Ofcom
making communications work
for everyone

Connected Nations 2018

Wales report

18 December 2018

Overview

Fast, reliable and affordable communications services have become a necessity to almost every home and business in Wales. Accessing public services, arranging for the movement of farm animals, communicating with friends and family, securing the most affordable goods and services, doing homework and applying for jobs all require connectivity and the needs of Wales are no different to those of any other developed economy. What is different is that for many years Wales has lagged behind the most populous parts of the UK and has had to wait for public policy and financial intervention to improve things. This year's Connected Nation report highlights the improvements made as a result of those interventions, whilst drawing attention to those aspects of connectivity that require further action.

This annual report tracks progress in fixed and mobile services in Wales and summarises the role Ofcom plays in helping to further improve them.

Over the past year:

- Superfast broadband coverage in Wales has increased to 93% of homes and businesses from 89% last year. This refers to the availability of fixed broadband services with a download speed of at least 30Mbit/s.
- Over 95,000 homes and businesses in Wales now have access to full-fibre connections (compared to 44,000 last year). These connections can deliver much higher download speeds, of up to 1Gbit/s.
- 90% of Wales' landmass has access to good 4G mobile coverage from at least one operator, while 57% has coverage from all four mobile network operators. Within this, individual operator coverage varies, with the highest being 83% and the lowest 67%.

Despite this progress, there are still large parts of Wales that are poorly served by communications services.

- Around 3% of premises in Wales cannot access a decent fixed broadband service that delivers a download speed of at least 10Mbit/s and upload speed of at least 1Mbit/s. However, this has improved from 5% last year.
- 93% of homes and businesses in Wales are in areas where superfast, or better, broadband is available, but only 38% of homes are using these services. This is the lowest take-up in any of the UK nations - Northern Ireland 45%, England 44%, and Scotland 40%.
- 10% of Wales' landmass has no good 4G coverage from any operator. This has improved from 22% a year ago but rural areas are still badly affected.
- 31% of homes and businesses in Wales do not have good indoor 4G coverage from all operators.
- We also estimate that there are 7,000 homes and businesses in Wales that cannot access a decent fixed broadband service or get good 4G coverage.

This report highlights the work Ofcom is doing, alongside governments and communications companies, to improve the availability of fixed and mobile services across the UK.

Alongside this report, we also publish reports on the other UK nations, a UK report and an interactive dashboard, allowing people to see data at the level and locations they are most interested in.[1] We are also making it even easier for people to access our data on fixed broadband and mobile coverage availability. We have released two Application Programming Interfaces (APIs), a way of sharing data between different systems. These will allow others to use our data creatively to develop services, such as apps and widgets to benefit consumers and businesses.

We have also launched the *Boost your broadband* campaign to help people identify the fixed broadband services available to them and get better value from their broadband deal.[2] Despite superfast broadband being available to more than nine in ten UK premises and momentum building behind full-fibre broadband, our data shows people are often not on the fastest service in their area. So, we are encouraging people to check what broadband they need, what's available in their area and to speak to their provider or shop around to make sure they are on the best deal for them.

Fixed broadband services

Our mission is to make communications work for everyone in the UK. We are supporting investment in ultrafast, more reliable fibre networks, which will be critical to the UK's economy. There is already growing momentum behind full-fibre broadband and this section highlights the progress being made to improve its availability across the UK. In July the UK Government set out its ambition in the Future Telecoms Infrastructure Review (FTIR) for 15 million premises to be connected to full fibre services by 2025 and nationwide coverage by 2033.[3]

Although broadband availability continues to improve, too many people still can't get the connection they need. In March this year, the UK Government made Ofcom responsible for implementing the broadband Universal Service Obligation. This will give people and businesses the right to request a broadband connection capable of delivering a download speed of at least 10Mbit/s and upload speed of at least 1Mbit/s.

Broadband coverage continues to improve, with superfast broadband in Wales now at 93%

This year has seen continued investment in faster broadband, with 93% of premises in Wales now able to access superfast broadband with a download speed of at least 30Mbit/s.[4] This is up from 89% in 2017. Coverage for small businesses in Wales is now at 87% (67,000). Coverage of ultrafast broadband, with download speeds of at least 300Mbit/s, has also increased from 10% of premises in 2017 to 29% of premises (426,000) in Wales.

Full-fibre coverage has now reached 7% of premises in Wales

We have also seen increased investment in full-fibre services, with coverage increasing to 7% of Wales premises, from 3% last year. 95,000 premises are now covered.

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[1] https://www.ofcom.org.uk/research-and-data/multi-sector-research/infrastructure-research/connected-nations-2018/interactive-report

[2] https://www.boostyourbroadband.com/

[3] https://www.gov.uk/government/publications/future-telecoms-infrastructure-review

[4] In the Spring update of the Connected Nations report, we reported that the UK Government met its target of 95% coverage of broadband with a download speed of at least 24Mbit/s.

But 3% of premises in Wales still cannot access a decent broadband service

Across Wales, 3% of premises (48,000) cannot currently access a decent broadband connection (one which can deliver a download speed of at least 10Mbit/s and an upload speed of at least 1Mbit/s) down from 5% in 2017. We recently published a consultation on which providers will deliver the Broadband Universal Service Obligation.[5] We expect people to be able to request these connections from 2020.

Lack of access to a decent broadband service is worse in rural areas: 13% of rural premises in Wales cannot access to such a connection, compared to 1% of urban premises.

Mobile voice and data services

People increasingly expect to be able to go online wherever they are. Improving good mobile coverage is a priority for Ofcom.

Mobile coverage in Wales is gradually improving but too many parts of the country still struggle to get a good mobile connection. We define an area as having good call coverage if nearly all voice calls complete without interruption and there is a data connection speed of at least 2Mbit/s.

Good reception is easier to achieve outdoors than inside because mobile signals are reduced by obstacles such as walls and the glass used in cars and trains. Because of this, we report separately on outdoor (by landmass) and indoor (by premises) coverage. We also report on in-car and out-of-car coverage on roads.

Outdoor coverage

Outdoors, voice coverage is available from all four operators to 75% of Wales' landmass, up from 62% a year ago.

Good 4G services provide a connection speed of at least 2Mbit/s. These services continue to be rolled out across Wales. Good outdoor 4G coverage is now available from all four operators to 57% of Wales' landmass, an improvement from 30% last year. 10% of the landmass in Wales does not have good outdoor 4G coverage from any operator decreasing from 22% in 2017, as operator roll-outs near completion.

Indoor mobile coverage

Indoor voice call coverage from all four operators is available to 88% of premises in Wales.

69% of premises in Wales have good 4G coverage from all four operators. Indoor coverage is lower in rural areas and is only 36% of rural premises have good 4G coverage from all four operators compared to 14% in 2017.

There are a small number of premises that do not have a decent fixed or good 4G mobile network connection

For the first time in this report we look at the number of premises unable to get a decent fixed or good mobile broadband service. Premises are considered to have access to a decent fixed

[5] https://www.ofcom.org.uk/consultations-and-statements/category-1/delivering-broadband-universal-service

connection if the broadband speed is above a download speed of at least 10 Mbit/s and an upload speed of at least 1 Mbit/s and to have good mobile coverage if indoor 4G mobile coverage is available. We estimate that 96% of premises in Wales can receive both decent fixed and good mobile broadband services, while 7,000 premises (0.5% of premises in Wales) are unable to access either.

Premises in rural areas of Wales and the Scottish Highlands and Islands are most likely to have neither a decent fixed or good mobile service available. 2% of rural premises in Wales and 3% of rural premises in Scotland are unable to receive either a decent fixed or good mobile service.

Our work to improve fixed and mobile coverage, through the broadband USO and mobile coverage obligations should reduce the number of premises that are unable to receive either a decent fixed or good mobile service. However, there may be some premises that will require an alternative technology solution.

Ofcom has a comprehensive programme of work to improve mobile coverage, enable 5G and support other innovative services

Since last year's report, Ofcom has been working on several initiatives:

- **Making more spectrum bands available for mobile to improve capacity and coverage:**
    - Earlier this year we auctioned 190 MHz of spectrum, increasing the total amount of mobile spectrum available to operators by 29%.
    - We are making more spectrum available for mobile, including for 5G services, at 700 MHz and 3.6-3.8 GHz
    - We are proposing to introduce shared spectrum which could enable new users to develop innovative business models and services, including 5G applications and high capacity wireless solutions that may address rural coverage. [6]
- **Coverage obligations:** in March 2018, we consulted on our initial proposals to introduce new obligations on companies wishing to access the airwaves in the 700 MHz spectrum, including options to impose enhanced coverage. [7] We have today published a consultation on our proposals for the auction of 700 MHz and 3.6-3.8 GHz spectrum, which includes our proposal to include two coverage obligations in the auction. [8]
- **Legalising repeaters to boost signals:** in April 2018 Ofcom introduced new rules that allow people to use certain types of mobile phone repeater, without the need for a licence, to help boost mobile signal at home.
- **Addressing barriers and reducing costs:** changes to the Electronic Communications Code, which allows companies the rights to install and maintain equipment without the need for a specific street works licence, and planning laws through UK Government initiatives that Ofcom has supported are paving the way to make it easier and cheaper to deploy masts.

[6] https://www.ofcom.org.uk/consultations-and-statements/category-1/enabling-opportunities-for-innovation
[7] https://www.ofcom.org.uk/consultations-and-statements/category-2/700-mhz-coverage-obligations
[8] https://www.ofcom.org.uk/consultations-and-statements/category-1/award-700mhz-3.6-3.8ghz-spectrum

Contents

Fixed broadband services in Wales

Key highlights for Wales

Fixed broadband networks	Wales	UK
Coverage of broadband faster than:		
>=2Mbit/s	99%	99.6%
>=10Mbit/s	97%	98%
Premises that don't have access to decent broadband	3%	2%
Superfast broadband coverage (% of premises with >=30Mbit/s)	93%	94%
Superfast broadband coverage in rural areas (% of premises)	77%	74%
Superfast lines delivering superfast speeds (% of premises – indicative of superfast take-up)	38%	45%
Average broadband speed (download)	39Mbit/s	49Mbit/s
Average broadband speed (upload)	6Mbit/s	7Mbit/s
Average broadband download speeds by settlement type:		
Urban	43Mbit/s	51Mbit/s
Rural	25Mbit/s	32Mbit/s
Data use (monthly average)	241GB	240GB

Source: Ofcom analysis of operator data

The most important points for fixed broadband in Wales are:

- superfast broadband availability in Wales has increased by 4pp, to 93% availability (rural = 77% / urban = 97%).
- availability for SMEs increased 4pp, to 87%. (rural = 66% / urban = 95%)
- the number of premises unable to receive a decent broadband service, a connection which provides a download speed at least 10Mbit/s and an upload speed at least 1Mbit/s, has fallen to 3%; (48,000)
- Brecon & Radnor (76%) and Carmarthen East and Dinefwr (78%) are the two National Assembly for Wales constituencies with the lowest availability of superfast broadband.
- Of the 95,000 premises with full fibre connections in Wales, 53,000 are located in rural areas. This compares to 12,000 in rural Scotland and 18,000 in rural parts of Northern Ireland.

Fixed Broadband Coverage has increased in Wales

There has been continued investment in fixed networks resulting in improvements on the availability of superfast broadband, ultrafast broadband and full fibre services. Consequently, the number of premises that do not receive a decent broadband service of a download sync speed of at least 10Mbit/s and an upload speed of at least 1Mbit/s has also fallen to 3%.

The number of premises with access to a Superfast Broadband service continues to increase

Ofcom defines Superfast Broadband as a service which delivers a minimum download sync speed of at least 30Mbit/s. The Welsh Government and Scottish Government also use this definition of superfast broadband in its schemes to extend the coverage of broadband services.

Over the past year the coverage of superfast broadband in Wales has increased by 4pp from 89% to 93%. In the UK as a whole it increased from 91% to 94%.

However, of the 93% of homes and businesses in Wales where superfast, or better, broadband is available, only 38% of homes and businesses are using these services (41% urban; 26% rural). However, within the Superfast Cymru intervention area, the Welsh Government claims that 49% of premises are using superfast services.[9] This is the lowest take-up in any of the UK nations - Northern Ireland 45%, England 44%, and Scotland 40%.

The Welsh Government completed the Superfast Cymru programme earlier this year. Superfast Cymru claims to have delivered superfast broadband to 733,000 homes and businesses in Wales, of these 676,553 can achieve speeds of at least 30Mbit/s with the remainder achieving speeds of at least 24Mbit/s.

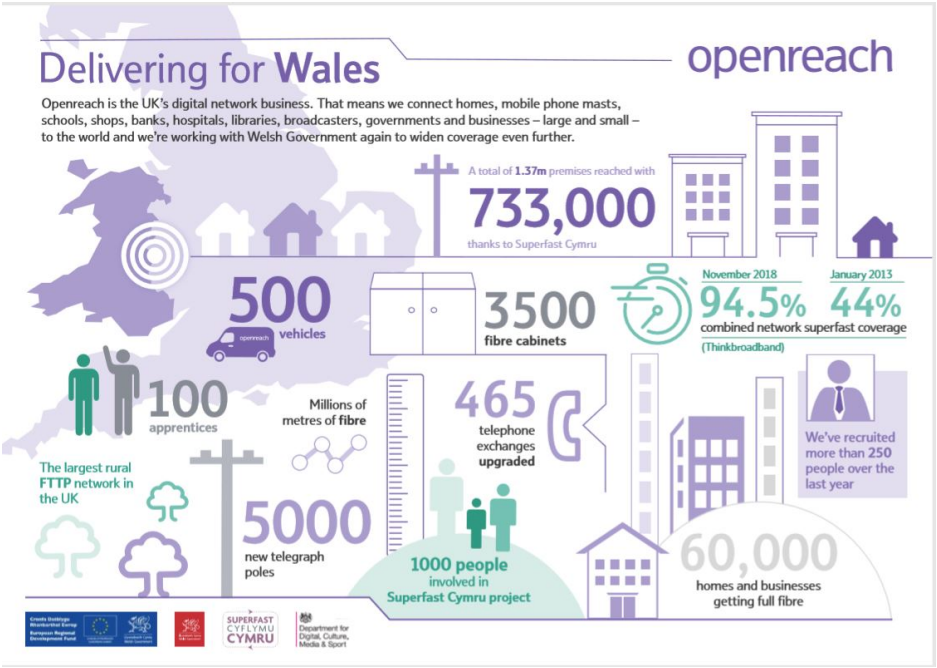
Figure 1 shows Openreach data relating to the programme including cabinets installed, exchanges upgraded, and new telegraph poles installed.

[9] https://beta.gov.wales/written-statement-superfast-cymru-0

Welsh Government on Superfast Cymru and next steps

"Through Superfast Cymru we have fundamentally altered the broadband landscape in Wales, bringing superfast broadband to areas of Wales that simply would not have been connected. We must not lose sight of the significant achievement that this large-scale engineering project represents. Homes and businesses the length and breadth of Wales are now enjoying the benefits of this investment and accessing digital services. Despite the success of Superfast Cymru in transforming broadband connectivity across Wales, there is clearly more work to be done and this Government is committed to taking further action. The suite of measures announced, when taken together, will help us to realise the ambition described in Taking Wales Forward to bring people together digitally by offering fast reliable broadband to every property in Wales. Together, the successor scheme, the community scheme and our voucher schemes will provide a comprehensive package of interventions that will help us meet the challenges ahead." Julie james AM, Leader of the House and Chief Whip.

Figure 1: Openreach summary of data relating to the Superfast Cymru programme



Source: Openreach

In October, the Welsh Government announced its plans for the next stages of rollout in those areas of Wales where public intervention is permitted.

The Welsh Government has already run both an Open Market Review and public consultation on its proposals. The replacement scheme is supported by a proposed public investment of £80 million (£2m from Broadband Delivery UK, £20m from the EU, £20m from the Welsh Government and a £37m public reinvestment from gain-share / BT clawback via the previous contract).

Stranded assets

Leader of the House and Chief Whip, Julie James AM, said in October that the Welsh Government had received a proposal from

Openreach as part of an £12.9M accelerated gainshare arrangement agreed between the UK Government and the European Commission. Under that arrangement, Openreach has proposed to complete part-built structures, also known as stranded assets, not completed and not paid for under the Superfast Cymru programme. The proposal received from Openreach is being considered by DCMS as part of the approval process.

The Welsh Government subsequently invited the market to present solutions in 3 lots with an emphasis on rural delivery, business prioritization and ultrafast 100 Mbit/s services.

The Superfast Cymru successor project will fund connectivity to 16,000 premises in Lot 1 (North Wales), Lot 2 (East Wales) and Lot 3 (South West and the Valleys). The Welsh Government has said that 90% of these premises will be served by FTTP connections including all premises in Lot 3. This will be achieved with £13m of public subsidy from the Welsh Government and EU funding. Following the evaluation of tenders all three contracts were awarded to BT.

Given that the successor project will only deliver connectivity to a relatively small number of premises which are without superfast services the remainder will have to rely on assistance from a variety of other support schemes.

The grant agreement is one part of a suite of measures to bring faster broadband to the remaining premises. The number of premises covered in the two lots are based on what the successful bidder felt they could deliver within the timeframe of the grant agreement. The Welsh Government has made it clear there is no single solution and is looking at a range of measures to reach the final premises.

Identified requirements for faster broadband in Wales

Lot 1 – North West Wales (Estimated value: £14.858m)

Intervention Area of 21,125 Next Generation Access (NGA) white premises has been identified with an additional 29,820 premises potentially available pending further information.

Lot 2 – East Wales (Estimated value: £21.706m)

Intervention Area of 30,862 NGA white premises has been identified with an additional 21,183 premises potentially available pending further information.

Lot 3 – South West Wales (Estimated value: £25.436m)

Intervention Area of 36,166 NGA white premises has been identified with an additional 17,552 premises potentially available pending further information.

The existing voucher schemes – Access Broadband Cymru (ABC) and Ultrafast Connectivity Vouchers will continue to provide funding and both schemes are currently being reviewed to ensure that they continue to provide the right solutions and complement the new Superfast Cymru successor scheme and the wider broadband landscape.

For those who cannot yet get fibre or a fast traditional broadband connection, Access Broadband Cymru part-funds the installation costs of new broadband connections for homes and businesses in Wales, delivering a step-change in download speeds. There are two levels of funding, depending on the speed required; £400 for speeds between 10Mbit/s

Community project aims to deliver Ultrafast broadband for Welsh rural community

Villagers in Michaelston y Fedw, west of Newport, have formed a Community Interest Company to bring ultrafast Fibre to the Premises (FTTP) broadband to residents and businesses with an upload and download speeds of 1Gbps or 1000Mbps.

The community project has employed contractors to do some of the work, while teams of volunteers have taken part in activities such as digging chambers, fibre splicing, laying out ducts and fitting out the village's communications hub.

The money required was raised to build the network in the knowledge that once built, the connections would be eligible to be funded by the Welsh Government's Access Broadband Cymru scheme or Ultrafast Connectivity Voucher once the speeds had been reached. Both schemes are available for premises which cannot currently access superfast broadband. The network is not yet fully operational and therefore not included in Ofcom's analysis.

The village pub, community hall and church are already connected to the ultrafast broadband and work is underway to connect over 175 premises in total in the community.

The Michaelston y Fedw (Myfi) project recently won the "*Innovative models of financing, business and investment*" category as part of the 2018 European Broadband Awards.

and 20Mbit/s, and £800 for download speeds of 30Mbit/s and above. The scheme is technology-neutral, using a range of technologies including satellite and fixed wireless access to deliver superfast speeds and/or speeds at least double current download speeds.

The Welsh Government has confirmed that its project to enable superfast services at business parks and industrial estates across North and South Wales is now complete.

Premises without access to superfast speeds of over 30Mbit/s, which are not in any private sector roll-out plans for the next three years, have been captured as eligible for government intervention. Use of the ABC voucher scheme will not exclude premises from the rollout it they are part of it. The Welsh Government is working with Openreach on confirming the premises which will benefit from the rollout.

A new online presence is being prepared for the suite of interventions, including the successor project with Openreach. Consumers will be able to check whether their premises are scheduled to be completed under this project or if another intervention would be more suitable. The target date for completion of these interventions is 2021.

Openreach Community Fibre Partnership

More than 35 premises in Nant Gwynant will have access to ultrafast speeds of up to 1Gbps as a result of FTTP technology installed under Openreach's Community Fibre Partnership programme (CFP).

The CFP scheme is designed to help people in places not included in any current roll-out plans to bring fibre broadband to their local area, working with Openreach to co-fund the installation. The cost of the Nant Gwynant CFP will be covered by a combination of investment from Openreach and the residents themselves who were able to access Welsh Government ABC vouchers and BT support.

Under the CFP programme, communities can apply for a grant of up to £30,000 towards the cost of getting superfast or ultrafast broadband with Openreach if the new technology will also benefit a local school or learning establishment, or a registered UK charity. Plas Gwynant Outdoor Education Centre is part of the Nant Gwynant CFP which enabled the community to access the BT grant. Residents of the north Wales village of Llanymawddwy who have had a promise of FTTP services withdrawn, have now been advised that the CFP is the only option open to them.

Data at National Assembly for Wales constituency level

National Assembly for Wales constituencies with the largest percentage of premises with less than 10Mbit/s

Looking at availability of broadband at the more granular constituency levels reveals the ongoing disparity across Wales. Figure 2 shows the number and percentage of premises unable to access services of 10Mbit/s or more in the constituencies with the highest percentage of premises unable to access decent broadband.

Four mid and west Wales constituencies each have double digit percentages of premises in this category.

Figure 2: National Assembly for Wales constituencies with the highest percentage of premises unable to access services of 10Mbit/s or more

Constituency	Premises	% Premises
Brecon and Radnorshire	4948	14%
Ceredigion	4633	13%
Montgomeryshire	3902	12%
Carmarthen East and Dinefwr	4287	12%
Preseli Pembrokeshire	3747	9%
Dwyfor Meirionnydd	3064	8%
Monmouth	3230	8%
Carmarthen West and South Pembrokeshire	2541	6%
Clwyd West	2294	6%
Clwyd South	1622	5%

Source: Ofcom analysis of operator data

Ultrafast broadband deployment continues to increase

Ultrafast services are defined as being able to deliver broadband speeds that are greater than or equal to 300Mbit/s. This definition includes G.fast, cable networks and full fibre technologies. G.fast services operate from a point near the end user, meaning that premises that are very close to the cabinet are capable of receiving very high speeds.

Over the last year the coverage of ultrafast broadband has increased from 10% to 29%.

We also expect ultrafast coverage to grow because of the increased interest in full fibre networks.

Full fibre investment and roll out continues to increase

In a 'Full fibre' or Fibre to the Premises network, fibre optic cables are connected all the way from the local exchange to the home or small business, and can deliver reliability and speeds of 1Gbit/s or more.[10] This contrasts with technologies that are a combination of fibre and copper like Fibre to the Cabinet, where the quality and distance of the copper to the premises can impact on both the reliability and speed of the service.

95,000 premises in Wales now have access to a full fibre connection. This is an increase of 51,000 premises compared to last year.

Ofcom supports the government's ambitions to extend the availability of full fibre networks. To encourage investment in building full fibre networks and to provide investors and companies with long term regulatory certainty, Ofcom has proposed several changes in our regulatory and policy approach.[11] They include:

- Allowing competing operators to use Openreach's ducts and poles for both people and businesses. Currently, duct and pole access is restricted to networks focusing primarily on the residential market, but we are proposing that the restriction now be removed to allow it to also be used for business customers.
- A flexible approach to regulation by deregulating in areas where there are competing fibre operators.
- Increasing the period of the telecom competition assessments from 3 to 5 years.

Full fibre coverage to rural premises is amongst the highest in Wales compared to the other nations in the UK with 16% of premises having access to this technology compared to 8% in rural England and Northern Ireland and 3% in rural Scotland.

End-to-end fibre network in Colwyn Bay

Colwyn Bay is set to be the first end-to-end pure fibre network in Wales by installing a pure fibre zone throughout the town.

Commencing works in January 2019, Pure Fibre Zone, a part of the British Fibre Networks Group, will build a fibre network around the town, providing access to residents and businesses. Using the town's existing infrastructure and ducting to minimise disruption, 17 masts located in Colwyn Bay will supply premises with a pure fibre connection, guaranteeing users of at least 100Mbps upload and download speeds. Wi-Fi zones will also be installed across the town centre.

Cardiff among first in UK to benefit from 'fibre first' programme

Thousands of homes in Cardiff are in the final stages of being connected to ultrafast broadband under the first phase of Openreach's 'fibre first' programme. The work is part of Openreach's plans to make new,

[10]We define full fibre coverage as where the network has been rolled out to a "lead-in" that will serve the consumer end premise and where the customer would expect to pay a standard installation charge for that connection.

[11]https://www.ofcom.org.uk/__data/assets/pdf_file/0025/116539/investment-full-fibre-broadband.pdf

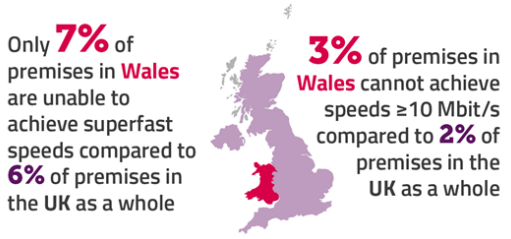
more reliable, and more resilient fibre to the premises technology available to three million homes and businesses across the UK by the end of 2020. Openreach says that the technology provides additional capacity for data-hungry services and applications, such as virtual reality gaming and smart homes. Cardiff is one of nine UK cities to make up the first phase of the fibre first programme, which aims to connect up to 40 UK towns, cities and boroughs with FTTP networks.

Openreach has announced that Swansea will be next to benefit from their "*Fibre First*" programme. The first areas to benefit from this new roll-out in Swansea will be SA1, SA2 and SA5.

The number of premises unable to access decent broadband has fallen

While superfast coverage continues to improve, there remains a significant minority of premises that do not have access to decent broadband services. In March 2018, the UK Government introduced legislation for a Broadband Universal Service Obligation, which will give eligible homes and businesses the right to request a broadband connection that delivers a decent broadband service of at least 10 Mbit/s download speed and 1Mbit/s upload speed. Ofcom is responsible for implementing the USO.

Coverage of decent broadband also varies across the nations in both rural and urban areas. Figure 3 highlights the differences between the nations and the urban/rural divide. Premises with no access to a decent broadband connection would be considered eligible for the Government's USO.



The number of premises in Wales unable to access a decent broadband service through a fixed broadband connection fell from 74,000 (5%) in 2017 to 48,000 (3%). This difference is more acute in rural areas with 42,000 (13%) of premises not able to receive decent broadband compared to 6,000 (1%) premises in urban areas.

Figure 3: Premises unable to access decent broadband by nation

	Premises unable to access decent broadband (to include premise numbers)		
Nations		Rural	Urban
England	484,000 (2%)	11%	1%
Scotland	105,000(4%)	21%	0.5%
Wales	48,000 (3%)	13%	1%
Northern Ireland	41,000 (5%)	17%	0.5%

Source: Ofcom analysis of operator data

Ofcom is currently in the process of designating the providers who would be responsible for delivering the Broadband USO. In June 2018 we published a consultation, inviting expressions of interest in being designated as a Universal Service Provider. Having received eight expressions of interest to this document, in our consultation published in December 2018, we proposed that BT and KCOM should be designated as the Universal Service Providers and that we expect people to be able to request these connections from 2020. By this point we expect the number of premises that could be eligible for the USO should have fallen further.

Fixed Wireless Access as a means of delivering broadband

Fixed Wireless Access (FWA) networks provide an alternative solution to traditional fixed broadband services. These networks use a wireless link for the final connection to a home or business, avoiding the installation of a line into the building. The capacity in the wireless access network is shared between multiple users. The service needs to be managed appropriately to ensure there is sufficient capacity to meet user needs, especially in areas with capacity constraints.

FWA networks can be deployed in different frequency bands, including licence exempt or light licensed spectrum such as the 5 GHz band, and licensed mobile band or new bands like mmWave. Some FWA networks use current mobile technologies such as the 4G Relish or EE home broadband router services or, in future, will rely on new 5G mobile technology. In response to our consultation on the broadband USO, BT has claimed that across the UK it will be able to cover around 450,000 premises that might otherwise need the USO using their EE home broadband service. We are doing more work to validate the likely coverage from the EE network.

Given the historically lower levels of availability of fixed broadband services, many users in Wales have relied on FWA providers for a service. Most of the installations have received financial support from the Welsh Government's Access Broadband Cymru scheme, and most providers are now able to provide 30Mbit/s services.

Fixed Wireless Access on shared spectrum

The majority of these services are delivered over FWA networks that communicate via a wireless link between a provider's mast site and an external antenna fixed to a customer's premises. The speeds and services delivered will depend on a number of factors including, but not limited to: the number of premises being served from the same transmitter, the location of the premises, line-of-sight issues, consumer equipment and available network capacity.

Ofcom's work with FWA network providers

Ofcom is working with companies to understand how FWA networks operate and the levels of service people receive.

Over the last year we contacted over 100 FWA providers which provide services across the UK to gauge their level of interest in providing us with details of their network and service.[12] To date, 12 of these FWA providers have submitted data to Ofcom.

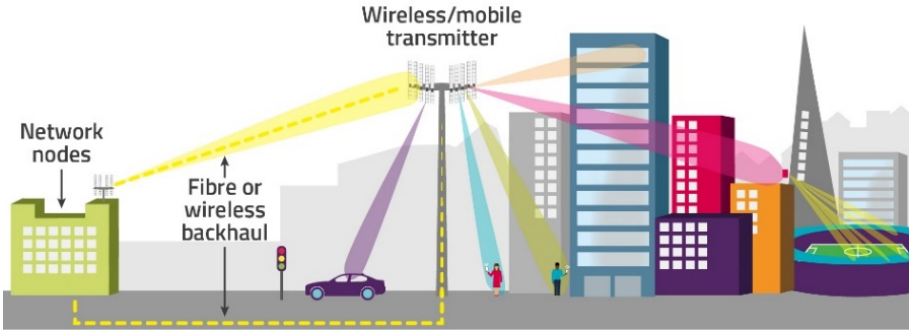


Figure 4: Schematic of Fixed Wireless Access network

[12] The full list of FWA providers who were contacted can be found in Annex A.

We have applied a modelling method to this data in order to predict the number of unique premises which could receive an FWA service via existing infrastructure. The modelling method provides an estimate only and does not account for network capacity constraints, interference or other external factors.[13]

We estimate that over 30k premises in Wales are able to receive a decent broadband service from an alternate FWA provider on licence exempt or light licensed spectrum.

The results of our modelling show that 32,000 unique premises in Wales have a medium or high chance of being able to receive a decent broadband service from an alternate FWA provider. Of these, 1,500 currently have no other means of accessing a decent fixed broadband service.

Figure 5 shows the total number of premises covered by one or more FWA networks. It also shows the number of premises which are unable to access a decent broadband service but can be covered by an alternate FWA network. This is labelled FWA USO in the table below.

Figure 5: Number of premises which can receive decent broadband from FWA providers by nation

Nation	FWA coverage	FWA USO
UK	903,500	41,500
England	829,500	32,500
Northern Ireland	21,000	5,000
Scotland	21,500	3,000
Wales	32,000	1,500

Source: Ofcom analysis of operator data

We intend to continue collating and analysing data on FWA networks given the increasingly important role that FWA plays in delivering a broadband service to people, especially in harder-to-reach areas.

Future of voice

As communications providers move away from deploying copper-based to fibre broadband technologies, the traditional telephone network will also have to change. Traditionally most landline services are delivered to people over the Public Switched Telephone Network (PSTN), using copper. With a reduction of technical knowledge on such copper dependent systems and the unavailability of spare parts, communications providers are preparing to move to an all IP world where telephone services will be delivered over the fibre broadband connection, often referred to as Voice over IP (VoIP).

Earlier this year, Openreach consulted on plans to withdraw its wholesale PSTN voice service and to move to offering access network inputs that will only support VoIP based services by 2025.[14] Virgin Media is also planning to migrate voice services to VoIP. Sky and TalkTalk already carry voice calls as IP traffic in their core network.

We are now gathering information about the technology used by communications providers to provide voice services so that we can track the migration to VoIP in the coming years. This data shows that the migration of voice services onto the broadband connection has yet to begin in any volume. Across the UK, most of services are still being supported by the traditional PSTN network, with a large minority (around a fifth) of services being supported by a modern IP-based network that imitates the characteristics of the traditional

[13] More detail on the methodology used to determine FWA network coverage can be found in Annex A.
[14] https://news.openreach.co.uk/pressreleases/openreach-to-consult-communication-provider-customers-on-switch-to-digital-phone-services-by-2025-2507133

PSTN (known as 'emulation'). We will continue to monitor this in future Connected Nations reports.

Some services that rely on the analogue characteristics of the current PSTN may be affected by the migration to IP, for example some types of fire alarms and telecare services. As a part of their plan for migration, BT are offering a test facility for providers of such services to test the impact of this transition.[15] Ofcom is also contacting government departments and other organisations in Wales to help raise awareness about the migration and potential impact for services they or their stakeholders use.

We have published guidance for communications providers on protecting access to emergency calls where there is a power cut at the customer's premises

Traditional voice calls are delivered to premises via copper connections and as these lines are powered from the local telephone exchange, people with corded phones can still make emergency calls in the event of a power cut at the premises. However, calls in such circumstances made over broadband using VoIP based technology will not function, as the broadband equipment at the premise requires mains power to work. As a result, calls will only be possible if additional protection measures are in place.

To support companies in their preparation for delivering voice services on fibre broadband connections, in October we published guidance for communications providers setting out our expectations on the measures they should have in place to ensure customers making calls over broadband are able to make emergency calls in a power cut at their premises.[16]

[15] https://www.btplc.com/DigitalServicesLab/index.htm
[16] https://www.ofcom.org.uk/consultations-and-statements/category-2/access-emergency-organisations-power-cut

In focus: Ceredigion and Montgomeryshire

Ceredigion and Montgomeryshire are two of Wales' most rural and sparsely populated constituencies.

Ceredigion constituency profile

Figure 6: Map of Ceredigion

The Ceredigion constituency elects both a Member of Parliament to the House of Commons (presently Ben Lake) and an Assembly Member to the National Assembly for Wales (presently Elin Jones). The boundaries of the constituency almost exactly mirror the county of Ceredigion. Welsh is spoken by over half of the population and its largest town is Aberystwyth

Traditionally, farming has been the staple of the Ceredigion economy. However, in 2001 Ceredigion was designated as a regional 'Tourist Growth Area' by the Wales Tourist Board, and tourism has become a growing part of the Ceredigion economy. It has few large-scale employers, but Newcastle Emlyn is home to Cawdor Cars, which employs 100 people in Ceredigion and has outlets in Llanelli, Carmarthen and Aberystwyth. Of the 40 Welsh seats it has the 12th highest economic inactivity rate, in large part due to its popularity with retirees.

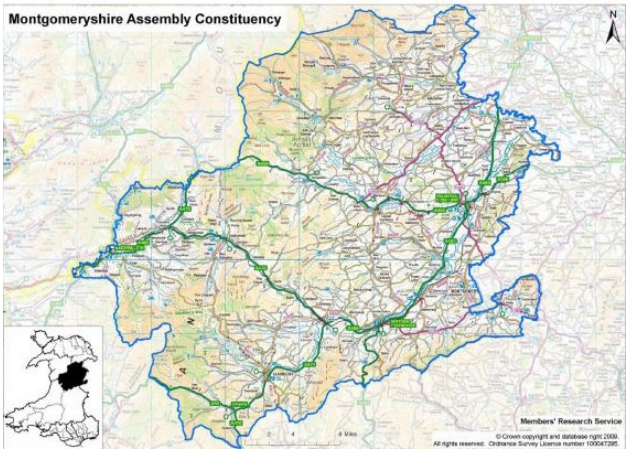
Figure 7: Key economic statistics for Ceredigion

Total Population	75,425
Total Population on Electoral Roll	50,260
Average Gross Weekly Earnings	£516
Percentage of Working Age Benefit Claimants	11%
Economic Inactivity Rate	22.6%
Percentage Without Qualifications	8%
Average House Price	£212,002
Percentage of Dwellings More Than 20 Minutes from Nearest Library	61.5% (highest in Wales)

Source: National Assembly for Wales research service

Montgomeryshire constituency profile

Figure 8: Map of Montgomeryshire



Montgomeryshire is an agricultural, border constituency. It is one of two constituencies covering Powys. It has a very low population density, with its largest settlements being Newtown, Welshpool and Llanidloes. Newtown and the Severn Valley area have seen considerable inward investment and the creation of a wide range of manufacturing jobs. A key example of this is Newtown's biggest company, Control Techniques, which employs 360 people at its global headquarters in the town and was recently taken over as one part of a £900m deal.

Figure 9: Key economic statistics for Montgomeryshire

Total Population	63,529
Total Population on Electoral Roll	48,135
Average Gross Weekly Earnings	£503
Percentage of Working Age Benefit Claimants	11%
Economic Inactivity Rate	17.2% (second lowest in Wales)
Percentage Without Qualifications	9%
Average House Price	£217,020
Percentage of Dwellings More Than 20 Minutes from Nearest Library	57.2% (second highest in Wales)

Source: National Assembly for Wales research service

Both constituencies have higher proportions of premises without access to decent broadband than the average for Wales – 13% v 3% and in the rural parts of both constituencies the percentages are even higher – 17% in rural Ceredigion and 19% in rural Montgomeryshire, both higher than the average for Wales of 13%.

Of those able to receive superfast services, a comparatively high proportion are able to do so via full fibre connections – 25% in Ceredigion and 27% in Montgomeryshire, which are higher than the all-Wales figure of 16%.

Both constituencies also have Fixed Wireless Access services from at least one provider in addition to fixed wireless services from a mobile network.

Fixed

Figure 10: Comparison Table of Ceredigion, Montgomeryshire and Wales: Percentage of premises unable to access decent broadband and those able to access a superfast broadband connection, full fibre and Fixed Wireless Access provider

	Ceredigion			Montgomeryshire			Wales		
	All	**Urban**	**Rural**	**All**	**Urban**	**Rural**	**All**	**Urban**	**Rural**
Unable to access decent broadband	13%	4%	17%	12%	0.4%	19%	3%	1%	13%
Superfast coverage (download speed at least 30Mbit/s)	80%	94%	74%	80%	98%	70%	93%	97%	77%
Full fibre	20%	8%	25%	20%	7%	27%	7%	4%	16%
FWA (sufficient for decent broadband)[17]		3%			7%				

Source: Ofcom analysis of operator data

[17] We contacted over 100 FWA providers for this year's report, but only 12 submitted coverage information on their networks. Of these, two had coverage in Wales. ResQnet provides services in South Ceredigion and Secure Web Services provides services in East Montgomeryshire.

Mobile

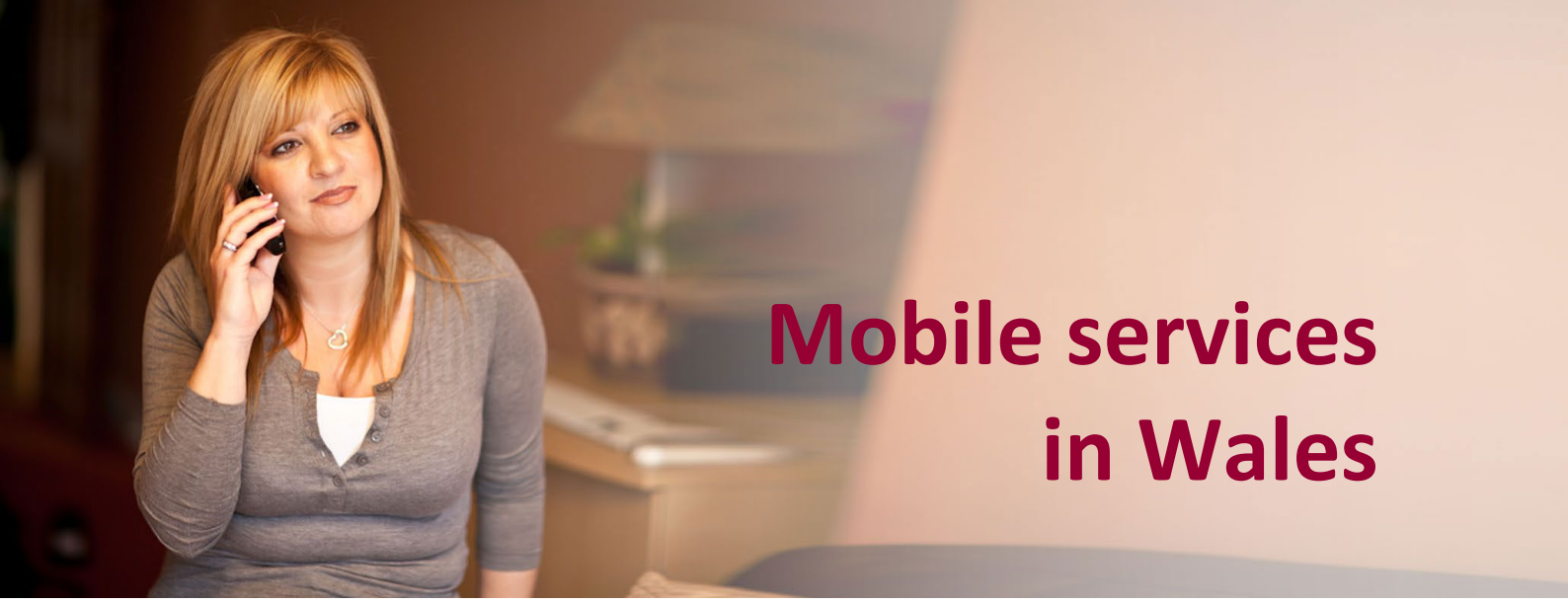
Voice services from at least one operator are available in 91% of Ceredigion and 96% of Montgomeryshire, but availability from all operators is significantly lower at 68% for both, well below the all-Wales figure of 75%

The availability of 4G services from at least one operator is lower in both constituencies - 85% in Ceredigion and 87% in Montgomeryshire (Wales: 90%), and 4G availability from all four operators drops to 49% in both constituencies (Wales: 57%).

Figure 11: Comparison Table of Ceredigion, Montgomeryshire and Wales: Coverage by all four operators of 4G services and on major roads (in vehicle)

	Ceredigion		Montgomeryshire		Wales	
	Outdoor geographic coverage	Major roads (in vehicle)	Outdoor geographic coverage	Major roads (in vehicle)	Outdoor geographic coverage	Major roads (in vehicle)
4G (at least 1 operator)	85%	92%	87%	97%	90%	95%
4G (all 4 operators)	49%	44%	49%	50%	57%	53%
Voice (at least 1 operator)	91%	97%	96%	99%	95%	97%
Voice (all 4 operators)	68%	65%	68%	75%	75%	75%

Source: Ofcom analysis of operator data



Mobile services in Wales

Mobile services are an increasingly important part of consumers lives and how business is conducted.

This has created an increasing expectation of being able to access a decent mobile connection wherever you are. At the same time the devices we use to access mobile services have changed, with the greater take-up and use of smartphones, tablets and Internet of Things (IoT) devices, which often require stronger signals than older, simpler phones.

The UK government's future telecoms infrastructure review (FTIR) sets out important and ambitious targets for making mobile coverage more widely available. Ofcom continues to support this ambition and its focus on providing widespread good quality coverage across all parts of the UK.

Mobile coverage highlights for Wales

Mobile networks[18]	Wales	UK
Indoor voice premises (coverage by all four operators)	88%	92%
Geographic voice (coverage by all four operators)	75%	78%
Indoor 4G premises (coverage by all four operators)	69%	77%
Geographic 4G (coverage by all four operators)	57%	66%
Indoor voice premises (complete not-spots)	1%	0.2%
Geographic voice (complete not-spots)	5%	5%
Indoor 4G premises (complete not-spots)	2%	1%
Geographic 4G (complete not-spots)	10%	9%

Source: Ofcom analysis of operator data

[18] Coverage thresholds are: 2G indoor (-71dBm), 2G outdoor (-81dBm), 3G indoor (-90dBm), 3G outdoor (-100dBm), Good quality 4G voice and data services indoor (-95dBm), Good quality 4G voice and data services outdoor (-105dBm), Lower speed 4G data services indoor (-105dBm) and Lower speed 4G data services outdoor (-115dBm).

Key findings

Mobile voice coverage from all four operators now extends to **75%** in Wales

4G mobile coverage now extends to 57% in Wales

The highlights for mobile coverage in Wales are: -

- Good 4G indoor premises coverage increased by 24pp to 69%.
- Indoor voice coverage by all four operators reached 88%.
- Geographic coverage by all four operators also increased across all categories. Voice coverage reached 75%, and good 4G coverage was up 27pp to 57%.

Mobile coverage is provided using combination of different mobile technologies

Several types of technology are used to deliver mobile services to people. Most modern mobile handsets support 2G, 3G, and 4G, whereas 5G devices will become available in 2019.

2G: this was the first digital mobile technology, launched in the UK in 1992. It is used to deliver: voice, text services and very low-speed data services.

3G: this is a later generation of digital mobile technology, launched in 2003. It can be used to deliver: voice, text and lower speed data services.

4G: this is the latest generation of mobile technology, launched in 2012. It can provide download speeds of over 10Mbit/s, and is used to deliver: voice, text and higher speed data services.

5G: will be the fifth generation of mobile technology. It is expected to deliver faster, lower latency mobile broadband, and to enable more revolutionary uses in sectors such as manufacturing, transport and healthcare.

Our approach to reporting on mobile coverage

The levels of mobile coverage included in this report relate to where a sufficiently strong mobile signal is available to deliver a good experience to smartphone users.[19] [20] This is where:

- Nearly all 90-second telephone calls are very likely to complete without interruption;
- Nearly all 4G connections will deliver a connection speed of at least 2Mbit/s. This is fast enough to browse the internet and watch glitch-free mobile video.

How you measure coverage is important, but so is *where* you measure it. To reflect the places in which consumers are likely to use their mobile, we look at coverage in three main ways:

[19] We have used crowdsourced data from consumer handsets and drive testing to identify the signal levels needed to meet these targets at least 95% of the time.

[20] We also report on the availability of lower speed earlier generation 3G data services. These are reported in combination with lower speed 4G data services (based on a lower target signal threshold) where they are likely to provide a connection speed of at least 200kbit/s for nearly all connections. These connections are likely to be sufficient to support lower speed data services such as basic web-browsing as opposed to higher resolution video.

- Outdoor: The percentage of geographic area where someone can use their phone while outdoors. This measurement is useful for assessing the likelihood of successfully using a phone while out and about.
- Indoor: The percentage of premises in which someone can use their phone. This measurement is useful for assessing the likelihood of successfully using a phone while at home or at work.
- Roads: The percentage of roads on which someone can use their phone while inside a vehicle. This measurement is useful for assessing the likelihood of successfully receiving coverage whilst on the road.

Finally, we report on whether coverage is available from all four operators. This reflects the level of choice of provider available to consumers. It is often much lower than the coverage available from a single operator. Given this, we also report on the coverage available from the best operator, noting that there are often significant differences between the coverage provided by mobile operators.

Mobile coverage continues to improve but remains limited in many rural areas

The ongoing roll out of 4G services combined with two coverage obligations being met at the end of 2017 have helped improve coverage.

The two coverage obligations delivered at the end of 2017 included:

1. All operators providing voice call coverage to 90% of the UK's landmass;[21]
2. O2 providing 2Mbit/s indoor 4G data connections to 98% of people, with an obligation to cover 95% in each of the four nations of the UK.

In early 2018 we concluded that both these obligations had been successfully met by mobile operators.[22] Despite this coverage remains poor in many rural areas. For example, in urban areas of Wales voice call services are now available from all operators to 95% of premises and good 4G data services of a least 2 Mbit/s to 79% of premises. In contrast, only 36% of premises can access good quality 4G data services in rural areas.

Hence, additional steps will be needed to improve coverage in rural areas, such as coverage obligations in the award of the 700MHz spectrum band and the use of technical innovation offered by 5G.

We find that population density and composition, topography, distance to mobile backhaul and whether the locality is urban or rural will affect the availability of mobile coverage. Compared to urban areas, rural areas will typically have a lower population density and more uneven terrain. This would mean that demand for mobile services is likely to be lower and costs are likely to be higher when deploying mobile infrastructure to rural locations.

Our analysis showed that these demand and cost factors were able to account for a sizable proportion of the differences in mobile coverage across regions and nations of the UK.

[21] These were based on a lower voice call signal level than that used to report on voice call coverage in this report.
[22] https://www.ofcom.org.uk/spectrum/information/cellular-coverage

Outdoor geographic coverage

Overall outdoor mobile coverage has improved, but the improvements vary considerably between operators and a quarter of the UK does not have coverage from all operators.

Seventy-five per cent of Wales' geographic area (78% UK) is now covered by all four operators for telephone calls, up from 62% in May 2017 (69% UK).[23] Geographic area not covered by any operator for telephone calls has fallen from 9% last year to 5% this year.

Outdoor access to good data services through 4G has also significantly increased from 30% to 57% of Wales' geographic area over the same period.[24] The area without good 4G data service from any operator has significantly reduced from 22% last year to 10% this year

There are considerable variations between the coverage provided by the individual operators in Wales. O2 provides the highest levels of good indoor data and voice and good outdoor geographic voice coverage. The greatest variation between operators occurs in relation to geographic coverage of good data services where EE provides the highest level of coverage (83%) and O2 the lowest (67%).

Figure 12: Coverage of mobile services in Wales by network operator September 2018

	O2	Vodafone	EE	Three
Indoor voice premises	98%	96%	93%	94%
Indoor data premises	89%	87%	88%	86%
Geographic voice	91%	87%	84%	87%
Geographic data	67%	71%	83%	78%

Source: Ofcom analysis of operator data

Indoor premise coverage

Indoor voice coverage from all networks at Wales homes and businesses stands at 88%. Some 88% premises in Wales have indoor telephone call coverage from all four mobile networks (92% UK), up from 80% in June 2017 (90% UK).[25] We welcome the improvement, but indoor coverage is very important for people so much more must be done to increase it.

69% of homes and business in Wales have good indoor 4G coverage from all operators. 69% of premises in Wales (77% UK) are now covered by a good 4G signal from all operators, up from 45% in June 2017.[26] The difference between operators is significant, with O2 premises coverage 3 percentage points higher than the worst operator.

[23] These figures include voice calls over 4G LTE services.
[24] Outdoor access to lower speed data services through 3G and 4G (where nearly all connections have access to a connection speed of at least 200kbit/s) has similarly increased. 82% of Wales' geographic area now has a lower speed mobile data service from all four operators, up from 60% in June 2017.
[25] We determine indoor coverage by applying an average building entry loss of 10dB across all buildings.
[26] Indoor access to lower speed data services through 3G and 4G (where nearly all connections have access to a connection speed of at least 200kbit/s) from all operators has similarly increased, 95% of premises in Wales now have a lower speed mobile data service from all operators, up from 82% in June 2017.

Figure 13: Coverage of 4G mobile services from all operators

	Indoor coverage, % premises	Geographic coverage, % landmass
UK	77% (↑12pp)	66% (↑17pp)
England	78% (↑10pp)	82% (↑14pp)
Northern Ireland	57% (↑10pp)	79% (↑15pp)
Scotland	75% (↑17pp)	38% (↑19pp)
Wales	69% (↑24pp)	57% (↑27pp)

Source: Ofcom analysis of operator data

There are 7,000 premises in Wales that do not have coverage from either decent fixed or good 4G mobile

Premises are considered to have access to a decent fixed connection if the broadband speed is a download sync speed of at least 10Mbit/s and an upload speed of at least 1Mbit/s and to have good mobile coverage if indoor 4G mobile coverage is available. Using this approach, we estimate that 96% premises in Wales (97% UK) can receive both decent fixed and good mobile services[27], whilst 7,000 premises (0.5% of premises in Wales, compared to 0.1% of premises in the UK) are unable to access either.

Premises in rural areas of Wales are most likely to have neither a decent fixed or good mobile service available. 2% of rural premises in Wales (3% in Scotland) are unable to receive either a decent fixed or good mobile service.

Roads coverage

The need for connectivity to be available to all roads is continuing to increase, with requirements including vehicle occupant communications, navigation, infotainment, and safety aids.

Figure 14: In car mobile coverage on selected roads in Wales

	Motorway and A roads
Voice	75%
4G	53%

Source: Ofcom analysis of operator data

Voice coverage on motorways and A roads stands at 75%, but there are large differences in availability between key A roads, with the A470 8pp lower than the average and the A55, A483 and A40 all above the average. The same is true for 4G coverage where each of three roads listed above exceed the average which stands at 53%, whilst the A470 is 8pp lower at 45%.

Figure 15: In car mobile coverage on selected roads in Wales

	A55	A470	A483	A40
Voice	88%	67%	85%	92%
4G	70%	45%	61%	69%

Source: Ofcom analysis of operator data

Ensuring the accuracy of the mobile coverage data

The mobile coverage figures provided in this report rely on the accuracy of coverage prediction data supplied by the mobile operators.

In our last Connected Nations report update published in October 2018, we noted that we had identified operators' potential overprediction in EE's 3G and underprediction in Vodafone's 4G services. These operators have subsequently resubmitted data on their coverage. Taking into account these adjustments we have provided re-stated historic mobile coverage levels including in the interactive dashboard.

[27] This consists of 2% of premises that can receive decent fixed, good mobile and FWA services and 94% that can receive decent fixed and good mobile.

We take the accuracy of the data supplied to us seriously given its importance to policy making and the information provided to people on coverage. In light of these corrections we decided to formally investigate these matters further.[28] [29] We have been reviewing the evidence and plan to publish an update in the new year.

The challenges in Wales

The topography and the density of its population poses particular challenges in improving mobile coverage in Wales.

Providing comparable levels of coverage with other nations of the UK will inevitably require the construction of more masts and in many cases the height of those masts will have a beneficial effect on the coverage levels achieved.

While the ongoing roll-out of 4G services has led to improvements, mobile coverage is still worse in Wales, Northern Ireland and Scotland than it is in England. Coverage varies considerably among MNOs and remains poor in many places, with only 57% of geographic area covered by good 4G services from all operators in Wales compared with 38% in Scotland, 79% in Northern Ireland and 82% in England. There is considerable variation in the levels of good 4G coverage that is available from each operator: EE 83%, Three 78%, Vodafone 71% and O2 67%. This is unsatisfactory and more needs to be done to improve coverage in all the nations.

There remain areas in Wales with no good mobile coverage from all four of the network operators as well as complete not-spots where there is no coverage at all. In geographic terms, 10% of Wales (9% UK) is not covered by a good 4G service from any operator and 5% (5% UK) not covered by a voice service by any operator.

Powys and Gwynedd amongst worst in UK for road coverage

In October the RAC Foundation published a report on mobile coverage on UK roads claiming that 5,540 miles of road had no coverage whatsoever and that a further 44,368 miles of roads have only partial voice coverage, with not all operators providing a signal. The report was based on Ofcom research. Two Welsh local authorities featured in the top 10 with the most miles of road lacking any mobile signal. Powys was second with 411 miles of road without coverage, and Gwynedd with 213 miles of road without coverage was seventh.

Figure 16: Ten devolved constituencies with the lowest coverage by all operators for 4G outdoor geographic coverage

Devolved Constituency UK	% Coverage
Argyll and Bute	13%
Na h-Eileanan an Iar	16%
Caithness, Sutherland and Ross	18%
Skye, Lochaber and Badenoch	19%
Stirling	35%
Cunninghame North	35%
Dwyfor Meirionnydd	37%
Perthshire North	38%
Moray	40%
Aberdeenshire West	42%

Source: Ofcom analysis of operator data

[28] https://www.ofcom.org.uk/about-ofcom/latest/bulletins/competition-bulletins/open-cases/cw_01232
[29] https://www.ofcom.org.uk/about-ofcom/latest/bulletins/competition-bulletins/open-cases/cw_01231

Of the 10 devolved constituencies with the lowest good 4G outdoor geographic coverage Dwyfor Meirionnydd is seventh from bottom (37%). When looked at by local authority, Gwynedd is ninth from bottom (42%) and Conwy tenth (43%).

Figure 17:Ten UK local authorities with the lowest coverage by all operators for 4G outdoor geographic coverage

Local authorities UK	% Coverage
Argyll and Bute	15%
Na H-Eileanan Siar	16%
Highland	21%
West Somerset	30%
Stirling	37%
Copeland	39%
South Ayrshire	41%
Moray	41%
Gwynedd	42%
Conwy	43%

Source: Ofcom analysis of operator data.

Initiatives to improve mobile communications

Coverage is improving, but expectations are also increasing and more must be done. We continue to work with Governments and industry to improve mobile communications in the UK and set out our key initiatives below to improve services across the UK.

Making more spectrum available for coverage

As set out in our Strategic Review of Digital Communications, the award of the mobile airwaves in the 700 MHz band provides an important opportunity to improve coverage.

To ensure mobile operators provide good quality coverage to more of the UK, we are consulting on including two coverage obligations in the award of 700 MHz and 3.6 GHz spectrum. Our proposed obligations would require the licence holders to improve geographic coverage for at least 90% of the UK's landmass (including improving coverage in each of the nations), as well as delivering outdoor coverage to an additional140,000 premises and deploying a minimum of 500 new sites. [30]

In October 2017, the Welsh Government published its Mobile Action Plan which sets out how it will work with the mobile phone industry and Ofcom, to provide connectivity to meet the needs of people and businesses in Wales. Although telecommunications policy is not devolved to Wales, the action plan focuses on key areas where the Welsh Government could use powers to improve mobile connectivity and capacity.

The Welsh Government has published draft proposals for the creation of a number of mobile action zones across Wales.

Within these zones the Welsh Government, mobile network operators, infrastructure providers and local authorities would work together to improve mobile connectivity. Depending on the circumstances of each zone either the public sector would work with the mobile industry to create the right conditions for commercial investment or where commercial investment in capital costs is not viable under any circumstances, then publicly funded mobile infrastructure would be considered.

Work is already underway to identify the candidate zones and will be followed by the choice of potential treatments applied to each zone and identification of potential infrastructure sites. The Welsh Government aims to complete this and to develop a formal strategic case for intervention by the turn of the year.

[30] https://www.ofcom.org.uk/consultations-and-statements/category-1/award-700mhz-3.6-3.8ghz-spectrum

Small Cell Technology

Wales has hosted 3 of the 5 UK trials where small cell technology has been deployed deployments as part of a partnership between the Welsh Government, EE and local stakeholders. The aim was to provide 4G coverage in areas where it is difficult to deploy conventional technology. Typically, coverage would be a whole village or settlement. Trials in Wales included the Snowdonia Enterprise Zone in Gwynedd and the villages of Tresaith and Llanddeiniol in Ceredigion.

The village of Llanddeiniol is located between 2 large cell sites, but unable to receive service due being lower down than surrounding area and therefore unable to gain line of sight to a nearby antenna. The trial site serviced a small village of around 40-50 premises and was hosted by the landowner.

The common aspect is an integrated 3G and 4G small cell in a secure cabinet. These were installed via antenna to the side of a building. A single cylindrical antenna housing incorporates separate 3G and 4G directional antennas, typically with a 90-degree spread plus a GPS receiver for synchronisation.

Some of the units only required mains power and used wireless links for backhaul. The others were directly connected to fibre backhaul. Where wireline backhaul isn't available, the service can be relayed from a nearby 4G 'donor' macro cell. This is then repackaged to provide both 3G and 4G at the local sites. Internal short-range line-of-sight datalinks between local small cells use the 5GHz unlicensed band.

We have made more spectrum available for capacity and performance with both 4G and 5G

This year we auctioned and released 40MHz of 2.3 GHz spectrum, ideal for providing extra speed and capacity to 4G mobile services. This spectrum is supported by many mobile devices today and has already been put into service to improve performance across large areas.

We also auctioned and released 150 MHz of spectrum at 3.4 GHz that may be used for 5G services in the future.

In addition, we recently changed the regulatory regime at 57-66 GHz as well as making new spectrum available at 66-71 GHz, to make a total of 14 GHz available for a range of fixed and mobile applications, including 5G, on a licence exempt basis.

Innovative spectrum uses

To enable opportunities for innovation, we are proposing to enable new users shared access to spectrum bands supporting mobile technology in locations not used by other licensed users. [31] This includes the 3.8-4.2 GHz band which is covered by 5G technology standard. This could enable new users to access spectrum for new business models and services, including 5G applications and high capacity wireless solutions that may address rural broadband coverage.

Improving coverage in buildings and in vehicles

This year we introduced new regulations that allow people to use some types of mobile phone repeaters without the need for a licence.[32] These repeaters can be an effective

[31] https://www.ofcom.org.uk/consultations-and-statements/category-1/enabling-opportunities-for-innovation
[32] https://www.ofcom.org.uk/consultations-and-statements/category-2/mobile-phone-repeaters

low-cost solution to help to boost mobile signal indoors and in vehicles.

5G Advisory Group for Wales

Wales' 5G Advisory Group met for the first time in October to 'prepare and shape a coherent national 5G programme in Wales which will support the wider UK5G ecosystem and help to position Wales as a world leader in the development and delivery of 5G.'

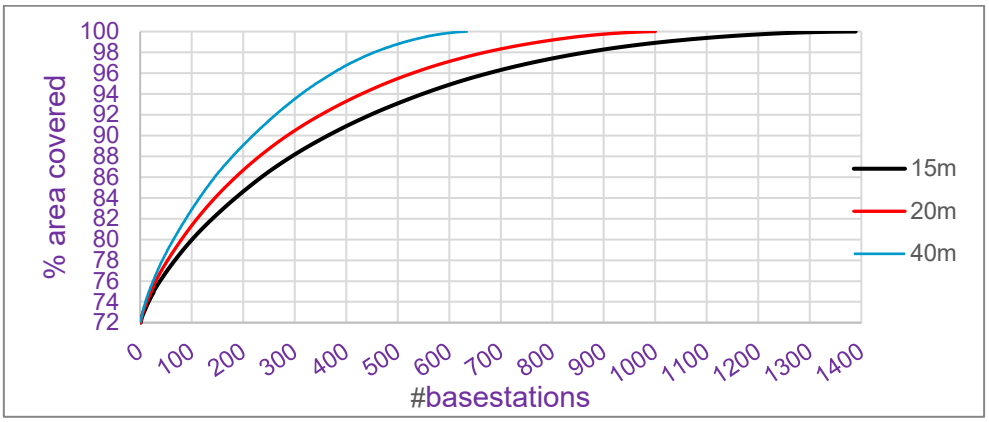
Convened by digital business growth agency Innovation Point, the group said that Fifth Generation Mobile Networks will undoubtedly be an enabler of new technologies, which can only support and accelerate wider digital opportunity across Wales. It believes that Wales is already establishing itself as a leader in the digital innovation space, through initiatives like The Compound Semiconductor Cluster based in South Wales – a world first in the development and large-scale production of IoT devices with a widespread application over multiple sectors and industries. The expert group added: "5G enabled technologies coupled with these compound semiconductors will transform the way in which future industries grow; will inform how future digital public services engage with citizens and will help to develop the kind of social innovations which will make for more inclusive, fair and equal communities."

Taking steps to improve coverage in rural areas by addressing barriers and reducing costs

Ofcom continues to work with Governments and industry to improve rural coverage in other ways. We have also supported changes to the Electronic Communications Code and to planning laws, to make it easier and cheaper to deploy mobile infrastructure.

During the year we provided the Welsh Government with an analysis modelling the Impact of mast heights on the future mobile coverage in Wales. The illustrative analysis indicated that the mast height MNOs use to deploy in a geographic coverage scenario has the potential to significantly impact the number of masts required to provide a much higher level of coverage.

Figure 18: Modelled deployment of 4G geographic coverage in Wales at mast heights of 15m, 20m and 40m



Source: Ofcom

Figure 18 shows that were 300 new masts to be deployed at heights of 15m, the maximum uplift in good geographic 4G coverage that could be achieved is modelled at around 16%, reaching 88% geographic coverage in this scenario. The same number of 40m masts could deliver a modelled increase of more than 21%, or a total modelled footprint of more than 93% geographic coverage in this scenario.

In December 2017 the Welsh Government published a report commissioned by Arcadis entitled "Planning for Mobile Telecommunications: An Assessment of Permitted Development Rights in Wales" [33] It recommended amending mast heights and widths allowed under permitted development rights and the preparation of simple guidance to accompany revisions to permitted development rights as they relate to telecommunications.

Relaxation of planning regulations

Currently, the maximum height restriction for communication masts in Wales is 50ft, whereas in England the maximum permitted height is 82ft. At this year's Royal Welsh Agricultural Show, the Welsh Conservatives urged the Welsh Government to change planning laws to enable the building of higher telecommunications masts. Paul Davies AM, the leader of the Welsh Conservative Assembly group said that bringing the maximum height restrictions in Wales in line with that of England will help significantly increase mobile coverage across Wales.

We have also provided advice to the UK Government following technical analysis of a variety of options to improve mobile coverage.[34] The advice focused on public subsidy, rural wholesale access (commonly known as rural roaming), infrastructure sharing and planning reform.

An example of public funding is the Scottish Government's *Scottish 4G Infill* Programme, which aims to extend 4G coverage to areas not covered by commercial roll out. Up to £25m of public funding, including funding from the European Union, will be invested to deliver 4G mobile infrastructure to serve selected mobile 'not-spots' throughout Scotland.[35] [36]

The importance of 5G for Wales

For Wales, 5G represents a major opportunity to participate in the development of globally critical mobile and wireless communications. 5G promises to be both an evolution and a radical innovation in mobile and wireless communications services we all rely on so heavily today.

5G will utilise a more diverse set of radio spectrum bands compared to its predecessors. This creates opportunities for Wales, whether it's in the broader coverage for enhanced mobile broadband in rural areas that 700 MHz can provide or the high speed, targeted and highly responsive data services of mmWave bands potentially used by everything from rural home broadband to autonomous vehicles.

[33] The full report can be found here - https://beta.gov.wales/sites/default/files/publications/2018-11/planning-for-mobile-telecommunications-an-assessment-of-permitted-development-rights.pdf
[34] https://www.ofcom.org.uk/phones-telecoms-and-internet/coverage/advice-government-improving-mobile-coverage
[35] https://news.gov.scot/news/improving-mobile-coverage-2
[36] https://www.gov.scot/publications/scottish-4g-infill-programme-consultation-request-information/

5G is also markedly different because of the three expected services it can deliver. From step-changes in the mobile broadband experience to the more radical innovations allowing vast numbers of connected 'things' with limited computing power or the near instant response times supporting Unmanned Autonomous Vehicles. Wales's leadership in industry sectors ranges from the fundamental technological innovations of its compound semiconductor cluster, through a globally significant creative screen media industry to the development of UAVs and agri-tech utilising Wales's extensive experience of upland livestock farming.

This all means 5G represents significant changes to what we mean by coverage, service quality, masts and base stations, mobile and wireless networks and who might build and manage them.

Wales has unique institutions to lead the development of 5G. The Well-Being of the Future Generations Act, seeks to deliver a broad range of value added for citizens, both now and in the future. The proposed National Spectrum Centre seeks to exploit Wales's unique mixture of landscapes and radio environments to test use cases. Welsh cross-sector initiatives such as City Deals and new 5G Advisory Board mean it can co-ordinate its use of 5G. Whilst the recent creation of the National Infrastructure Commission for Wales means a broader strategic focus can be brought to 5G's role in the overall infrastructure mix in Wales.

5G is still very much in its infancy with the first standards being approved now. Wales can participate in answering some pressing questions facing 5G: How will it improve and enhance rural mobile services? What spectrum is best suited for which new services? Which of the many complementary technologies to 5G are most useful? How will fibre support 5G and vice versa? What does a 5G network look like in urban and rural areas? What specific uses is it best used for? The ACW is working with key stakeholders to address these questions and play its part in ensuring 5G is an opportunity for the citizens, businesses and 3rd and public institutions in Wales.

We fully support the Government's aspiration to be a world leader in the next generation of mobile technology, 5G, with deployment to the majority of the country by 2027 so that UK consumers and businesses can take early advantage of the benefits.

The improved performance, speed, latency and capacity that 5G will support will enable innovative new mobile communications services for both people and industries in various sectors of the economy.

To date, some small-scale trials are being operated across the UK, but in 2019 we expect 5G services to be launched commercially. Our release of 5G spectrum, trial licensing, and flexible shared spectrum models are key to this innovation

Interactive dashboard

The publication of this report is accompanied by an interactive dashboard. This allows more flexibility to interact with the data of most interest. The additional features introduced enables users to view the data in a granularity that is most useful to them.

The user will have the option to choose from the following levels of geographical detail on most pages.

- Nations
- Local Authorities
- Westminster Constituencies
- Devolved government constituencies (NI, Scotland and Wales only)

Furthermore, for each level of detail, the user can always compare selected figures with the equivalent UK figures. These features have been introduced to meet the demand that has been observed from previous years, to access local figures and compare them against UK average.

Coverage Comparison table

Figure 19: Coverage by all four operators of voice and 4G services across the UK and Nations, September 2018

		Indoor premises		Outdoor geographic		Major roads	
		4G	Voice	4G	Voice	4G	Voice
UK	Total	77% (12↑pp)	92% (3↑pp)	66% (17↑pp)	78% (9↑pp)	64% (18↑pp)	82% (8↑pp)
	Urban	83% (11↑pp)	97% (2↑pp)	97% (6↑pp)	99% (1↑pp)	83% (12↑pp)	95% (2↑pp)
	Rural	41% (17↑pp)	66% (11↑pp)	62% (18↑pp)	75% (10↑pp)	53% (21↑pp)	75% (12↑pp)
England	Total	78% (11↑pp)	93% (2↑pp)	82% (14↑pp)	91% (4↑pp)	70% (16↑pp)	88% (5↑pp)
	Urban	83% (10↑pp)	97% (1↑pp)	98% (4↑pp)	99% (1↑pp)	84% (10↑pp)	96% (2↑pp)
	Rural	42% (16↑pp)	67% (9↑pp)	79% (16↑pp)	90% (5↑pp)	60% (20↑pp)	83% (8↑pp)
Northern Ireland	Total	57% (10↑pp)	80% (5↑pp)	79% (15↑pp)	88% (8↑pp)	61% (20↑pp)	78% (10↑pp)
	Urban	65% (8↑pp)	89% (2↑pp)	93% (6↑pp)	96% (2↑pp)	68% (11↑pp)	87% (3↑pp)
	Rural	39% (16↑pp)	59% (12↑pp)	78% (15↑pp)	87% (9↑pp)	58% (23↑pp)	74% (13↑pp)
Scotland	Total	75% (17↑pp)	91% (5↑pp)	38% (20↑pp)	54% (15↑pp)	46% (22↑pp)	65% (15↑pp)
	Urban	82% (16↑pp)	97% (3↑pp)	96% (8↑pp)	99% (1↑pp)	83% (18↑pp)	96% (3↑pp)
	Rural	44% (23↑pp)	66% (15↑pp)	37% (20↑pp)	53% (16↑pp)	40% (23↑pp)	60% (17↑pp)
Wales	Total	69% (24↑pp)	88% (8↑pp)	57% (27↑pp)	75% (13↑pp)	53% (27↑pp)	75% (15↑pp)
	Urban	79% (24↑pp)	95% (5↑pp)	89% (19↑pp)	96% (3↑pp)	76% (27↑pp)	92% (6↑pp)
	Rural	36% (22↑pp)	66% (21↑pp)	53% (28↑pp)	73% (14↑pp)	43% (26↑pp)	69% (18↑pp)

Source: Ofcom analysis of operator data