91.6%	74.8%	92.5%	75.4%	79.7%	67.4%
VDSL	56.6%	30.1%	56.6%	30.0%	58.4%	29.4%	52.6%	37.8%
VDSL2 Vectoring	0%	0%	0%	0%	0%	0%	38.7%	22.0%
FTTP	87.2%	77.0%	81.9%	70.4%	75.3%	64.0%	64.0%	52.8%
Cable modem DOCSIS 3.0	40.8%	3.6%	40.7%	1.1%	40.3%	1.7%	41.1%	9.5%
Cable modem DOCSIS 3.1	38.8%	2.3%	*32.5%*	0.0%	1.0%	0.0%	33.6%	5.3%
FWA	92.6%	88.8%	86.5%	82.6%	94.1%	84.9%	68.5%	59.6%
5G	95.3%	85.4%	81.5%	59.8%	23.8%	4.5%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	61.9%	14.9%	45.7%	6.5%	-	-	50.6%	15.2%
Satellite	97.2%	92.7%	*97.2%*	*92.7%*	*97.2%*	*92.7%*	99.9%	99.9%
Overall fixed broadband	99.9%	99.4%	99.8%	99.1%	98.1%	91.0%	97.7%	92.2%
Overall NGA broadband	95.2%	77.2%	94.1%	73.6%	91.8%	68.7%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	93.1%	77.0%	81.9%	70.4%	75.8%	64.0%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	99.8%	-	98.5%	-	91.7%	-	93.3%	-
At least 100Mbps	96.6%	-	93.6%	-	89.2%	-	89.0%	-
At least 1Gbps	95.1%	-	92.5%	-	86.5%	-	75.6%	-
At least 1Gbps upload and download	87.2%	-	81.9%	-	*73.6%*	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

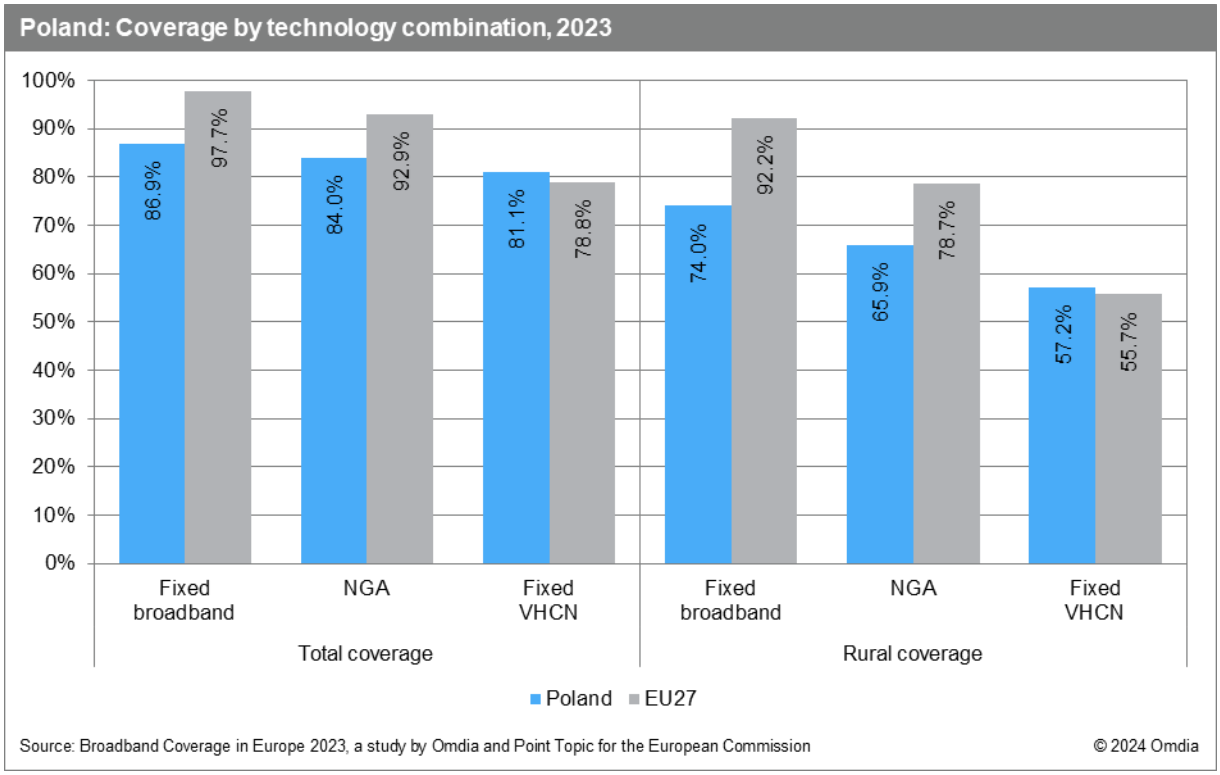
All restatements are highlighted in italics.

5.23 Poland

5.23.1 National coverage by broadband technology

Fixed broadband coverage reached 86.9% at national level and 74.0% at rural level by the end of June 2023. But despite an improvement of 4.0 and 5.2 percentage points at national and rural level, respectively, Poland recorded the third lowest broadband coverage among EU member states. Poland also fell below the EU average in terms of NGA coverage, but it significantly narrowed the gap to the EU average compared to mid-2022. Rural NGA grew to 65.9%, up by 25.6 percentage points.

The coverage of 1Gbps-capable fixed VHCN networks (FTTP & DOCSIS 3.1) grew by 10.4 percentage points and reached 81.1% by mid-2023, reflecting an accelerated pace of FTTP deployment. In rural Poland, fixed VHCN coverage grew by 24.3 percentage points over the 12-month period.

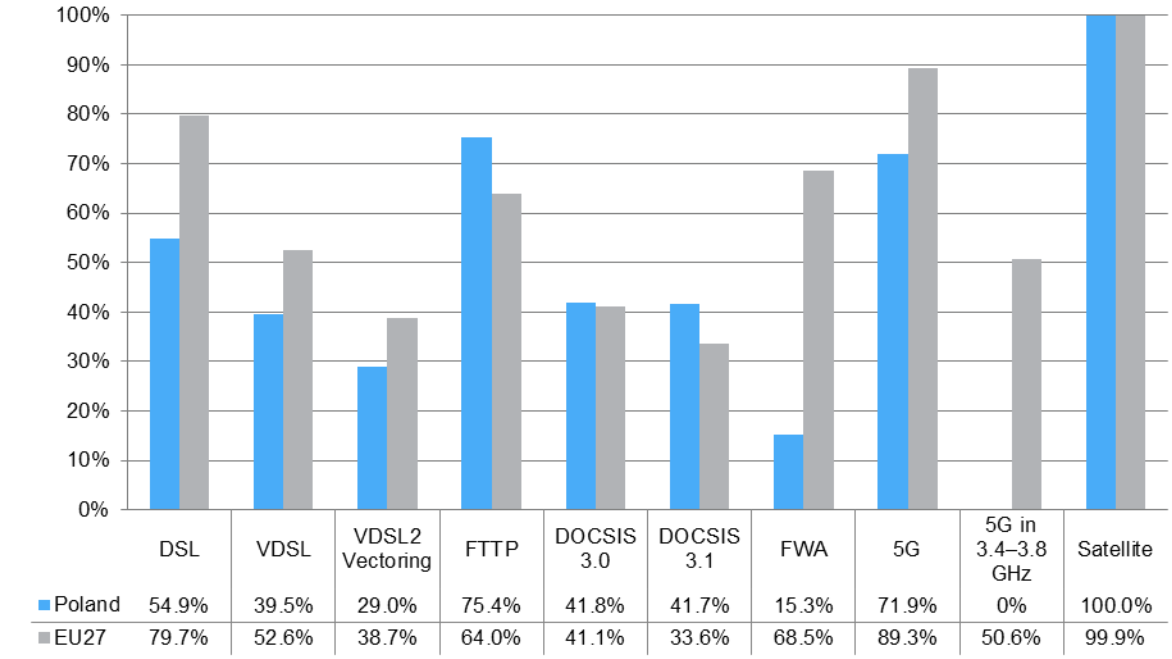


FTTP remained the most prevalent broadband technology in Poland, with three quarters (75.4%) of homes passed. Strong growth of 15.9 percentage points enabled Poland to exceed the EU average by 11.4 percentage points.

DSL was the second most prevalent technology, despite a 2.2 percentage point decline in coverage. Polish operators also progressed with upgrades to VDSL and VDSL2 Vectoring which were available to 39.5% and 29.0% of Polish households, respectively. The upgrade of cable networks to DOCSIS 3.1 standard is almost complete, with 99.7% of the footprint upgraded as of mid-2023, up from 98.4% in the prior year.

5G coverage improved by 8.5 percentage points but remained 17.4 percentage points below the EU average. As frequencies in the 3.4–3.8 GHz band had not yet been allocated as of mid-2023, Poland had no 5G coverage in that band yet.

Poland: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Poland	54.9%	39.5%	29.0%	75.4%	41.8%	41.7%	15.3%	71.9%	0%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

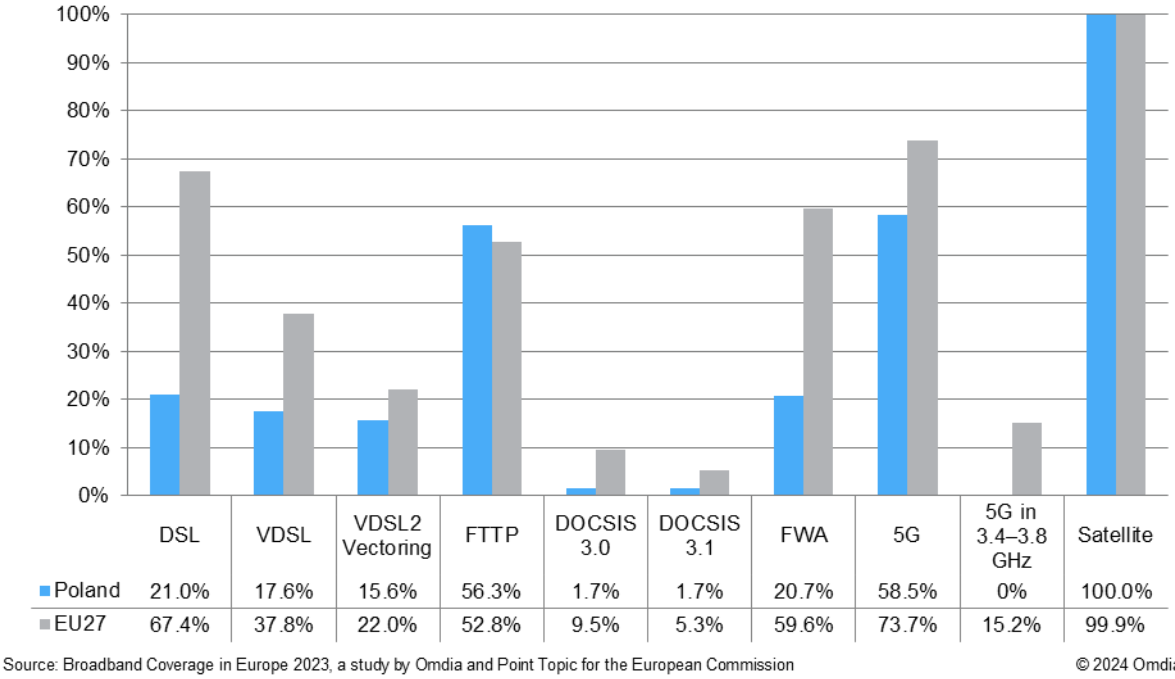
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Poland, FTTP overtook DSL to become the largest broadband technology, with 56.3% of homes passed by mid-2023. FTTP recorded the strongest growth among broadband technologies, up by 24.3 percentage points, and unlike in previous years, it exceeded the EU average.

Poland remained below the EU average across all other categories, with the largest gap in DSL (46.4 percentage points) and FWA (38.9 percentage points). Cable remained a minor technology in rural Poland, with just 1.7% of homes passed, but almost the entire cable network (99.8%) had been upgraded to the DOCSIS 3.1 standard.

5G deployment in rural areas progressed considerably over the 12-month period, with 58.5% of rural households covered by mid-2023, up by 55.7 percentage points compared to mid-2022.

Poland: Coverage by technology, rural areas, 2023



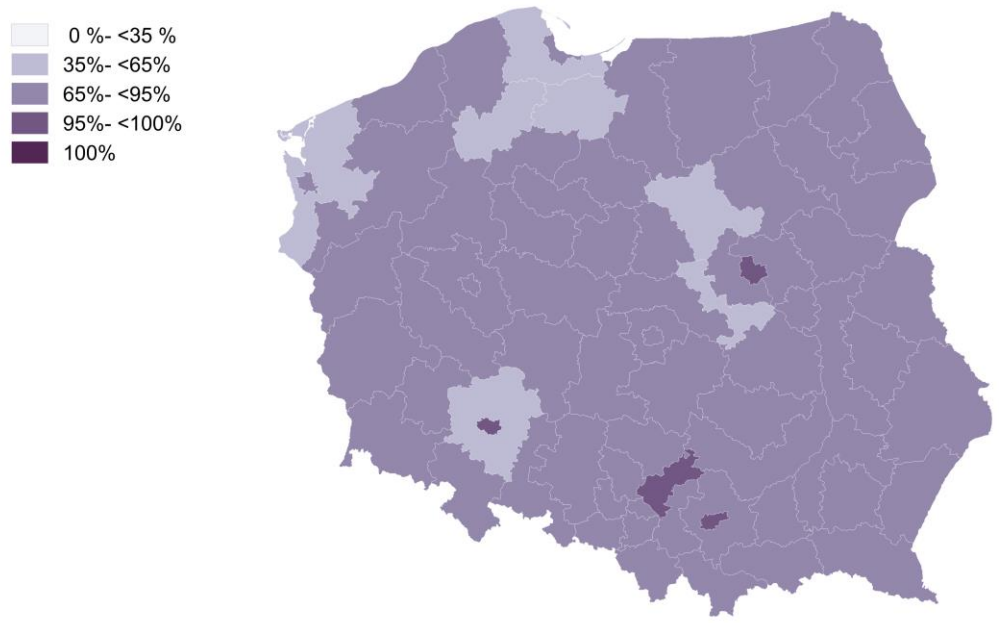
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Poland	21.0%	17.6%	15.6%	56.3%	1.7%	1.7%	20.7%	58.5%	0%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.23.2 Regional coverage by broadband technology

Four out of 73 regions in Poland recorded more than 95% fixed VHCN (FTTP & DOCSIS 3.1) coverage, while no region fell below the 35% threshold. Coverage ranged from 48.2% in Chojnicki to 99.6% in Miasto Warszawa.

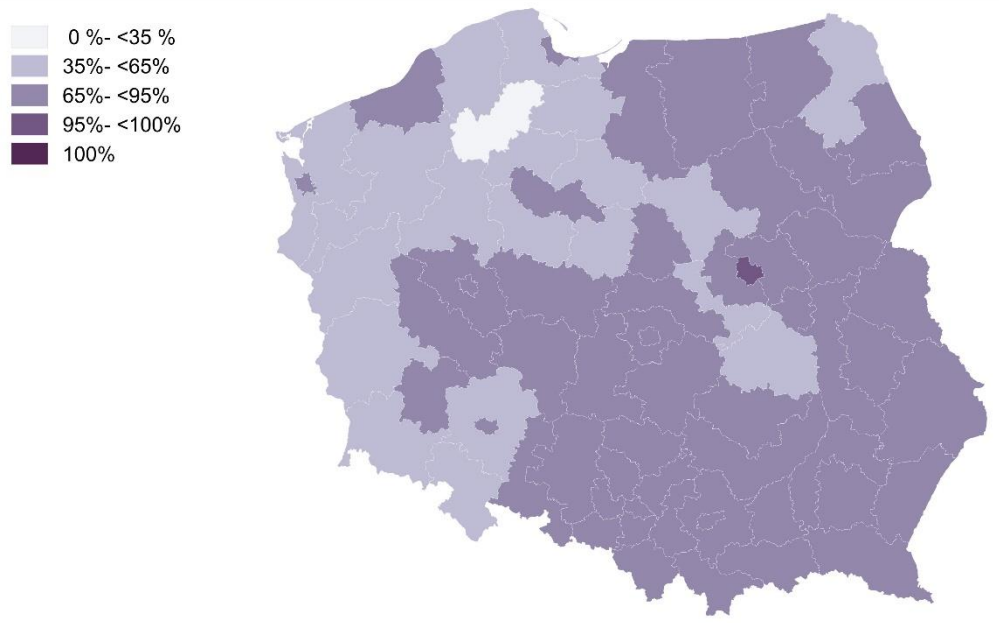
Poland: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Miasto Warszawa was the only region that exceeded the 95% threshold in FTTP coverage, while Chojnicki was the only region with less than 35% coverage.

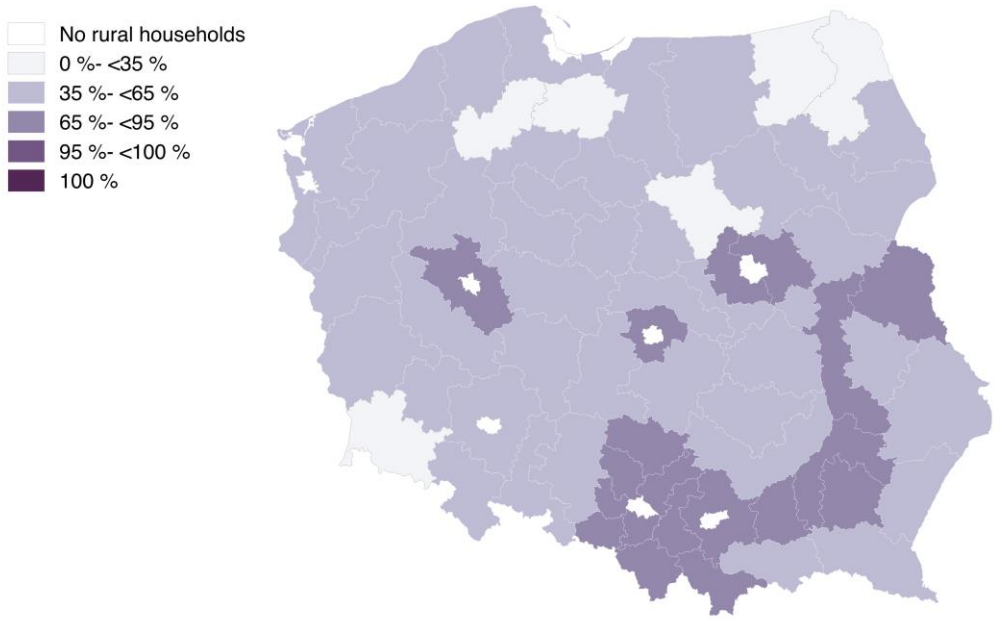
Poland: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Poland, only six regions fell below the 35% threshold which is a significant improvement to last year. 19 regions exceeded the 65% threshold, up from seven regions in mid-2022. None of the regions exceeded the 95% threshold in rural fixed VHCN (FTTP & DOCSIS 3.1) coverage.

Poland: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.23.3 Data tables for Poland

Statistic	National
Population	37,654,247
Persons per household	2.4
Rural proportion	32.4%

	Poland 2023		Poland 2022		Poland 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	54.9%	21.0%	57.1%	43.6%	64.5%	44.5%	79.7%	67.4%
VDSL	39.5%	17.6%	24.2%	12.0%	26.6%	10.3%	52.6%	37.8%
VDSL2 Vectoring	29.0%	15.6%	16.6%	9.8%	18.7%	9.8%	38.7%	22.0%
FTTP	75.4%	56.3%	59.5%	32.1%	51.9%	32.6%	64.0%	52.8%
Cable modem DOCSIS 3.0	41.8%	1.7%	43.4%	1.6%	43.9%	1.6%	41.1%	9.5%
Cable modem DOCSIS 3.1	41.7%	1.7%	42.8%	1.5%	43.0%	1.5%	33.6%	5.3%
FWA	15.3%	20.7%	14.4%	16.4%	15.5%	16.9%	68.5%	59.6%
5G	71.9%	58.5%	63.4%	2.8%	34.2%	1.1%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	0%	0%	0%	0%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	86.9%	74.0%	82.9%	68.7%	89.7%	69.8%	97.7%	92.2%
Overall NGA broadband	84.0%	65.9%	73.4%	40.3%	78.2%	40.0%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	81.1%	57.2%	70.7%	32.8%	70.0%	33.4%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	86.9%	-	76.0%	-	77.0%	-	93.3%	-
At least 100Mbps	81.5%	-	73.8%	-	69.2%	-	89.0%	-
At least 1Gbps	75.1%	-	62.2%	-	55.2%	-	75.6%	-
At least 1Gbps upload and download	45.0%	-	-	-	-	-	-	-

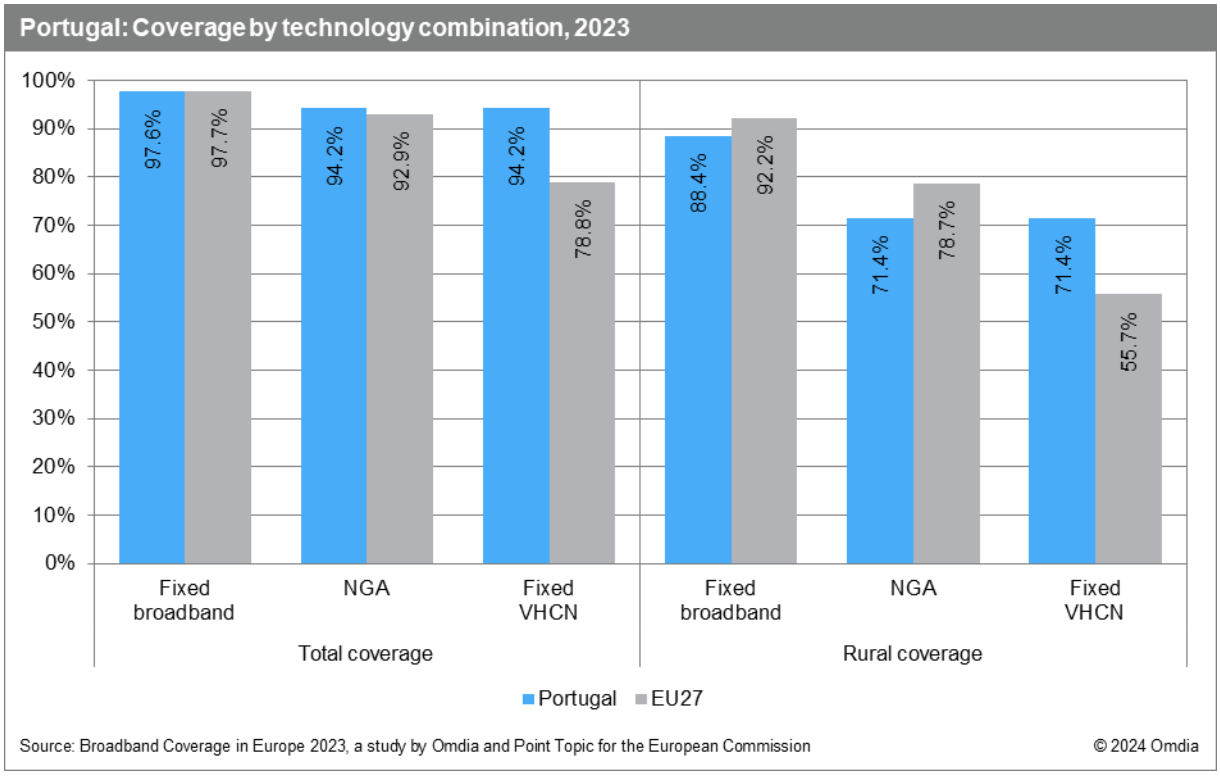
Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

5.24 Portugal

5.24.1 National coverage by broadband technology

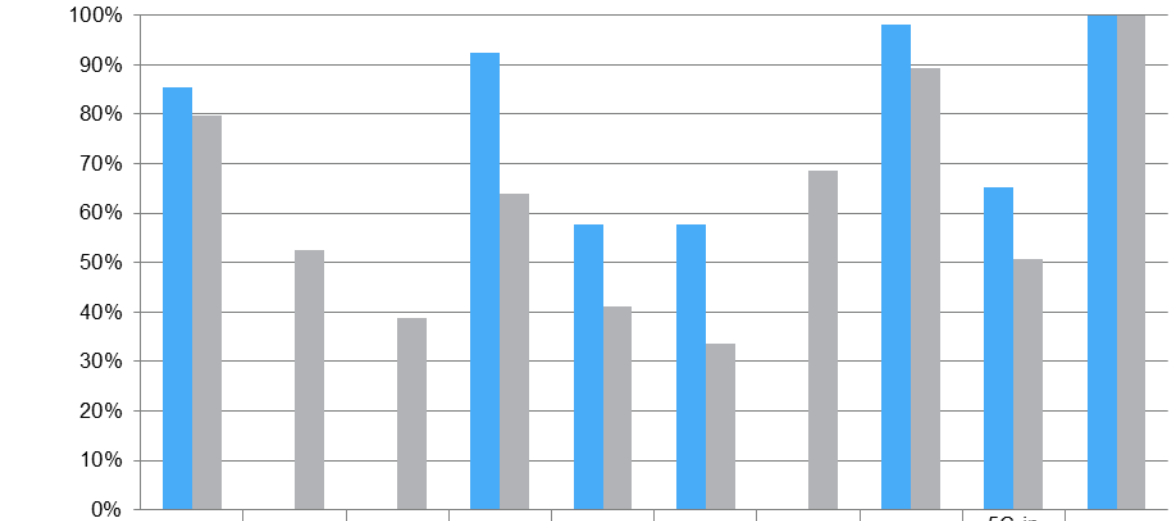
Availability of fixed VHCN (FTTP & DOCSIS 3.1) networks in Portugal increased by 1.2 p.p. to reach 94.2% of homes at June 2023, more than 15 p.p. ahead of the EU average. Rural fixed VHCN coverage was also well ahead of the EU average, at 71.4% of households. There have been no deployments of VDSL in Portugal, and cable networks have all been upgraded to support the DOCSIS 3.1 standard – thus the NGA coverage is equal to the fixed VHCN coverage. Overall NGA coverage is slightly ahead of the EU average at national level, but the absence of rural VDSL puts Portugal 5.3 p.p. behind the average for rural NGA coverage. By the end of June 2023, overall fixed broadband coverage reached 97.6% of all Portuguese households and 88.4% of rural households.



In terms of individual technologies, FTTP is the most prevalent, and coverage continues to increase with 92.3% of homes passed as of June 2023, up from 90.8% one year previously. DSL coverage remained flat for the fifth year running, at 85.3%. As discussed previously, Portuguese operators have opted for FTTP deployment, rather than upgrading DSL to VDSL. Cable modem DOCSIS 3.1 coverage grew slightly to reach 57.8% of households, the entirety of the network having been upgraded from DOCSIS 3.0 to DOCSIS 3.1.

Portugal launched 5G in late 2021, among the last countries in Europe to do so. But by June 2023 5G coverage had overtaken the EU average of 89.3%, with near-universal coverage reported (98.1% of households), one and a half years after the 5G commercial launch. Coverage of 5G services using the 3.4–3.8 GHz band was also ahead of the average, at almost two thirds of households (65.2%).

Portugal: Coverage by technology, total, 2023



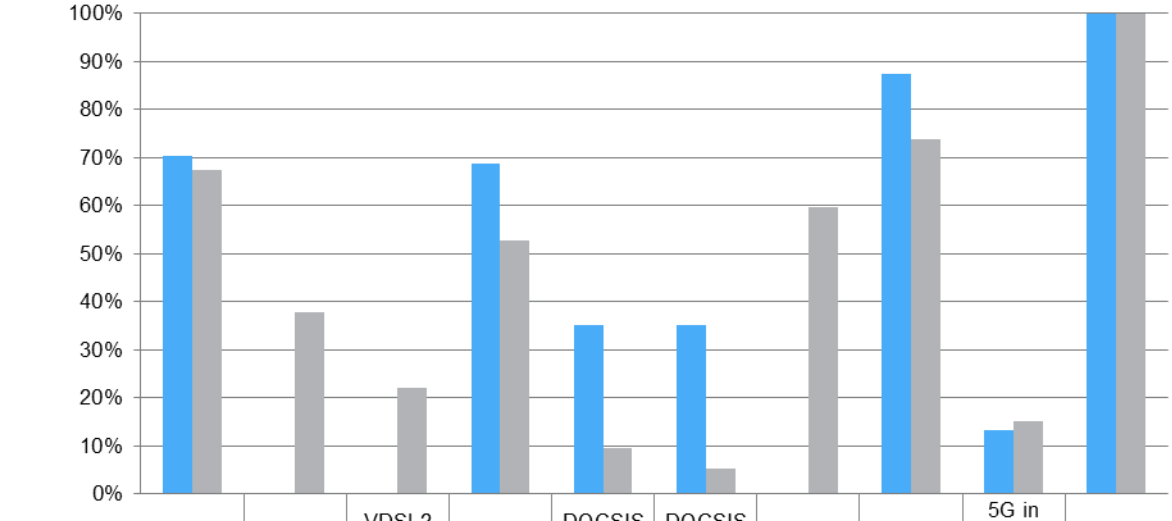
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Portugal	85.3%	0%	0%	92.3%	57.8%	57.8%	0%	98.1%	65.2%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In terms of rural areas, FTTP coverage improved by 3.6 p.p. over the study period, to reach 68.7% of rural Portuguese households, up from 65.1% in mid-2022. But DSL is still the most prevalent rural technology, reaching 70.3% of households (unchanged), while cable modem DOCSIS 3.1 reached over a third of rural homes (35.3%), well ahead of the EU average.

Initial 5G deployments were focussed on urban areas, but rural 5G coverage saw a significant increase in the year to June 2023, reaching 87.5% of rural households as of June 2023, compared with only 20.8% the previous year. Rural 5G coverage in the 3.4–3.8 GHz band was estimated at 13.3%, slightly below the EU average.

Portugal: Coverage by technology, rural areas, 2023



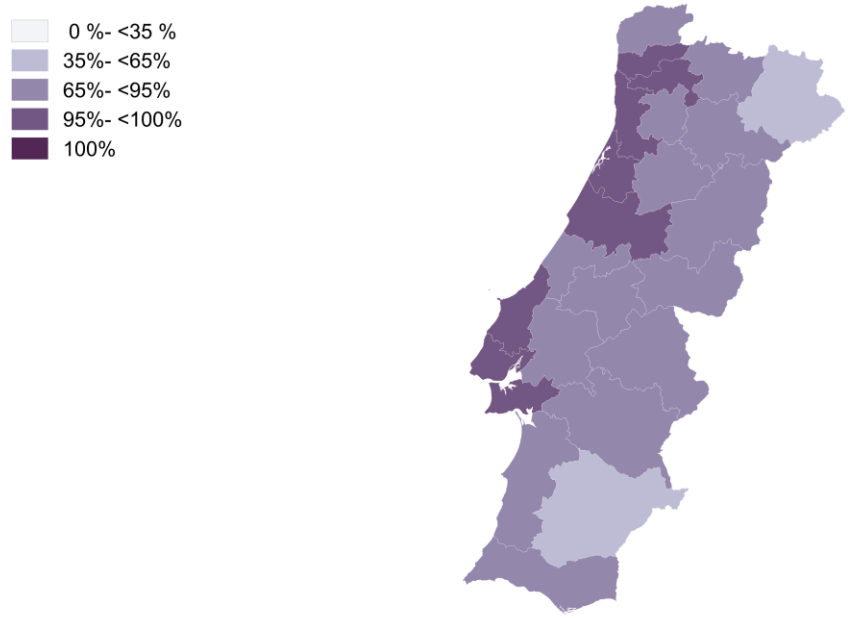
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Portugal	70.3%	0%	0%	68.7%	35.3%	35.3%	0%	87.5%	13.3%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.24.2 Regional coverage by broadband technology

In this iteration of the study, nine of Portugal's 25 regions achieved fixed VHCN (FTTP & DOCSIS 3.1) coverage greater than 95%: the two largest cities (Lisbon and Porto), Cávado, Ave, Oeste, Região de Aveiro, Região de Coimbra, and the two autonomous regions of Madeira and the Azores. As last year. only two regions failed to reach 65% coverage – Terras de Trás-os-Montes, and Baixo Alentejo.

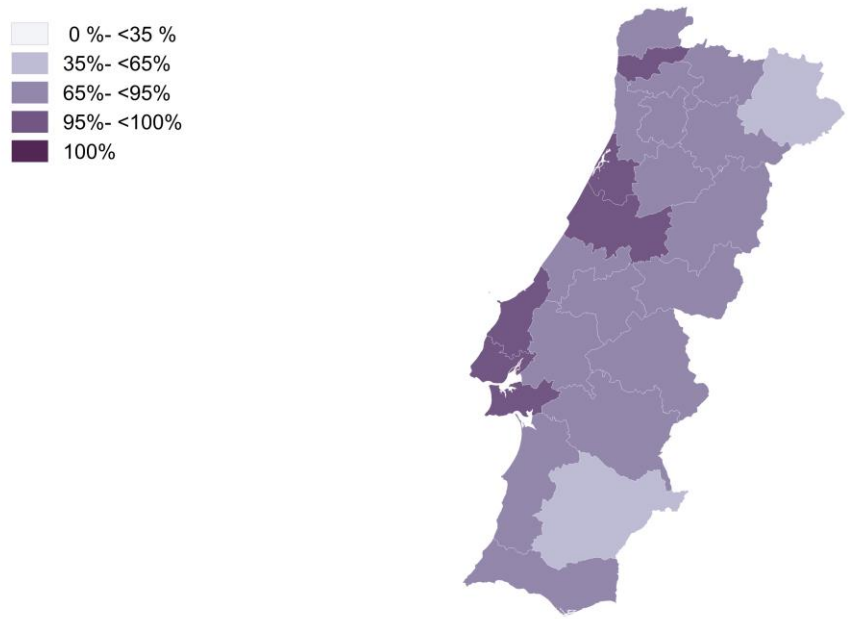
Portugal: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

For FTTP alone the picture was very similar, with only Porto and Ave dropping below the 95% threshold.

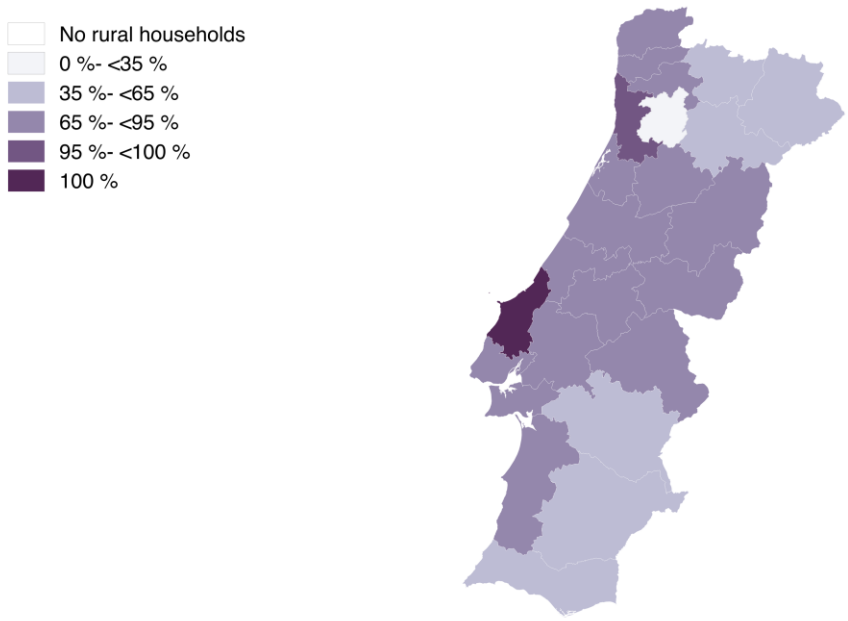
Portugal: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural areas, two regions achieved 100% fixed VHCN (FTTP & DOCSIS 3.1) coverage – Oeste, and the autonomous region of Madeira – while Porto surpassed 95%. Only Tâmega e Sousa, in the north of the country, failed to achieve 35% rural coverage.

Portugal: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

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

Coverage data for Portuguese NUTS 3 areas outside mainland Europe

NUTS 3	Description	Total fixed VHCN (FTTP & DOCSIS 3.1)	Total FTTP	Rural fixed VHCN (FTTP & DOCSIS 3.1)
PT200	Região Autónoma dos Açores	95%-<100%	95%-<100%	65%-<95%
PT300	Região Autónoma da Madeira	95%-<100%	95%-<100%	100%

5.24.3 Data tables for Portugal

Statistic	National
Population	10,352,042
Persons per household	2.5
Rural proportion	14.4%

	Portugal 2023		Portugal 2022		Portugal 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	85.3%	70.3%	85.4%	70.3%	85.4%	70.3%	79.7%	67.4%
VDSL	0%	0%	0%	0%	0%	0%	52.6%	37.8%
VDSL2 Vectoring	0%	0%	0%	0%	0%	0%	38.7%	22.0%
FTTP	92.3%	68.7%	90.8%	65.1%	87.6%	60.7%	64.0%	52.8%
Cable modem DOCSIS 3.0	57.8%	35.3%	57.5%	35.3%	57.6%	43.3%	41.1%	9.5%
Cable modem DOCSIS 3.1	57.8%	35.3%	57.5%	35.3%	57.6%	43.3%	33.6%	5.3%
FWA	0%	0%	0%	0%	0%	0%	68.5%	59.6%
5G	98.1%	87.5%	70.1%	20.8%	0%	0%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	65.2%	13.3%	48.2%	9.2%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.6%	88.4%	97.3%	88.6%	96.3%	90.5%	97.7%	92.2%
Overall NGA broadband	94.2%	71.4%	93.0%	68.8%	90.5%	75.9%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	94.2%	71.4%	93.0%	68.8%	90.5%	75.9%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	95.7%	-	94.9%	-	92.8%	-	93.3%	-
At least 100Mbps	95.7%	-	94.9%	-	92.8%	-	89.0%	-
At least 1Gbps	89.5%	-	88.4%	-	86.0%	-	75.6%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

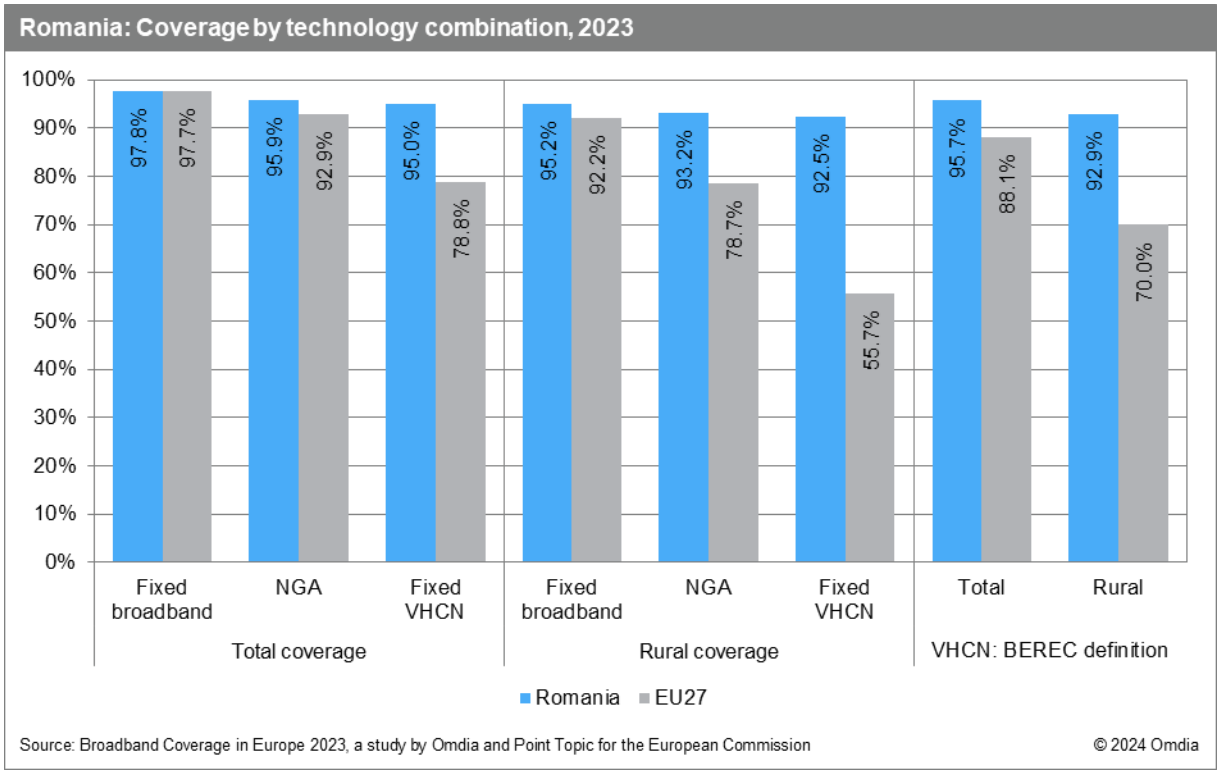
5.25 Romania

5.25.1 National coverage by broadband technology

Overall fixed broadband coverage in Romania remained stable over the course of the study period, reaching 97.8% of households. Rural fixed broadband coverage reached 95.2% of rural households, above the EU average of 92.2%. NGA coverage reached 95.9% of Romanian households at a national level and 93.2% at rural level by the end of June 2023.

Fixed VHCN coverage of networks capable of achieving gigabit speeds, i.e. FTTP & DOCSIS 3.1, was much higher than the EU average at both national and rural level. By mid-2023, 95.0% of all homes and 92.5% of rural homes were passed by networks potentially capable of delivering gigabit speeds.

VHCN coverage as defined by the BEREC rules reached 95.7% of all households and 92.9% of rural households, both categories exceeding EU average levels.



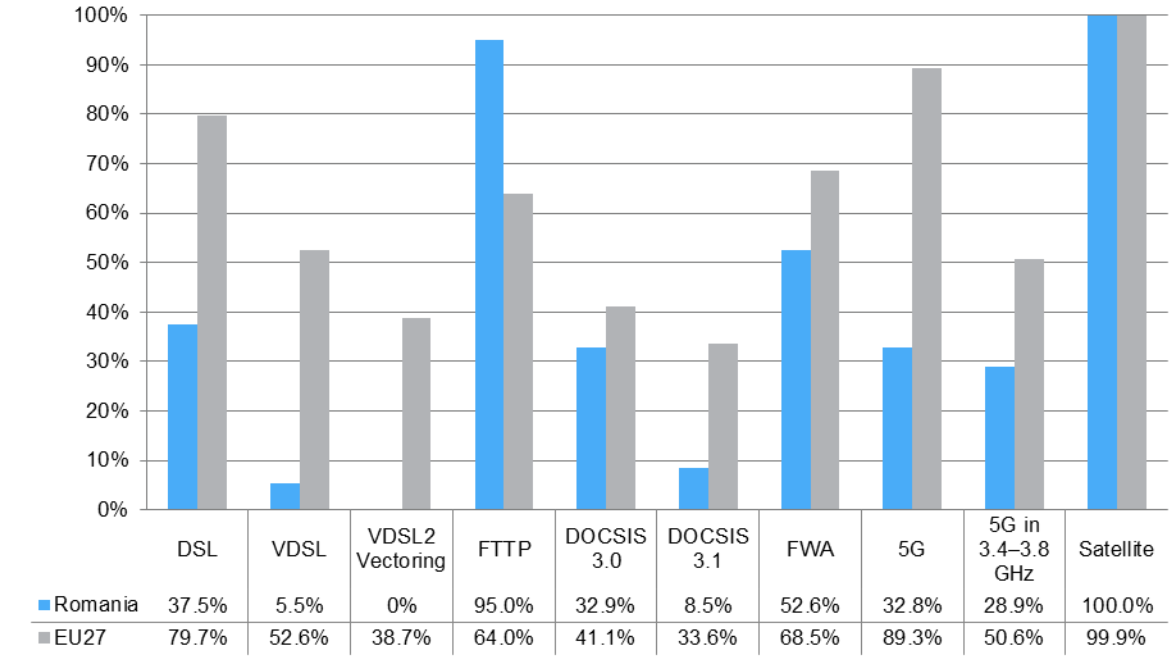
In terms of individual technologies, DSL continued to decrease, with 37.5% of households covered. As is the case in several study countries, this decrease in DSL coverage is due to the incumbent Orange's focus on investing in fibre deployment and gradual decommissioning of legacy copper networks. FWA in Romania covered 52.6% of houses at the end of June 2023.

Looking at NGA technologies, FTTP coverage remained stable, with 95.0% of households covered. At the end of June 2023, Romania was the second leading study country in terms of FTTP coverage behind Spain.

Cable modem DOCSIS 3.0 remained the second most prevalent NGA broadband technology in Romania, reaching 32.9% of homes. In the twelve months to mid-2023, cable operators in Romania launched DOCSIS 3.1 upgrades to their networks and DOCSIS 3.1 services were available to 8.5% of Romanian households by the end of June 2023. Lastly, VDSL remained the least common NGA technology in Romania with 5.5% of households covered. VDSL2 Vectoring has not been deployed.

In terms of mobile broadband coverage, there has been some progress in 5G coverage, which grew by 6.0 p.p. and reached 32.8% by mid-2023. 5G services in the 3.4–3.8 GHz spectrum were available to little more than a quarter (28.9%) of Romanian households.

Romania: Coverage by technology, total, 2023



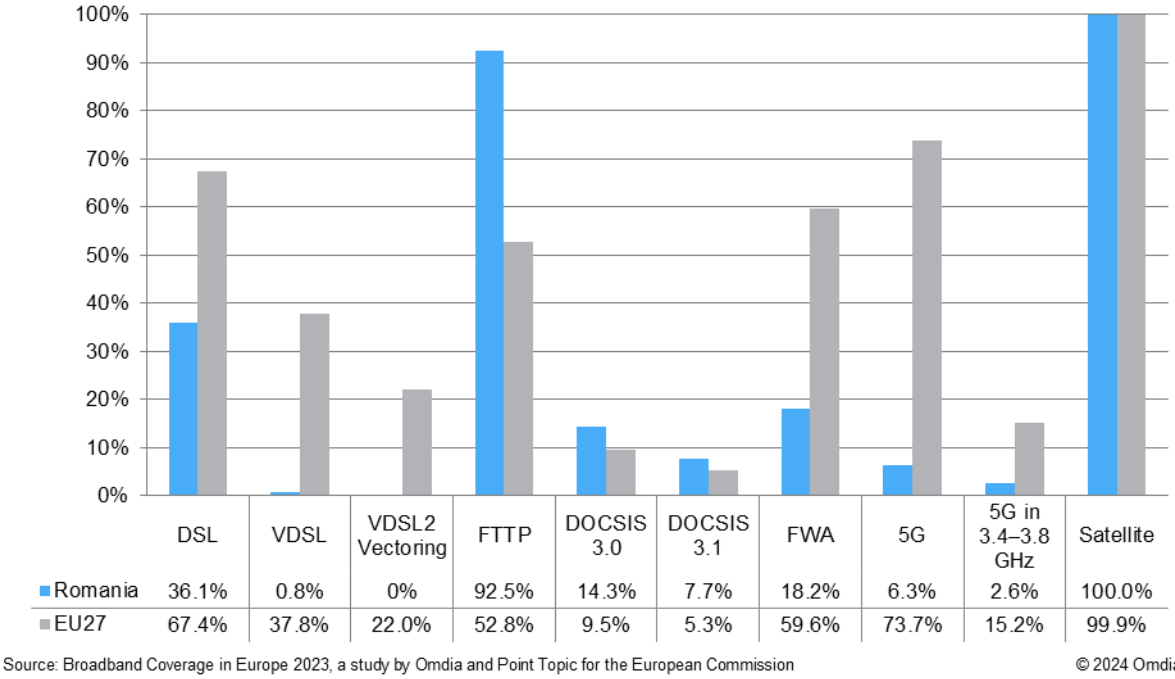
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Romania	37.5%	5.5%	0%	95.0%	32.9%	8.5%	52.6%	32.8%	28.9%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Looking at rural regions of Romania, FTTP was the most prevalent technology in rural Romania with FTTP services available to nine in ten (92.5%) rural households, a 2.4 p.p. increase compared to mid-2022 and nearly double the EU average. DSL coverage declined to 36.1% of rural households. Rural DOCSIS 3.0 coverage decreased from 17.8% to 14.3% pointing to a growing preference for the FTTP technology. This puts it behind FWA at 18.2% by June 2023.

Rural 5G coverage was limited (6.3% of households) as deployments continue to be focused on more densely populated areas.

Romania: Coverage by technology, rural areas, 2023



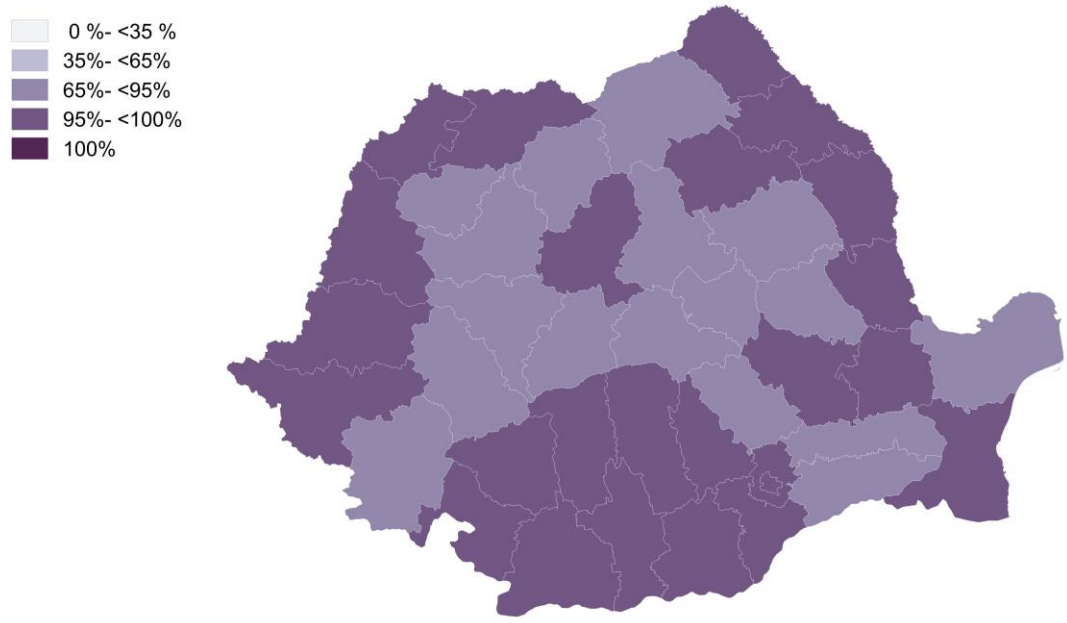
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Romania	36.1%	0.8%	0%	92.5%	14.3%	7.7%	18.2%	6.3%	2.6%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.25.2 Regional coverage by broadband technology

Fixed VHCN (FTTP & DOCSIS 3.1) coverage across Romanian regions is quite varied, ranging from near universal coverage in the Argeş region, to 86.4% in the region of Tulcea.

Romania: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023

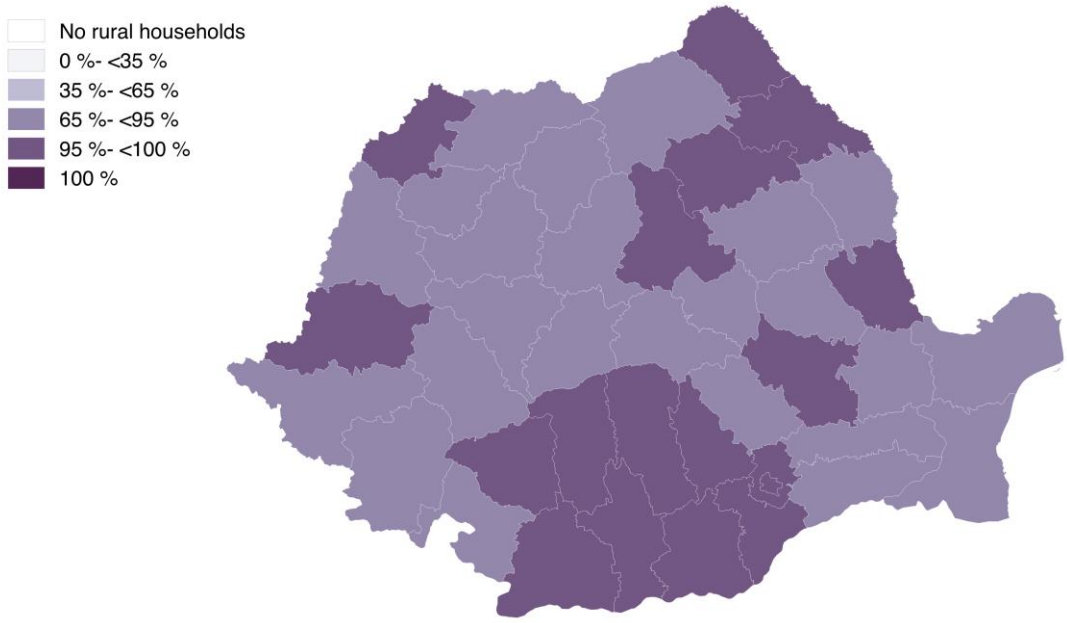


Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Even though DOCSIS 3.1 services have now been partially rolled out in Romania, it has been in areas where FTTP networks were already deployed and hence the FTTP coverage is identical to fixed VHCN (FTTP & DOCSIS 3.1) coverage.

In terms of rural fixed VHCN coverage, all regions recorded coverage above 65%. Highest coverage – 99.0% of rural households – was reported for the Olt region in Southern Romania.

Romania: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.25.3 Data tables for Romania

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

	Romania 2023		Romania 2022		Romania 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	37.5%	36.1%	53.1%	54.4%	55.1%	56.7%	79.7%	67.4%
VDSL	5.5%	0.8%	9.1%	2.3%	9.1%	2.3%	52.6%	37.8%
VDSL2 Vectoring	0%	0%	0%	0%	0%	0%	38.7%	22.0%
FTTP	95.0%	92.5%	95.6%	90.1%	87.1%	75.7%	64.0%	52.8%
Cable modem DOCSIS 3.0	32.9%	14.3%	40.2%	17.8%	43.7%	24.5%	41.1%	9.5%
Cable modem DOCSIS 3.1	8.5%	7.7%	0%	0%	0%	0%	33.6%	5.3%
FWA	52.6%	18.2%	58.0%	25.3%	58.0%	25.3%	68.5%	59.6%
5G	32.8%	6.3%	26.8%	2.9%	24.9%	2.0%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	28.9%	2.6%	25.7%	2.2%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.8%	95.2%	97.8%	95.1%	94.1%	89.0%	97.7%	92.2%
Overall NGA broadband	95.9%	93.2%	97.2%	93.7%	93.3%	84.7%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	95.0%	92.5%	95.6%	90.1%	87.1%	75.7%	78.8%	55.7%
VHCN (as defined by BEREC)	95.7%	92.9%	-	-	-	-	88.1%	70.0%
At least 30Mbps	95.8%	-	96.1%	-	93.7%	-	93.3%	-
At least 100Mbps	95.7%	-	94.5%	-	88.6%	-	89.0%	-
At least 1Gbps	95.0%	-	91.8%	-	85.2%	-	75.6%	-
At least 1Gbps upload and download	0%	-	0%	-	0%	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic. All restatements are highlighted in italics.

For 2023, the household's coverage has been assessed by using data supplied by operators at the address level. Thus, due to the detailed geographical spatial resolution (address level), the reporting has been more robust and pertinent, leading to subtle differences from the previous reports.

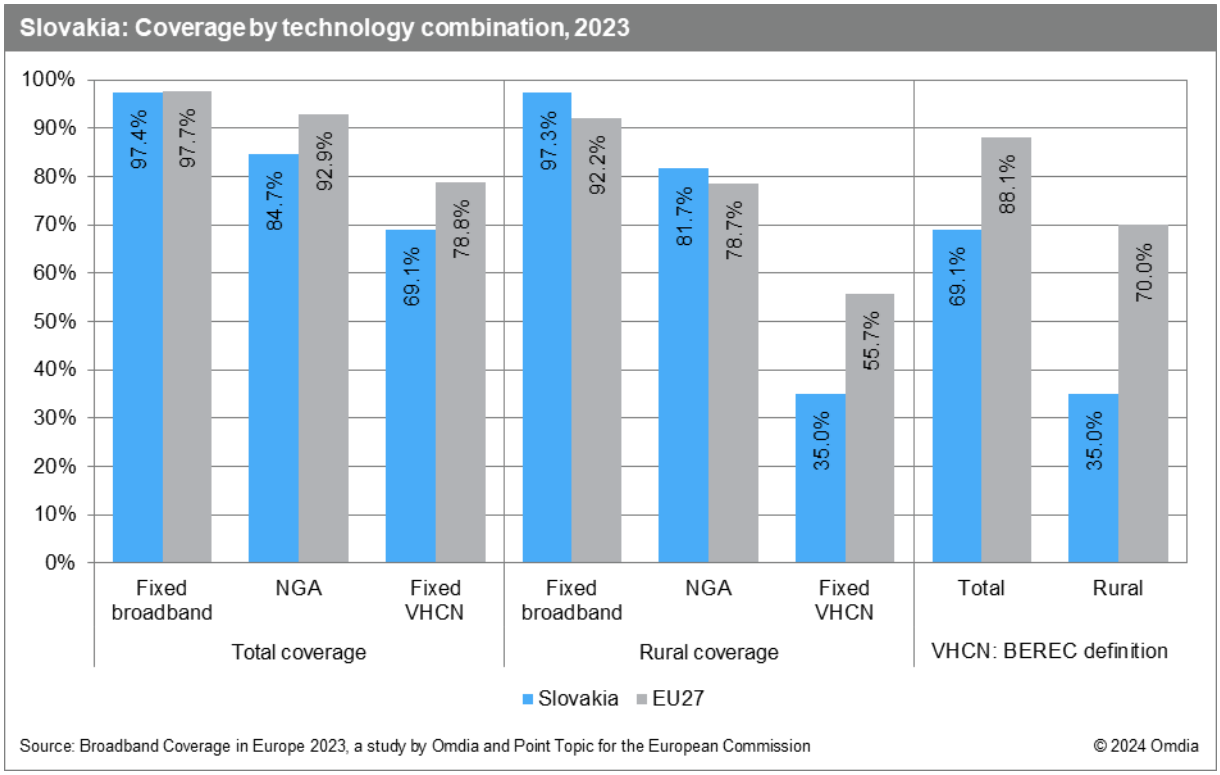
In Romania, speeds are strictly specified based on transport layer protocol payload, in line with paragraph 140 of the BoR (20) 112 BEREC Guidelines on the Implementation of the Open Internet Regulation (page 40). Practically, an internet offer with maximum/advertised "best-effort" speed of 1Gbps is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

Slovakia's fixed broadband coverage remained unchanged with 97.4% at national and 97.3% at rural level by the end of June 2023, respectively. NGA coverage grew by 0.3 percentage points, but Slovakia remained towards the bottom of the ranking, with an 8.2 percentage point gap to the EU average. In rural areas, however, NGA coverage exceeded the EU average, with 81.7% homes passed, up by 8.8 percentage points compared to mid-2022.

Fixed VHCN coverage of networks capable of delivering gigabit speeds (FTTP & DOCSIS 3.1) fell below the EU average at both national and rural level, with 69.1% and 35.0% of homes passed, respectively, which equalled BEREC-defined VHCN coverage in the country.

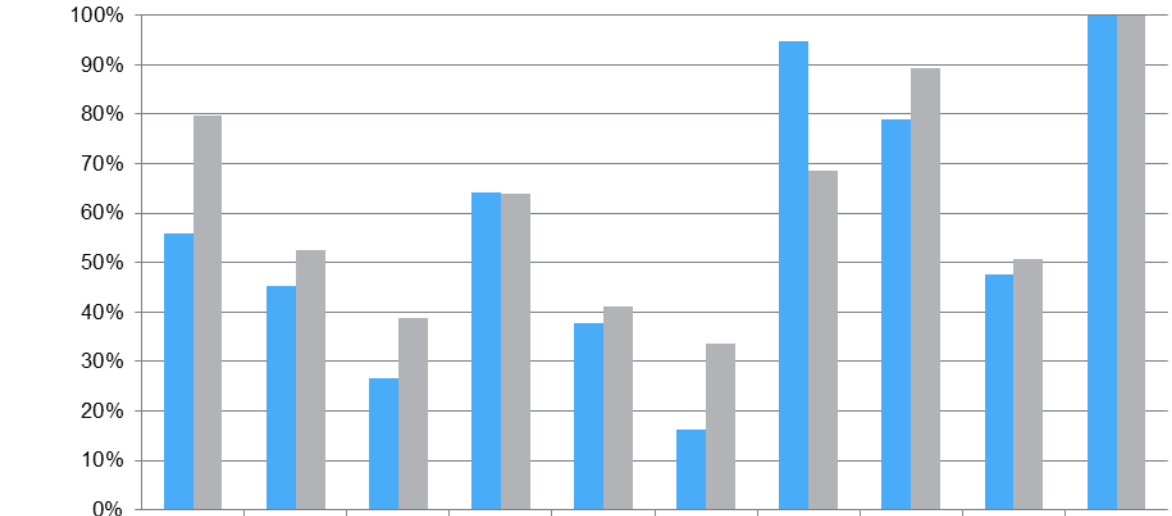


Slovakia is one of the study countries with comparatively low DSL coverage (55.9%) and has seen a steady decline in coverage since 2020. The decline accelerated to 11.1 percentage points over the 12-month period. VDSL and VDSL2 Vectoring coverage stood at 45.2% and 26.5% by mid-2023, respectively.

Similarly to Czechia, FWA technologies provide connectivity to most households (94.8%), which are typically offered by small and regional operators. Cable networks were available to 37.8% of Slovak households, while 43.2% of the cable footprint had been upgraded to DOCSIS 3.1 by mid-2023.

Slovak operators progressed with 5G deployments which improved coverage by 23.7 percentage points to cover 79.0% of households by mid-2023. Despite the considerable improvement, Slovakia maintained a 10.3 percentage gap to the EU average. 5G coverage in the 3.4–3.8 GHz band improved by 8.3 percentage points and was available to almost half (47.5%) of households, but also remained below the EU average.

Slovakia: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Slovakia	55.9%	45.2%	26.5%	64.2%	37.8%	16.4%	94.8%	79.0%	47.5%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

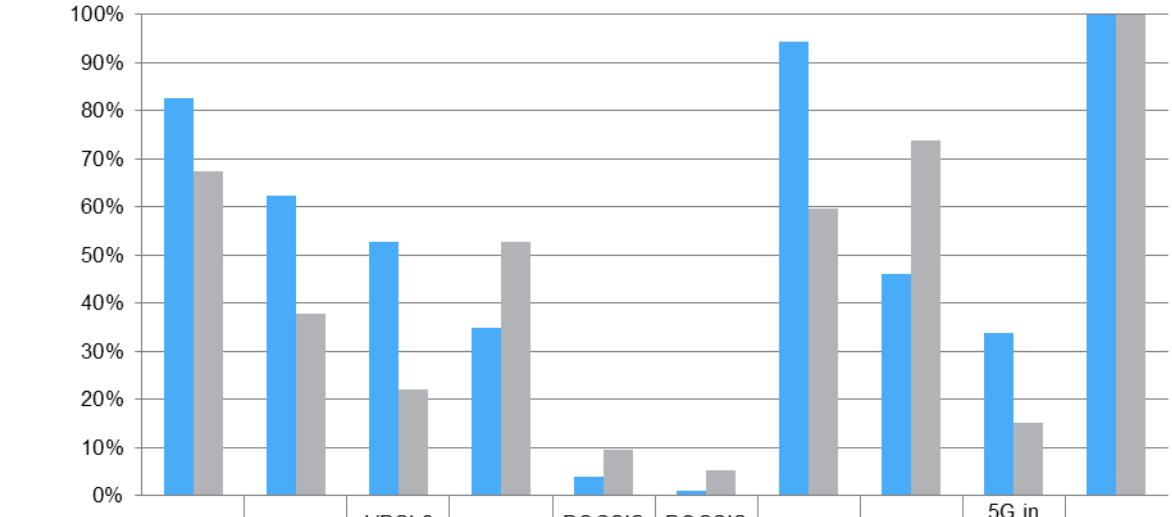
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Slovakia, FWA remained the most prevalent technology, covering 94.8% of households, followed by DSL with 82.7% coverage. VDSL and VDSL2 Vectoring networks were available to 62.5% and 52.6% of rural households, respectively. Unlike at national level, Slovakia exceeded the EU average across all three copper categories.

FTTP coverage grew by 3.7 percentage points and stood at 35.0% by mid-2023 but maintained a 17.7 percentage point gap to the EU average. DOCSIS 3.0 coverage grew by 1.2 percentage points, with 26% of the cable footprint upgraded to DOCSIS 3.1 as of mid-2023.

5G coverage grew by 6.9 percentage points by mid-2023, and by 6.0 percentage points when looking at the 3.4–3.8 GHz band only. While Slovakia fell below the EU average in the overall 5G coverage, it surpassed the EU average in the 3.4–3.8 GHz band.

Slovakia: Coverage by technology, rural areas, 2023



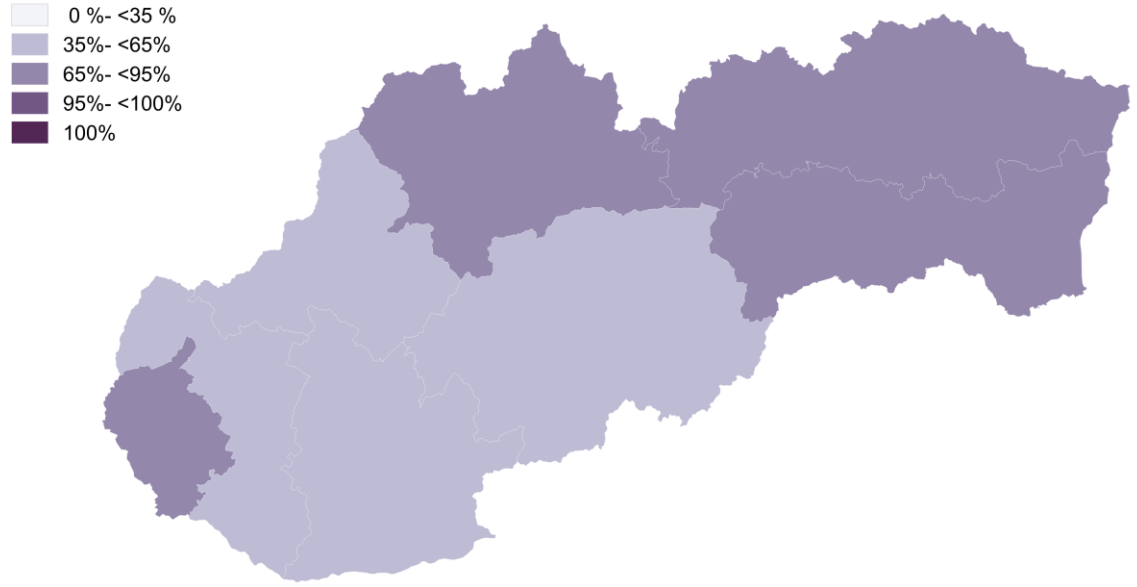
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Slovakia	82.7%	62.5%	52.6%	35.0%	4.0%	1.0%	94.3%	46.1%	34.0%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.26.2 Regional coverage by broadband technology

Fixed VHCN (FTTP & DOCSIS 3.1) coverage in Slovakia ranged from 59.3% in Nitriansky kraj to 87.0% in Bratislavský kraj. None of the regions exceeded the 95% threshold nor fell below 35%.

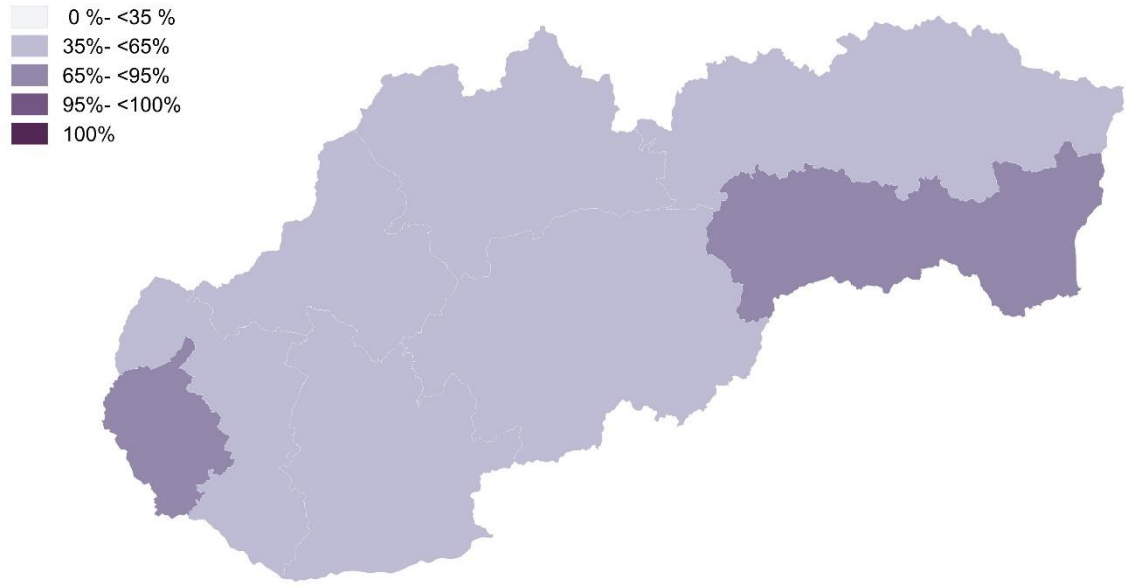
Slovakia: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Bratislavský kraj (87.0%) and Košický kraj (78.7%) were the only two regions that exceeded the 65% threshold, while Trnavský kraj recorded the lowest coverage (55.3%).

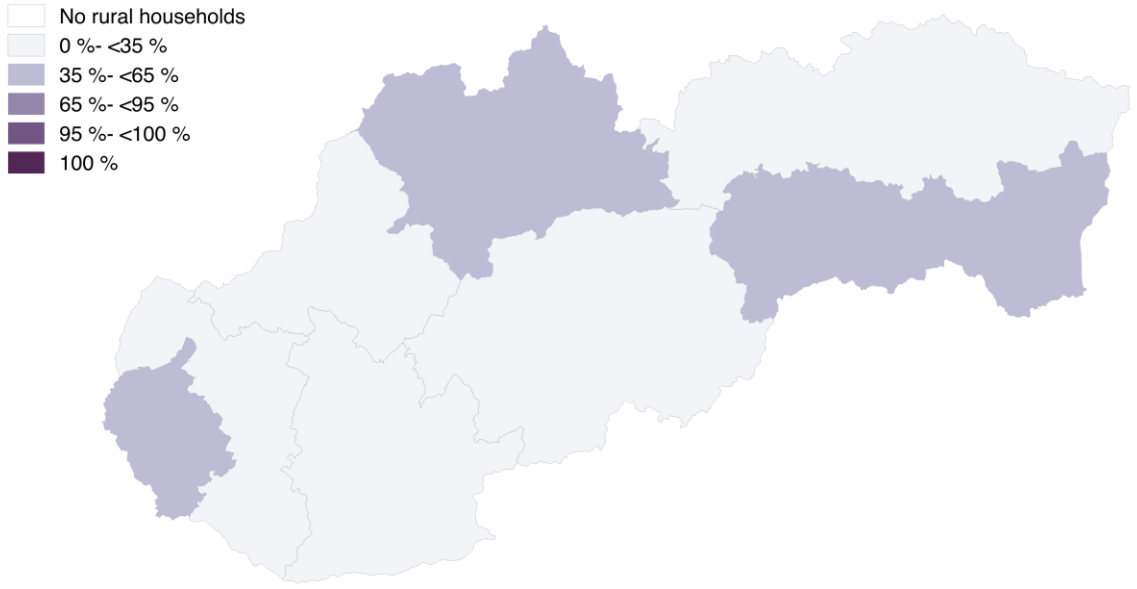
Slovakia: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Slovakia, fixed VHCN (FTTP & DOCSIS 3.1) coverage ranged from 27.9% in Trnavský kraj to 53.2% in Košický kraj. Only 3 out of 8 Slovak regions exceeded the 35% threshold.

Slovakia: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.26.3 Data tables for Slovakia

Statistic	National
Population	5,449,270
Persons per household	3.0
Rural proportion	24.9%

	Slovakia 2023		Slovakia 2022		Slovakia 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	55.9%	82.7%	66.9%	74.2%	71.5%	80.0%	79.7%	67.4%
VDSL	45.2%	62.5%	54.7%	56.6%	57.7%	60.2%	52.6%	37.8%
VDSL2 Vectoring	26.5%	52.6%	32.0%	48.1%	33.4%	51.0%	38.7%	22.0%
FTTP	64.2%	35.0%	66.9%	31.2%	62.3%	21.6%	64.0%	52.8%
Cable modem DOCSIS 3.0	37.8%	4.0%	40.7%	*2.9%*	39.4%	2.6%	41.1%	9.5%
Cable modem DOCSIS 3.1	16.4%	1.0%	*17.6%*	*0.8%*	17.4%	0.8%	33.6%	5.3%
FWA	94.8%	94.3%	94.9%	94.6%	94.8%	94.3%	68.5%	59.6%
5G	79.0%	46.1%	55.3%	39.3%	13.8%	2.4%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	47.5%	34.0%	39.2%	27.9%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	97.4%	97.3%	97.4%	97.3%	97.4%	97.1%	97.7%	92.2%
Overall NGA broadband	84.7%	81.7%	84.4%	72.9%	84.3%	79.5%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	69.1%	35.0%	71.3%	32.3%	66.7%	21.6%	78.8%	55.7%
VHCN (as defined by BEREC)	69.1%	35.0%	-	-	-	-	88.1%	70.0%
At least 30Mbps	97.4%	-	82.8%	-	82.3%	-	93.3%	-
At least 100Mbps	84.7%	-	80.2%	-	75.4%	-	89.0%	-
At least 1Gbps	60.9%	-	*40.3%*	-	28.0%	-	75.6%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

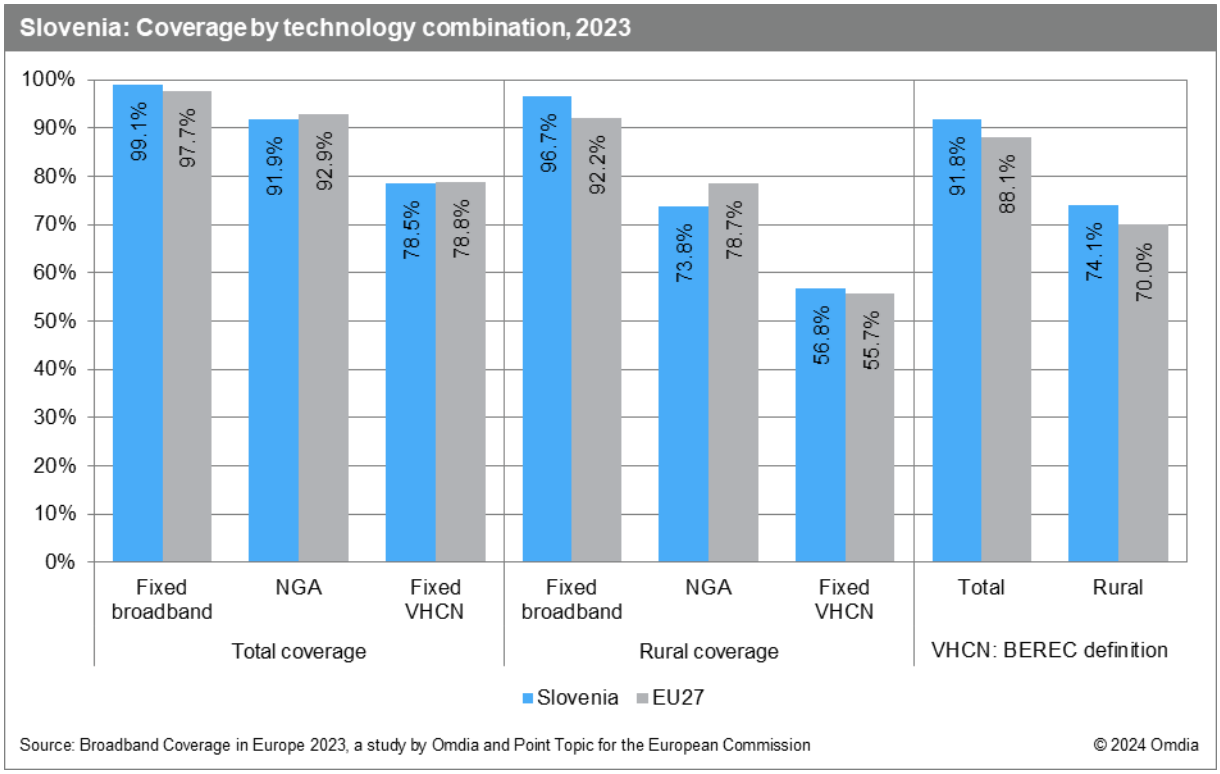
All restatements are highlighted in italics.

5.27 Slovenia

5.27.1 National coverage by broadband technology

Fixed broadband in Slovenia nears universal coverage, with 99.1% of homes passed by the end of June 2023, an increase of 0.1 percentage points compared to mid-2022. In rural Slovenia, coverage increased by 0.4 percentage points and stood at 96.7%. The availability of high-speed networks also grew over the 12-month period, but NGA coverage remained below the EU average at national and rural level, with 91.9% and 73.8% of households covered, respectively.

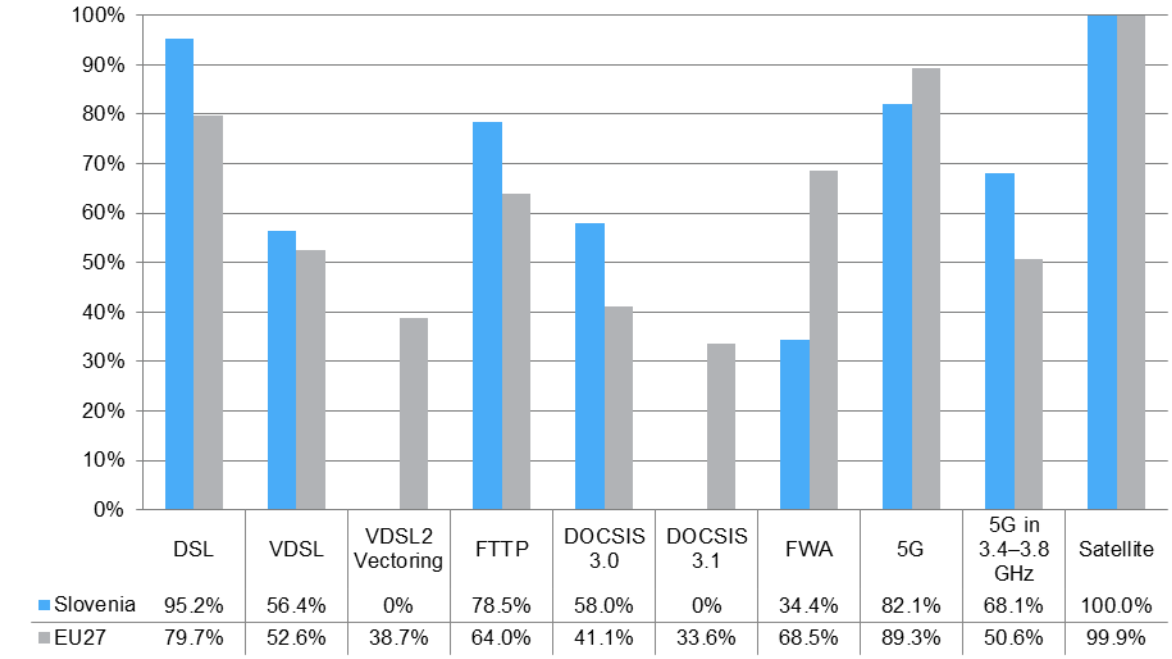
The availability of fixed VHCN (FTTP & DOCSIS 3.1) increased by 3.0 percentage points and reached 78.5% by mid-2023. Rural coverage was ahead of the EU average, with 56.8% households covered. The fixed VHCN category remained limited to FTTP only, as there was no record of DOCSIS 3.1 deployments by the end of June 2023. BEREC-defined VHCN coverage stood at 91.8% by mid-2023.



DSL remained the largest broadband technology in Slovenia, despite a small decline of 0.4 percentage points in this year's study. VDSL was available to 56.4% of households, while no upgrade to VDSL2 Vectoring had taken place by mid-2023. DOCSIS 3.0 coverage stood at 58.0%, but none of the operators had yet upgraded to the DOCSIS 3.1 standard. FTTP coverage reached 78.5%, up by 3.0 percentage points, and was well above the EU average. FWA recorded stronger growth than in previous years, and coverage was up by 4.5 percentage points compared to mid-2022.

5G coverage hit 82.1% by mid-2023, up by 18.2 percentage points, but despite considerable improvement, Slovenia remained below the EU average. 5G coverage in the 3.4–3.8 GHz band improved by 12.7 percentage points and was 17.5 percentage points above the EU average.

Slovenia: Coverage by technology, total, 2023



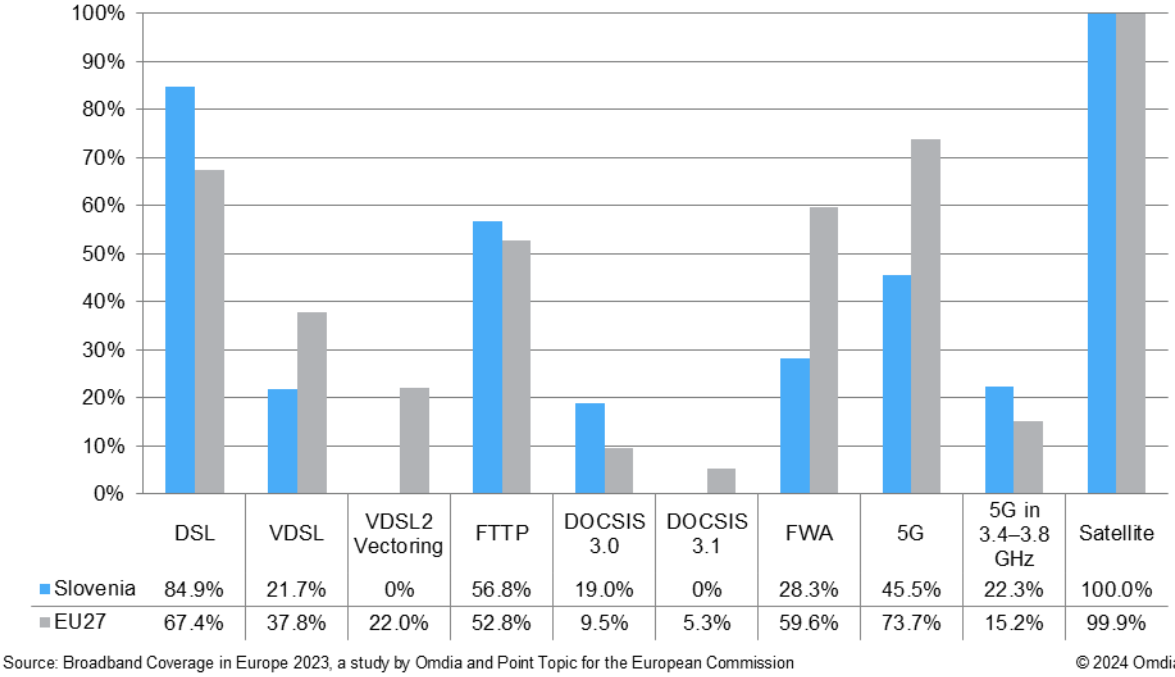
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Slovenia	95.2%	56.4%	0%	78.5%	58.0%	0%	34.4%	82.1%	68.1%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Slovenia, DSL coverage continued its slow decline (1.2 percentage points), but remained the most prevalent technology, with 84.9% rural homes passed by mid-2023. VDSL was available to 21.7% of rural households. FTTP recorded the strongest growth among broadband technologies with 5.8 percentage points and covered 56.8% of rural households. FWA coverage increased by 0.8 percentage points but maintained a gap of 31.3 percentage points to the EU average.

The pace of 5G deployment in rural Slovenia accelerated over the last year, with 45.5% of households covered by mid-2023, up from 14.1% in the prior year. 5G coverage in the 3.4–3.8 GHz band stood at 22.3%, above the EU average.

Slovenia: Coverage by technology, rural areas, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Slovenia	84.9%	21.7%	0%	56.8%	19.0%	0%	28.3%	45.5%	22.3%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

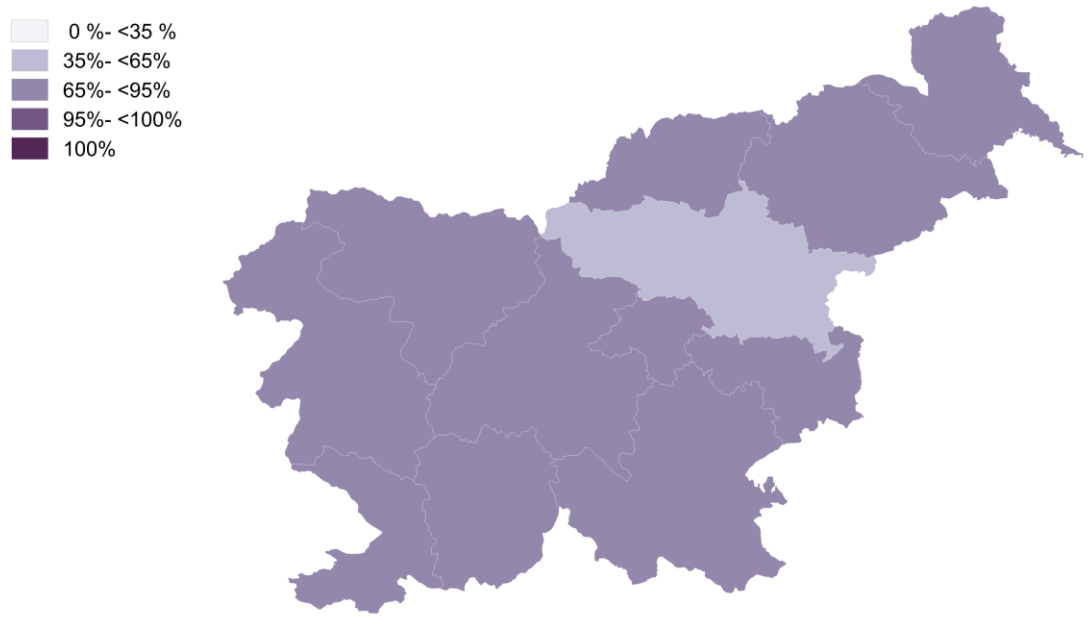
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.27.2 Regional coverage by broadband technology

Savinjska was the only region in Slovenia that fell below the 65% threshold which is an improvement from four regions in mid-2022. While none of the regions surpassed the 95% threshold, Jugovzhodna Slovenija and Osrednjeslovenska were close with 92.6% and 92.1% coverage, respectively.

In the absence of DOCSIS 3.1 networks, the fixed VHCN category is identical to FTTP coverage.

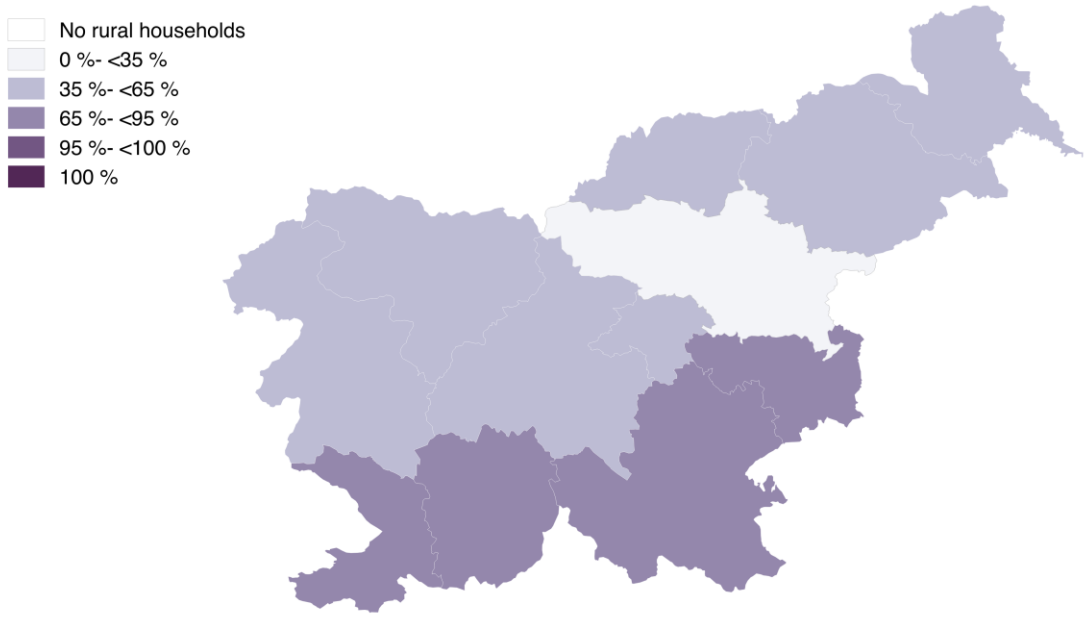
Slovenia: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Slovenia, fixed VHCN (FTTP & DOCSIS 3.1) coverage ranged from 91.7% in Primorsko-notranjska to 20.5% in Savinjska.

Slovenia: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.27.3 Data tables for Slovenia

Statistic	National
Population	2,048,290
Persons per household	2.9
Rural proportion	22.3%

	Slovenia 2023		Slovenia 2022		Slovenia 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	95.2%	84.9%	95.6%	86.1%	95.8%	86.5%	79.7%	67.4%
VDSL	56.4%	21.7%	56.2%	21.8%	56.6%	22.0%	52.6%	37.8%
VDSL2 Vectoring	0%	0%	0%	0%	0%	0%	38.7%	22.0%
FTTP	78.5%	56.8%	75.5%	51.0%	72.5%	46.4%	64.0%	52.8%
Cable modem DOCSIS 3.0	58.0%	19.0%	58.4%	20.1%	58.5%	19.3%	41.1%	9.5%
Cable modem DOCSIS 3.1	0%	0%	0%	0%	0%	0%	33.6%	5.3%
FWA	34.4%	28.3%	29.9%	27.5%	29.7%	27.4%	68.5%	59.6%
5G	82.1%	45.5%	63.9%	14.1%	36.6%	2.8%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	68.1%	22.3%	55.4%	9.3%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.1%	96.7%	99.0%	96.3%	98.9%	96.0%	97.7%	92.2%
Overall NGA broadband	91.9%	73.8%	90.5%	70.0%	89.5%	67.0%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	78.5%	56.8%	75.5%	51.0%	72.4%	46.4%	78.8%	55.7%
VHCN (as defined by BEREC)	91.8%	74.1%	-	-	-	-	88.1%	70.0%
At least 30Mbps	91.9%	-	90.5%	-	89.5%	-	93.3%	-
At least 100Mbps	89.0%	-	87.2%	-	85.5%	-	89.0%	-
At least 1Gbps	10.9%	-	*6.6%*	-	0.9%	-	75.6%	-
At least 1Gbps upload and download	10.9%	-	*6.6%*	-	*0.9%*	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

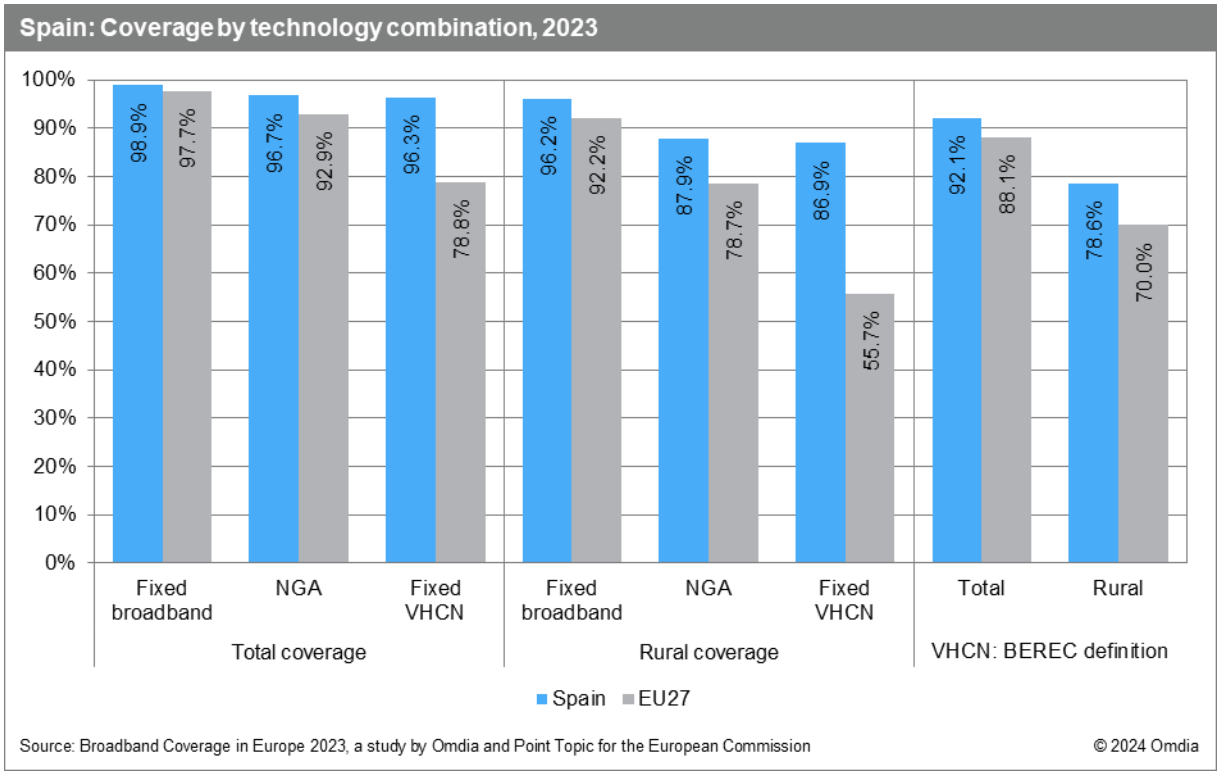
All restatements are highlighted in italics.

5.28 Spain

5.28.1 National coverage by broadband technology

Fixed broadband in Spain nears universal coverage levels, with 98.9% of homes passed, up by 3.0 percentage points compared to mid-2022. The availability of NGA and fixed VHCN, i.e. FTTP & DOCSIS 3.1 networks grew by 2.6 and 3.0 percentage points, respectively. Rural Spain recorded good growth across all combination categories in this year's study, with particularly strong growth in the NGA and fixed VHCN (FTTP & DOCSIS 3.1) categories, which were up by 7.5 and 11.0 percentage points, respectively.

Spain exceeded the EU average across all four categories at both national and rural level. In the fixed VHCN category, Spain ranked fourth and fifth at national and rural level, respectively.



FTTP is the most prevalent broadband technology in Spain, and with 95.2% homes passed, Spain recorded the highest FTTP coverage among all study countries in 2023. Compared to mid-2022, when Spain ranked second, FTTP coverage grew by 4.2 percentage points. Cable networks were available to one third of Spanish households (32.8%), and 86% of the cable network had been upgraded to the DOCSIS 3.1 standard by mid-2023. FWA coverage stood at 97.5%.

The decommissioning of copper networks was far progressed by mid-2023, with plans to complete it by April 2024. The Spanish incumbent started to close small copper plants in 2014, and the pace of decommissioning accelerated over the study period which led to a 47.2 percentage point drop in DSL coverage in this year's study. VDSL coverage fell to just 1.1%.

The availability of 5G grew by 10.0 percentage points and hit 92.3%, compared to 89.3% for the EU as a whole. Spain also exceeded the EU average in the 5G in the 3.4–3.8 GHz band category which stood at 58.3%, up by 19.2 percentage points compared to mid-2022.

Spain: Coverage by technology, total, 2023

	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Spain	31.6%	1.1%	0%	95.2%	32.8%	31.4%	97.5%	92.3%	58.3%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural Spain, FTTP was the most prevalent technology, and with 85.9% of homes passed, Spain recorded the third highest rural FTTP coverage among study countries in 2023. Compared to mid-2022, coverage grew by 12.0 percentage points. The availability of cable networks remained low, with just 4.8% of rural households covered, while 4.1% of rural households were covered by DOCSIS 3.1.

DSL decomissioning also caused a sharp drop in rural DSL coverage which fell to 19.8% by mid-2023, while VDSL coverage stood at just 1.7%. FWA coverage increased to 90.2%.

Rural 5G coverage improved by 19.1 percentage points, but unlike at national level, Spain remained below the EU average, with a total of 67.4% of households covered. Spain also remained below the EU average when looking at the 3.4–3.8 GHz band, with 10.2% of rural households covered, compared to 15.2% for the EU as a whole.

Spain: Coverage by technology, rural areas, 2023

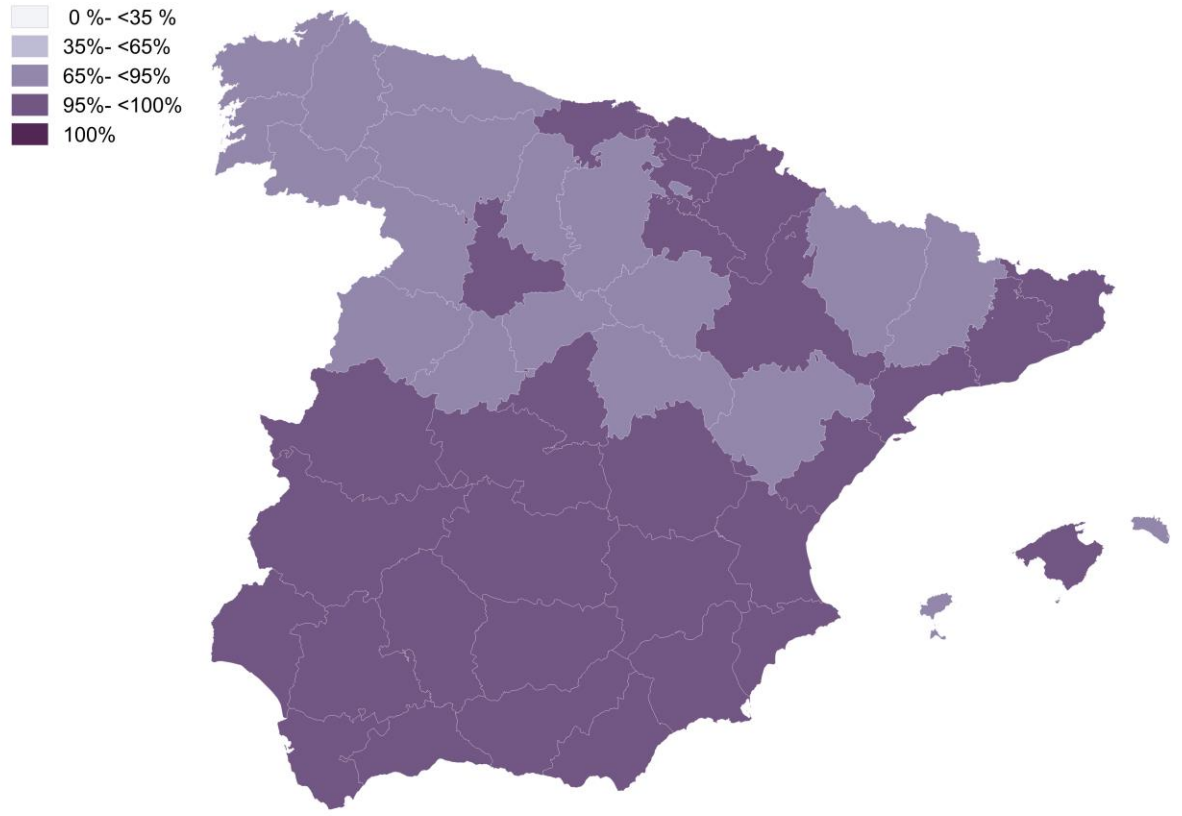
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Spain	19.8%	1.7%	0%	85.9%	4.8%	4.1%	90.2%	67.4%	10.2%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.28.2 Regional coverage by broadband technology

All Spanish regions surpassed the 65% threshold in fixed VHCN (FTTP & DOCSIS 3.1) coverage by mid-2023, while 36 out of 59 regions exceeded 95% coverage. Madrid (99.6%), Barcelona (99.2%), and Melilla (99.1%) came close to universal coverage.

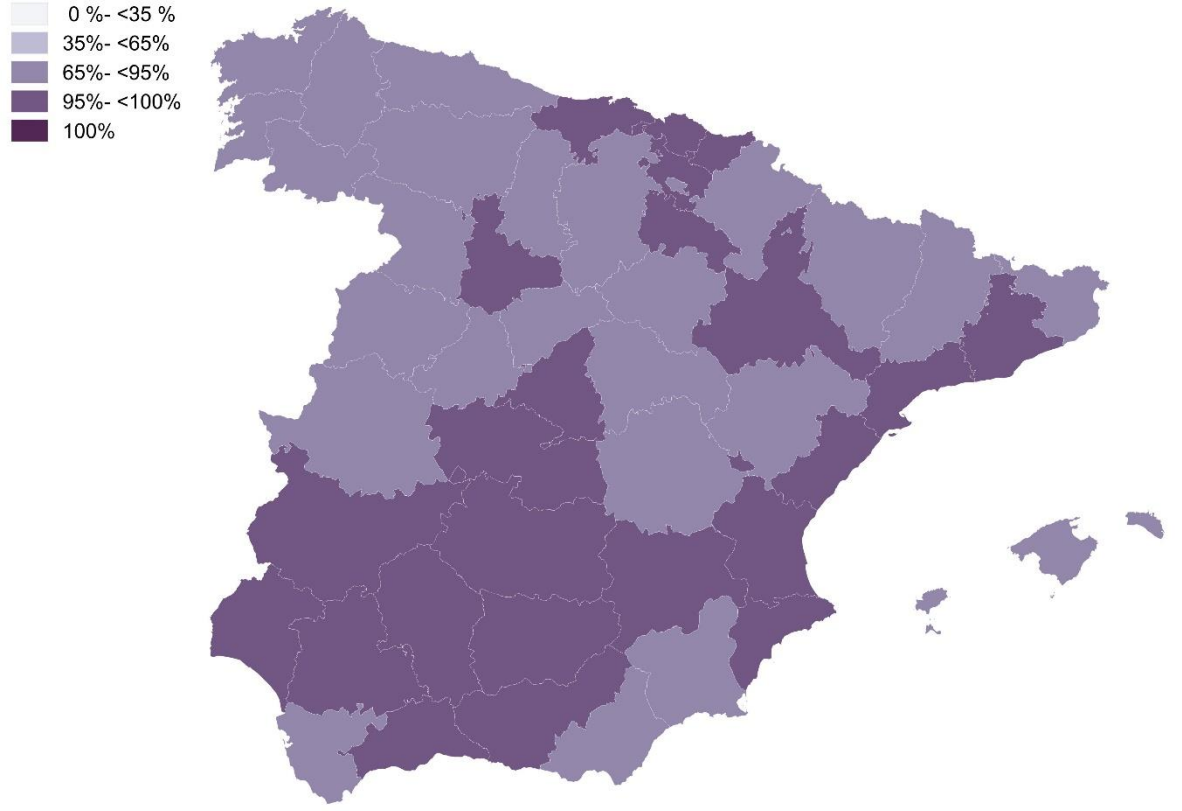
Spain: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

FTTP coverage ranged from 99.2% in Madrid to 74.5% in El Hierro. 26 out of 59 regions in Spain recorded FTTP coverage above 95%.

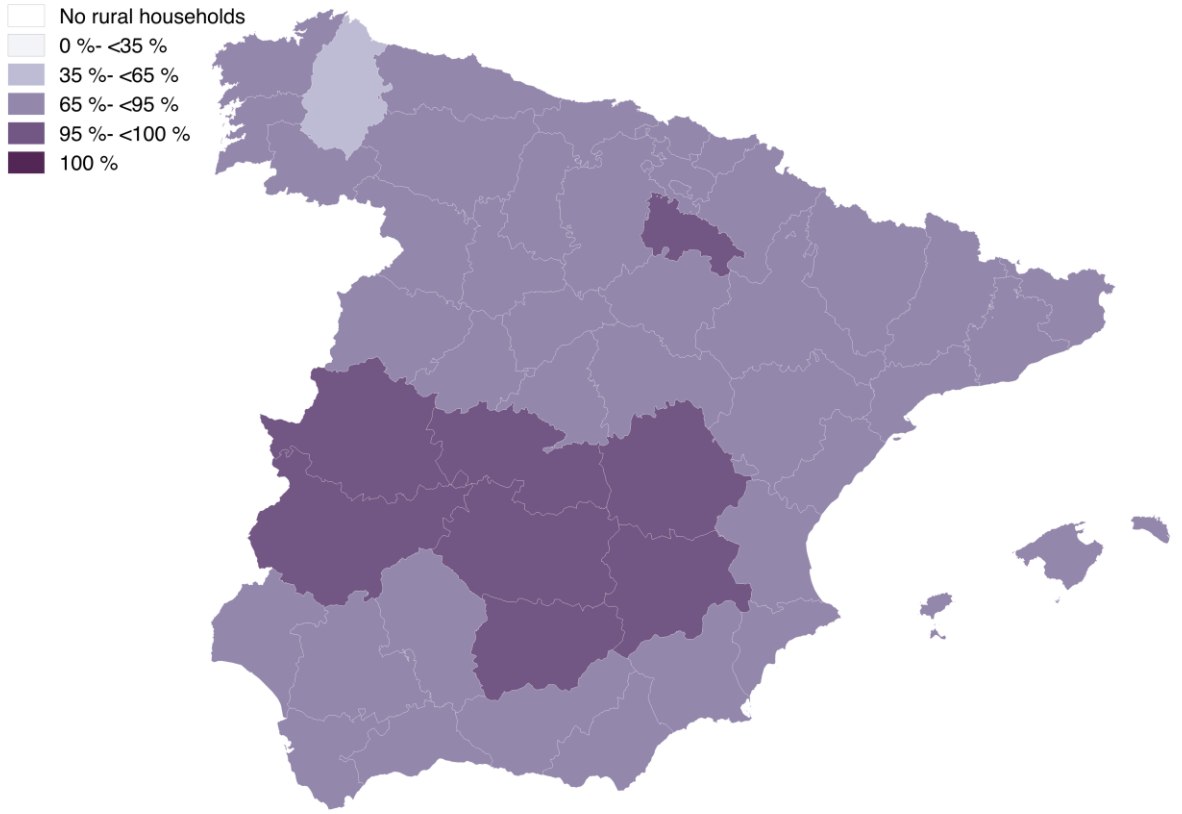
Spain: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

The majority of Spanish regions (47 out of 59) recorded rural fixed VHCN (FTTP & DOCSIS 3.1) coverage between 65%–95%, while ten regions exceeded the 95% threshold. Lugo and La Palma were the only two regions in which coverage remained below 65%.

Spain: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

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

Coverage data for Spanish NUTS 3 areas outside mainland Europe

NUTS 3	Description	Total fixed VHCN (FTTP & DOCSIS 3.1)	Total FTTP	Rural fixed VHCN (FTTP & DOCSIS 3.1)
ES630	Ceuta	95%-<100%	95%-<100%	95%-<100%
ES640	Melilla	95%-<100%	95%-<100%	95%-<100%
ES703	El Hierro	65%-<95%	65%-<95%	65%-<95%
ES704	Fuerteventura	65%-<95%	65%-<95%	65%-<95%
ES705	Gran Canaria	95%-<100%	95%-<100%	65%-<95%
ES706	La Gomera	65%-<95%	65%-<95%	65%-<95%
ES707	La Palma	65%-<95%	65%-<95%	35%-<65%
ES708	Lanzarote	95%-<100%	65%-<95%	65%-<95%
ES709	Tenerife	95%-<100%	65%-<95%	65%-<95%

5.28.3 Data tables for Spain

Statistic	National
Population	47,432,893
Persons per household	2.6
Rural proportion	16.6%

	Spain 2023		Spain 2022		Spain 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	31.6%	19.8%	78.7%	54.5%	88.8%	85.4%	79.7%	67.4%
VDSL	1.1%	1.7%	11.0%	9.6%	11.9%	16.0%	52.6%	37.8%
VDSL2 Vectoring	0%	0%	0%	0%	0%	0%	38.7%	22.0%
FTTP	95.2%	85.9%	91.0%	73.9%	88.9%	68.9%	64.0%	52.8%
Cable modem DOCSIS 3.0	32.8%	4.8%	33.0%	4.6%	38.4%	6.3%	41.1%	9.5%
Cable modem DOCSIS 3.1	31.4%	4.1%	33.0%	4.6%	38.4%	6.3%	33.6%	5.3%
FWA	97.5%	90.2%	58.8%	68.5%	35.3%	62.3%	68.5%	59.6%
5G	92.3%	67.4%	82.3%	48.3%	58.9%	24.8%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	58.3%	10.2%	39.1%	1.9%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	98.9%	96.2%	96.0%	90.6%	96.4%	93.8%	97.7%	92.2%
Overall NGA broadband	96.7%	87.9%	94.1%	80.4%	94.4%	78.6%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	96.3%	86.9%	93.3%	76.0%	93.8%	71.5%	78.8%	55.7%
VHCN (as defined by BEREC)	92.1%	78.6%	-	-	-	-	88.1%	70.0%
At least 30Mbps	96.2%	-	96.7%	-	96.2%	-	93.3%	-
At least 100Mbps	95.7%	-	91.2%	-	93.8%	-	89.0%	-
At least 1Gbps	92.6%	-	86.7%	-	92.5%	-	75.6%	-
At least 1Gbps upload and download	90.2%	-	83.3%	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

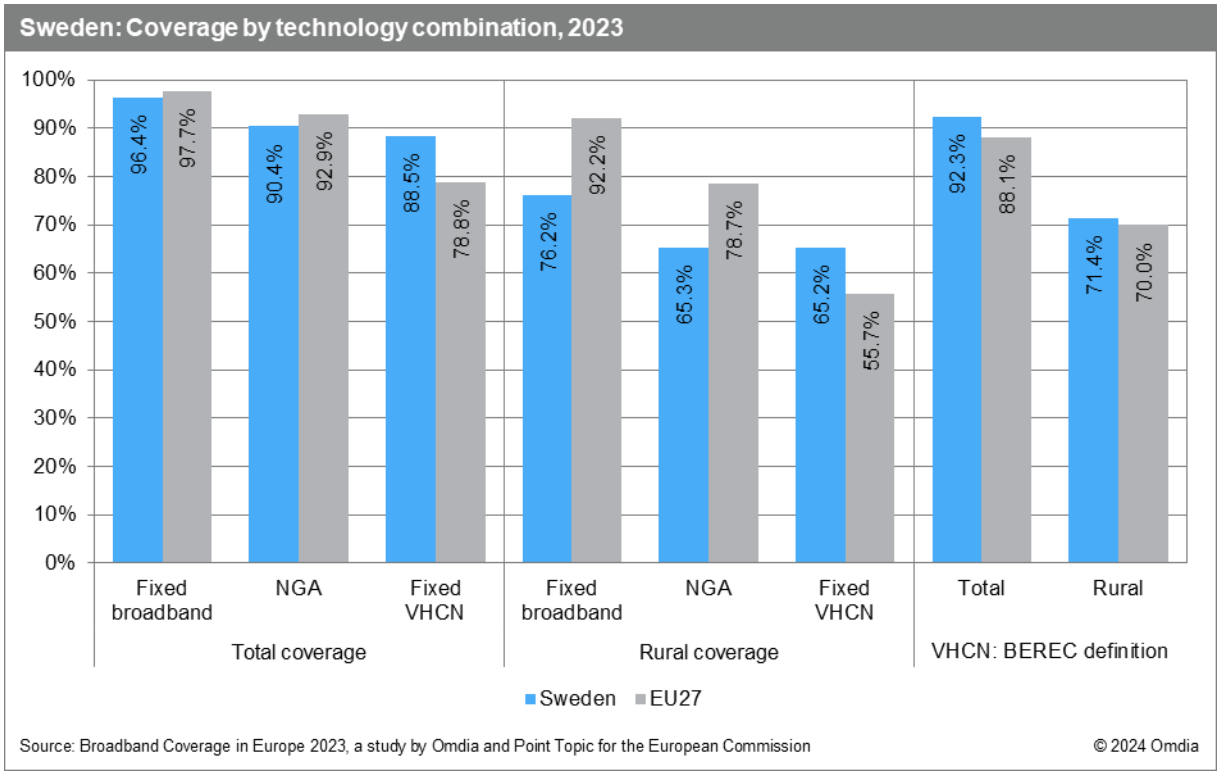
5.29 Sweden

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 96.4% of homes passed by at least one fixed broadband network at the end of June 2023. However, with just 76.2% of rural households having access to fixed broadband services, Sweden remained below the EU average of 92.2%. NGA broadband services were available to 90.4% of all households and 65.3% of rural households.

Overall coverage of fixed VHCN (FTTP & DOCSIS 3.1) remained significantly above the EU average at both rural and national level, owing to Sweden's high coverage of FTTP. By mid-2023, 88.5% of Swedish homes were passed by networks capable of delivering gigabit speeds, while such services were available to 65.2% or rural households.

BEREC-defined VHCN coverage reached 92.3% of all households and 71.4% of rural households, exceeding the total EU average level but below the rural EU average level.

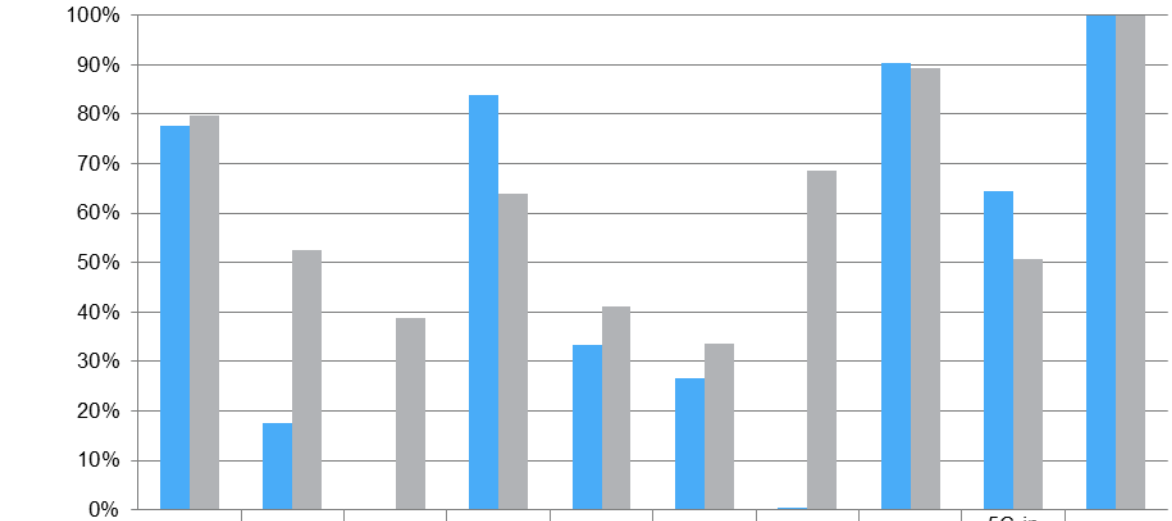


By mid-2023, FTTP was the leading broadband technology in Sweden, increasing by 2.4 p.p. and reaching 83.9% of households, compared to 77.7% of households covered by DSL networks. As the incumbent Telia continued with its deployment of fibre and gradual switch-off of copper networks, DSL decreased by 5.1 percentage points year-on-year, as did VDSL (by 0.9 percentage points). By the end of June 2023, 17.6% of Swedish households had access to VDSL broadband services. As in previous years, there were no VDSL2 Vectoring deployments reported in Sweden.

Cable modem DOCSIS 3.0 stood at 33.5% of homes passed at the end of June 2023. DOCSIS 3.1 upgrades have gained momentum in the twelve months to mid-2023, growing by 26.2 p.p. and reaching 26.5% of households.

Availability of 5G services improved dramatically over the study period with 5G coverage increasing by 70 percentage points compared to mid-2022 and at the end of June 2023, 90.3% of Swedish households had access to at least one 5G network. Availability of 5G services in the 3.4–3.8 GHz band also increased considerably, growing from 9.7% in mid-2022 to 64.5% in mid-2023.

Sweden: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Sweden	77.7%	17.6%	0%	83.9%	33.5%	26.5%	0.6%	90.3%	64.5%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

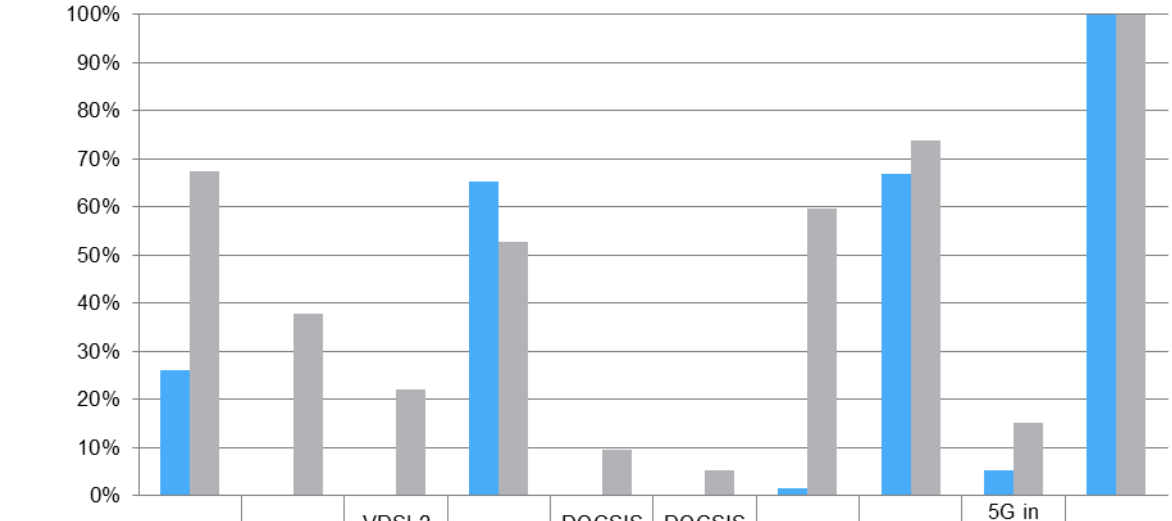
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Looking at broadband availability in rural Sweden, DSL coverage continued to fall, recording a 15.7 p.p. decrease compared to mid-2022. With just 26.6% of rural households covered by DSL networks, FTTP was the most prevalent access technology reaching 65.2% of rural Swedish households, following a 5.6 p.p. increase during the study period.

Rural VDSL and cable modem DOCSIS 3.0 coverage remained negligible, with both remaining below 1.0% of coverage, at 0.2% and 0.3% respectively.

As was the case on a national level, rural 5G coverage increased considerably and reached 67.0% of rural households at the end of June 2023 compared to just 0.5% recorded in mid-2022. However, rural coverage of 5G networks using the 3.4–3.8 GHz band remained limited with just 5.3% of rural Swedish homes passed.

Sweden: Coverage by technology, rural areas, 2023



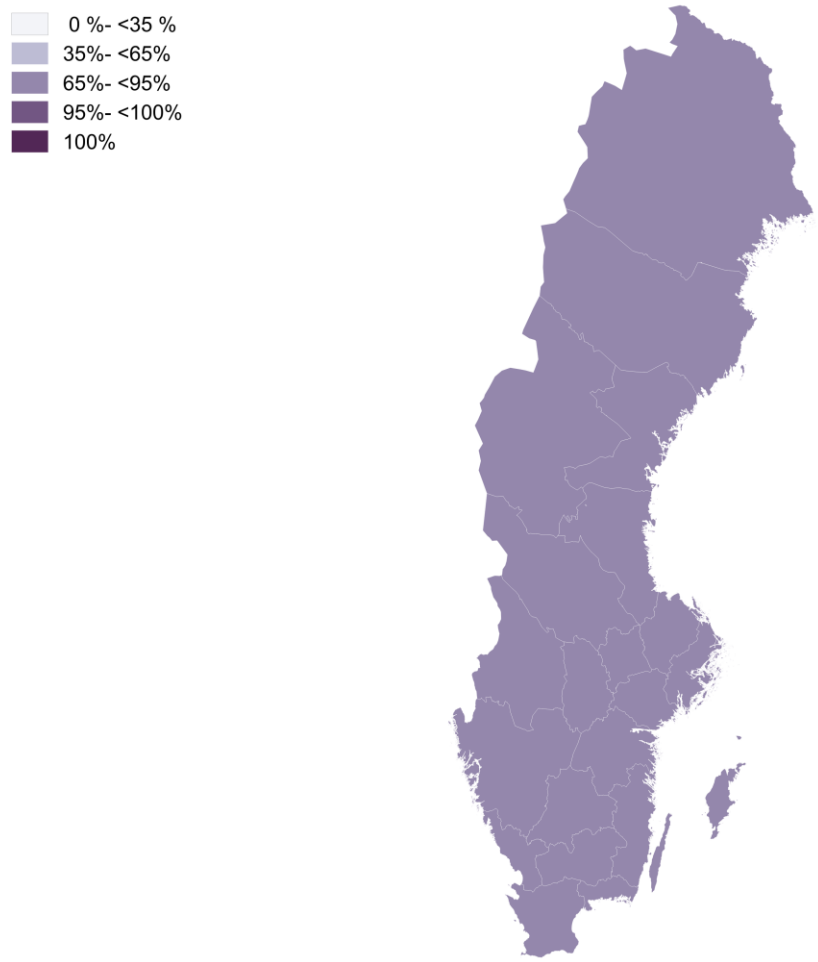
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Sweden	26.2%	0.2%	0%	65.2%	0.3%	0.0%	1.7%	67.0%	5.3%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.29.2 Regional coverage by broadband technology

At the end of June 2023, fixed VHCN (FTTP & DOCSIS 3.1) coverage (which in the absence of DOCSIS 3.1 equals FTTP coverage) in all Swedish regions fell between 77% and 95%, with the capital region of Stockholm recording the highest coverage level.

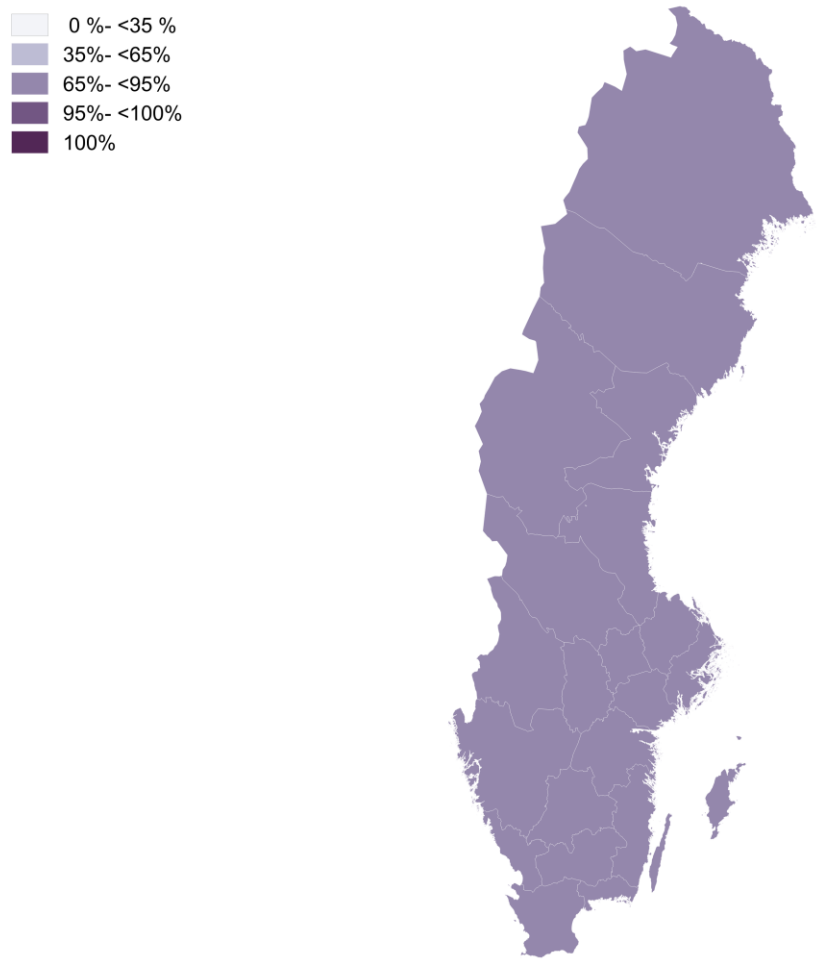
Sweden: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Since coverage of DOCSIS 3.1 remains very limited in Sweden, regional FTTP coverage shows a similar pattern to the fixed VHCN (FTTP & DOCSIS 3.1) coverage.

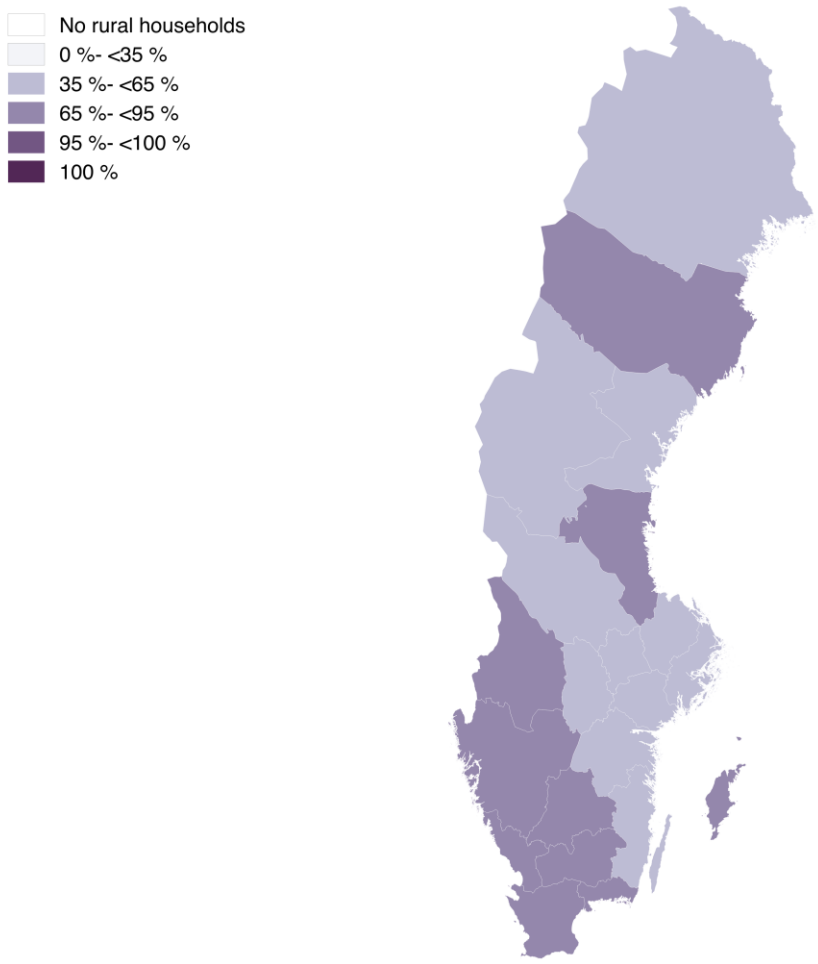
Sweden: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In terms of rural fixed VHCN (FTTP & DOCSIS 3.1) coverage, 10 out of the 21 regions recorded coverage levels higher than 65% of rural households.

Sweden: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.29.3 Data tables for Sweden

Statistic	National
Population	10,452,326
Persons per household	2.2
Rural proportion	9.3%

	Sweden 2023		Sweden 2022		Sweden 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	77.7%	26.2%	82.8%	41.8%	87.4%	56.2%	79.7%	67.4%
VDSL	17.6%	0.2%	18.5%	0.3%	20.1%	0.5%	52.6%	37.8%
VDSL2 Vectoring	0%	0%	0%	0%	0%	0%	38.7%	22.0%
FTTP	83.9%	65.2%	*81.5%*	*59.6%*	82.5%	54.3%	64.0%	52.8%
Cable modem DOCSIS 3.0	33.5%	0.3%	*33.4%*	0.3%	35.8%	0.3%	41.1%	9.5%
Cable modem DOCSIS 3.1	26.5%	0.0%	0.3%	0.0%	0.4%	0.0%	33.6%	5.3%
FWA	0.6%	1.7%	0.5%	1.4%	0.4%	0.6%	68.5%	59.6%
5G	90.3%	67.0%	20.5%	0.5%	17.7%	0.5%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	64.5%	5.3%	9.7%	0.1%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	96.4%	76.2%	*96.7%*	*77.5%*	97.6%	80.6%	97.7%	92.2%
Overall NGA broadband	90.4%	65.3%	*88.8%*	*59.8%*	85.6%	54.6%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	88.5%	65.2%	*81.6%*	*59.6%*	82.5%	54.3%	78.8%	55.7%
VHCN (as defined by BEREC)	92.3%	71.4%	-	-	-	-	88.1%	70.0%
At least 30Mbps	90.8%	-	*89.1%*	-	88.9%	-	93.3%	-
At least 100Mbps	89.0%	-	*86.8%*	-	86.7%	-	89.0%	-
At least 1Gbps	88.5%	-	*81.6%*	-	82.5%	-	75.6%	-
At least 1Gbps upload and download	88.5%	-	*81.6%*	-	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 2023 figures represent the state of broadband coverage on 1st October 2022. The 2022 and 2021 figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

All restatements are highlighted in italics.

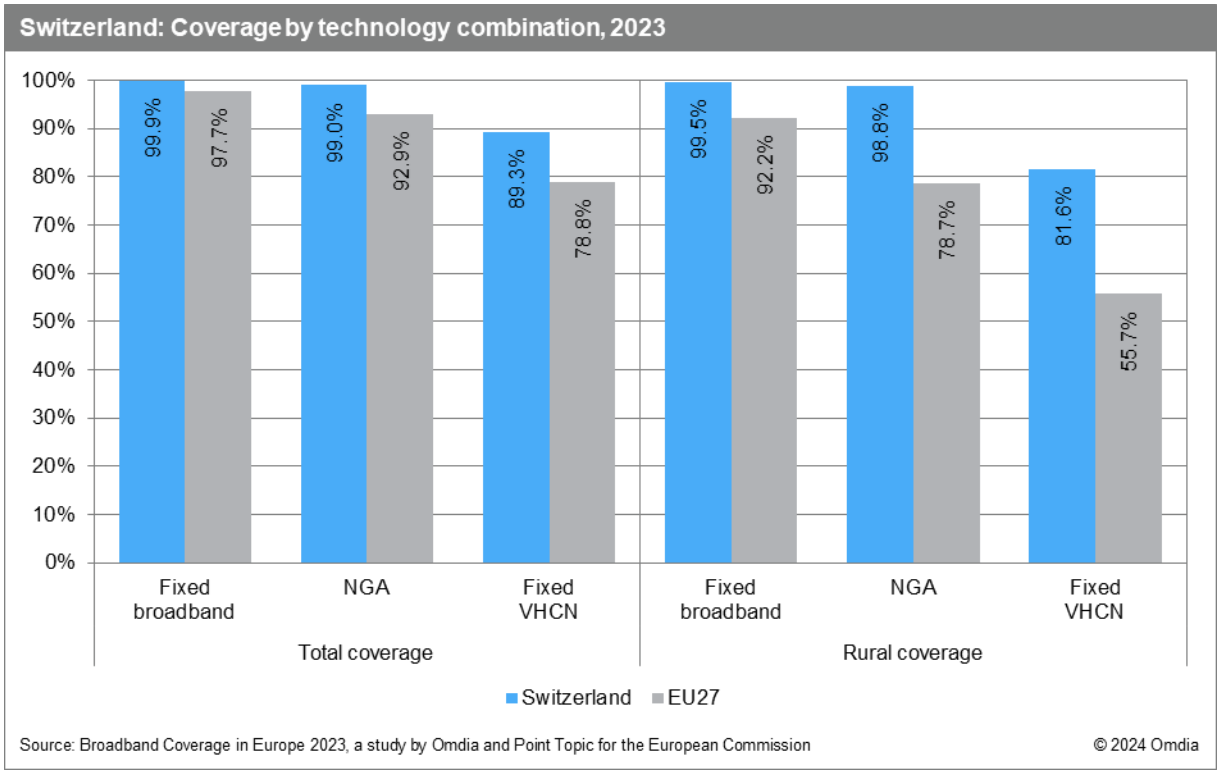
5.30 Switzerland

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-2023, which was unchanged from last year. In rural regions, broadband services passed 99.5% of rural homes. NGA networks were available to 99.0% and 98.8% of households on national and rural level, respectively. The fixed Very High Capacity networks, i.e. FTTP & DOCSIS 3.1 networks, covered 89.3% of all Swiss households and 81.6% of rural households.

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

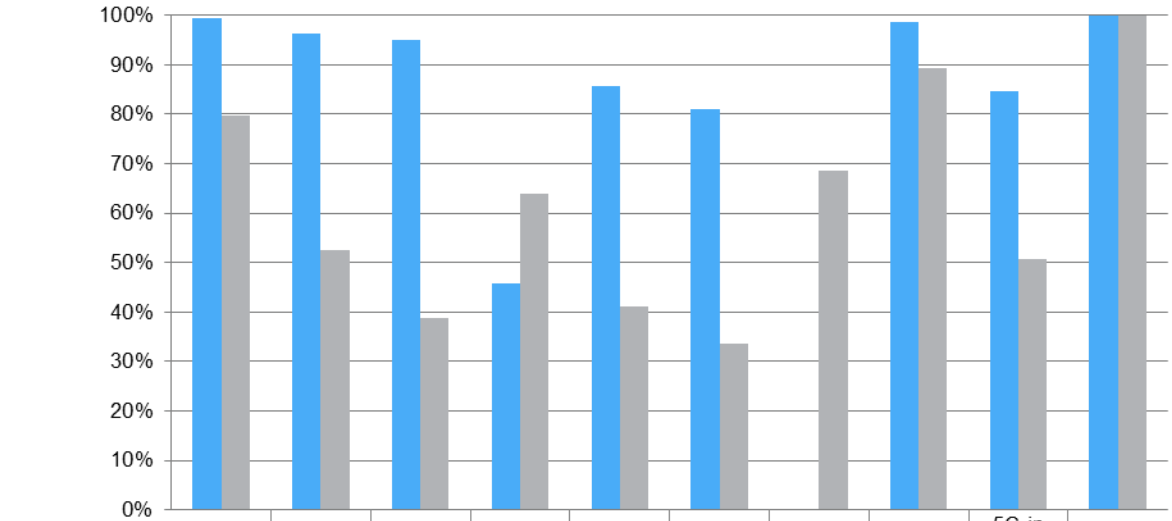


DSL remained the leading broadband technology in Switzerland, providing almost universal coverage (99.5%), as seen in previous years. Availability of high-speed copper-based technologies continued to be much higher than in other study countries: VDSL coverage expanded by 1.6 percentage points and reached 96.4% of households, while VDSL2 Vectoring networks passed 94.9% of homes. Switzerland continued to record the highest VDSL2 Vectoring coverage and came third among the study countries in terms of VDSL coverage.

DOCSIS 3.0 services were available to 85.8% of households by mid-2023. The majority of cable networks have been upgraded to DOCSIS 3.1 standard, which was available to 81.0% of Swiss households. FTTP was the only broadband technology that performed below EU average, with 45.8% of Swiss homes passed, compared to the EU average of 64.0%, this is despite a 2.7 percentage point growth in FTTP coverage compared to mid-2022.

At the end of June 2023, 98.5% of Swiss households were passed with 5G technology, while 5G services utilizing the 3.4–3.8 GHz frequency band were available to 84.6% of Swiss households.

Switzerland: Coverage by technology, total, 2023



	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Switzerland	99.5%	96.4%	94.9%	45.8%	85.8%	81.0%	0%	98.5%	84.5%	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

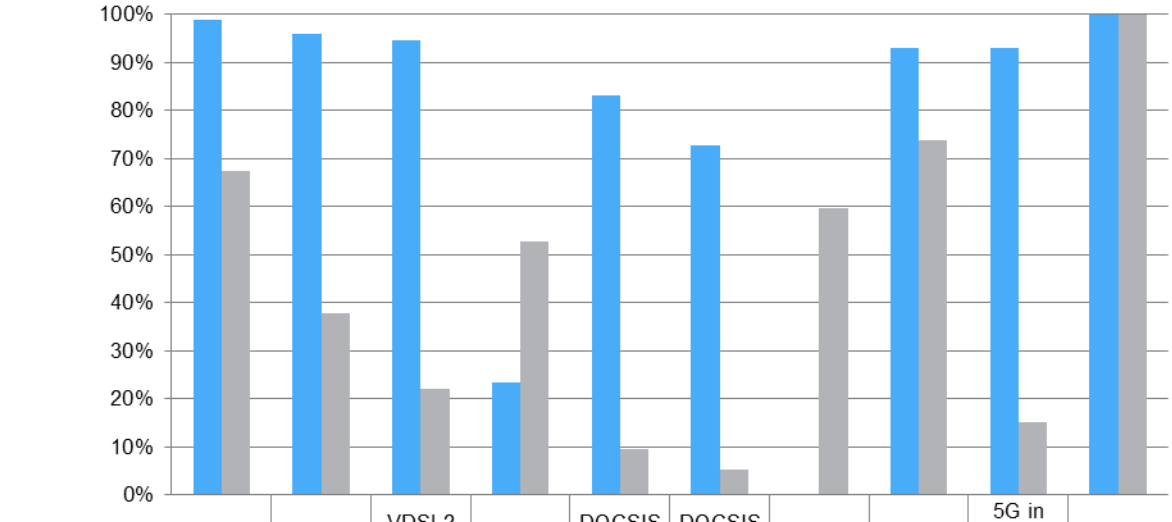
Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural regions, DSL remained the most widespread technology with 98.8% of rural households covered. VDSL coverage (95.9%) was more than double the average EU level (37.8%), while VDSL2 Vectoring (94.6%) was almost five times higher than the EU average (22.0%).

Cable modem DOCSIS 3.0 passed 83.3% of rural homes, unchanged compared to mid-2022. DOCSIS 3.1 services were available to 72.9% of rural households. FTTP coverage remained low compared to other NGA technologies as only 23.5% of rural homes were passed by FTTP networks.

At the end of June 2023, 5G services were available to more than nine in ten (93.0%) rural Swiss households, similar to coverage reached by 5G networks using the 3.4–3.8 GHz band.

Switzerland: Coverage by technology, rural areas, 2023



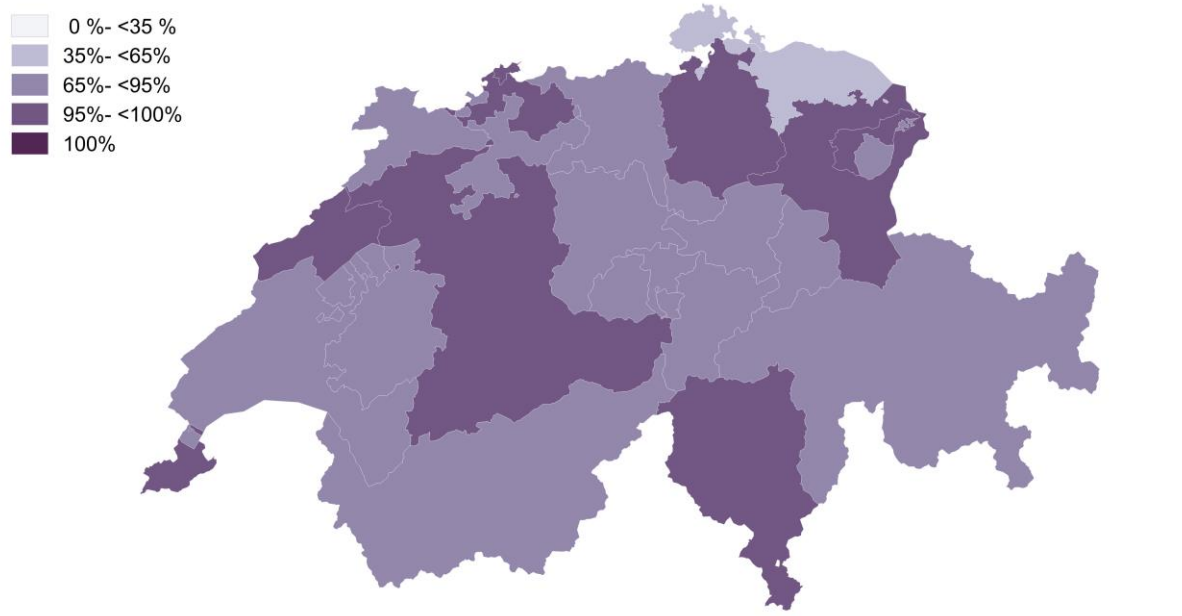
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
Switzerland	98.8%	95.9%	94.6%	23.5%	83.3%	72.9%	0%	93.0%	93.0%	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.30.2 Regional coverage by broadband technology

Fixed VHCN (FTTP & DOCSIS 3.1) coverage levels varied greatly across the Swiss cantons, with the Genève, Bern, Neuchâtel, and Basel-Stadt cantons all recoding coverage higher than 95%, while the Schaffhausen and Thurgau cantons seeing coverage below 65%.

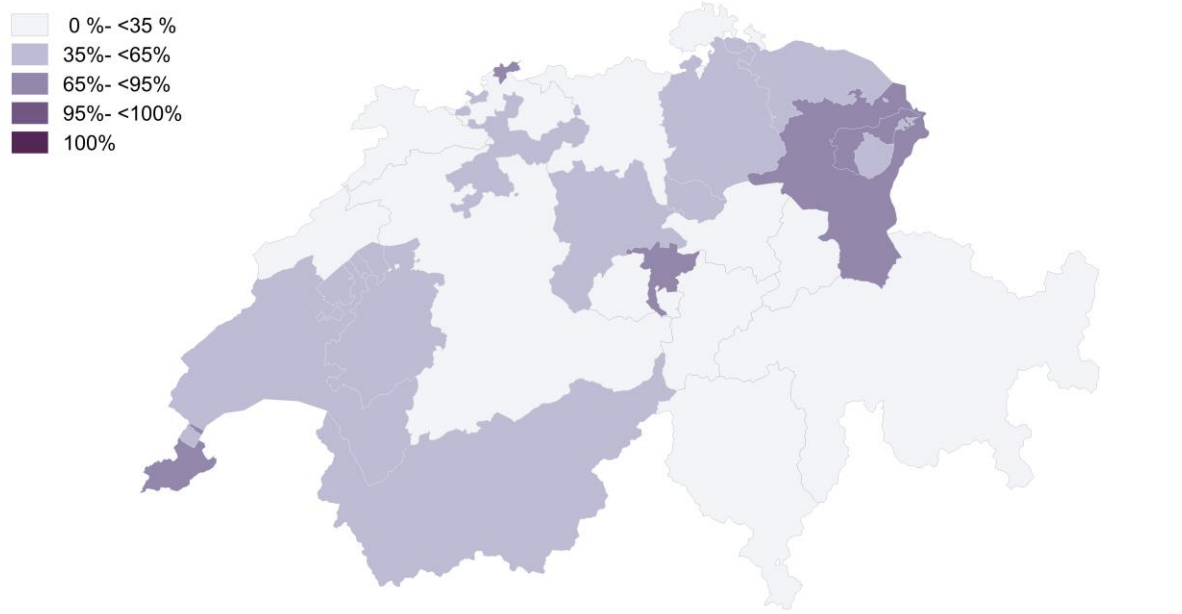
Switzerland: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

With FTTP deployments being limited in Switzerland, 12 cantons recorded FTTP coverage lower than 35%. On the other hand, Basel-Stadt and Genève cantons reached 93.3% and 93.2% FTTP coverage, respectively.

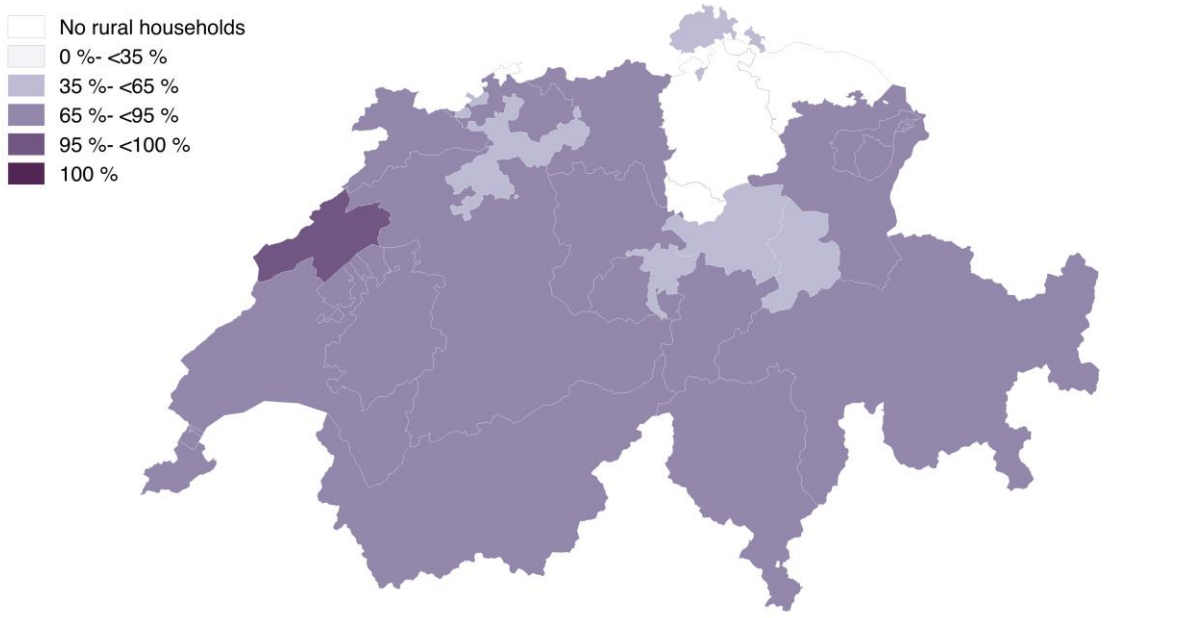
Switzerland: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Rural fixed VHCN (FTTP & DOCSIS 3.1) coverage also varied significantly among Swiss cantons, ranging from 49.0% in Schwyz to 98.1% in Neuchâtel.

Switzerland: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.30.3 Data tables for Switzerland

Statistic	National
Population	8,738,791
Persons per household	2.2
Rural proportion	12.5%

	Switzerland 2023		Switzerland 2022		Switzerland 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.5%	98.8%	99.5%	98.4%	99.5%	98.4%	79.7%	67.4%
VDSL	96.4%	95.9%	94.8%	92.7%	93.2%	89.3%	52.6%	37.8%
VDSL2 Vectoring	94.9%	94.6%	92.7%	90.6%	90.7%	86.3%	38.7%	22.0%
FTTP	45.8%	23.5%	43.1%	21.3%	40.2%	21.1%	64.0%	52.8%
Cable modem DOCSIS 3.0	85.8%	83.3%	85.2%	83.3%	85.2%	82.2%	41.1%	9.5%
Cable modem DOCSIS 3.1	81.0%	72.9%	77.4%	71.5%	77.3%	68.2%	33.6%	5.3%
FWA	0%	0%	0%	0%	0%	0%	68.5%	59.6%
5G	98.5%	93.0%	96.8%	90.0%	94.6%	88.8%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	84.5%	93.0%	75.3%	70.6%	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	99.9%	99.5%	99.9%	99.6%	99.9%	99.6%	97.7%	92.2%
Overall NGA broadband	99.0%	98.8%	98.4%	97.7%	98.9%	96.4%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	89.3%	81.6%	86.8%	80.0%	86.6%	77.0%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	99.8%	-	99.8%	-	99.8%	-	93.3%	-
At least 100Mbps	98.6%	-	98.6%	-	98.6%	-	89.0%	-
At least 1Gbps	68.3%	-	65.6%	-	63.7%	-	75.6%	-
At least 1Gbps upload and download	33.2%	-	33.2%	-	*32.7%*	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (end of June) figures are drawn from the previous studies conducted by IHS Markit, Omdia, and Point Topic.

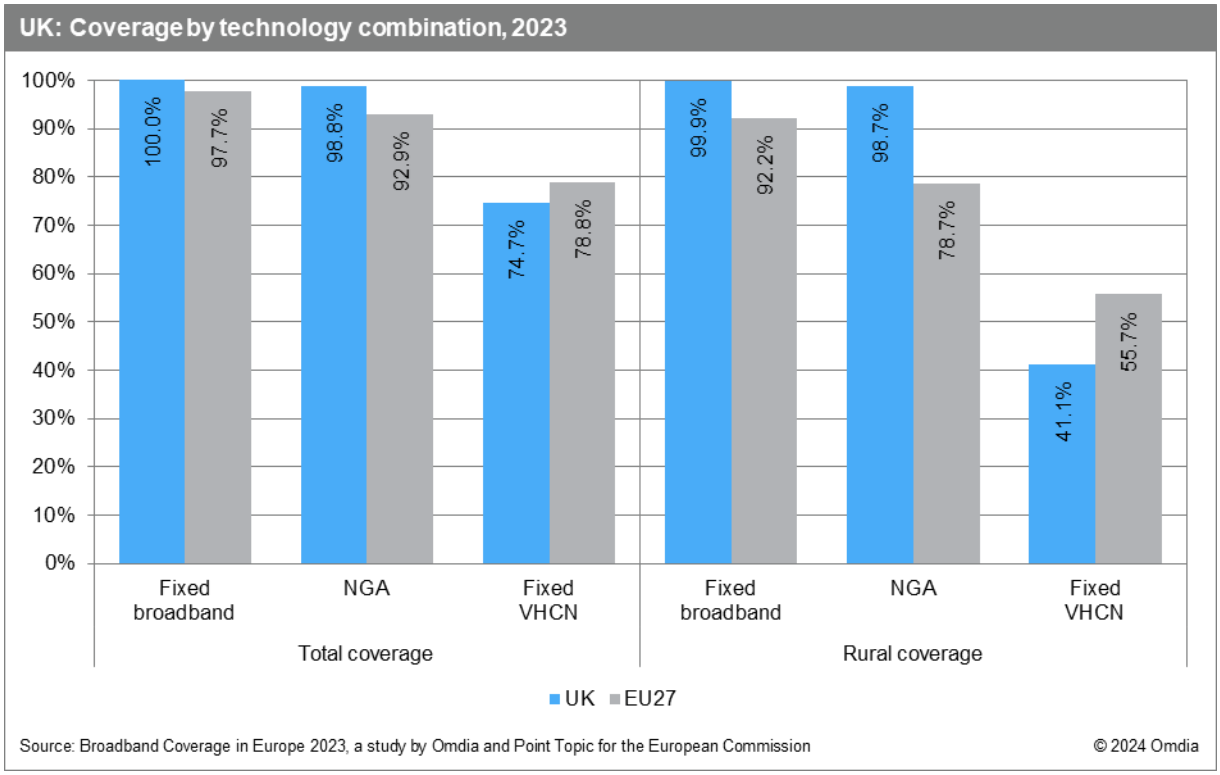
All restatements are highlighted in italics.

5.31 United Kingdom

5.31.1 National coverage by broadband technology

The UK recorded further strong growth in coverage of fixed Very High Capacity networks, i.e. FTTP & DOCSIS 3.1 networks, in the year to June 2023, yet it still remained below the EU average. Fixed VHCN coverage increased by 8.5 p.p. up to 74.7% of households, versus 78.8% in the EU. Growth in rural areas was stronger (+9.9 p.p.) as the government's rural broadband support scheme started to bear fruit, and coverage reached 41.1%, well below the EU's 55.7%.

Over the study period, availability of NGA broadband increased by 0.8 percentage points at national level, and 1.5% at rural level, to reach 98.8% of homes, including 98.7% of rural homes. In both categories, the UK surpassed the EU average, by a significant margin in the case of rural coverage. This reflects the historical focus on investment in FTTC at the expense of FTTP. Meanwhile overall fixed broadband coverage remained universal or near-universal, at both national and rural levels.



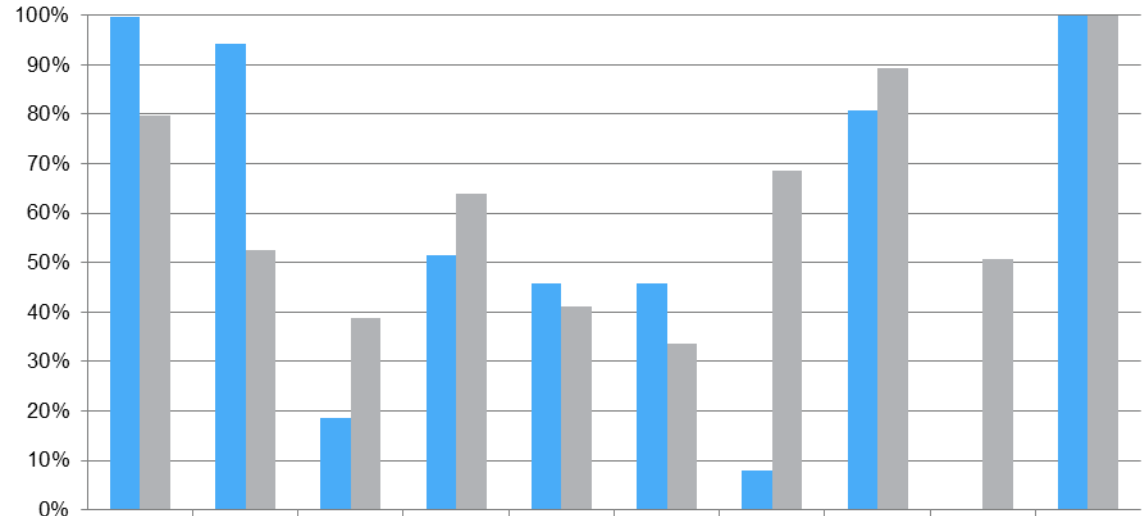
Looking at individual technologies, FTTP rollout continued to be a key priority for UK operators, with numerous smaller providers competing with the established players to roll out the technology, and coverage growth accelerated over the year. By mid-2023, 51.6% of households had access to FTTP broadband services, 15.2 p.p. higher than in 2022, though the UK remained below the EU average of 64.0%. The UK's FTTP coverage level was the seventh-lowest recorded in this study, which represents an improvement on fourth-lowest the previous year, having overtaken Austria, Czechia and Switzerland over the course of the year.

Cable modem DOCSIS 3.0 coverage declined slightly over the study period, reaching 45.9% of households. The UK cable operator, Virgin Media O2, has upgraded all of its network to the DOCSIS 3.1 standard, so DOCSIS 3.1 coverage is equal to DOCSIS 3.0.

DSL continued to be the most widespread broadband technology, providing near-universal coverage to UK households. FWA coverage increased slightly to 7.9% of premises. VDSL remained the leading NGA technology, with 94.3% of UK households having access to VDSL services. Moreover, 18.5% of UK households had access to VDSL2 Vectoring services providing download speeds higher than 100Mbps, a 0.4 p.p. increase year-on-year.

UK mobile network operators launched 5G networks in 2019 and by the end of June 2023, 80.9% of UK households were covered by 5G networks, up from 57.2% the previous year, but below the EU average (89.3%). Data on coverage of 5G in the 3.4–3.8 GHz band was not available for the UK.

UK: Coverage by technology, total, 2023



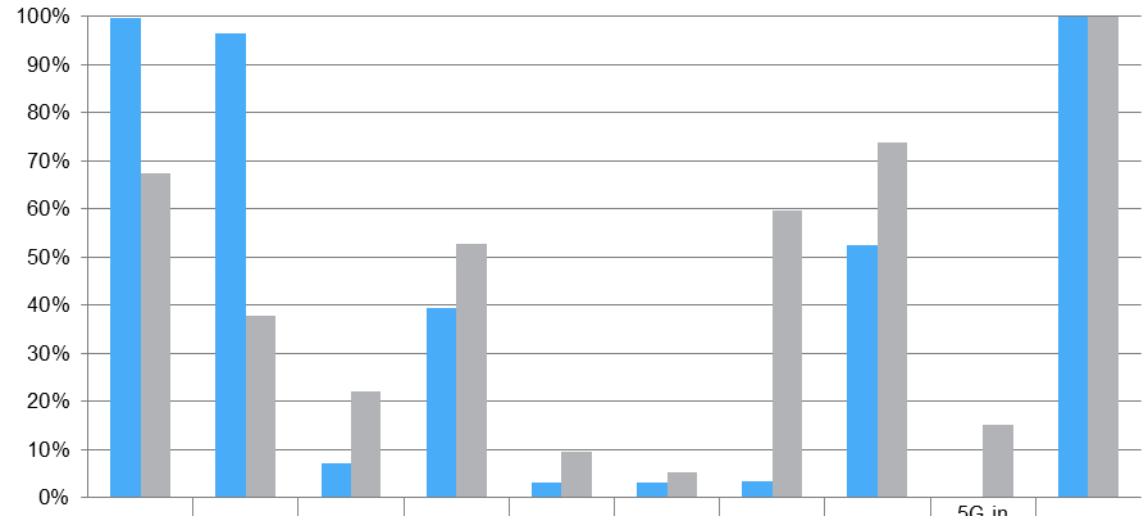
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
UK	99.7%	94.3%	18.5%	51.6%	45.9%	45.9%	7.9%	80.9%	-	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

In rural regions of the UK, FTTP coverage also increased significantly, rising by 9.9 percentage points to reach 39.4% of rural households in June 2023. DOCSIS coverage in rural areas remains minimal (3.3%), and VDSL thus maintains its position as the most prevalent rural NGA technology, with coverage of 96.5% of rural households (the third highest after Cyprus and Malta). Meanwhile DSL remained the most prevalent broadband technology overall, covering 99.7% of rural households, while VDSL2 Vectoring-enabled services were available to 7.2% of rural households. Rural coverage of Fixed Wireless Access services stood at 3.6% as of June 2023.

Rural 5G coverage remained well below the EU average, with only around half of rural households having access (52.4%), compared with almost three quarters (73.7%) in the EU.

UK: Coverage by technology, rural areas, 2023



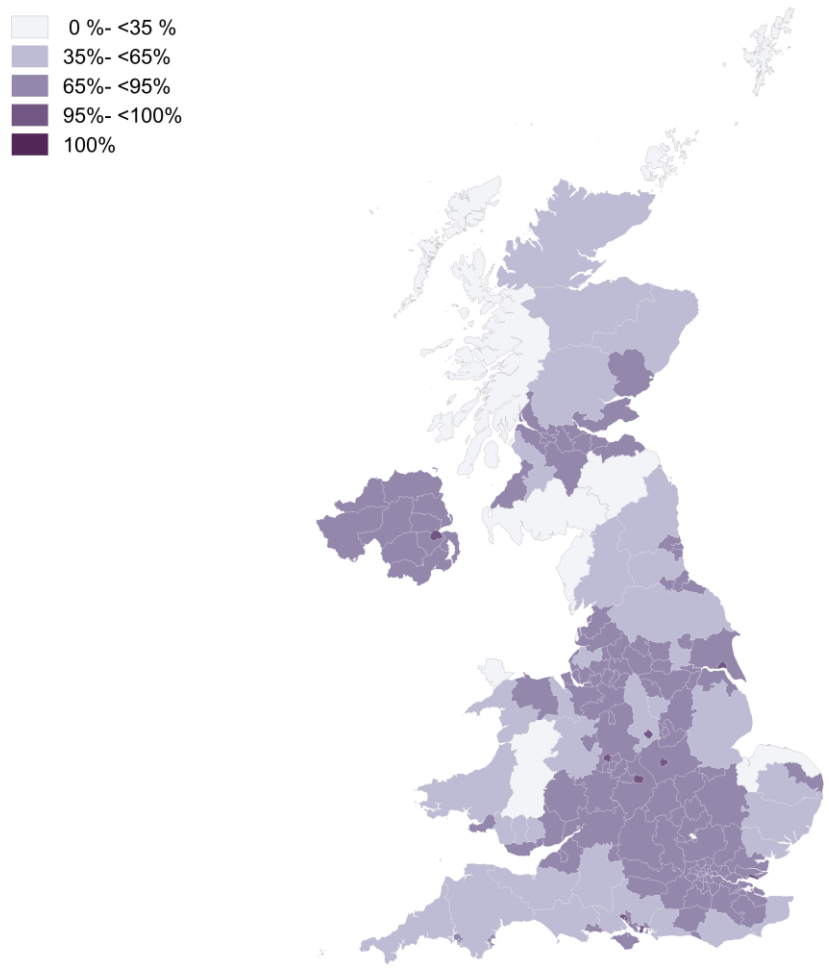
	DSL	VDSL	VDSL2 Vectoring	FTTP	DOCSIS 3.0	DOCSIS 3.1	FWA	5G	5G in 3.4–3.8 GHz	Satellite
UK	99.7%	96.5%	7.2%	39.4%	3.3%	3.3%	3.6%	52.4%	-	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	99.9%

Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.31.2 Regional coverage by broadband technology

Looking at coverage of fixed VHCN (FTTP & DOCSIS 3.1) in UK regions, there is a wide range of coverage levels ranging from <5.2% in Blackpool, to 98.9% in Kingston upon Hull, where the local incumbent operator KCOM has rolled out an extensive FTTP network. Generally the coverage is greatest in more urban parts of the UK, especially for DOCSIS 3.1 where rural coverage is minimal.

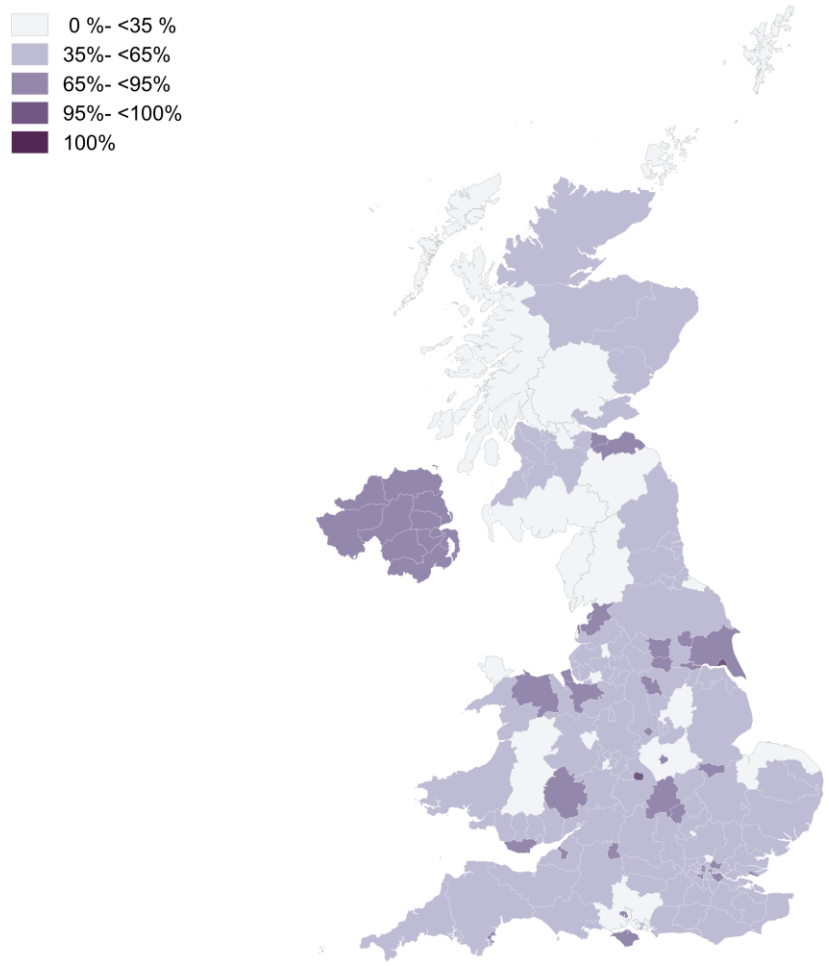
United Kingdom: Fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Kingston upon Hull and Coventry are the only regions to exceed 95% coverage of FTTP, but 43 of the UK's 179 regions exceeded 65% coverage in June 2023, up from only 22 in last year's study.

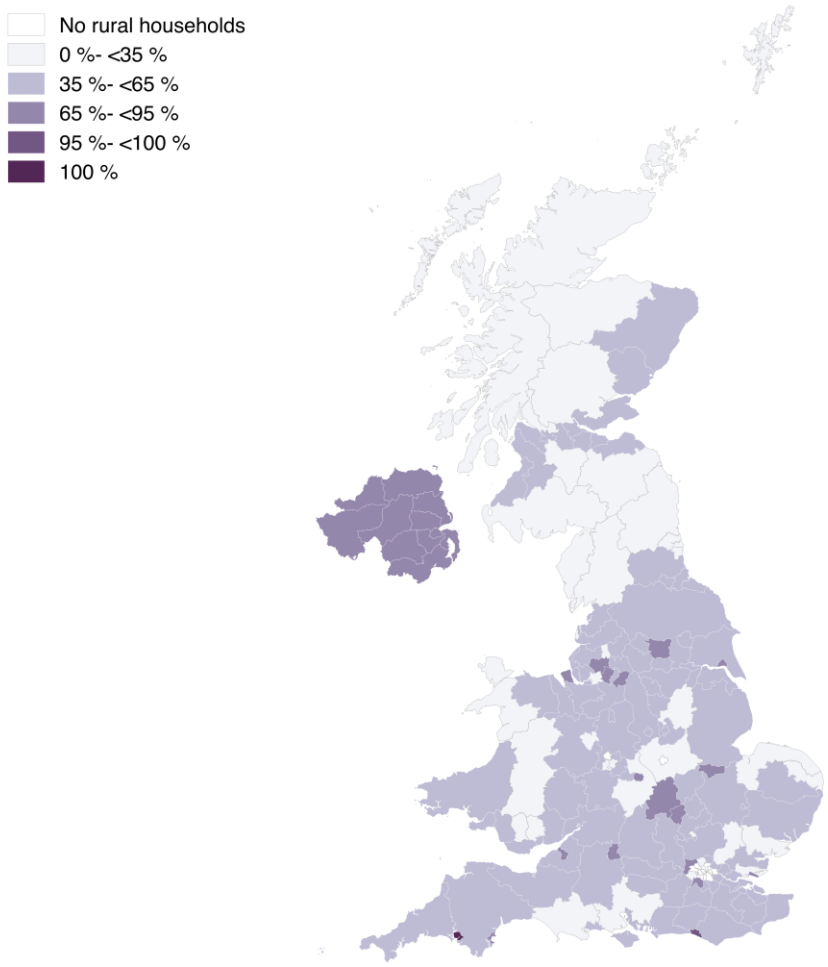
United Kingdom: FTTP coverage, 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

Rural coverage of fixed VHCN (FTTP & DOCSIS 3.1) also varies considerably, reaching 100% in one region (Plymouth), but remaining very low in the predominantly rural parts of the country, notably the Scottish Highlands and Islands.

United Kingdom: Rural fixed VHCN coverage (FTTP & DOCSIS 3.1), 2023



Source: Broadband Coverage in Europe 2023, a study by Omdia and Point Topic for the European Commission

5.31.3 Data tables for the United Kingdom

Statistic	National
Population	66,714,867
Persons per household	2.3
Rural proportion	8.9%

	UK 2023		UK 2022		UK 2021		EU27 2023	
Technology	Total	Rural	Total	Rural	Total	Rural	Total	Rural
DSL	99.7%	99.7%	99.8%	98.3%	99.7%	98.1%	79.7%	67.4%
VDSL	94.3%	96.5%	94.2%	95.5%	94.3%	93.8%	52.6%	37.8%
VDSL2 Vectoring	18.5%	7.2%	18.2%	7.1%	17.8%	6.9%	38.7%	22.0%
FTTP	51.6%	39.4%	36.3%	29.5%	23.3%	20.2%	64.0%	52.8%
Cable modem DOCSIS 3.0	45.9%	3.3%	48.2%	3.2%	50.3%	3.2%	41.1%	9.5%
Cable modem DOCSIS 3.1	45.9%	3.3%	48.2%	3.2%	23.0%	0.4%	33.6%	5.3%
FWA	7.9%	3.6%	7.4%	3.8%	5.8%	3.5%	68.5%	59.6%
5G	80.9%	52.4%	57.2%	10.0%	37.9%	4.4%	89.3%	73.7%
5G in the 3.4–3.8 GHz band	-	-	-	-	-	-	50.6%	15.2%
Satellite	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	99.9%	99.9%
Overall fixed broadband	100.0%	99.9%	99.9%	99.2%	99.8%	99.1%	97.7%	92.2%
Overall NGA broadband	98.8%	98.7%	98.0%	97.2%	97.5%	96.7%	92.9%	78.7%
Fixed VHCN (FTTP & DOCSIS 3.1)	74.7%	41.1%	66.2%	31.2%	39.9%	20.5%	78.8%	55.7%
VHCN (as defined by BEREC)	-	-	-	-	-	-	88.1%	70.0%
At least 30Mbps	97.2%	-	95.8%	-	95.0%	-	93.3%	-
At least 100Mbps	77.1%	-	69.8%	-	63.2%	-	89.0%	-
At least 1Gbps	75.1%	-	66.6%	-	38.7%	-	75.6%	-
At least 1Gbps upload and download	-	-	-	-	-	-	-	-

Note: The 2023 figures represent the state of broadband coverage at the end of June 2023. The 2022 (end of June) and 2021 (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. 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, ADSL2+, VDSL or VDSL2) deliver download speeds of at least 2Mbps. Not all DSL connections are capable of download speeds of 2Mbps and higher (e.g. due to a large distance – typically more than 5km – between customer and exchange), these connections should not be reported in the survey, but we ask you to note this fact in Step 7 – 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 7 – 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 (coper, fibre). It can be implemented various standardised technologies (e.g. WiMAX, LTE, 5G).
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. This can include DSS and 700 MHz bands.
5G coverage in the 3.4–3.8 GHz band	5G using the 3.4–3.8 GHz frequency band only.

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 in a telephone exchange area fully enabled for DSL. Includes all types of xDSL.
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. Includes VDSL, VDSL2, VDSL2 Vectoring etc.
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 3.0 or higher service without requiring the construction of new cable TV network infrastructure and is available to be connected within reasonable time and cost limits. Includes DOCSIS 3.1.
Cable modem DOCSIS 3.1	A household has DOCSIS 3.1 coverage if it can be connected now to a DOCSIS 3.1 or higher 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.
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.
5G coverage in the 3.4–3.8 GHz band	A household has 5G coverage in the 3.4–3.8 GHz band if it is in the stated coverage area for at least one 5G mobile network utilizing that frequency band. 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**	Fixed VHCN (FTTP & DOCSIS 3.1)***	VHCN (as defined by BEREC)	Overall fixed broadband coverage*	Overall NGA coverage**	Fixed VHCN (FTTP & DOCSIS 3.1)***	VHCN (as defined by BEREC)
AT	99.2%	94.2%	67.6%	-	96.2%	71.1%	35.8%	-
BE	100.0%	99.6%	96.0%	-	99.5%	93.6%	51.4%	-
BG	99.1%	95.8%	88.6%	-	95.4%	82.3%	73.7%	-
HR	99.1%	89.0%	67.8%	-	95.9%	56.9%	25.5%	-
CY	100.0%	100.0%	77.1%	77.1%	100.0%	100.0%	55.7%	55.7%
CZ	99.6%	88.4%	50.5%	55.6%	98.7%	63.6%	7.2%	14.8%
DK	99.6%	98.8%	97.2%	99.9%	99.0%	94.3%	90.8%	99.9%
EE	100.0%	86.0%	76.9%	-	100.0%	78.3%	67.8%	-
FI	82.7%	79.7%	77.7%	-	76.6%	56.8%	39.3%	-
FR	100.0%	86.2%	81.4%	81.4%	99.9%	73.2%	64.6%	64.6%
DE	99.0%	95.6%	74.7%	-	97.5%	86.3%	37.6%	-
EL	97.3%	88.9%	38.4%	-	90.9%	54.9%	0%	-
HU	97.0%	95.9%	84.1%	-	95.9%	93.7%	70.1%	-
IS	99.3%	98.9%	92.6%	-	91.7%	91.7%	84.3%	-
IE	97.2%	95.0%	87.0%	-	92.7%	86.8%	65.5%	-
IT	100.0%	98.4%	59.6%	92.9%	99.9%	93.6%	37.7%	75.8%
LT	89.5%	87.0%	78.1%	98.3%	69.4%	62.5%	41.1%	94.6%
LV	74.0%	72.0%	71.4%	73.2%	31.6%	24.7%	13.1%	14.2%
LU	100.0%	97.3%	94.7%	94.7%	100.0%	90.5%	80.3%	80.3%
MT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
NL	99.7%	99.2%	98.3%	98.3%	99.5%	97.8%	89.4%	89.4%
NO	99.9%	95.2%	93.1%	-	99.4%	77.2%	77.0%	-
PL	86.9%	84.0%	81.1%	-	74.0%	65.9%	57.2%	-
PT	97.6%	94.2%	94.2%	-	88.4%	71.4%	71.4%	-
RO	97.8%	95.9%	95.0%	95.7%	95.2%	93.2%	92.5%	92.9%
SK	97.4%	84.7%	69.1%	69.1%	97.3%	81.7%	35.0%	35.0%
SI	99.1%	91.9%	78.5%	91.8%	96.7%	73.8%	56.8%	74.1%
ES	98.9%	96.7%	96.3%	92.1%	96.2%	87.9%	86.9%	78.6%
SE	96.4%	90.4%	88.5%	92.3%	76.2%	65.3%	65.2%	71.4%
CH	99.9%	99.0%	89.3%	-	99.5%	98.8%	81.6%	-
UK	100.0%	98.8%	74.7%	-	99.9%	98.7%	41.1%	-
EU27	97.7%	92.9%	78.8%	88.1%	92.2%	78.7%	55.7%	70.0%

* 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	5G: total***	5G: 3.4–3.8 GHz	Satellite
AT	96.5%	83.4%	57.1%	41.0%	59.4%	52.6%	18.7%	96.0%	79.1%	100.0%
BE	99.9%	96.5%	43.8%	25.0%	96.0%	95.4%	99.8%	40.4%	14.2%	100.0%
BG	85.5%	22.5%	0%	88.6%	70.9%	0%	18.8%	70.9%	45.1%	100.0%
HR	98.0%	77.9%	13.9%	62.1%	34.6%	32.9%	44.5%	83.4%	40.0%	100.0%
CY	100.0%	100.0%	21.5%	77.1%	59.0%	0%	99.6%	100.0%	35.0%	100.0%
CZ	91.0%	81.8%	81.7%	36.0%	38.5%	32.2%	80.5%	94.6%	39.3%	100.0%
DK	87.8%	57.5%	14.9%	84.0%	66.1%	66.1%	9.9%	100.0%	85.0%	100.0%
EE	58.8%	53.3%	45.4%	76.9%	77.3%	0%	99.9%	87.5%	43.7%	75.4%
FI	27.5%	22.6%	19.9%	61.1%	32.4%	32.4%	0%	98.3%	89.7%	100.0%
FR	97.3%	16.6%	0%	81.4%	19.7%	0%	99.0%	93.2%	64.8%	100.0%
DE	96.7%	86.6%	79.4%	29.8%	63.5%	63.1%	90.3%	98.1%	43.8%	100.0%
EL	96.0%	77.1%	54.9%	38.4%	0%	0%	0%	98.1%	58.8%	100.0%
HU	66.6%	42.4%	39.7%	76.2%	77.6%	41.1%	58.6%	83.7%	37.7%	100.0%
IS	90.8%	90.8%	68.6%	91.0%	3.1%	3.1%	2.0%	91.6%	-	0%
IE	93.0%	85.7%	80.2%	78.5%	41.9%	41.7%	30.0%	85.3%	56.7%	100.0%
IT	99.8%	96.4%	70.6%	59.6%	0%	0%	100.0%	99.5%	88.3%	100.0%
LT	85.2%	78.0%	78.0%	78.1%	25.6%	0%	26.3%	98.9%	61.4%	100.0%
LV	21.4%	15.2%	15.2%	61.9%	22.2%	18.1%	4.0%	53.1%	39.0%	100.0%
LU	23.6%	23.0%	11.3%	78.9%	87.6%	84.0%	0%	99.6%	63.1%	100.0%
MT	100.0%	72.0%	0%	69.6%	100.0%	100.0%	100.0%	100.0%	24.7%	100.0%
NL	53.8%	52.8%	41.6%	77.7%	88.6%	87.8%	0%	100.0%	0%	100.0%
NO	91.6%	56.6%	0%	87.2%	40.8%	38.8%	92.6%	95.3%	61.9%	97.2%
PL	54.9%	39.5%	29.0%	75.4%	41.8%	41.7%	15.3%	71.9%	0%	100.0%
PT	85.3%	0%	0%	92.3%	57.8%	57.8%	0%	98.1%	65.2%	100.0%
RO	37.5%	5.5%	0%	95.0%	32.9%	8.5%	52.6%	32.8%	28.9%	100.0%
SK	55.9%	45.2%	26.5%	64.2%	37.8%	16.4%	94.8%	79.0%	47.5%	100.0%
SI	95.2%	56.4%	0%	78.5%	58.0%	0%	34.4%	82.1%	68.1%	100.0%
ES	31.6%	1.1%	0%	95.2%	32.8%	31.4%	97.5%	92.3%	58.3%	100.0%
SE	77.7%	17.6%	0%	83.9%	33.5%	26.5%	0.6%	90.3%	64.5%	100.0%
CH	99.5%	96.4%	94.9%	45.8%	85.8%	81.0%	0%	98.5%	84.5%	100.0%
UK	99.7%	94.3%	18.5%	51.6%	45.9%	45.9%	7.9%	80.9%	-	100.0%
EU27	79.7%	52.6%	38.7%	64.0%	41.1%	33.6%	68.5%	89.3%	50.6%	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	5G: total***	5G: 3.4–3.8 GHz	Satellite
AT	92.7%	47.8%	27.4%	28.7%	13.1%	9.1%	23.5%	82.0%	41.5%	100.0%
BE	97.4%	84.1%	16.4%	7.3%	53.9%	49.0%	96.9%	28.9%	3.8%	100.0%
BG	75.7%	19.7%	0%	73.7%	28.3%	0%	9.8%	20.1%	11.3%	100.0%
HR	92.8%	35.9%	4.1%	19.7%	11.4%	9.2%	7.9%	80.1%	8.0%	100.0%
CY	100.0%	100.0%	8.9%	55.7%	0%	0%	97.9%	100.0%	28.0%	100.0%
CZ	77.5%	61.5%	61.5%	7.2%	2.0%	0.0%	85.4%	72.7%	32.3%	100.0%
DK	89.7%	16.5%	4.4%	90.3%	5.1%	5.1%	14.7%	100.0%	24.0%	100.0%
EE	51.6%	47.5%	40.1%	67.8%	46.8%	0%	99.9%	87.0%	40.6%	75.4%
FI	42.0%	26.3%	13.3%	39.3%	0%	0%	0%	92.4%	50.2%	100.0%
FR	98.2%	25.2%	0%	64.6%	0.2%	0%	97.3%	91.2%	11.6%	100.0%
DE	94.6%	71.8%	58.8%	25.6%	16.0%	15.2%	88.1%	92.8%	4.8%	100.0%
EL	90.9%	54.9%	10.0%	0%	0%	0%	0%	92.1%	6.2%	100.0%
HU	78.1%	39.1%	33.3%	64.7%	63.7%	8.2%	53.3%	57.5%	3.1%	100.0%
IS	49.5%	49.5%	1.2%	83.9%	0.9%	0.9%	19.1%	11.8%	-	0%
IE	81.3%	66.5%	54.7%	62.7%	3.8%	3.4%	19.4%	62.3%	10.5%	100.0%
IT	98.9%	87.1%	34.4%	37.7%	0%	0%	99.9%	98.3%	68.9%	100.0%
LT	61.4%	53.3%	53.3%	41.1%	0.5%	0%	13.4%	96.4%	8.2%	100.0%
LV	26.3%	18.3%	17.9%	11.7%	0%	0%	5.4%	0%	0%	100.0%
LU	53.7%	52.6%	31.7%	60.3%	55.9%	54.8%	0%	96.9%	14.1%	100.0%
MT	100.0%	0%	0%	16.2%	100.0%	100.0%	100.0%	100.0%	6.0%	100.0%
NL	82.3%	68.9%	42.3%	78.4%	26.9%	26.0%	0%	100.0%	0%	100.0%
NO	74.8%	30.1%	0%	77.0%	3.6%	2.3%	88.8%	85.4%	14.9%	92.7%
PL	21.0%	17.6%	15.6%	56.3%	1.7%	1.7%	20.7%	58.5%	0%	100.0%
PT	70.3%	0%	0%	68.7%	35.3%	35.3%	0%	87.5%	13.3%	100.0%
RO	36.1%	0.8%	0%	92.5%	14.3%	7.7%	18.2%	6.3%	2.6%	100.0%
SK	82.7%	62.5%	52.6%	35.0%	4.0%	1.0%	94.3%	46.1%	34.0%	100.0%
SI	84.9%	21.7%	0%	56.8%	19.0%	0%	28.3%	45.5%	22.3%	100.0%
ES	19.8%	1.7%	0%	85.9%	4.8%	4.1%	90.2%	67.4%	10.2%	100.0%
SE	26.2%	0.2%	0%	65.2%	0.3%	0.0%	1.7%	67.0%	5.3%	100.0%
CH	98.8%	95.9%	94.6%	23.5%	83.3%	72.9%	0%	93.0%	93.0%	100.0%
UK	99.7%	96.5%	7.2%	39.4%	3.3%	3.3%	3.6%	52.4%	-	100.0%
EU27	67.4%	37.8%	22.0%	52.8%	9.5%	5.3%	59.6%	73.7%	15.2%	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	94.2%	87.5%	65.1%	39.9%
BE	97.8%	96.9%	95.7%	25.0%
BG	95.1%	93.6%	28.4%	-
HR	89.0%	71.5%	67.8%	10.7%
CY	100.0%	92.5%	77.1%	-
CZ	98.2%	91.1%	40.3%	13.5%
DK	98.8%	98.0%	94.6%	84.6%
EE	100.0%	84.4%	67.0%	60.8%
FI	81.0%	78.0%	71.0%	33.0%
FR	86.5%	82.1%	81.7%	80.7%
DE	96.1%	92.9%	73.6%	12.4%
EL	97.5%	60.7%	39.5%	39.5%
HU	96.0%	95.1%	82.4%	-
IS	99.1%	89.3%	88.6%	88.6%
IE	92.1%	91.6%	73.2%	-
IT	94.2%	87.1%	59.6%	59.6%
LT	86.9%	86.9%	78.0%	78.0%
LV	68.3%	63.6%	0.0%	-
LU	97.3%	95.4%	94.7%	78.9%
MT	100.0%	100.0%	100.0%	0%
NL	98.9%	98.7%	98.2%	78.4%
NO	99.8%	96.6%	95.1%	87.2%
PL	86.9%	81.5%	75.1%	45.0%
PT	95.7%	95.7%	89.5%	-
RO	95.8%	95.7%	95.0%	0%
SK	97.4%	84.7%	60.9%	-
SI	91.9%	89.0%	10.9%	10.9%
ES	96.2%	95.7%	92.6%	90.2%
SE	90.8%	89.0%	88.5%	88.5%
CH	99.8%	98.6%	68.3%	33.2%
UK	97.2%	77.1%	75.1%	-
EU27	93.3%	89.0%	75.6%	-

* Only available where reported by the NRA

European Commission

Broadband Coverage in Europe 2023
Luxembourg, Publications Office of the European Union

2024 – 225 pages

ISBN 978-92-68-16769-4
doi: 10.2759/094495

KK-06-24-085-EN-N

doi: 10.2759/094495 ISBN 978-92-68-16769-4