Department for
Digital, Culture,
Media & Sport

Call for Evidence:
Improving broadband for Very Hard to Reach Premises

Government Response

Project Gigabit - building fast reliable broadband for everyone in the UK

The government's response to the Call for Evidence: *Improving broadband for Very Hard to Reach Premises*

Contents

1. Ministerial Foreword

The government is committed to making the UK a global leader in digital connectivity. Levelling up means ensuring that reliable, long-lasting gigabit-capable connections are made widely available across the UK.

It is now more important than ever to have resilient telecoms networks in place. During the last 18 months, digital connectivity has been imperative, allowing millions to work from their homes, providing information and entertainment to those isolating and allowing education to continue while schools, colleges, and universities were closed.

I am proud of the work done so far by the telecoms industry, supported by the government and Ofcom, which has already delivered gigabit-capable broadband to over 65.8% of premises in the UK, including more than half a million homes and businesses in hard to reach areas. However, there is a lot more still to be done.

Our rural communities need good digital connectivity to prosper in an increasingly connected world, and we are committed to ensuring that no part of the UK is left behind. By definition, it is going to be much more difficult to deliver gigabit connectivity to the hardest to reach parts of the UK - around 20% of UK premises - and that is why we have committed a record £5 billion of capital funding to support deployment in these areas.

I am keen that decisions about better broadband are based on evidence from those who will be most affected by them. Detailed information about the demand for broadband services, their invaluable benefits, barriers to deployment and take-up is crucial. We also need evidence from suppliers and vendors on technology availability, maturity, capabilities and costs to provide connectivity in Very Hard to Reach areas, both in the UK and overseas.

I would like to thank everyone who submitted a response to this call for evidence. This will be used to inform the future policy decision making of the experiences of those facing limited connectivity so that we do not see a digital divide emerge.

Julia Lopez

Minister for Media, Data, and Digital Infrastructure

2. Executive Summary

Context

2.1.   The government has ambitious plans to achieve a nationwide rollout of future-proof, gigabit-capable broadband and 5G networks as soon as possible to unlock the huge economic and social benefits that this will bring. As we emerge from the coronavirus (COVID-19) pandemic, ensuring the whole country has access to world-class digital infrastructure will be critical to our economic recovery.

2.2.   DCMS continues to work with the industry to target a minimum of 85% gigabit-capable coverage by 2025 and to get as close to 100% as possible. We have launched our £5 billion 'Project Gigabit' programme to ensure premises in hard-to-reach areas are not left behind in being able to access gigabit-capable networks. We have already announced which areas will benefit from the first 2 phases of this record investment, and we will continue to update our procurement pipeline on a quarterly basis.

2.3.   We are aiming to ensure that 95% of the UK's geographic landmass has 4G coverage from at least one mobile network operator by 2025 and that the majority of the UK population has 5G coverage by 2027. We are already taking steps to deliver this and through our Wireless Infrastructure Strategy we will set out a long-term strategic policy framework for the development, deployment and adoption of 5G and future networks in the UK.

2.4.   However, while the government is making significant progress in delivering improved connectivity to the country, we know that in some areas the cost of delivering gigabit-capable broadband coverage rises exponentially. We are therefore likely to need to consider alternative options to connect some premises, initially estimated to be less than 100,000 in total, which are deemed 'Very Hard to Reach'.

2.5. To do this, we needed to better understand and explore all possible options for improving broadband connectivity for these Very Hard to Reach premises. The purpose of this call for evidence was to develop our understanding of these areas and seek more information on:

- Demand
- Benefits
- Barriers
- Approaches

2.6. The call for evidence set out the current broadband programmes being offered by the government as well the rationale for undertaking the call for evidence as a means of understanding the requirements of prohibitively expensive premises and the range of technology approaches available.

2.7. The responses that we have received from the consultation have been used to inform our response and will help to inform our policy proposals for improving broadband in Very Hard to Reach areas in the future.

The Call for Evidence

2.8. The call for evidence ran between 15 March and 25 June 2021 and sought stakeholders views in the following 3 areas:

- Demand
- Benefits
- Barriers

2.9. The call for evidence also exclusively sought the views of Market Participants in the following area:

- Approaches

2.10. Resident household and business users of rural broadband were invited to submit their responses through an online survey. Market participants and organisations representing relevant stakeholders were invited to participate either through the survey or by providing a long-form response.

2.11. The majority of responses were received through the online survey. Therefore answers have been collated to form a more detailed understanding of the issues that affect respondents' rural connectivity.

2.12. Responses received as a long-form submission often linked their answers to the overarching subject matter rather than per the specific question asked. Therefore, this document has been structured in a similar manner, taking into account both the survey responses and the long-form submissions to reflect the information provided.

2.13. A significant proportion of the responses provided by representative organisations made reference to Project Gigabit. This was either regarding the procurements that are ongoing or the Gigabit Broadband Voucher Scheme that is available to some premises.

2.14. As highlighted in the call for evidence, the focus of this document was on premises that are primarily Very Hard to Reach because of their geographic location. Therefore, premises that are due to be covered by a government-

funded rollout such as the Superfast Broadband Programme or expected to be delivered by Project Gigabit will not be classified as Very Hard to Reach.

2.15.   In addition, we recognise that some premises may not be geographically Very Hard to Reach but may have a high cost to upgrade and/or serve due to low economies of scale. This could be because of previous network deployment strategies or legacy services.

2.16. **However, while we understand that premises such as these exist, they are not the focus of this call for evidence.**

Government Response

2.17.   All responses to the call for evidence have been recorded and analysed. This document outlines the key points made, drawing out the common themes that have emerged and the most frequently expressed points of view.

2.18.   Based on the evidence gathered during the call for evidence, the government will produce a set of policy proposals in due course that will set out how we expect the market in these areas to develop and what further actions might need to be taken to address the needs of these premises.

2.19.   The government's response is discussed in more detail at the end of this document.

3. Overview

The UK government's ambition is to deliver nationwide gigabit-capable broadband as soon as possible. We have set a clear strategy through the Future Telecoms Infrastructure Review, Statement of Strategic Priorities, and the planned, record £5 billion investment into Project Gigabit. In the period to 2025, we are targeting a minimum of 85% gigabit-capable coverage but are working with the industry to accelerate delivery to get as close to 100% as possible.

To support private sector deployment in the most commercial 80% of the UK, the government will continue to implement an ambitious programme of work to encourage investment in gigabit-capable broadband and remove barriers to rollout. Delivering gigabit-capable broadband in the hardest to reach 20% of the UK is more challenging, which is why the government has set out plans to support the delivery of gigabit-capable connectivity to these areas through Project Gigabit.

This programme builds on the previous programmes that the government has established to improve broadband in less well-served areas. For example, the £1.9 billion Superfast Broadband programme has delivered superfast broadband speeds to over 5.5 million UK premises (approaching 20% of the UK). Through public and private sector investment, superfast broadband is now available to 97% of UK premises[1] and the UK has one of the highest rates of superfast coverage in Europe, including in rural areas.

The Superfast Broadband Programme is continuing alongside Project Gigabit, and it is now mainly delivering full-fibre broadband to the 3% of UK premises that do not yet have access to superfast speeds. Before the launch of Project Gigabit, the government also rolled out other programmes such as the Local Full Fibre Networks programme and Rural Gigabit Connectivity programme to stimulate gigabit broadband rollout, including in more rural and remote areas.

Through the broadband Universal Service Obligation (USO), the government has legislated to provide every household with a 'backstop' legal right to request a decent broadband connection, providing a minimum download speed of 10 Mbps and an upload speed of 1 Mbps. The broadband USO is funded by the telecoms industry and is subject to a cost threshold of £3,400 per premise. Consumers are required to pay the excess costs of connection above this threshold.

Since this legislation was enacted in the Digital Economy Act 2017, the number of premises that cannot get a broadband service that meets the minimum specification

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[1] Check UK Broadband Performance and Coverage Statistics

under the USO has fallen from 1.1 million premises to 123,000 premises as of September 2021.[2] This is due in part to the government's Superfast Broadband programme but also significant improvements in 4G network coverage and wider availability of Fixed Wireless Access (FWA) services. Our £5 billion Project Gigabit will also prioritise premises without access to superfast broadband speeds, wherever possible.

We expect that the number of premises that cannot get a USO level service will continue to reduce over time as a result of further government investment in broadband, including through the £5 billion Project Gigabit, as well as further improvements in wireless networks from additional spectrum and masts, and the USO itself.

In October 2021, BT stated that they had already built USO connections that covered over 3,700 homes and were in the process of building over 2,500 more across the UK[3]. The vast majority of these premises are being upgraded to a gigabit-capable full-fibre connection compared to the minimum download speed of 10 Mbps under the USO. BT's next report is due by 30 April 2022 and we expect that thousands more premises will be benefiting from the USO by that point.

However, the costs of delivering gigabit-capable broadband coverage rise exponentially as deployment continues to the most remote premises. A very small proportion of premises - potentially less than 100,000 - are therefore likely to be significantly above the broadband USO's reasonable cost threshold and considered 'Very Hard to Reach' with gigabit-capable broadband technologies like fibre to the premises technology. This is due to factors like their isolated geographic locations or the often substantial distances between them and existing or planned telecoms infrastructure, which make it challenging to deliver improved broadband.

The purpose of this call for evidence, therefore, was to develop our understanding of these areas and seek more information on:

- **Demand:** Consumer and business demand for broadband services in Very Hard to Reach areas. In particular, we were seeking information on current provision and adoption patterns by consumers and businesses in these areas, including businesses in the agricultural sector.

- **Benefits:** Further evidence on the benefits that delivering enhanced broadband services to Very Hard to Reach areas yields, including social, environmental or economic benefits.

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[2] Figures from Ofcom Connected Nations 2017 and Connected Nations 2021.

[3] BT Report on progress against the Broadband USO

- **Barriers:** Evidence of barriers to user adoption (other than services being unavailable in an area), and evidence relating to barriers that may impede infrastructure operators and service providers from offering improved broadband services in these areas. This evidence could also relate to barriers to investment (for parties providing finance for such investments).

- **Approaches:** Evidence relating to the availability, maturity, capabilities and costs of advanced technologies and novel approaches to provide connectivity in Very Hard to Reach areas, either within the UK or from overseas.

We asked for evidence from 4 types of stakeholders:

- **Consumers** of broadband services, in particular those who are resident in remote rural parts of the UK and cannot access broadband speeds that meet the minimum specification under the broadband USO.

- **Business** users of broadband services in these areas, including those working in the agricultural sector.

- **Market participants,** including infrastructure suppliers/operators, retail or independent broadband service providers, mobile network operators and equipment vendors.

- **Representative organisations,** who may for example be representing rural stakeholders, consumer groups or any sub-groups of the stakeholders listed above. This group could also include local government bodies and rural enterprise partnerships.

4. Responses

4.1. The call for evidence received responses from residential households, businesses, market participants and representative organisations representing consumers, small businesses, farmers and crofters, as well as local councils.

4.2. The call for evidence asked for information on 4 themes to develop our understanding of these areas and seek more information concerning delivering improved connectivity to Very Hard to Reach premises. A series of questions were asked on each of the following areas:

- Topic A: Demand
- Topic B: Benefits
- Topic C: Barriers
- Topic D: Approaches

4.3. The specific questions asked can be found in Annex A.

4.4. Most of the responses linked their answers to the overall theme rather than a specific question being asked, providing a more detailed view of the wider policy area. This document, therefore, responds similarly, reflecting each theme individually rather than addressing each question in turn.

4.5. We received 3315 responses to the call for evidence, including 67 from market participants and organisations representing them. Due to some age groups (**Figure 4.2**) and regions (**Figure 4.5**) being overrepresented in the survey, consumer and business responses were weighted by age group and regions to make the results more representative. The supplier data, however, is unweighted. The weights have been estimated based on ONS population data and NSPL premises level data. All data and charts have used the weighted data unless otherwise stated.

Figure 4.1: Responses to the Call for Evidence Survey per Nation (Unweighted)


Scotland
Responses: 358
Responses per
million residents: 66
VHTR premises per
1,000 population: <5

Northern Ireland
Responses: 68
Responses per
million residents: 36
VHTR premises per
1,000 population: <1

England
Responses: 2,294
Responses per
million residents: 41
VHTR premises per
1,000 population: ~1

Wales
Responses: 180
Responses per
million residents: 57
VHTR premises per
1,000 population: <8

VHTR estimates excludes any forward delivery under Project Gigabit Infrastructure Subsidy contracts, further Gigabit vouchers or ongoing and future build under the Broadband Universal Service Obligation. Responses are responses to the call for evidence survey only.

Figure 4.2: Our consumer response sample is skewed towards older age groups (unweighted data).
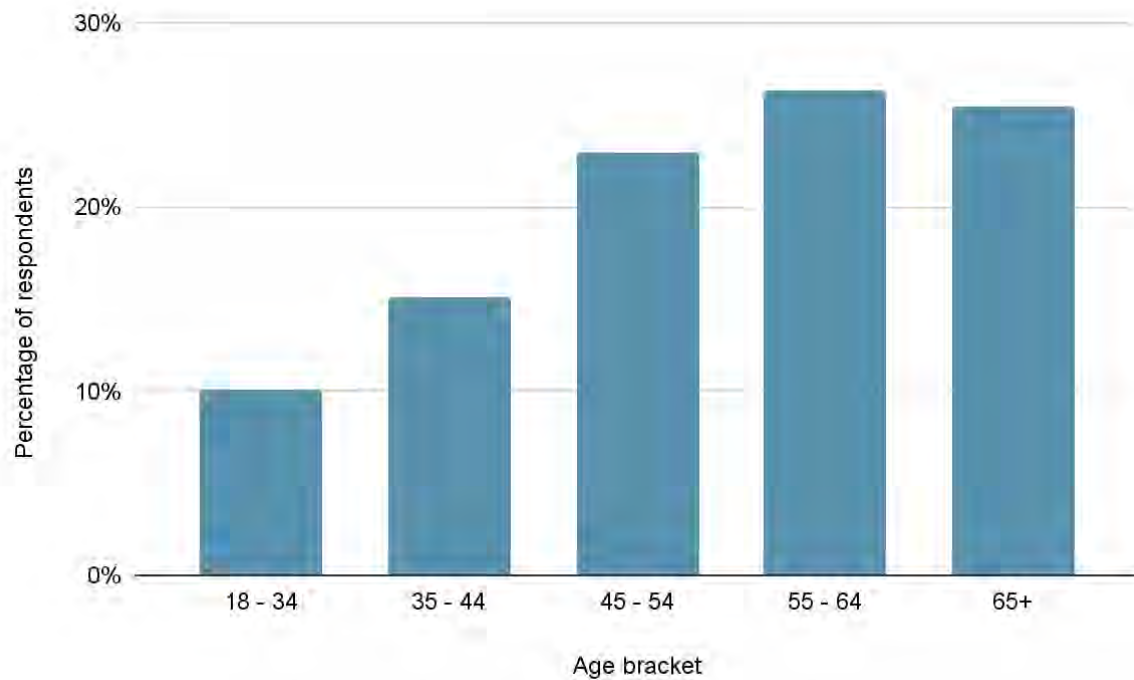
4.6.   As shown in **Figure 4.3**, the majority of businesses are 10 years old or older. This echoes that the majority of our respondents are older as seen in the chart above (**Figure 4.2**).

Figure 4.3: The majority of businesses in our sample have been operating for more than 10 years (unweighted data).
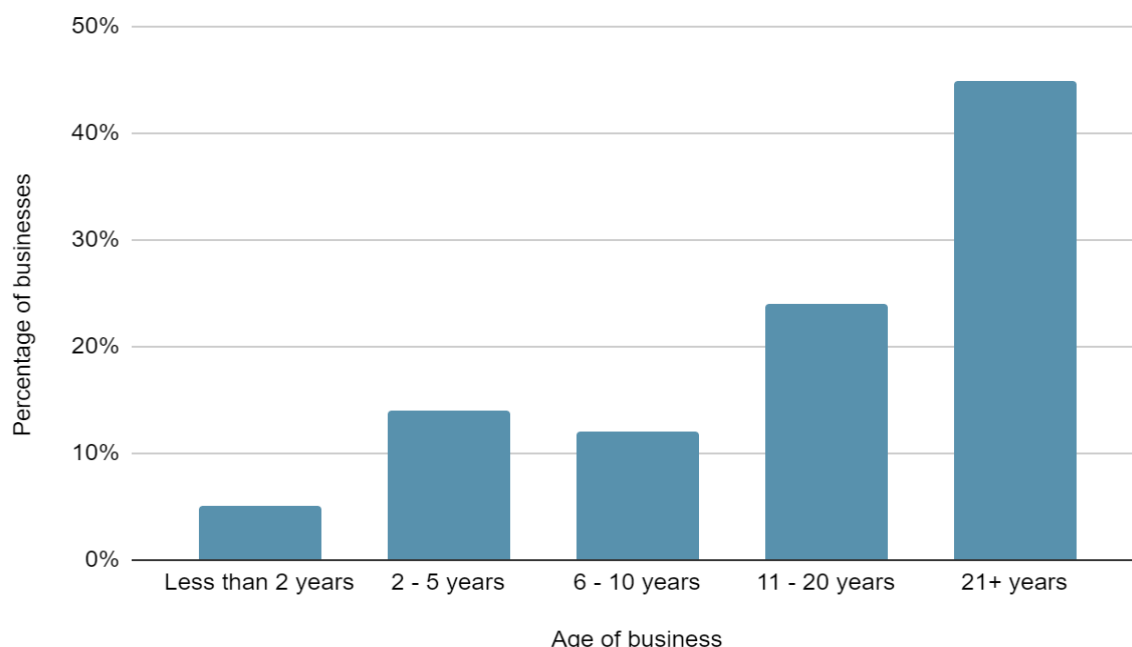
4.7.   **Figure 4.4** shows the rurality of respondents, using 2 measures. The first is the count of responses to the question posed. The second uses respondents' postcodes and matches them to National Statistics Postcode Lookup data (NSPL)[4]. There is a slight discrepancy between the 2 estimates as there are some postcodes from the call for evidence that do not match with the NSPL data. The results show a broader spread, and that some respondents declaring themselves rural are actually in suburban or remote areas, by NSPL definitions.

Figure 4.4: Self-declared and NSPL rurality of respondents (unweighted data).

Rurality category	Self-declared	NSPL estimated
Urban	2% (68)	1% (36)
Suburban	5% (137)	8% (220)
Rural	80% (2369)	71% (2054)
Remote	13% (390)	20% (578)
Unsure	1% (35)	N/A

Questions: How would you describe the area you live? NSPL rurality based on postcode (What is your postcode?). N = 2964 and 2888 respectively.

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[4] An ONS developed data source

4.8.   **Figure 4.5** shows that the majority of responses were in the East Midlands, the South West and Scotland. This is partly due to some postcode outliers within these regions, such as Leicestershire and Shetland more specifically, which had very high levels of responses. Additionally, the Warwickshire town of Southam also had a disproportionately high response rate. Conversely, only 9 responses were received from London based postcodes.

Figure 4.5: Our consumer sample is skewed towards the East Midlands, South West and Scotland (unweighted data).
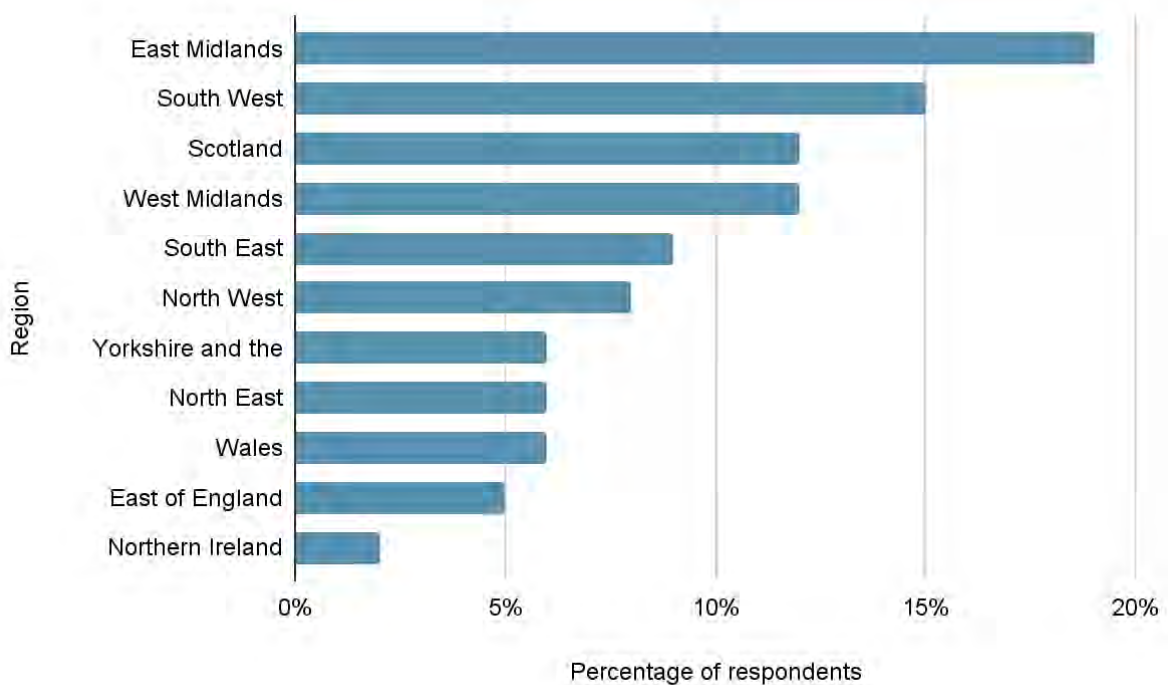
Question: Which part of the UK are you from? N = 2999

4.9.   Long-form responses to the call for evidence suggested that the majority of rural businesses in our sample are micro and SME family businesses. Businesses that responded to the call for evidence were predominantly in the agriculture and tourism industries (**Figure 4.6**).

Figure 4.6: Our business sample is mostly made up of agriculture and construction/transport firms (unweighted data).
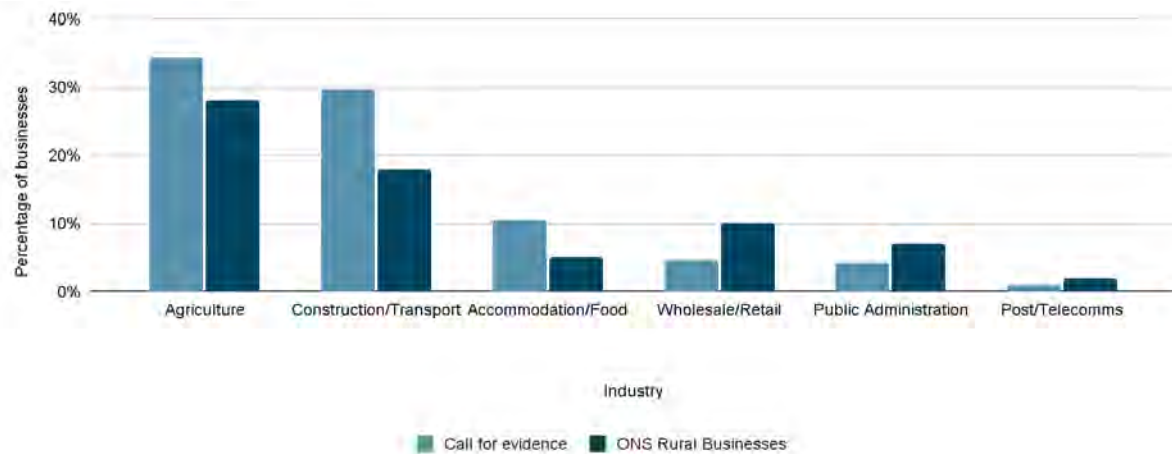
ONS rural business data[5]

4.10.   The non-nationwide providers in our sample are mostly operating outside of London and the South East (**Figure 4.7**).

Figure 4.7: The majority of responses from non-nationwide market participants came from Scotland, the South West and the North of England (unweighted data).
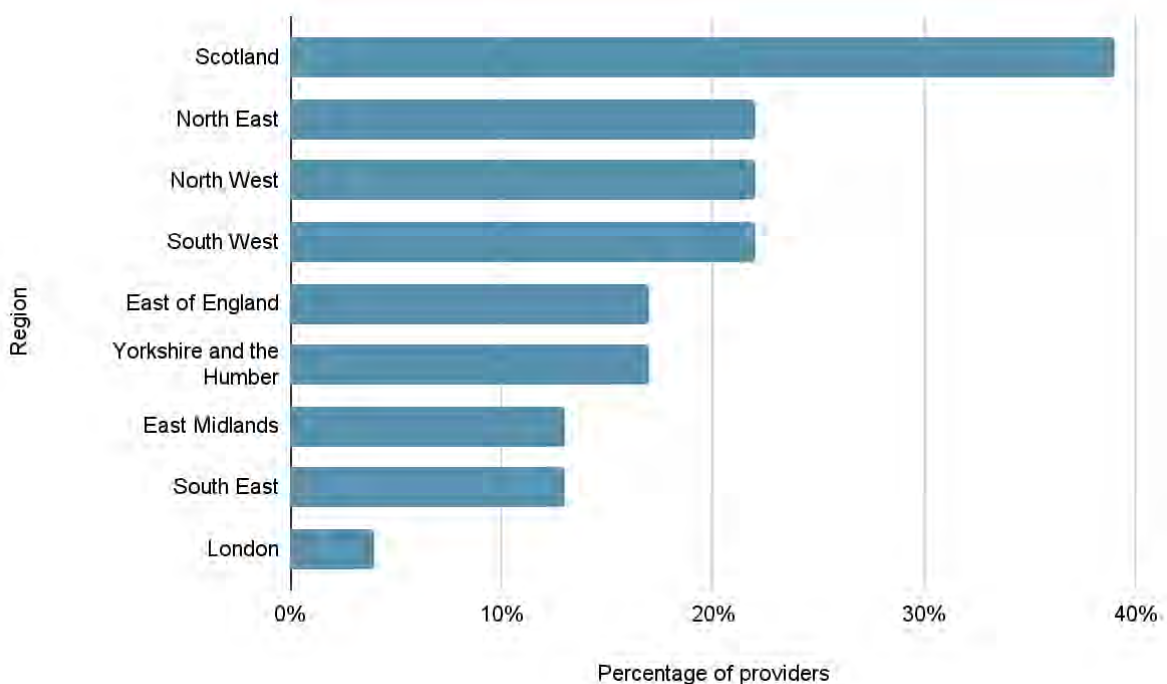
Question: Which region of the country do you operate in? N = 23

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[5] ONS rural business data aims to estimate the number and type of UK businesses in rural areas

5. Topic A: Demand

The questions asked in this section can be found in Annex A.

Context

5.1. As outlined in the call for evidence we need to understand in more detail the needs of communities and businesses located in Very Hard to Reach locations and how they expect their needs and requirements to change over time.

5.2. This is because currently available evidence on demand for broadband services is often affected by measurement techniques or the substantial aggregation of data.

5.3. Having an understanding of the needs of the consumer both now, and in the future, will allow us to optimise future policy in a more geographically specific manner, tailored to the needs of these areas.

5.4. The most up to date evidence, as detailed in the call for evidence, is from before the COVID-19 pandemic and showed that consumers in remote and rural areas are already more likely to work from home. It also showed that there are proportionately more registered businesses in remote rural areas than in any other rurality type.

5.5. The most abundant business types registered in rural areas are 'agriculture' (28%), construction & transport (18%), wholesale/retail (10%), public administration/social security (7%), and hospitality (5%) as in **Figure 4.5**.

We Heard

Rural and remote areas have slower speeds than urban areas despite having similar broadband needs.

5.6. Consumer and business responses from the call for evidence showed that a significant majority of premises in remote and rural areas experience slower broadband speeds than those located in urban areas.

5.7. **Figure 5.1** estimates the average speeds of consumer respondents split by their rurality. The consumers who live in postcodes classified as remote are more likely to have slower speeds at a postcode level than those in rural or urban and suburban postcodes.

Figure 5.1: Respondents in remote areas had lower average download speeds than more urban postcodes.
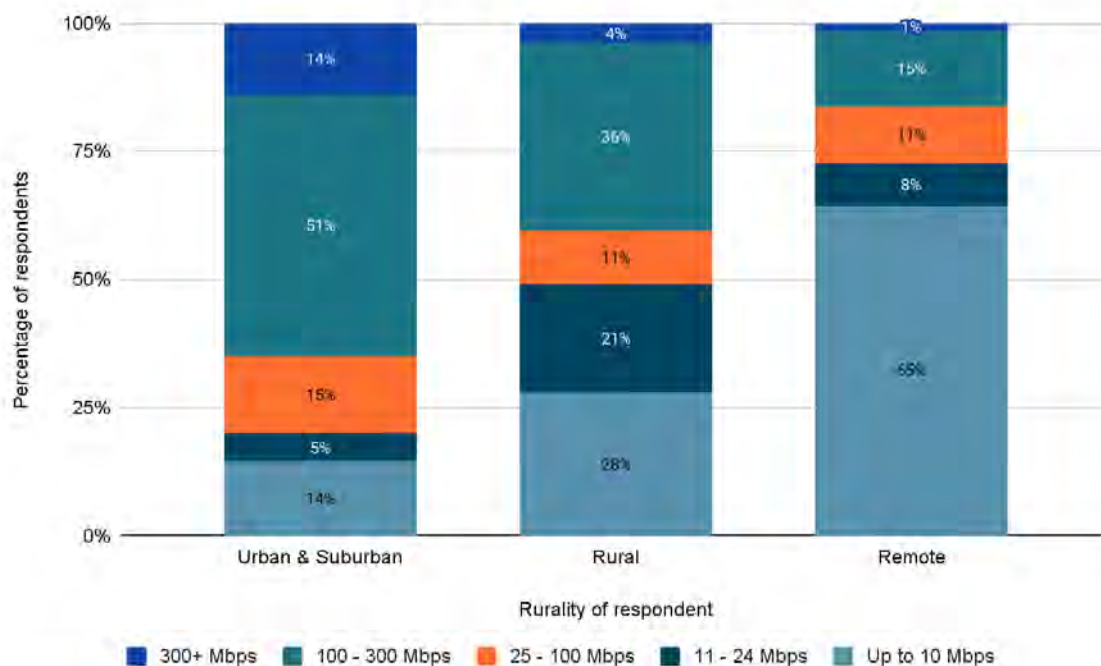
5.8.   The majority of respondents who live in remote areas are estimated to have broadband speeds below 10 Mbps. While some of these premises are likely to be eligible for the broadband Universal Service Obligation (USO), many will also be able to access a faster speed through either a forthcoming government scheme or by accessing a Fixed Wireless Access (FWA) service.

5.9.   We learned from many long-form responses that in remote and rural areas in the UK, there is a strong demand for good connectivity. Generally, those living and working in rural areas want to see an improvement in their broadband service. In addition, it was noted that there was greater demand for improved broadband speeds and reliability amongst residents with the slowest connectivity.

5.10.   As part of its response, the Independent Networks Cooperative Association (INCA) provided data showing that:

  ○ 16% of rural premises currently have a download speed of <10 Mbps which INCA describes as "*completely inadequate broadband and therefore have an urgent need for a better connection to avoid complete digital exclusion.*"

○ A further 15% (total 31%) have "*an immediate need to improve broadband to meet current expectations*".

○ A final 50% (total 81%) would "*need to upgrade by approximately 2025 to keep up with changing requirements*".

5.11. Ofcom estimated[6] that as of September 2021, 123,000 premises were potentially eligible for a broadband Universal Service Obligation connection as they did not have access to a decent broadband service from a fixed network or a Fixed Wireless Access (FWA) network. Ofcom stated that 111,099[7] of these premises are located in areas designated as 'Rural'. Therefore, while some premises identified by both the INCA report and the call for evidence survey may have a connection of less than 10 Mbps, overall, only approximately c.2.5% of premises in rural areas[8] are unable to access a decent broadband connection.

5.12. **Figure 5.2** below shows that across ruralities, the most common speeds required are between 25 - 100 Mbps. Furthermore, within ruralities, the median required speed is mostly consistent at 75 Mbps for Rural, and Urban and Suburban, only dropping to 37 Mbps in remote areas.
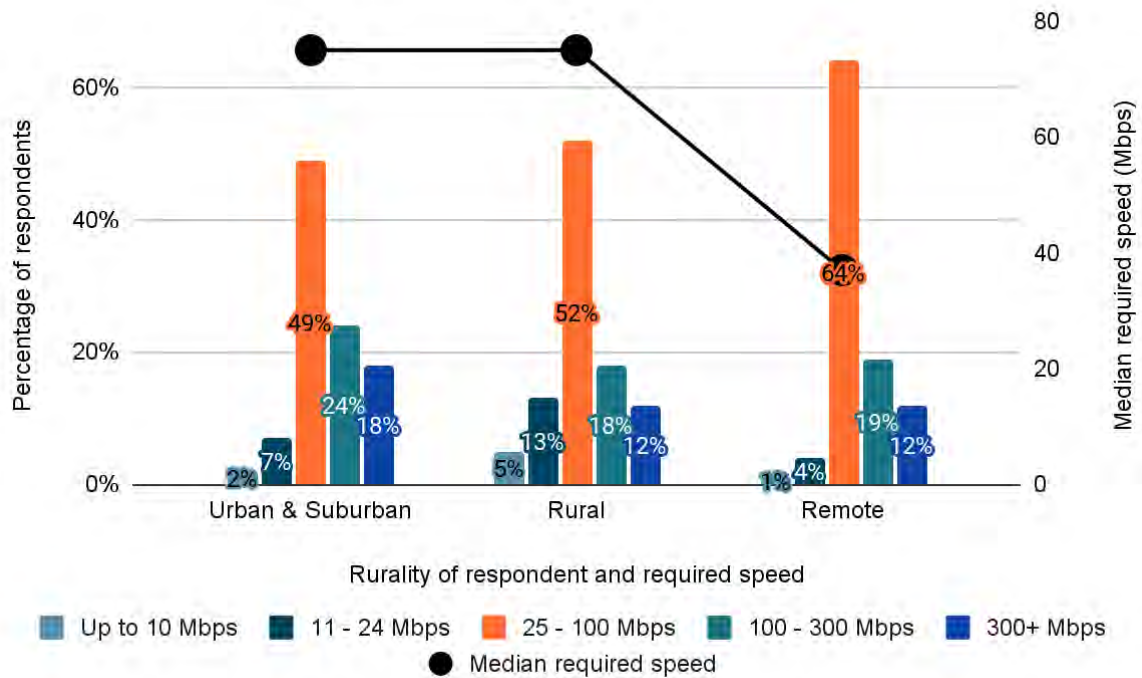
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[6] Ofcom Connected Nations 2021
[7] Ofcom Connected Nations 2021: Interactive Report
[8] Ofcom Connected Nations 2021

Figure 5.2: Respondents required similar speeds across ruralities.

Questions: What broadband download speed do you think you currently require? To clarify, this is the speed which meets your needs, this may or may not differ to the speed you currently purchase. NSPL rurality based on postcode (What is your postcode?). N = 1569

5.13. Representative organisations including Cumbria County Council and the Federation of Small Businesses in response to the call for evidence noted that a reliable connection delivering 10 Mbps was more important than a faster connection. The NALC, among others (noted below) also highlighted that councils stated residents' needs were for speeds between 40 and 100 Mbps.

5.14. The Agricultural Productivity Task Force's (APTF) long-form response said: '*Approaches need to be varied and suited to the particular location and need of the businesses, with a priority of connecting with a decent speed now instead of making farms wait for gigabit speeds for many years, while they remain less productive.*'

5.15. West Sussex County Council said in its long-form response: '*It is evident that many rural businesses and premises require faster connections, but not necessarily gigabit-capable solutions*" and "*It is felt that the requirement for gigabit-capability in the full end to end solution could [increase] the cost unnecessarily, when there are alternative opportunities for low cost, very quick improvements to rural connection speeds, which would be a dramatic improvement for the consumer and meet their urgent needs.*'

5.16. The NFU (National Farmers Union) is calling for a '*wider application of alternative broadband solutions for these very hard to reach areas as we feel*

that delivering broadband of good-to-average speeds immediately is the first priority.'

5.17. In its response, the National Association of Local Councils (NALC) said that '*typically councils stated that their residents needed speeds of between 40 Mbps and ultra-fast 100 Mbps'.*

5.18. The survey results identified that rural and remote businesses reported needing speeds well above what they receive and that larger businesses saw a wider disparity than smaller ones **(Figure 5.3).** Businesses often identified the use of video conferencing with customers or suppliers as the aspect of their business operations for which current speeds are insufficient.

Figure 5.3: Almost all respondents reported that they needed a greater download speed for their business than their current highest advertised speed.
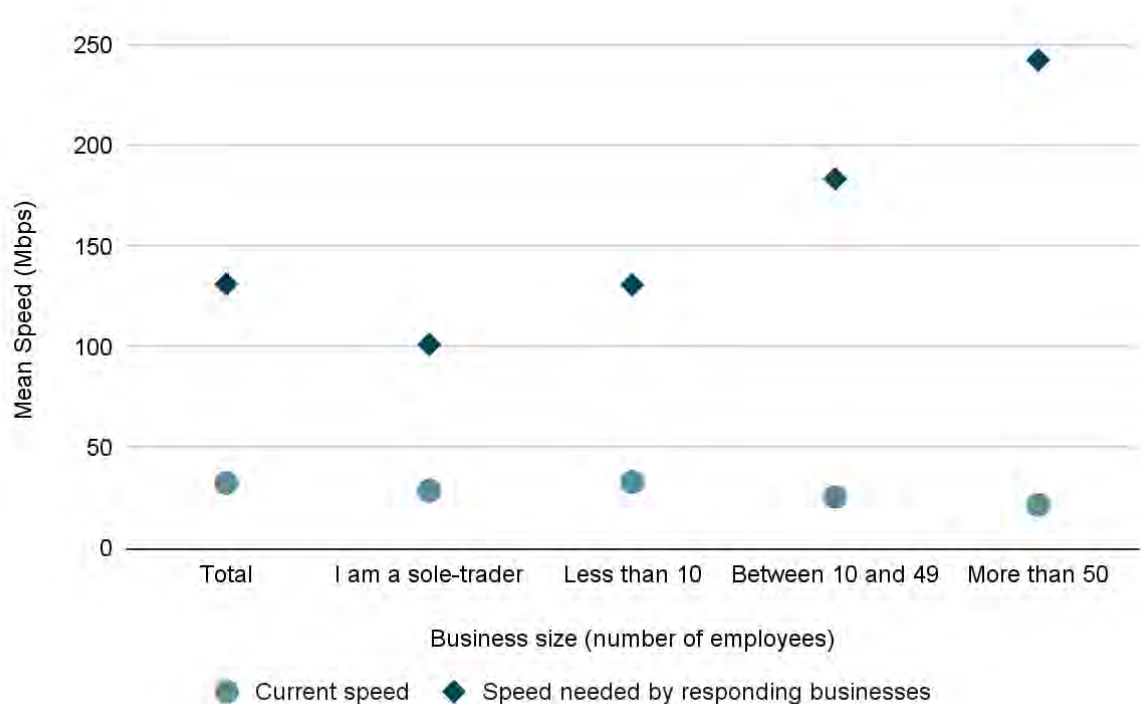
Questions: What broadband download speed do you think is currently required for your business? Vs What is your maximum advertised download speed (according to your supplier)? N = 266

5.19. We heard that currently, to get a connection suitable for their needs, some residents must travel to alternative locations to complete online activities. The Farmers' Union of Wales (FUW) stated that it wasn't *'uncommon for FUW members to have to walk or drive to a certain hot spot in order to obtain mobile phone signal and/or internet coverage.'*

5.20. The department has also received correspondence from members of the public which expresses frustration at this issue, with one correspondent explaining their frustration at not being able to work from home due to poor connections and instead having to go into their workplace as a key worker despite also being considered as someone who should shield from COVID-19.

5.21. Anecdotal evidence was given, to suggest that during the COVID-19 pandemic, children attended online lessons from cars after parents had driven them to a place with a suitable connection. Online schooling during this time was difficult for those living in rural areas due to poor broadband with the NALC reporting that some pupils were forced to attend school by exception to continue their education.

5.22. The majority of respondents reported that they are unhappy with their current service citing unreliable services and poor speeds. In long-form responses, anecdotal evidence was given of difficulties including an example of some residents finding it takes over 2 hours to do an online grocery shop because they have lost signal multiple times.

5.23. **Figure 5.4** shows remote and rural consumers in our survey tended to be less satisfied with most aspects of their broadband compared with urban/suburban consumers.

5.24. The most remote consumers have lower satisfaction with both reliability and pricing. Comparing this to survey work by Which?[9], we observe price and reliability also being the most complained about the issue.

Figure 5.4: Rural and remote consumers tend to be less satisfied than urban/suburban.

Average satisfaction	Urban & Suburban	Rural	Remote	Overall
Speeds	2.1	2	1.8	2
Reliability	2.6	2.4	2.3	2.4
Customer service	2.9	3	3	3
Price	2.8	2.6	2.4	2.6
Usage restrictions	2.8	3.1	2.8	3

Questions: NSPL rurality based on postcode (What is your postcode?). Please rate your satisfaction with the following aspects of broadband service: Speed, Reliability, Customer Service, Price, Usage Restrictions, Overall. N = 1661 - 1677. 1 = Lowest Satisfaction, 5 = Highest Satisfaction

5.25. Ofcom, as part of its Customer Satisfaction Tracker, estimated that 87% of consumers were satisfied with their internet service[10] with a further 8% dissatisfied. Compared to our analysis, we observed very polarising results,

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[9] Which? Complaints survey - across all ISPs, the top 3 topics of complaint (in order) were price increases, reliability, and speed.

[10] Ofcom Customer Satisfaction Tracker - Table 30, pg 82

with 56% of respondents answering as dissatisfied and 18% as satisfied (25% answered as neutral). Ofcom's estimate is a nationwide average and is not split by rurality, which may explain the difference and suggest that rural/remote respondents may generally be less satisfied.

5.26. We also heard in long-form responses from representative organisations that there is a significant proportion of premises in rural areas that are dissatisfied with their current broadband service due to unreliability. The Federation of Small Businesses (FSB) said in its response to the call for evidence that a "*Lack of reliability is a key issue for small businesses and often more important than speed itself.*" This was reportedly an issue for both fixed broadband and wireless services.

5.27. We heard that some rural businesses, employees, and rural residents have to drive to hotspots to access and use online services such as email, accounting, and video conferencing. During the COVID-19 pandemic, some people reported working outside friends' houses in their cars so they could follow government COVID-19 restrictions and have access to a suitable broadband connection. Others stated that they have had to incur additional costs to rent an alternative office space that has a broadband connection suitable for their business needs.

5.28. Generally, most individuals who responded to our call for evidence stated that they own a smartphone and possess multiple devices. However, the Action for Communities in Rural England stated in the call for evidence response provided by the Communications Consumer Panel & Advisory Committee for Older and Disabled people (ACOD) that some younger respondents have been reported to find it difficult only having a smartphone to access online services which can make accessing work, education and opportunities harder.

5.29. **Figure 5.5** shows that younger demographics are more inclined to use mobile phones as well as video and music streaming services[11], and conversely, those aged 65 and over are more inclined to use landline phones[12]. Ofcom data[13] shows total mobile phone use is in the range 97%-98% for all age groups except for those above the age of 65 where it is instead 84%. Pay-TV access was surprisingly lower in elderly groups in our survey, but this may be due to confusion around the difference between Pay-TV and video streaming[14].

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[11] TV Usage Estimates, Media Nations 2021

[12] Landline Usage Estimates

[13] Ofcom Adults' Media Use and Attitudes 2021

[14] Note we apply a slight adjustment to try and account for any possible confusion from the questioning, which may have resulted in a slight discrepancy in responses from older respondents

Figure 5.5: Respondents who are aged 65+ tended to have lower access to music and video streaming services.
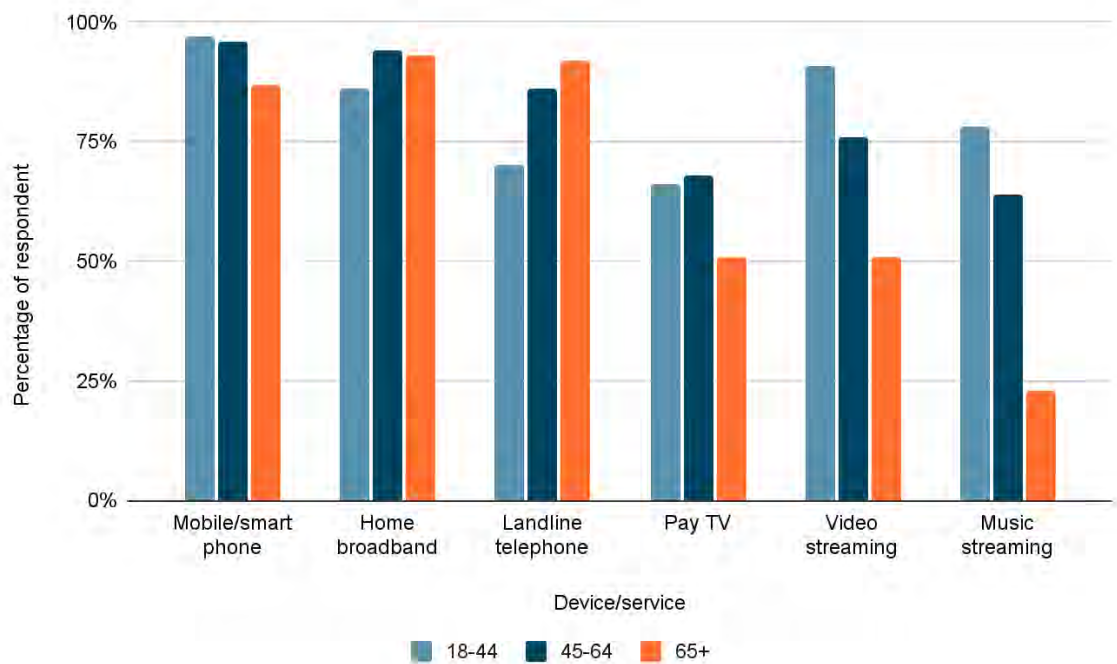
Questions: How old are you? Which of the following services do you have access to? N = 1897

5.30.   **Figure 5.6** shows that all households tend to make use of multiple devices that connect to the internet regardless of rurality, which will be driving increased demand for better broadband.
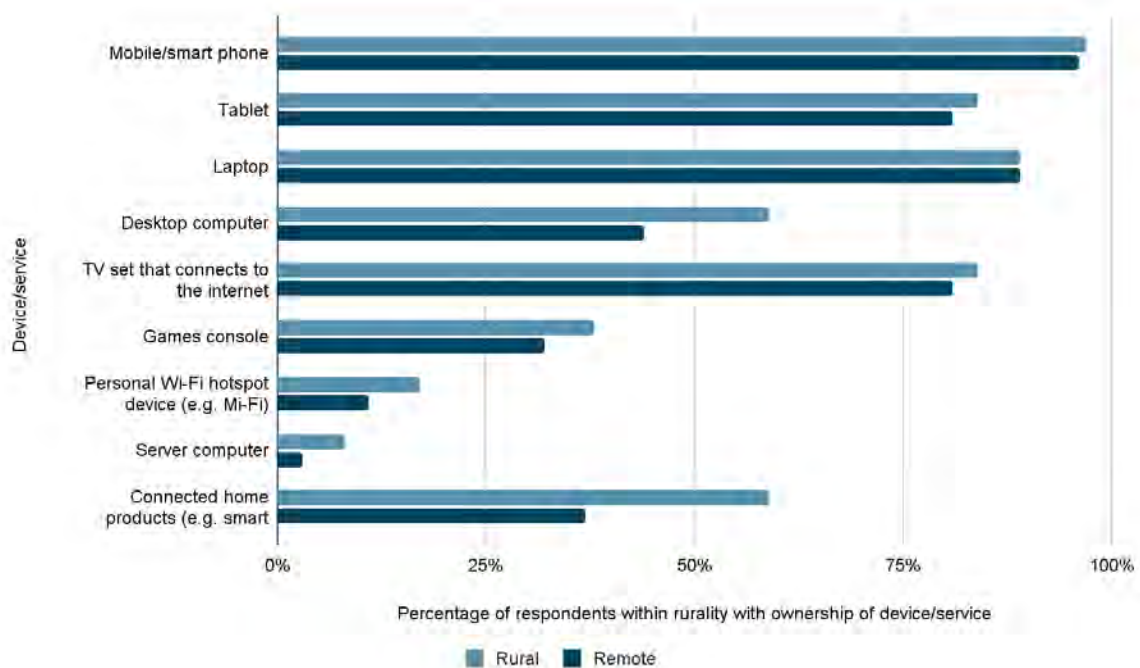
5.31. We also heard in the long-form response from Lancaster University Management School that *"those with good connectivity through broadband also tend to own smart TVs and gaming equipment, and some had digital home security devices."* The adoption of connected devices varies on the speed available to the premises.

The COVID-19 pandemic has accelerated the need for improved connectivity in rural and remote areas.

5.32. There was agreement among respondents that the COVID-19 pandemic has accelerated the need for improved connectivity in rural and remote areas for consumers and businesses. In its response to the call for evidence, the FSB said that digital connectivity "*will be vital in the post-covid recovery*".

5.33. Market participants also reported that the COVID-19 pandemic has significantly impacted consumption patterns amongst consumers and brought forward a large rise in bandwidth use.

5.34. All respondents agreed that the COVID-19 pandemic has increased the need for digital connectivity and that people were reliant on their broadband connections for working from home, shopping, entertainment, and socialising. Video conferencing platforms were used more and Lancaster University found that these platforms were used for social interactions that before the COVID-19 pandemic were not usually online such as book clubs, the Women's Institute, online bell ringing, and virtual conferences.

5.35. The Farmers' Union of Wales (FUW) said that the COVID-19 pandemic exacerbated the rural-urban divide as large numbers of rural children were unable to access online classes and online learning platforms following the closure of schools. The National Farmers' Union Scotland (NFUS) also noted during the COVID-19 pandemic a widening of the rural-urban divide, stating that farming and crofting communities were at a greater disadvantage than urban areas.

5.36. There was a consensus among the respondents that those with poor broadband access particularly struggled through the COVID-19 pandemic and were left in vulnerable circumstances. They had difficulties ordering supplies online and could not get them from physical shops as they were shut due to the COVID-19 pandemic. Cairngorms National Park Authority believe there is a need for improved broadband connections in remote-rural areas for education and healthcare.

5.37. The response from Communications Consumer Panel and Advisory Committee for Older and Disabled people (ACOD) said: "*We understand from d/Deaf stakeholders that consumers using text and video relay, and speech-to-text services in rural areas (or connecting with others who are in rural areas) during the [COVID-19] pandemic, have found it difficult to participate fully, due to connectivity issues affecting the speed and delivery of the captions and images they rely on.*"

5.38. Caithness Chamber of Commerce highlighted how the Scottish and UK governments appear to be encouraging hybrid working for the foreseeable future means that increased broadband consumption patterns will become the norm.

5.39. In response to the COVID-19 pandemic, satellite provider Viasat noted that customers had increasingly migrated from entry-level speed (ViaSat-1 offered 12 Mbps) and data packages to the highest level offerings (ViaSat-2 offered 50 to 100 Mbps) during the COVID-19 pandemic. This, Viasat noted, was largely due to the need for more telework, telemedicine and remote learning.

5.40. Quickline presented that data consumption had continued to grow 'exponentially' in recent years and that they expected this to continue for the 'foreseeable future' ultimately leading to an ongoing increase in the bandwidth requirement of around 30% per year. However, one change, due to the COVID-19 pandemic, has been an increase in demand during the 'busy hour', with it now a 'busy period'.

5.41. Other respondents also agreed with Quickline's findings that changes because of the COVID-19 pandemic would increase data consumption including a pattern of increased use surrounding the 'busy hour' creating a broader peak. Video streaming is likely to be driving the demand alongside an increase in working from home which respondents expect to continue.

Businesses

5.42. According to research carried out by FSB in 2019[15], 47% of rural businesses use an ADSL connection while just 11% use an FTTP (Fibre to the Premises) connection. 37% of the 1,500 locations that Historic Houses represent say they have access to reliable 4G and fibre optic broadband.

5.43. Representative organisations with an agricultural focus said that FTTC (Fibre to the Cabinet) is the dominant connection for their members, but a high proportion are reliant on mobile connections, and 4G dongles are frequently adopted.

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[15] Lost Connection: How Poor Broadband and Mobile Connectivity Hinders Small Firms, FSB 2019

5.44. APTF and NFU noted that they believe *"Total mobile coverage and gigabit-capable broadband access for farming businesses is essential if the industry is to be able to respond to the changes in agricultural policy, consumer/market demands for more sustainable and ethical production and remain profitable."*

Mobile Coverage

5.45. Some respondents noted that residents of rural areas can sometimes experience a lack of wireless signal and be located in mobile not-spots.

5.46. Respondents have reported disparity between 4G coverage, meaning that some large areas do not have sufficient coverage to access the internet with a mobile device. NFU reported that 7% of respondents to its annual survey reported no reception at all, and therefore, they deem that the current mobile network is insufficient for the needs of its community.

5.47. Ofcom (2021)[16] estimated that 100% of urban premises have indoor 4G coverage from at least one mobile network operator. This is based on figures provided by Mobile Network Operators (MNOs) to Ofcom. This drops a little in rural areas to 96% indoor 4G coverage. This is not borne out in our data, with **Figure 5.7** showing only 59% and 45% indoor coverage in rural and remote areas, respectively.

5.48. This discrepancy in mobile coverage compared to Ofcom estimates is partly a reflection of how rural some respondents are, however it may also be due to respondents only answering based on their current provider's coverage as opposed to all 4 mobile network operators.

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[16] Ofcom Connected Nations 2021

Figure 5.7: A large number of respondents in remote areas reported no mobile coverage.
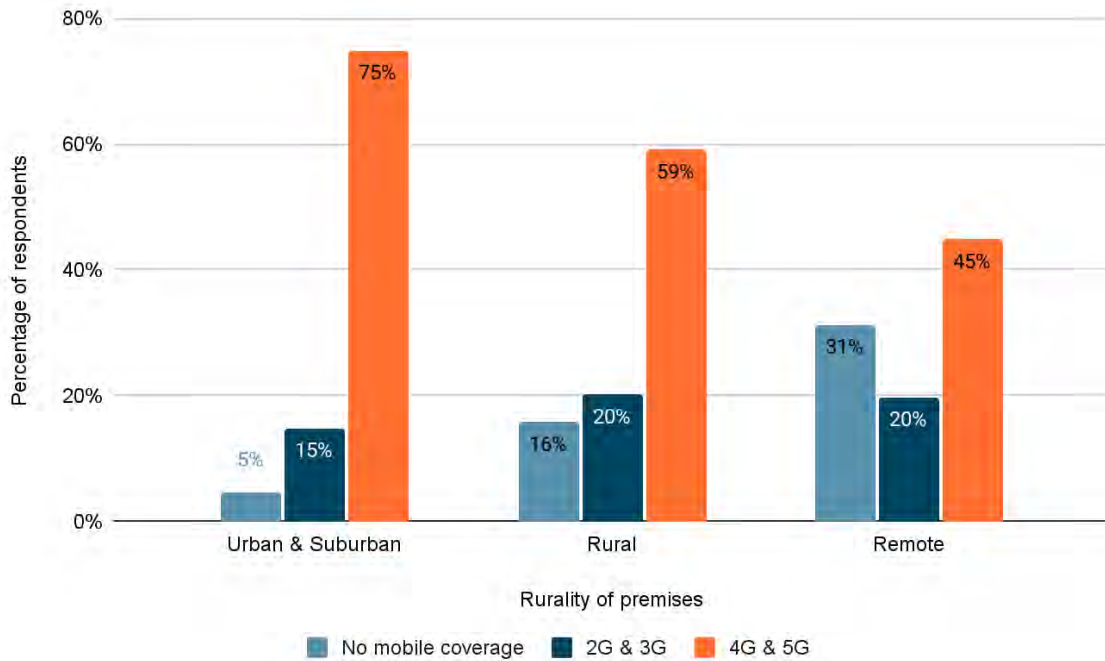
Questions: Do you have a 2G, 3G, 4G or 5G mobile service at your household? NSPL rurality based on postcode (What is your postcode?) N = 1822

5.49. In its long-form response, NFUS reported *"The 2021 NFUS member survey revealed 48% of respondents described the quality of their mobile signal in their home and office as 'poor' or 'very poor', 25% 'acceptable', and 26% 'good' or 'very good'. Similar experiences were reported for mobile signal quality on and around farms."*

5.50. Similarly, in our call for evidence business survey (of which most respondents were either rural (78%) or remote (18%)), we heard that only 18% of respondents had coverage that worked well indoors and out. Most of the remaining respondents said they had partial workplace coverage **(Figure 5.8)**.

Figure 5.8: The majority of businesses experienced limited mobile coverage.
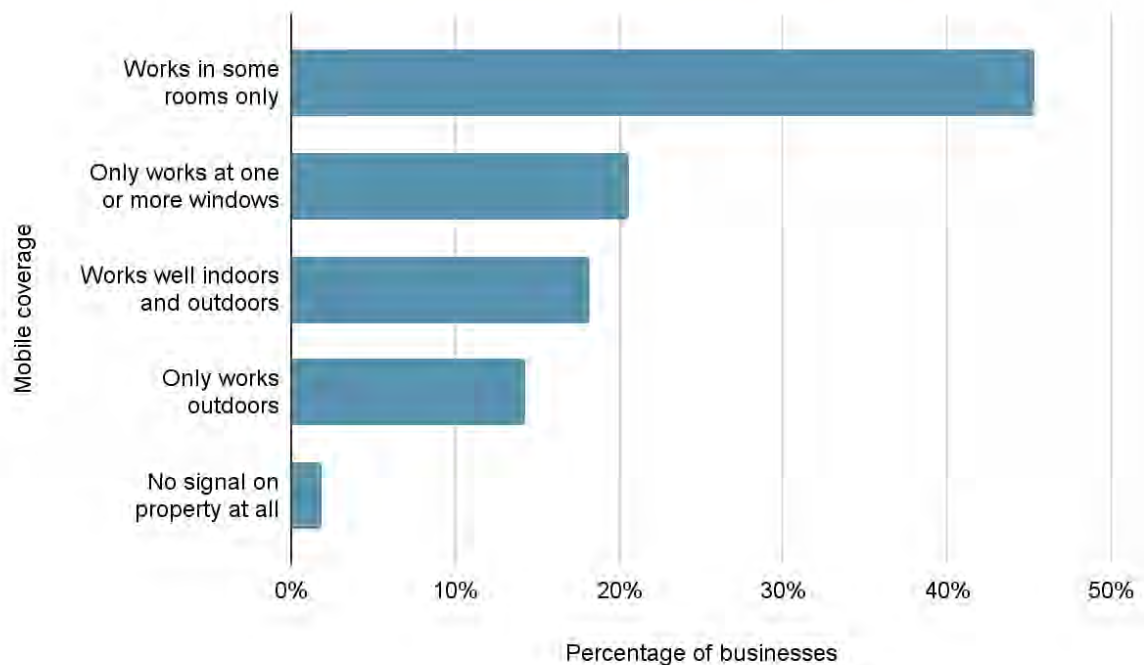
Question: What is mobile coverage like inside your workplace? N = 336

Respondents to the call for evidence commented that the government's current broadband schemes, including both the broadband USO and the government's Gigabit Broadband Voucher Scheme, needed to be amended to meet demand from both businesses and consumers.

5.51. Historic Houses noted in its response that the broadband USO should be increased to a minimum download speed of 20 Mbps and an upload speed of 2 Mbps. The CLA and the Countryside Alliance also called for a 2 Mbps upload speed to be the USO requirement. In addition, Historic Houses stated that they believed that there should be more assistance from the government to enable community broadband schemes.

5.52. Cairngorms National Park Authority said that after 2 years of work, nothing came out of the community scheme developed by Community Broadband Scotland, as the solutions were to be provided centrally via the Scottish Government's Reaching 100 (R100) Superfast rollout programme.

5.53. Only 12% of businesses said they had applied for a broadband connectivity voucher, and of those, only 18% (2.5% in total) have so far received a better connection. **Figure 5.9** shows that most were awaiting their connection and Gigabit vouchers and the Superfast Broadband Programme were the slightly more popular schemes. Only one business mentioned the broadband USO.

Figure 5.9: Most businesses did not use or receive a better connection from voucher schemes

Voucher	Awaiting	Scheme did not proceed	Received a better connection	Total
Gigabit voucher	15	14	4	33
Superfast scheme	6	7	3	16
Better broadband	8	10	2	20
Local authority scheme	7	8	1	16
Other	3	5	3	11

Question: You stated that you have applied for a broadband connectivity voucher. Please tick all the vouchers which you applied for and which stage of the application you are at. N = 56
N.b. Some businesses applied for more than one scheme therefore these totals do not add up to the N above

5.54. **Figure 5.10** shows that of businesses that had not applied for vouchers, only one in 3 knew where they could find more information.

Figure 5.10: Most of the respondents were unaware of where to find information on vouchers

Yes - I'm aware	No - I'm unaware
30.2%	69.8%

Question: You haven't applied for a broadband connectivity voucher. Are you aware of where to find information on these vouchers in your area? N = 349

6. Topic B: Benefits

The questions asked in this section can be found in Annex A.

Context

6.1. Despite having evidence from both previous and ongoing government schemes, the call for evidence looked to further quantify the social, environmental and economic benefits of improved connectivity for communities who are located in Very Hard to Reach Areas.

6.2. Additional evidence is required as previous academic and social research has primarily focused on rural areas, rather than remote rural premises which make up the vast majority of Very Hard to Reach Areas.

6.3. New technologies including agri-tech and other rural digital communication platforms also require further research on their benefits given how relatively recently they have been introduced.

6.4. The evidence that we can compile from the call for evidence will enable us to assess the benefits of improved and more reliable broadband in Very Hard to Reach locations, both regarding their geographical remoteness but also compared to their current level of access to digital connectivity and alternative services.

6.5. Previous evidence has shown that residents in remote rural areas face substantially greater travel times and disruption when attending work or social activities as well as accessing basic services.

6.6. With agriculture, forestry and fishing making up approximately 50% of registered businesses in Very Hard to Reach Areas in England[17], these industries are disproportionately affected by poorer connectivity, which could have a detrimental impact on their productivity.

We Heard

In the responses we received to the call for evidence, there was a consensus amongst respondents that an improved connection would improve the general standard of living for most in remote and rural areas of the UK.

6.7. Responses noted that an improved connection would improve the reliability of video and screen sharing on conference calls, improve the situation for those working from home, improve access to services for an ageing population, reduce social isolation, further enable location-based services and increase

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[17] DEFRA Statistical Digest of Rural England - page 63

productivity as a result of less time being spent waiting for a connection to load.

6.8. All responses said that better broadband would improve access to online services, such as banking and healthcare, the ability to work from home and keep in touch with friends and family.

6.9. In the survey, we asked respondents whether they believed better broadband would improve their ability to keep in touch with family and friends, use online entertainment, access support services, work from home whilst caring for someone, and improve their welfare and wellbeing. As shown in **Figure 6.1**, we found that across all ruralities, respondents overwhelmingly agreed that better broadband would improve all of these things. Here, we define agreement with these statements as respondents choosing either agree or strongly agree in response to the questions posed.

Figure 6.1: Almost all respondents agree broadband improves key facets of their lives regardless of rurality.
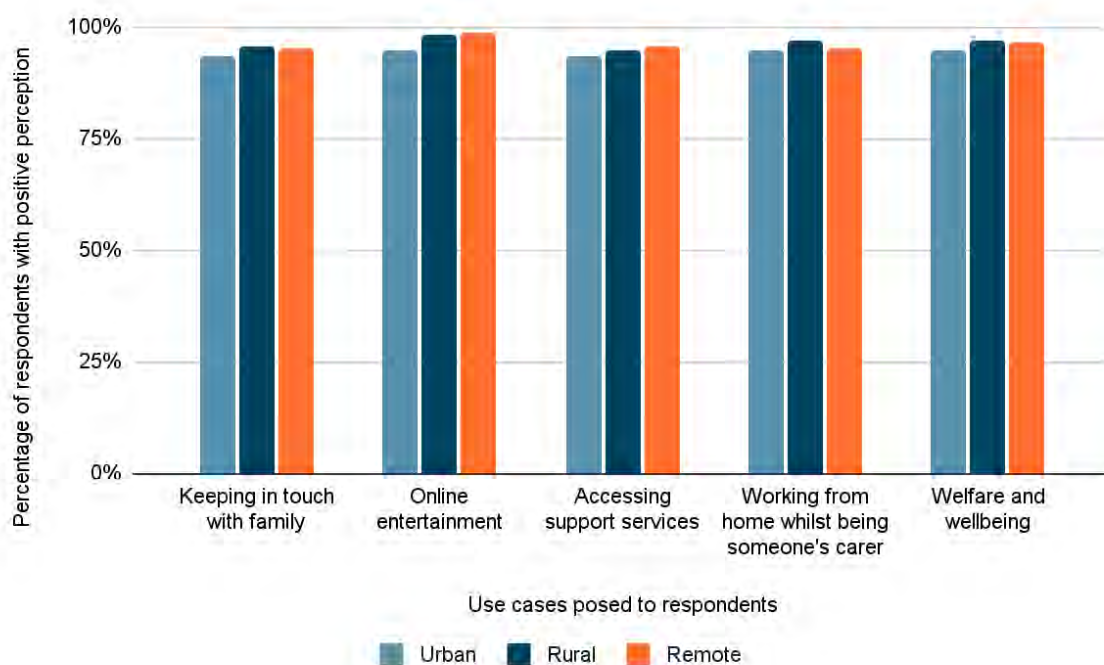
Questions: Do you agree or disagree with the following statements: Better broadband would improve my ability to keep in touch with friends and family, Better broadband would allow me to/improve my access to online entertainment (e.g. films and TV streaming), Better broadband would make it easier to access support services, Better broadband would improve my ability to work from home whilst also caring for others, Better broadband would support my well-being and welfare. N = 314, 885, 1523, 1823, 1689 by use case respectively. When respondents chose 'agree' or 'strongly agree' to the question above, this is considered a positive perception.

Education was severely affected by the COVID-19 pandemic and highlighted

the need for improved connectivity and limitations imposed on those with limited service.

6.10. During the COVID-19 pandemic, the majority of students were expected to work from home due to COVID-19 restrictions. Online schooling was found to be a particular challenge for those living in rural areas due to poor connectivity.

6.11. We heard through long-form responses that respondents found better broadband allowed for easier and better remote learning, especially when it is the only option (e.g. during national lockdowns) as well as better live-streamed online lessons.

6.12. In its response, the National Association of Local Councils (NALC) reported that some pupils were forced to attend school by exception because of poor connectivity. It is believed that for many of these pupils an improved broadband connection would have allowed them to learn from home and play a more interactive role in their remote education than was otherwise possible.

6.13. In its response, Pupils 2 Parliament said that with faster broadband, the children and young people they had interviewed would play more games, faster, more complicated and with better graphics, do online school homework and be able to call friends and family.

6.14. **Figure 6.2** shows that the proportion of respondents who had a positive perception of virtual education increased across ruralities since the beginning of the COVID-19 pandemic. The highest proportion is in remote areas, but the largest post-pandemic increase is in rural areas. We define a positive perception as a respondent choosing either 'agree' or 'strongly agree' to one of the statements put forward.

Figure 6.2 The majority of respondents had a more positive perception of virtual education after the COVID-19 pandemic.
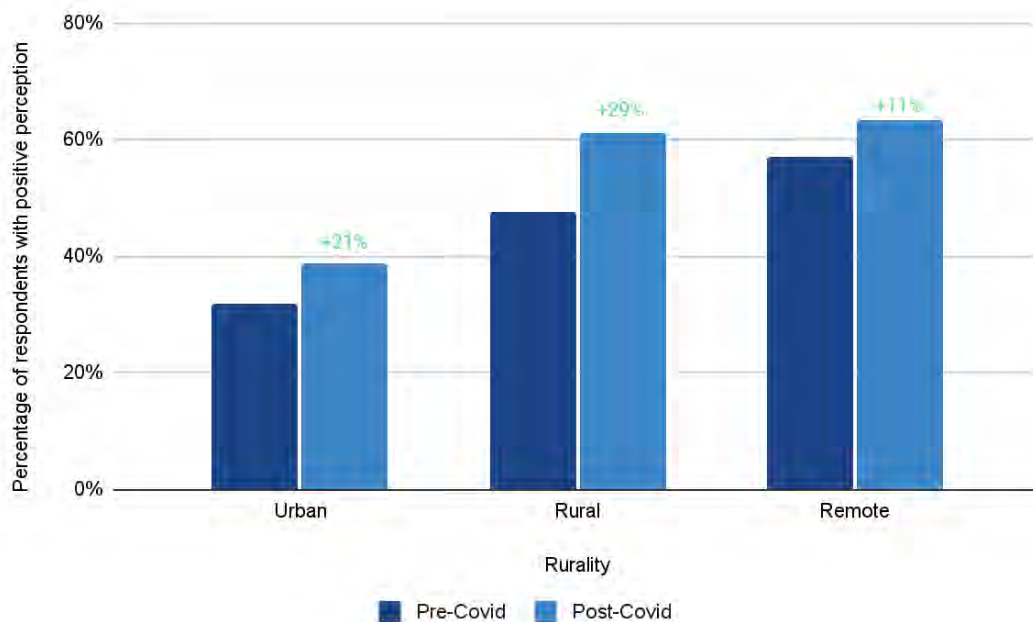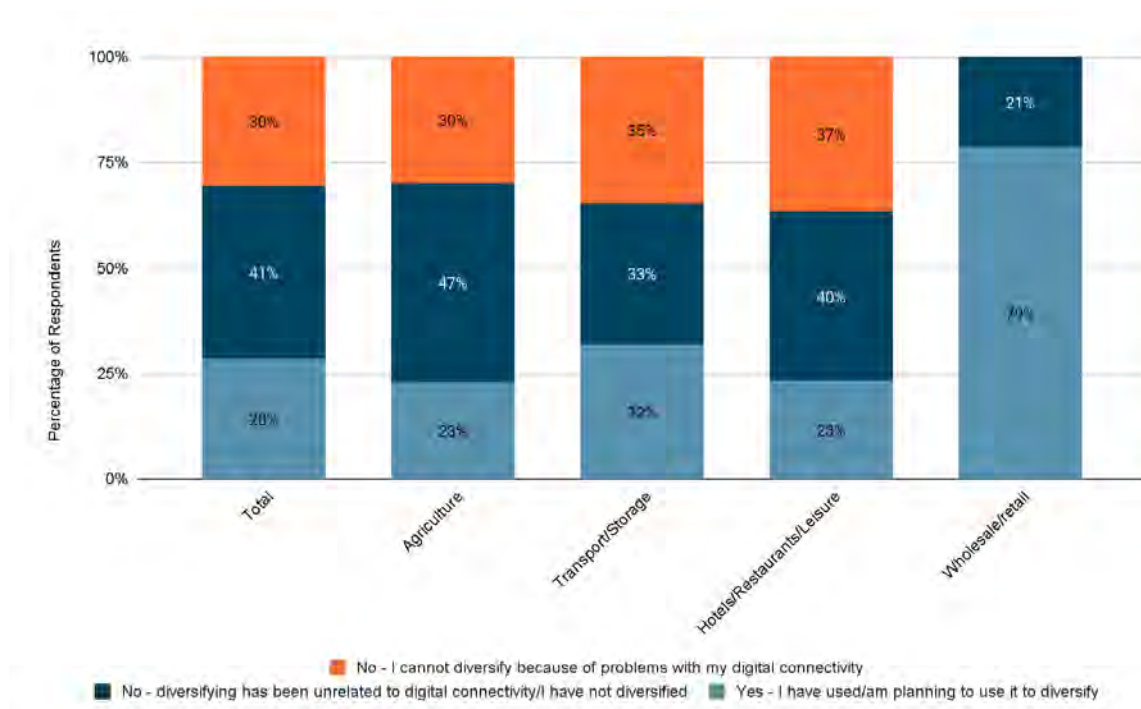
Questions: Based on your virtual education experience before March 2020 (the beginning of the first COVID-19 lockdown), please rank the following statements: It saved you time compared to a face to face lesson, The virtual lesson's structure was as good as being face to face, Broadband quality didn't affect my virtual lesson, The quality of learning was as good as being face to face, The household participant felt as engaged in the virtual lesson as a face to face lesson, The household participant would be open to having another virtual education session. Based on your virtual education experience since March 2020 (the beginning of the first COVID-19 lockdown), please rank the following statements: The structure of virtual lessons was as good as face to face, Your teachers/lecturers adapted quickly and comfortably to virtual lessons, You had all the required technology to best adapt to virtual learning, Broadband hasn't affected your virtual education experience, The household participant felt as engaged in the virtual lesson as a face to face lesson, The household participant would be open to having another virtual education session. N = 41, 426, 63 respectively by rurality

Productivity

6.15.   The responses to the call for evidence suggested that most rural businesses already make use of online applications for accounting, orders, conferencing, and banking where they can. However, many struggle without 'decent broadband' and therefore require better connectivity to complete tasks. All respondents said that improved connectivity would improve the productivity of businesses and would mean that online applications can be used more extensively and efficiently.

6.16.   In its response, Which? highlighted a study by Olive which reported: "*58% of people said that they had been unable to access the help of online banking facilities they needed from home since [the COVID-19 national] lockdown*". Respondents to the call for evidence consider these services an integral part of the modern lifestyle. National Parks England told us that these online services are vital in remote and rural areas to provide online access to services that are otherwise physically located many miles away.

6.17. We heard that the COVID-19 pandemic exacerbated the issues faced by those with poor connectivity. Most respondents noted that some rural businesses would diversify if they had the connectivity to do so.

6.18. The restrictions imposed on businesses through the COVID-19 pandemic has however forced some rural businesses to use what connectivity they have to diversify their business to continue running. Caithness Chamber of Commerce said this is most notable in the food and drink manufacturing sector who made use of social media and online ordering to move to a direct-to-customer model during the COVID-19 pandemic.

6.19. Tourism NI noted in its response that '*Many businesses have already enhanced their online presence, or may do so*' to improve their current situation and aid recovery post-pandemic.

6.20. While the general lack of connectivity appeared to affect the day to day running of rural businesses based on responses received to the call for evidence (online bookings, placing orders with suppliers, etc), Historic Houses reported that many of their members adapted their visitor attraction businesses during the national COVID-19 lockdowns. They were able to offer virtual tours, online exhibitions and craft fairs despite these changes requiring a faster speed than usual.

6.21. **Figure 6.3** illustrates that approximately 28% of businesses in our survey said they were able to diversify using their current digital connectivity. However, 30% said that poor connectivity was a barrier to their diversification plans.

Figure 6.3: Digital connectivity has allowed some firms to enter different markets, the largest effect has been in the wholesale/retail market

Chart legend:
- No - I cannot diversify because of problems with my digital connectivity
- No - diversifying has been unrelated to digital connectivity/I have not diversified
- Yes - I have used/am planning to use it to diversify

Question: Has digital connectivity enabled you to enter different markets/sectors in addition to your original business activities? N = 396

6.22. In their response to the call for evidence, Historic Houses agreed that diversification was important, stating that *'Reliable connectivity in rural areas can also enable historic house estates to diversify by offering business lets and units to other rural SMEs and start-ups. For example, Houghton Hall and Belvoir Castle have recently successfully set up business parks and retail parks on their estates. Access to reliable broadband is critical to these initiatives, and a lack of connectivity is currently a major barrier to businesses basing themselves in more remote areas. Driving more business to rural areas will support fragile rural economies, provide jobs and improve access to products and services for people living in rural areas.'*

6.23. Openreach stated in its response to the call for evidence that nationwide-full fibre could enhance workforce participation through remote and flexible working. They estimate that this could result in:...

- 'Nearly 1,000,000 more people could enter the workforce by 2025 (compared to around 500,000 in the previous research). This includes over 300,000 working-age carers, nearly 250,000 older workers, and 400,000 parents of dependent children;'

- 'In addition to the £59 billion GVA boost, the increase in workforce participation would have a GVA impact of £25 billion (approximately doubling the previously estimated impact of £13 billion) – increasing GVA in 2025 by just over 1.3%.'

6.24. While this research was national, it did not provide a breakdown of rurality. However, Openreach noted that *'it did assess the residential choices in several different density areas, including the lowest density'*.

6.25. The Agricultural Productivity Task Force (APTF) stated in its response to the call for evidence that *'Research conducted in the US has determined that successful implementation of digital connectivity could bring an additional $500 billion to global GDP by 2030.'*

Agriculture

6.26. From an agricultural perspective, improved connectivity could increase farm productivity through monitoring crops and livestock, access to remote learning and working, leading to expansions in businesses and diversification of farm businesses, and improved farm safety. It could also lead to an adoption of AgriTech and 5G technologies onto farms.

6.27. NFU said in response to the call for evidence that *'7.8% of the farming workforce [are] over 70 and therefore in the vulnerable group, the lifeline that digital connectivity gives cannot be underestimated.'*

6.28. Many agricultural applications have importance for running a business or working remotely, and the importance was exacerbated during the COVID-19 pandemic. Many agricultural representative organisations offered examples in their responses:

- Farmers' Union of Wales: *'many farmers are still unable to complete online quarterly VAT returns, SAF, BCMS or EIDCymru submissions due to poor broadband, and must rely on others to do this for them.'*

- Agricultural Productivity Task Force: *'Precision farming is a term for farming practices where technology is used to improve efficiency and is becoming increasingly common and has the potential to improve yields, profits, and lessen environmental impact. Precision farming is used across farm types with farmers using technology to manage crops or livestock. A report of case studies showed that dairy farmers save approximately 20% on labour through the use of robotic milking systems and some farmers reported increases in milk yields of 2-12%.'*

- National Farmers Union: *'On many horticulture farms (such as soft fruit farms) irrigation is almost entirely computerised with programmes that water each plant to meet individual water needs.'*

6.29. While no responses were given explaining how the provision of specific broadband services would have social or economic benefits to remote rural

customers, many responses explained how improved connectivity overall would have social and economic benefits. This shows that consumer focus is broadly on the availability of connectivity rather than the technology available to deliver it.

6.30. Respondents to the call for evidence highlighted the potential for improvements in digital connectivity that could lead to significant economic, social and environmental benefits.

6.31. The CLA stated in its response to the call for evidence that *'When looking at the potential of digital connectivity in rural areas, the Rural England and Scotland's Rural College report estimates that: "Unlocking the digital potential of rural areas across the UK could add between £12 billion and £26 billion (Gross Value Added) annually to the UK economy. This would result from the additional turnover achieved by rural-based businesses, which would be between £15billion and £34 billion annually."'*

6.32. The Agricultural Productivity Task Force responded to the call for evidence by noting that *'A report from the Centre for Economics and Business Research (CEBR) for Openreach estimated that businesses with a substantial broadband speed increase of 200-500 Mbps had an estimated incremental impact of 3% productivity gain per worker. The report states that some productivity increases will be indirect where the farmer themself may not have fibre broadband, but if others that they interact within the supply chain are running more efficiently, it will contribute to an overall improvement in productivity. This will arguably be even greater for rural businesses as the current start point is much lower than the standard business.'*

6.33. Caithness Chamber of Commerce also believes that there is no need for an assessment of the economic or social benefits of the provision of improved digital connectivity as it is fundamental to doing business today.

6.34. There were 140 agricultural firms surveyed and 30% required whole farm coverage. As seen in **Figure 6.4**, of the 30% that required whole farm coverage over half relied on a mobile network to provide coverage and 20% used FWA.

Figure 6.4: Most agricultural firms who use connectivity across their farm use a mobile network.
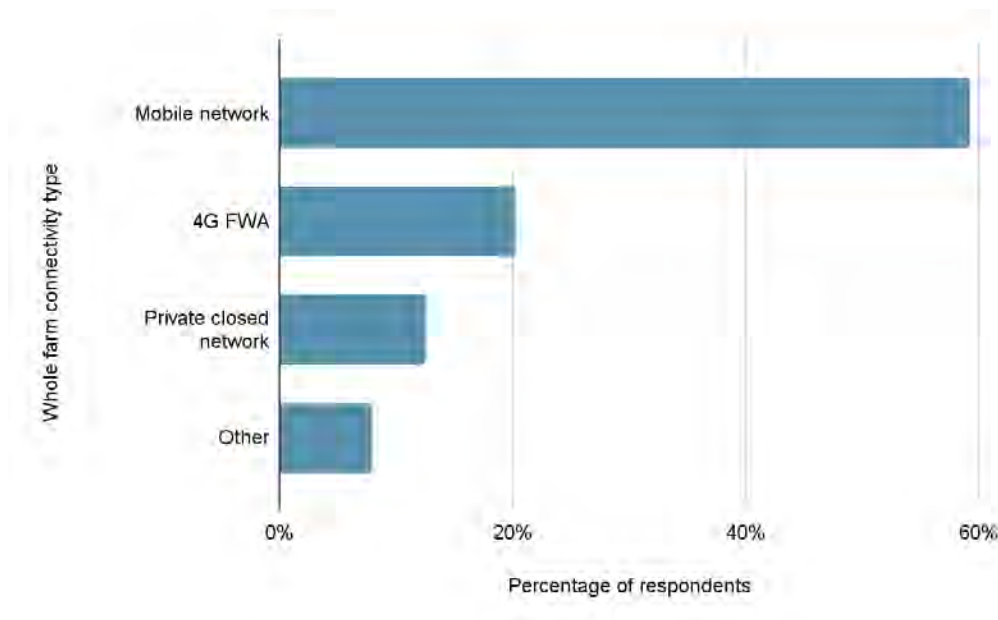
Question: What do you have in place to provide whole-farm connectivity? N = 36

A boost to the local economy

6.35.   Several responses from representative organisations said that improved digital connectivity could retain and increase rural populations and help address the issue of an increasingly ageing population.

6.36.   It was also suggested in long-form responses that an improvement in digital connectivity in rural areas may bring more tourism as rural businesses will be able to attract more guests with online advertising, and tourists will enjoy feeling connected in rural locations. In its response, the British Holiday & Home Parks Association (BH&HPA) said: '*Holidaymakers may also be taking longer breaks with the option to work while away from home. Parks are therefore finding that the provision of wi-fi to their customers or holiday caravan owners is becoming more important and is regarded as an essential service rather than a 'nice to have'.*'

6.37.   Lancaster University Management School found in its study that there is a desire for good connectivity as it attracts and keeps people in the community. In particular, they said that 5G could future-proof the community and fast track entrepreneurial and business diversification plans.

Health and Wellbeing

6.38. Improved broadband is thought to improve both mental and physical health, as well as overall increasing safety. This is especially important for those living in rural and remote areas, who have dangerous occupations.

6.39. While respondents seem generally keen on online/virtual health services such as online GP appointments, many reported that members were unable to make use of them due to poor connectivity. Respondents say this is an example of needing better connectivity in rural remote areas.

6.40. We heard that improved connectivity means that it could be easier to keep in touch with loved ones, even if it is not in person. All respondents said that access to services, such as online libraries, medical appointments, learning, and banking, due to better connectivity would improve wellbeing and welfare. In their research, Lancaster University Management School had a respondent who said: *'My heart sinks when the landline and broadband go down. It leaves you feeling isolated (particularly as we have no mobile reception) as it sometimes takes days to be resolved'.*

6.41. The theme of isolation was recurring and Farmers' Union for Wales said in their response *'farming is known as a particularly isolated occupation, with the highest rate of suicide above any other occupation. In a recent survey by Tir Dewi, 51% of farmers surveyed in Powys saw mental health as an issue affecting them. The [COVID-19] pandemic has prevented agricultural shows and agricultural markets from operating as usual, therefore digital connectivity has been even more important for allowing farmers to have contact and socialise (albeit over a screen).'*

Environmental Impacts

6.42. It was noted by some respondents that improved connectivity would have a secondary benefit of helping to reduce the environmental impact of some activities as well as helping to monitor activities related to the environment.

6.43. Lancaster University Management School said in its response: "*The Environmental Monitoring use case is focusing on monitoring water and flooding in Coverdale and surrounding areas by engaging with three principal infrastructures in monitoring activities: vulnerable bridges, roads, and ancillary infrastructures. The goal is to be able to intervene earlier to prevent expensive damage, either through bridge collapse or total road closures through remote monitoring 5G enabled equipment. Several bridges have been identified together with a local water treatment plant that supplies water to a local village.*"

6.44. The Agricultural Productivity Task Force (APTF) stated that improved broadband would allow for more *'precision farming'* which would *'improve*

efficiency and is becoming increasingly common and has the potential to improve yields, profits, and lessen environmental impact.'

6.45. As further environmental regulations and agri-environment schemes are introduced, the Farmers' Union of Wales (FUW) said that connectivity *'will be increasingly important to enhance agriculture's beneficial impact on the environment, to monitor and document improvement, and to improve accuracy of inputs.'*.

6.46. Research from 2018, highlighted Cornwall Council's response, that the amount of time people are working at home has increased since connecting to a superfast service and as a result "*The uplift in homeworking has positive environmental consequences – taking an average of 154 miles off the typical weekly commute.*"[18]

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[18] Superfast Cornwall Project Evaluation Report - September 2020

7. Topic C: Barriers

The questions asked in this section can be found in Annex A.

Context

7.1. The very low presence and availability of existing networks in remote rural areas is a known fundamental barrier to the adoption of improved broadband services in Very Hard to Reach Areas.

7.2. While the government has substantial and detailed data, typically at the premises level, on 'fixed wired' broadband networks, data on 'fixed wireless' networks is less detailed and often relies on modelling assumptions.

7.3. Furthermore, information on space-based systems such as satellites is much more limited and often provided on a case-by-case basis by providers themselves rather than through official data gathering (e.g. Ofcom Connected Nations Reports).

7.4. This call for evidence aimed to assess how best to remove current barriers to delivering improved broadband to consumers in Very Hard to Reach locations and to realise the benefits without distorting existing competitive markets.

7.5. From previous correspondence to the department, it was identified that some of the most common barriers to consumers at present are, in no particular order:

- high quotes given by broadband providers
- information on future builds or current availability is not accessible
- general lack of infrastructure, e.g. premises too far away from the cabinet, with no/intermittent 4G signal
- the premises have missed out or been excluded from a previous network build

<u>**We Heard**</u>

Several significant barriers to better broadband connectivity remain for both businesses and consumers in remote rural areas, leaving them with fewer choices and slower speeds than their urban and suburban counterparts.

7.6.   Several barriers to faster connectivity were identified by consumers, businesses and representative organisations in response to the call for evidence both through the survey and the long-form responses.

7.7.   The most commonly identified barriers to better connectivity included; the availability of services in an area, the cost and reliability of a given connection and the perception that switching broadband providers could be risky and lead to a loss of service completely.

7.8.   The responses to both the consumer and business survey highlighted that premises in remote and rural areas had significantly slower average download speeds than their counterparts in urban and suburban areas, despite having similar broadband demands (**Figure 5.2, Page 19**). This speed data was generated by matching the respondents' postcode with Ofcom connected nations data. This demonstrates that one of the primary barriers to accessing faster connectivity speeds faced by consumers and businesses in Very Hard to Reach areas is a lack of availability.

7.9.   The majority of both remote and rural premises are designated by Ofcom as Area 3 (91% and 83% respectively). These are 'Non-Competitive Areas' as determined by the regulator, with Openreach typically the only operator providing a large-scale network. The remaining premises are located in Ofcom Area 2, which are 'Potentially Competitive Areas' where one or more existing alternative ultrafast networks are already present or where one or more operators have a plan to deploy.

7.10. Even where competitive alternatives to Openreach's network exist, consumers may not feel comfortable switching. Consumer advocate group Which? highlighted in its response that 38% of consumers believed that changing providers '*is too risky and may lead to a worse service'*, with almost half of this group (46%) preferring to *'stick with their current broadband as it's 'tried and tested''*.

7.11. The consumer responses to our call for evidence were comparable to the findings by the Which? research. When asked whether in the past 3 years they had done anything to try and improve the speed or quality of their broadband connection 29% of respondents said they had changed their provider - with 32% stating they had changed package or service (whilst remaining with the same supplier).

7.12. The responses from the call for evidence consumer survey highlight the difficulty that many consumers may feel when it comes to accessing a better broadband connection through a fixed-line. Often they are left with only one fixed infrastructure provider (Openreach), meaning that switching (retail provider) will not result in a faster or more reliable connection.

While FTTP remains the preferred technology choice, less than half of businesses and consumers were aware of the government's Gigabit Broadband Voucher Scheme. However, businesses and consumers are willing to try alternatives to fixed connectivity where available.

7.13. There are several alternative connectivity options available in some rural areas to both residential consumers and businesses who are looking to switch away from a fixed line broadband service in order to boost reliability or speed such as 4G/5G Fixed Wireless Access and satellite.

7.14. In addition, there are a number of schemes that may be able to help consumers and businesses access financial support to upgrade their connection including the broadband Universal Service Obligation and the government's Gigabit Broadband Voucher Scheme.

7.15. Only 14% of consumers stated that they had changed the technology used to deliver broadband in the past 3 years. Of the consumers who had switched technology, the majority had moved from ADSL to either a Superfast connection, Fixed Wireless Access, or a mobile broadband solution. (**Figure 7.1**)

Figure 7.1: Sankey diagram of consumers who said they switched technology (Left: from, Right: to). Consumers are willing to try alternatives to fixed-line connections to access an improved connection.
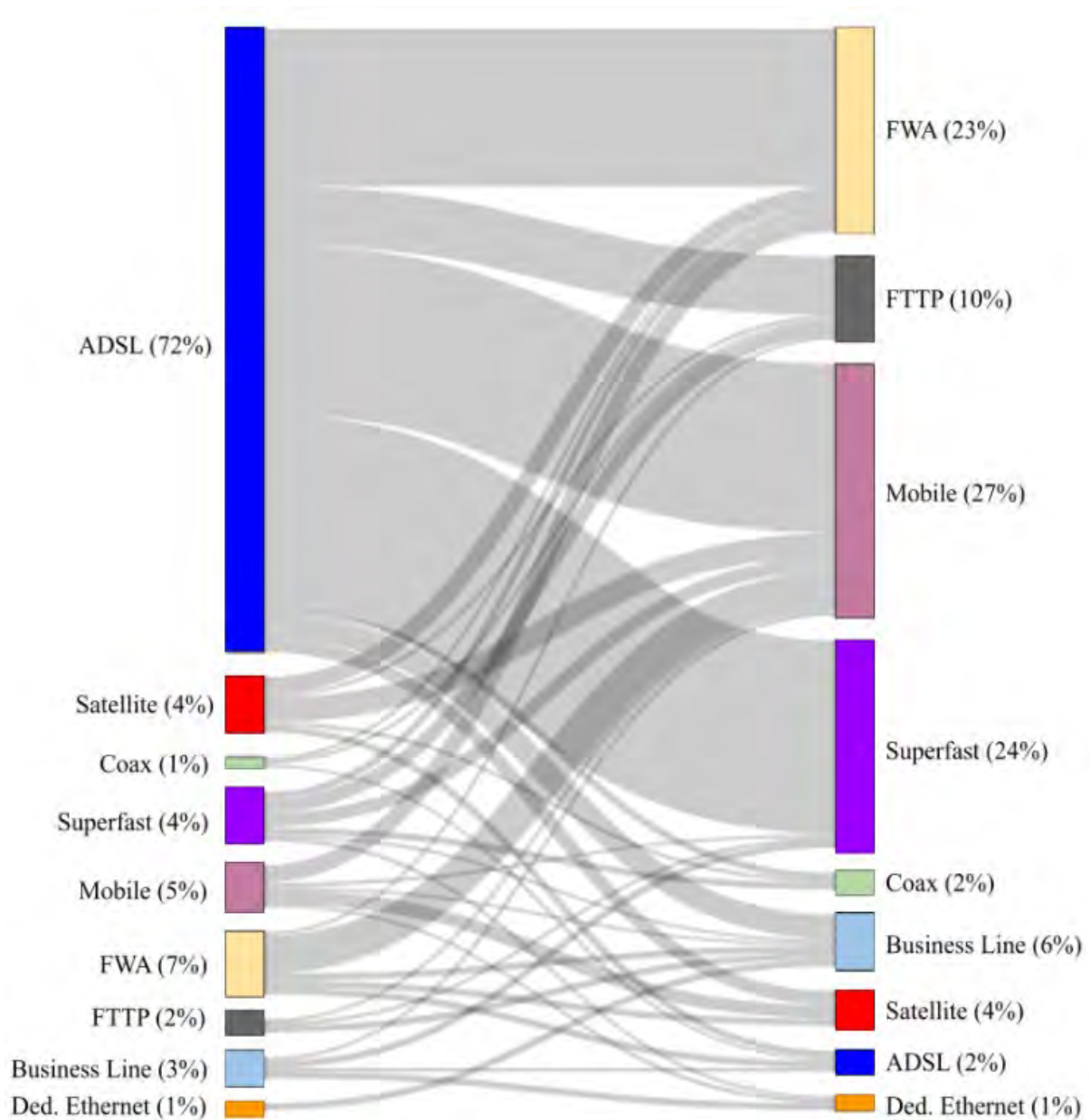
Question: You stated that you changed technology to improve broadband, which technology did you change from and to? N = 256. 'Other' includes 'Dedicated Ethernet' and 'Hybrid Fibre Coaxial Cable'.

7.16. On the other hand, 65% of business respondents indicated that they had tried an alternative to fixed broadband, with 56% of those surveyed exploring Fixed Wireless Access and 43% exploring Satellite. Just under one-third (29%) of all respondents indicated they had tried both. Businesses appear to be more active in exploring new technologies compared to consumers.

7.17. Responses from a number of representative organisations noted that FTTP remained the preferred technology choice. However, they also noted that

consumers and businesses without access to FTTP were happy to take on a Fixed Wireless or Satellite connection to boost their connectivity options.

7.18. While the local delivery body, Connecting Devon and Somerset stated that respondents only saw '*technologies like 4G or satellite [as nothing] more than potential interim, stop-gap solutions',* other respondents were more positive and called on the government to do more to support them.

7.19. Which? responded that it recognised a *'trade off'* needed to be made between '*cost of provision, cost to the consumer and speed of the connection'.* Historic Houses noted that wireless systems would '*reduce the expense and disruption of cable-based broadband in protected areas'*, while Lancaster University Management School stated that as part of its independent study Mobile Access North Yorkshire (MANY) wireless systems were seen as the most '*cost-effective method'* of delivering high-speed internet services in rural and hard to reach areas.

7.20. Awareness of Fixed Wireless Access was low amongst consumers, whereas almost half of respondents were aware of a satellite connection. When asked if they had explored the use of either Fixed Wireless Access or satellite service, 71% stated they were aware of what Fixed Wireless Access is, with 79% saying the same about satellite connectivity (**Figure 7.2**).

7.21. However, despite high awareness, satellites were less explored than Fixed Wireless Access connections, indicating a gap between awareness and interest. One potential explanation is increased media coverage of new broadband satellite projects such as OneWeb and Starlink.

Figure 7.2: Consumers are more aware of satellite connectivity but less interested in taking out a connection.
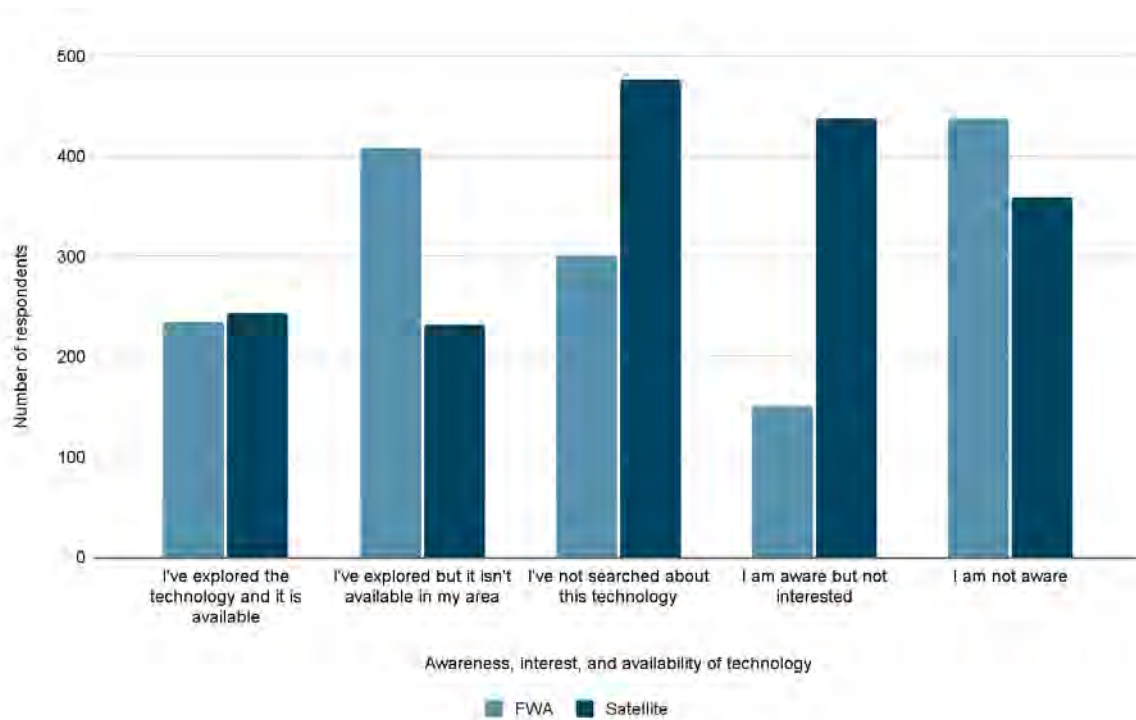
Questions: NSPL rurality based on postcode (What is your postcode?) Have you explored the use of fixed wireless services in your area? Have you explored the use of satellite services in your area? N = 1749

7.22.   When respondents were asked what was preventing them from taking a FWA or satellite service, both consumers and businesses noted that price, speed and reliability were all concerns that prevented them from taking an alternative service. Respondents also noted that data caps, listed building status and high latency were other smaller factors that contributed to this hesitancy to adopt a Fixed Wireless Access or satellite service.

7.23.   The findings from the call for evidence survey were similar to comments made by organisations representing consumers. The Ofcom Advisory Committee for Scotland noted that *"While many hail satellite broadband as the solution to rural connectivity, costs, performance and latency have traditionally been mitigating factors. Further, in areas of the Scottish Highlands, mountainous territory has prevented optimal reception."*. Furthermore, the National Association of Local Councils (NALC) highlighted that while Councils were aware of the services on offer, often their constituents were not.

Gigabit Broadband Voucher Scheme and the broadband USO

7.24.   The majority of market participants that responded to the call for evidence stated that they were not registered with one of the schemes listed in question

C27[19]. However, Openreach and the rural SMEs including Quickline and Wessex Internet were registered to some, or all, of the schemes listed. This was not unexpected given that many of the respondents to the call for evidence were either service or infrastructure providers who are ineligible to access the schemes due to the current limitations of their infrastructure.

7.25. Awareness of both the Gigabit Broadband Voucher Scheme and the broadband Universal Service Obligation (USO) was low amongst both consumers and businesses.

7.26. As previously shown in **Figure 5.10 (Page 29)**, when asked about both schemes, only 12% of businesses stated they had applied for a voucher and of those that hadn't applied, only 30% said they were aware of where to find further information. Only one business mentioned the broadband Universal Service Obligation .

7.27. Consumers showed a slightly higher degree of awareness than businesses when asked about available broadband schemes, although less than half (41%) had explored either a community broadband scheme or applied for a Gigabit Broadband Voucher

7.28. When asked in the call for evidence survey, exactly half of all suppliers who responded stated that they offered either a 'community-based partnership' or another mechanism which allowed consumers to group together to deliver an improved network.

7.29. Half of the suppliers also noted that they offered discounts for customers based on whether they were able to self dig or provide site provision or power. This helped to lower the cost to the customer and remove a potential barrier to deployment for both supplier and customer.

7.30. Responses to the call for evidence showed that on average, 172 connections per supplier have been made using community-based partnerships[20]. While often used within a community-based partnership, not all of these connections may have been delivered using the government's Gigabit Broadband Voucher Scheme[21].

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[19] Is your organisation registered as a supplier as part of the following schemes and procurements?
- Superfast Broadband scheme
- Gigabit Voucher Scheme
- Public Sector Hub upgrades & Gigabit-Capable Connectivity DPS
- Market engagement for upcoming UK Gigabit Programme Gigabit Procurements
- Other

[20] When including one supplier who had made a total of 8,000 connections, the average was raised to 825 connections per supplier.

[21] Building Digital UK (BDUK), the government's delivery body, have indicated that as of W/C 1st November 2021 a total of 96,711 vouchers have been issued under the Gigabit Broadband Voucher Scheme since it was launched.

7.31. However, more broadly, representative organisations noted that both the broadband USO and the Gigabit Broadband Voucher Scheme had aspects to them that meant applicants were unable to benefit due to the high connection costs - even with the additional funding offered.

7.32. The Country Land and Business Association (CLA) stated in its response "*One of the major issues we are evidencing with the Universal Service Obligation (USO) is that the application of the price threshold of £3,400 for infrastructure is a major constraint…*" while the National Farmers Union for England and Wales (NFU) highlighted that the price cap made it *"unlikely that many of our farms will be able to qualify for the USO"*.

7.33. Furthermore, with regard to Gigabit Broadband Vouchers, Which? stated that *'While access to vouchers, such as the Gigabit Broadband Voucher Scheme, aims to help those in rural areas with slow speeds, costs may still be prohibitive even with this support in very hard to reach areas.'*.

When taking out a new service, responding businesses and consumers are willing to pay slightly more to see a doubling of their broadband speeds and increased reliability.

7.34. As part of the consumer survey, we asked respondents both what they were paying for their broadband connection, as well as how much extra they would be willing to pay for:
   ○ A doubling of their download speeds
   ○ A tangible increase in reliability, such as halving the number of faults

7.35. The average consumer who responded to the call for evidence reported currently paying, on average, £37.16 for their broadband connection, a slightly higher amount than Ofcom's estimated average of £31 for dual-play services[22].

7.36. Generally, those who paid more for broadband were more likely to be receiving higher speeds. **Figure 7.3** shows that consumers in both rural and remote areas would be willing to pay slightly more for both increased speeds and reliability.

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[22] [Ofcom Prices Trend Report 2021](#), Figure 9, dual-play refers to a landline and broadband bundle package

Figure 7.3: Consumers are willing to pay slightly more per month for increased reliability and a doubling of their broadband speeds.

	Rural	Remote
Willingness to pay for doubling of download speed	+£5.55 per month	+£4.97 per month
Willingness to pay for halving number of faults with connection	+£4.57 per month	+£3.83 per month
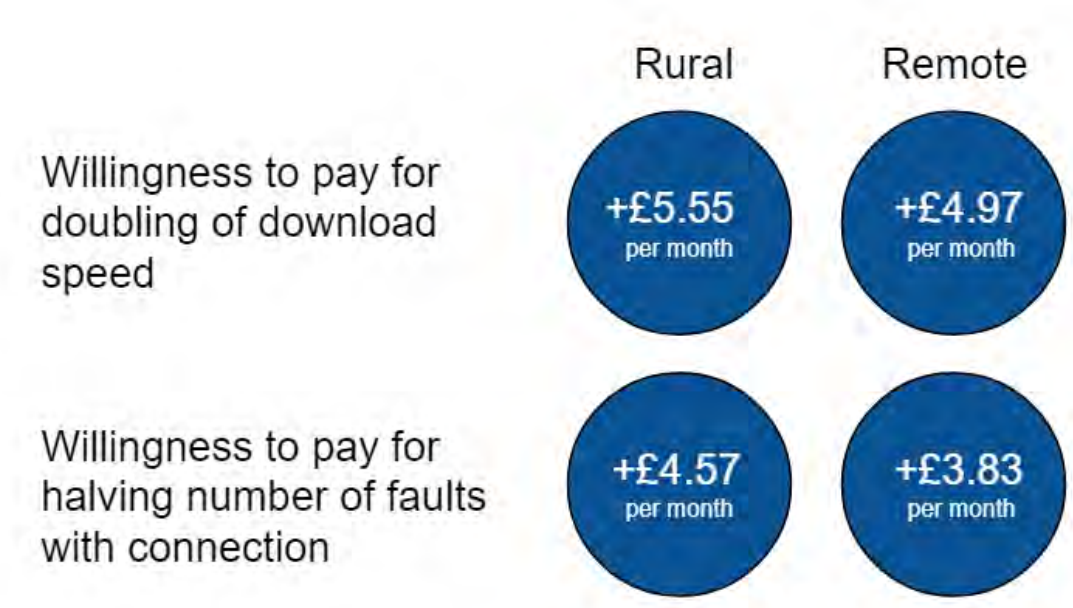
Questions: NSPL rurality based on postcode (What is your postcode?). How much per month would you value a doubling of your download speeds, on top of what you currently pay? How much per month would you value a tangible increase in reliability, such as halving the number of faults, on top of what you currently pay? N = 1699

7.37. Which? noted that only one-third of consumers (36%) '*are not willing to pay more for their connections'* to achieve a faster broadband connection, especially amongst low-income households. This data refers to consumers in general rather than specifically those in Very Hard to Reach Areas.

7.38. The Campaign for National Parks also provided some analogous examples of consumers in rural areas being willing to pay more for a utility, even if it does not improve performance. The Campaign for National Parks stated that *'Ofgem has agreed an allowance of just over £123m (in 2019/20 prices) to be spent on the undergrounding of overhead electricity lines'.* This allowance is paid for by consumers through their electricity bills and was based on Willingness to Pay research.

7.39. Suppliers Quickline, Openreach and Wessex Internet all stated in their responses that customers in remote rural areas are less price-sensitive and willing to pay more than urban areas. However, both Openreach and Wessex Internet stated that this willingness to pay was often tied to existing infrastructure, with those on poorer infrastructure often willing to pay more for a step-change in service.

7.40. Responses from space-based providers did note that higher prices in remote rural areas were not necessarily a given. They stated that broadband

delivered via either a satellite or high-altitude platform system would remove any potential urban/rural divide in broadband pricing. Eutelsat highlighted that often the main financial limitation to uptake is not the monthly cost but the *'...the cost of the Customer Premises Equipment (CPE), or user terminal (antenna and modem)'*. These responses however reflect the consistency of pricing of satellite services by rurality, rather than the comparable price of satellite-based and terrestrial services.

Respondents noted that even improved connectivity may not be enough to encourage uptake of faster speeds. Access to improved connectivity needs to be matched with better access to digital skills to allow consumers and businesses to make the most of their improved connectivity.

7.41.   Several representative organisations highlighted that a significant barrier to accessing improved digital connectivity and the services available was a lack of digital skills amongst both consumers and businesses.

7.42.   The CLA noted in its call for evidence response that the COVID-19 pandemic had also highlighted the need for improved digital skills. They stated that there was *'a lack of understanding and confidence in using digital skills programmes even if businesses can gain access.'*.

7.43.   When businesses were asked if they had ever *'experienced any of the following constraints in adopting digital connectivity for your firm, beyond any connectivity challenges?'*:
   ○ 13% said they had issues *'finding external digital support'*
   ○ 8% said that their *'existing workforce lacks digital skills'*
   ○ 3% said that they had issues *'accessing appropriate digital training'*

7.44.   The Agricultural Productivity Task Force (APTF) stated in its response that *'the rollout [of broadband] needs to be accompanied by a programme of digital skills training to ensure that the greater speeds and capacity of broadband are utilised to their full potential by farmers and rural businesses'*. Furthermore, the CLA highlighted that there was a '*lack of understanding and confidence in using digital skills programmes even if businesses can gain access'*.

7.45.   Away from businesses, the Communications Consumer Panel & Advisory Committee for Older and Disabled People noted that '*consumers consider being online unsafe due to cybersecurity threats and scams'* highlighting that a lack of digital skills acts as a barrier to internet use in remote rural areas due to their older demographics.

7.46.   While some representative organisations, including the CLA and the FSB, noted that SMEs, in particular, were often run by those with limited or no knowledge of IT services. Responses to the call for evidence survey indicated

that fewer than 5% said recruiting people with digital skills, or lacking access to appropriate training was a constraint.

7.47. In its response, Suffolk County Council drew attention to a report by the Good Things Foundation[23] which stated "*An increasing number of daily tasks or job responsibilities require digital skills and those that haven't learnt Basic Digital Skills end up being socially marginalised.*" The report found that digital skills could have significant benefits:

- ○ **Time savings:** Undertaking financial and government transactions online can bring about considerable time savings when compared to having to visit a bank branch, or local council office.

- ○ **Employment benefits**: Basic Digital Skills support can increase the likelihood of unemployed, or economically inactive individuals to enter the workforce.

- ○ **Transaction benefits:** Learning digital skills gives individuals the opportunity to shop online, allowing for considerable cost savings/access to online-only deals. It also includes the benefits of online banking and the considerable ease of access to monetary transactions online.

- ○ **Communications benefits:** Digital skills inclusion implies that individuals can use online tools to keep in touch with their friends, family and local community, thereby feeling more connected and reducing social isolation.

- ○ **NHS savings:** Individuals who have learnt Basic Digital Skills can take advantage of the NHS Choices website, E-prescriptions and online bookings systems. This will lead to a reduction in the number of avoidable GP visits, as well as a reduction in the costs of providing offline booking services.

- ○ **Digital efficiency savings:** Supporting the development of a digitally included population can foster the growth in the use of online government services. This will lead to a reduction in the use of offline services which are more costly to the government to provide.

Investors remain positive about focussing on remote rural areas. However, topography, workforce and wayleaves continue to be barriers to investment and delivery for some suppliers furthering their rollout in remote rural locations.

7.48. Suppliers who were operating in rural areas, as well as other infrastructure providers, noted that investors were positive about focussing on remote rural areas, and understood the benefits of doing so.

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[23] Economic Impact of Digital Inclusion in the UK 2018

7.49. Satellite broadband provider Eutelsat stated that *'Investment in connectivity for remote rural areas is one of the key pillars of Eutelsat's strategy and is fully supported by investors and other stakeholders'*. Quickline were also positive about their future investment prospects noting that they had *'recently secured significant funding to allow us to continue to focus on our rural deployment'*.

7.50. But barriers to investment and delivery remain a challenge for both suppliers and infrastructure providers in remote rural areas. Particular difficulties arise in Areas of Outstanding Natural Beauty (AONB) and National Parks. This was identified due to the need for additional planning permissions before deploying infrastructure and communities being upset at *'urban infrastructure'* being installed in a rural environment.

7.51. When market participants were asked what the biggest challenges to investing in remote rural areas were; high capital costs and high operational costs were the biggest barriers for all providers (**Figure 7.4**).

Figure 7.4: The biggest challenge to investing in remote rural areas is the high capital and operational costs experienced by providers. However, they are not the only barriers that suppliers experience.

	FWA	Mobile	Satellite
High capital costs	1.8	2.1	1.7
High operational costs	3.8	4.0	2.7
Lack of demand/low uptake of services	5.6	6.0	7.0
Low willingness to pay among these premises	5.5	4.6	2.0
Small scale of projects/not enough aggregation of premises	4.5	5.1	5.7
Planning difficulties	5.9	6.5	6.0
Challenges in working with local councils	5.9	6.9	5.0
Finding skilled labour force to deploy the network in these areas	5.9	5.4	8.0
Competitive intensity or uncertainty	7.1	6.4	9.3

Question: What is most challenging for investing in remote rural areas? Please rank the following statements where 1 is the most challenging, and 10 is least challenging. Rank them by dragging and dropping each sentence

7.52. techUK, a trade association for digital technology companies, stated in its response to the call for evidence that its members had found *'gaining planning permission for digital infrastructure (such as satellite dishes) is challenging' in Areas of Outstanding Natural Beauty'*.

7.53. However, suppliers delivering alternative technologies including satellites stated that deploying these technologies in AONB and National Parks is relatively easy due to the limited ground equipment that was required for deployment.

7.54. It should be noted that a Joint Accord between Openreach, National Parks England, National Parks Wales and the National Association for Areas of Outstanding Natural Beauty was drawn up in 2013. This Accord was written in order to help the rollout of fibre broadband and other technologies in a way that protected and enhanced these areas. A new Accord is due to be drafted in 2022 with further guidance to suppliers on matters regarding the delivery of broadband in these areas.

7.55. The experience of alternative technology providers is in contrast to the responses we received from both Fibre to the Premises and Fixed Wireless Access providers who stated that deploying in these areas added '*cost and complexity'* (Wessex Internet) due to the additional planning and negotiation that was often required.

7.56. In order to overcome some of these challenges and enable them to be recognised in a more consistent manner, Wessex Internet proposed a '*Very Hard to Reach scoring multiplier'* when assessing tender submissions for government procurements. By doing this, Wessex Internet suggested that it would help suppliers who had a higher average cost per premises to be awarded government contracts if they were delivering to a higher proportion of Very Hard to Reach premises than their competitors.

Barriers not directly related to topography

7.57. As was shown by **Figure 7.4** above, while high operational and capital costs remain the biggest barriers to investment according to respondents, other challenges apart from topography do remain.

7.58. Market participants informed us through their responses to the call for evidence that challenges to investment also included access to workforce, ability to transport materials, a lack of adequate sites and access to power for backhaul, and higher costs for customer acquisition.

7.59. Staffing and recruitment was a particular challenge raised by suppliers, including members of techUK. However, views were split with some of techUK's members indicating that staff resourcing in rural areas was possible where engineers could be placed to work within specific geographic footprints.

7.60. **Figure 7.5** (below) corroborates techUK's findings with an almost equal split between those suppliers who have the required workforce to deliver improved connectivity in remote rural areas, and those who are currently struggling to recruit staff with the necessary expertise required.

7.61. Other respondents to the call for evidence were similarly split. Fixed Wireless Access and FTTP provider Quickline stated that they believed *'Access to skilled workforce is a challenge for the industry as a whole'*. Wessex Internet, also noted that there *'... is strong competition and limited supply within the sector. We are currently scaling as required for our growth plans, but it is not without recruitment challenges.'*.

7.62. But for satellite providers the availability of on-site engineers was less of a barrier to their growth. OneWeb stated in its response that it was looking to increase its staff base from *'300 globally'* but offered no indicators that it would find this a challenge, while Eutelsat highlighted that *'Rural network deployment via satellite requires only a one-time installation at the customer premises, so recruitment is not a particular challenge in this respect.'*.

7.63. With only a finite pool of telecoms technicians, planners and engineers, Connecting Devon and Somerset (CDS) highlighted that they found delivering at pace a potential challenge. They also stated that the finite pool also caused tensions in delivery between '*Superfast contracts against demand-led, tactical deployments'*.

7.64. All this indicates that while recruitment may be a barrier to deployment for some suppliers, it is potentially both geographically and technology-specific.

7.65. While not the biggest challenge faced by suppliers, challenges in working with local councils were raised by suppliers. In order to help address this, BDUK continues to engage all highways authorities with Highway Authorities and Utilities Committee UK (HAUC UK) ahead of delivery phases to ensure common approaches to permitting and road closures, and sufficient advance notification of works.

Figure 7.5: There is an even split between suppliers who are facing recruitment challenges in rural network deployment and those that are not.
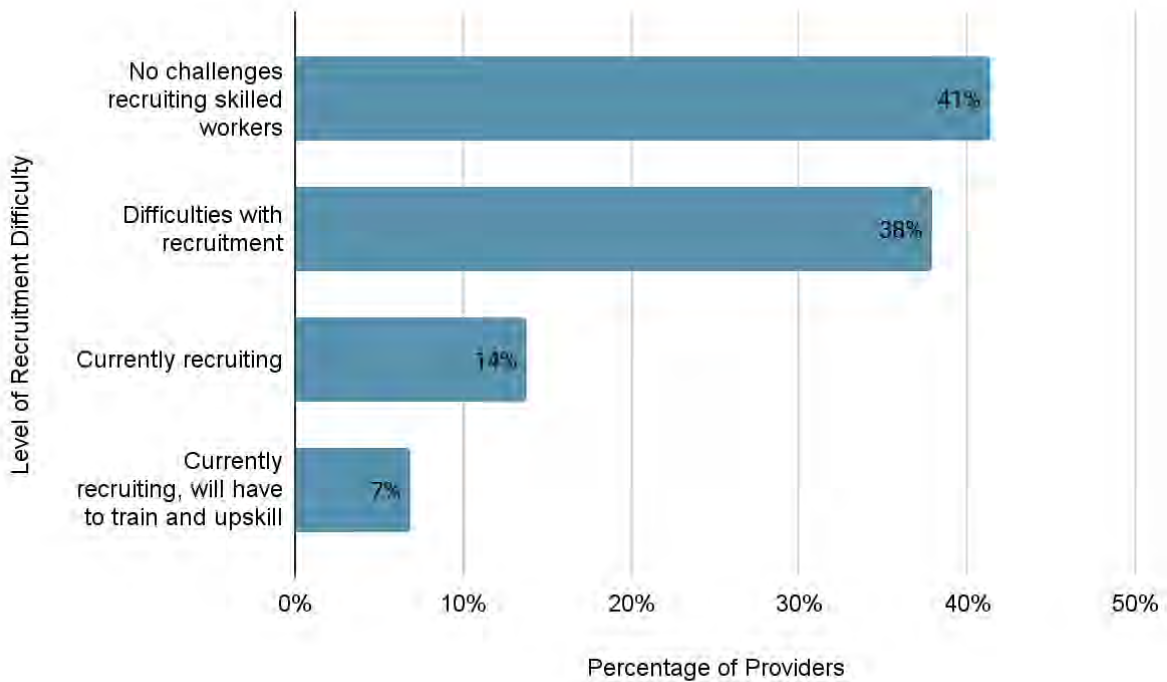
Question: How would you describe staffing and recruitment challenges to support remote/rural network deployment? N = 29

7.66.   In response to the call for evidence, some fixed infrastructure providers specifically highlighted that wayleaves and some local planning issues continued to be a regulatory and administrative burden on rollouts.

7.67.   Further to wayleaves, Fixed Wireless Access providers highlighted that the inability to obtain the necessary backhaul provision, as well as the power required to connect them, in remote and rural areas was challenging. Quickline stated that *'After salaries, backhaul is the single largest operating cost faced by Quickline. It consumes a large proportion of the revenue we get from each customer.'*. INCA, the Independent Networks Cooperative Association also highlighted that *'recent changes by Openreach to the costs for backhaul for deploying smaller rural networks have demonstrated that costs previously assumed to be fixed in the regulatory regime can be subject to commercial uncertainty.'*.

7.68.   However, Wessex Internet, another rural Fixed Wireless Access provider, noted in its response that it was the *'semi-national landowners including National Trust, the Crown Estates or the Forestry Commission'* who were often found to not be *'amenable'* when negotiating the land access required. Conversely, private landowners they said were *'often found to be amenable'*.

7.69. In addition, Wessex Internet noted that when delivering connectivity in Protected Landscapes[24], they had to consider the *'...lengthier negotiation phases that need to be undertaken. While we are rarely denied access, the processes are often lengthy adding cost and complexity to projects.'*.

7.70. Finally, delivery of power to backhaul sites was also raised as an additional barrier to improved connectivity in remote rural areas. The reason most commonly cited by respondents was due to the increased costs associated with the civil engineering required to install power supplies. Some providers such as Wessex Internet stated they had worked to overcome some of the issues by providing discounts to landowners who provided power to an active site, to help mitigate the issue.

7.71. The Broadband Stakeholder Group (BSG) indicated in its response that all terrestrial technologies would potentially be affected by both *'access to local grid power'* and the need for *'permissions from local landowners to authorise deployments'* - mirroring what other market participants stated in their responses.

7.72. However, for providers who are delivering improved connectivity via either a satellite or High Altitude Platform (HAP) system, the need for access to power and backhaul was limited, and therefore posed less of a challenge to providing connectivity in these areas. In addition, some Fixed Wireless Access providers noted that new technologies that enabled them to increase transmission distances could also significantly reduce the need for access to power.

7.73. However, it was noted by the Broadband Stakeholder Group that other potential barriers do exist for High Altitude Platform systems such as aviation regulation, spectrum approvals and potential latitude constrictions where unmanned aerial vehicle (UAV) HAPs are powered by solar.

Data collection and government schemes

7.74. The majority of suppliers told us that they used publicly available data from Ofcom's Connected Nations Reports. While this data was not specifically cited as a barrier, concerns were raised that it was only available at a postcode rather than the Unique Property (UPRN) level. To help overcome this, some suppliers told us they had commissioned a further analysis of premises data to locate underserved communities.

7.75. FTTP and FWA provider Wessex Internet highlighted that the lack of detail from Ofcom's reporting about the classification of speeds for premises between 30 Mbps and 300 Mbps caused a challenge. They stated that they,

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[24] Areas of Outstanding Natural Beauty, National Parks and Sites of Specific Scientific Interest

like others, would prefer to see the data at a UPRN level rather than postcode as there were often *'wide speed variations'* within postcodes in rural and remote areas.

7.76. By understanding this, Wessex Internet believed that challenges could be overcome and it could make it more viable to determine who is eligible for Gigabit Vouchers. In addition, Wessex Internet warned that any updates to voucher eligibility should come with a good warning from DCMS to ensure any changes to the risk-reward profile are foreseen.

7.77. Eutelsat specifically indicated that the Scottish Voucher Scheme gave them access to a pre-vetted list of eligible premises. This, they stated, allowed them to target the premises that required better connectivity more accurately.

7.78. With specific regard to UK government procurements, Eutelsat also stated in its response that there was no *'architectural separation'* between backhaul and last-mile (i.e access) which left many satellite providers unable to access government schemes as they do distinguish between the two.

Satellite and FWA providers noted that equipment costs and access to spectrum remained the biggest barriers they faced.

7.79. Satellite providers typically cited 2 primary barriers that needed to be removed: The cost of customer premises equipment, which may require a subsidy, and the need for continued or improved access to spectrum - in particular at 28GHz. Independent providers emphasised the capabilities of new wireless equipment in addition to conditions on government schemes that may limit the ability to deploy this equipment immediately.

7.80. OneWeb stated in its response that to *'maximise the provision of connectivity to [Very Hard to Reach] premises, the UK should allow licence exemption and free circulation for satellite earth stations for the whole 14.0 - 14.5GHz band'*. While satellite provider Viasat noted that *'The central challenge we face from a regulatory perspective is access to adequate spectrum—the same consideration that affects many terrestrial networks.'*

7.81. Satellite provider Eutelsat gave evidence citing that the cost of the Customer Premises Equipment (CPE) was approximately £200 per household with installation costs varying from £150 - £300. However, Eutelsat currently subsidises this, charging customers an installation fee of £49.

7.82. Eutelsat cited anecdotal evidence that in countries where satellite broadband connectivity was highest, they had found that government subsidies to alleviate some of the CPE costs had helped to increase uptake by offering a 'level playing field' amongst broadband solutions.

7.83. INCA noted that more equipment was "*becoming available in the 3.8-4.2GHz spectrum that can deliver Gigabit Capable services to significant distances (in excess of 20km from the mast).*" However, they also highlighted that equipment was "*already readily available that can deliver near gigabit services in the same environments.*" This, they stated, could potentially enable "*high-quality ultrafast services to locations currently struggling to access USO services.*"

7.84. **Figure 7.6** shows which factors providers believe would help make the case for wireless networks in rural areas. The most important factor is the availability of and differing terms for spectrum. MNOs bid for spectrum from Ofcom, spectrum being the frequency they provide their network on, and it is often viewed as a scarce resource.

7.85. The second most important factor was fibre backhaul capacity. This is a fibre connection from the cabinet to the exchange. This tends to be quite long and expensive and has been done in most cabinets across the country, but in many rural areas fibre has not been laid down yet.

Figure 7.6 The availability and terms for spectrum as well as fibre backhaul capacity are amongst the most important factors in helping make the case for wireless networks in rural areas
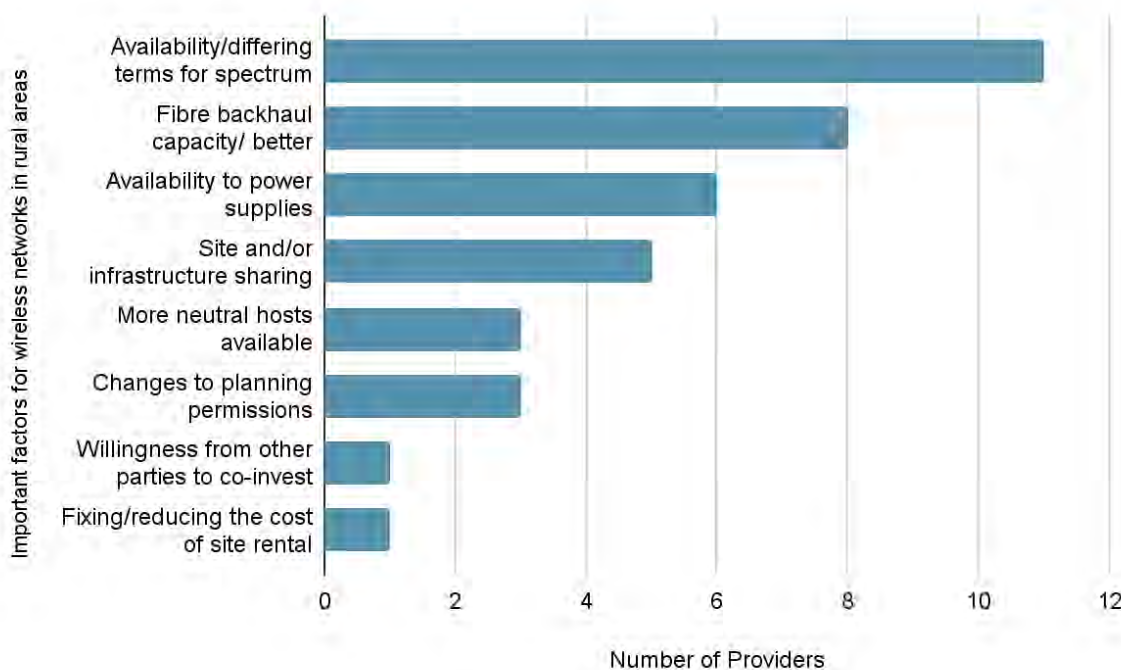
Question: As a fixed wireless ISP, which of the following do you think would help the most to make the case for wireless networks in these remote rural areas? Select up to 3: More spectrum availability/differing terms for spectrum, More fibre backhaul capacity or at better commercial terms, Availability to power supplies, Site and/or infrastructure sharing, More neutral hosts available, Changes to planning permissions, Willingness from other parties to co-invest, Fixing/reducing the cost of site rental, Other. N = 38

7.86. In addition, the Broadband Stakeholder Group indicated that while maturity for most alternative technology approaches, including Macrocell FWA, Line of Sight FWA and Geostationary (GEO) Satellites was high, there was still more to be done for Line of Sight FWA (above 300 Mbps), LEO Satellites and High Altitude Platform Systems.

8. Topic D: Approaches

The questions asked in this section can be found in Annex A.

Context

8.1. The call for evidence looked to understand evidence and examples of current approaches that suppliers are taking, both in the UK and internationally, to help illustrate the way that novel technology approaches can help improve the delivery of broadband in Very Hard to Reach Areas.

8.2. However, further evidence of these approaches is needed as often many carry substantial commercial, financial and technical risks as well as having uncertain long-term affordability outlooks.

8.3. A great deal of evidence for many of these technology systems is commercially confidential and not available to the public, especially where it relates to platforms that are still in development or which have not yet been fully commercialised.

8.4. The questions in this section were put specifically to businesses and organisations that had experience in delivering improved broadband to Very Hard to Reach areas to allow us to understand the effect of their offerings on the future market for telecommunications services in such locations.

8.5. While the call for evidence did not specifically preference one technological approach over another, before the call for evidence was launched, we were aware of evidence highlighting several approaches that may be feasible in Very Hard to Reach Areas including

- Hybrid Networks (Combining multiple access technologies)
- New Fibre Deployment Technologies
- New Wireless Technologies
- New Space-Based Platforms
- New High Altitude Platforms

8.6.   Unlike the previous 3 topics explored in this call for evidence response, *Topic D: Approaches* was specifically aimed at market participants who either delivered a broadband service or provided the necessary infrastructure. Representative organisations, including local bodies with experience of planning and managing the delivery of alternative technologies, were also welcome to respond where appropriate.

8.7.   As a result, this section follows a different format to the other topics in this response document. It has been drafted based on the technology used by each supplier or infrastructure partner rather than on overall themes.

8.8.   We received 17 long-form responses to the call for evidence, of which 8 were provided either in full or partially, in confidence. These responses have not been quoted in this response, and are not included in the list of respondents in Annex B. A further 50 suppliers responded anonymously through the call for evidence survey - we understand these to be typically, but not exclusively, smaller providers

8.9.   Due to a large number of confidential responses, the government is limited in its ability to publish a full breakdown of the responses. However, these responses were still analysed and will be taken into account in the future.

A variety of suppliers responded to the call for evidence with a range of technologies put forward as appropriate for very hard to reach premises.

8.10.   The majority of suppliers who responded to the call for evidence were delivering both FWA and mobile, both FTTC and FTTP, or solely satellite, with some supplying a combination of approaches (**Figure 8.1**).

Figure 8.1: The majority of suppliers delivered 2 different broadband technologies

Technology provided	Number of Suppliers across all ruralities
Solely FTTP	4
Solely DSL/FTTC	1
Both FTTP/FTTC	11
Hybrid Fibre Coaxial	3
Satellite	10
Solely Mobile	2
Solely FWA	8
Both FWA/Mobile	12

Question: What type of connectivity do you offer? FTTP (Fibre to the Premise), DSL/FTTC, Hybrid Fibre Coaxial, FWA, Mobile, Satellite. N = 36

8.11.   Of the 36 respondents noted in **Figure 8.1** above**,** the vast majority were both network and service providers (**Figure 8.2**). This means they both offer access to their infrastructure and sell directly to consumers and businesses.

Figure 8.2: Most respondents operated both the network and the service on that network, with few doing one or the other.

Network Providers   Service Providers

5   26   5
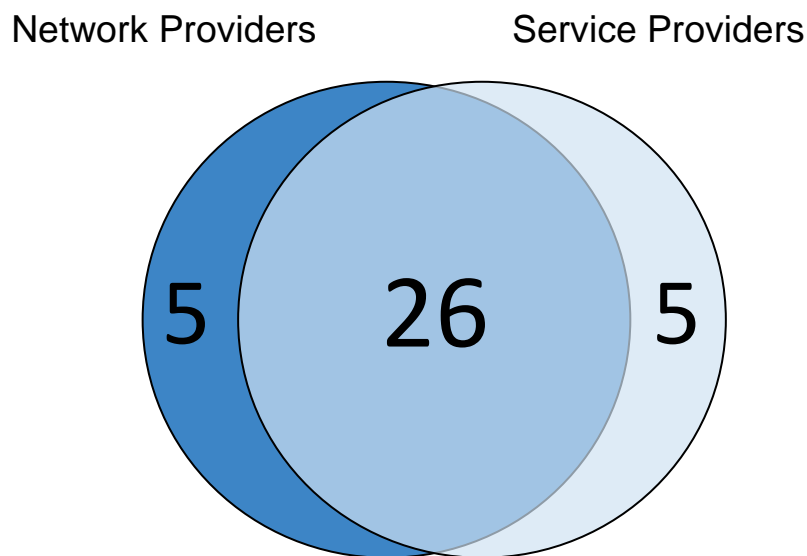
Question: What type of services do you offer? N = 36

8.12.   We also asked suppliers how many employees they currently had working at their firm. The results showed that our sample was mostly made up of small firms with less than 10 employees (20 respondents), a few medium-sized firms of between 10 - 249 employees (14 respondents) and very few large firms with over 250 employees (3 respondents).

8.13.   In its public response to the call for evidence, The Broadband Stakeholder Group mirrored the results found in **Figure 8.3** below. It noted that FTTP was able to provide the highest speeds both today and in the future, but that all other alternative technology types could deliver at least 50 Mbps today (*'current achievable speeds'*) with the potential for all of them to deliver at least 300 Mbps in the future, bar GEO satellites which were deemed to be limited to 200 Mbps.

Figure 8.3: FTTP providers are able to deliver the highest average peak speed of any technology type, while satellites are able to deliver just below 100 Mbps.

Question: What are the highest advertised download speeds that you typically offer in remote/rural areas? FTTP, DSL/FTTC, HFC, FWA, Mobile Broadband, Satellite, Other tech. N = 52

Telecommunication equipment vendors showed that there was a demand for alternative technology types in addressing Very Hard to Reach premises in the UK - although negative perceptions do persist.

8.14.   Representative organisations who responded to the Call for Evidence noted that alternative technologies such as Fixed Wireless Access, Low Earth Orbit (LEO) satellites and hybrid networks were all welcome additions to delivering broadband connectivity in remote rural areas. This was the case even where such technologies could not deliver gigabit speeds.

8.15.   This does not appear to be an issue for users in remote rural areas, with the majority of suppliers reporting that premises are willing to take a service that does not deliver gigabit speeds. (**Figure 8.4**)

Figure 8.4: Consumers' most popular download speeds were between 24 and 50 Mbps, while businesses opted for a faster connection.
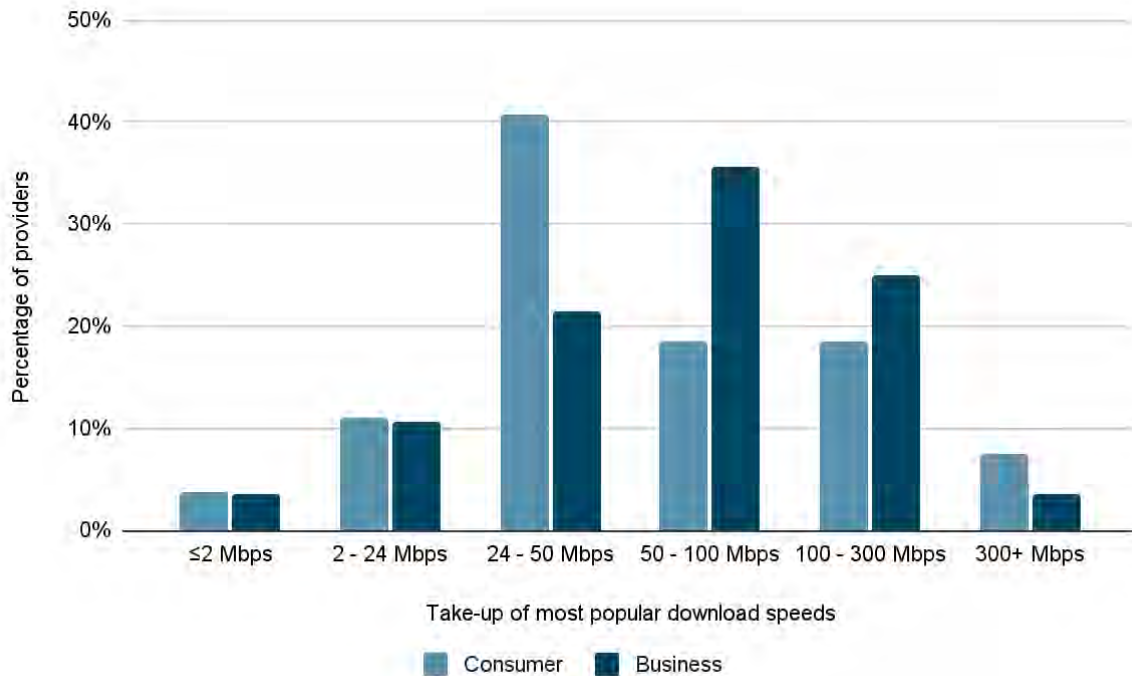
Question: What are the most popular speeds actually purchased by rural customers/businesses? N = 55

8.16.   **Figure 8.3** (above) shows the average peak speed (Mbps) in remote rural areas. This is an average of the provider's self-declared highest advertised download speed. It's noticeable that on average both satellite and fixed wireless access claim they can deliver top speeds in excess of a Superfast connection.

8.17.   Respondents indicated that experience gained internationally, from working to deliver connectivity to Very Hard to Reach premises in areas including the Middle East and Africa, could be used to help overcome challenges in delivering to Very Hard to Reach premises in the UK.

8.18.   The Broadband Stakeholder Group (BSG) carried out commercial analysis[25] which found that overall Macrocell Fixed Wireless Access was the lowest cost option for 30 Mbps speeds, while at higher speeds (300 Mbps) Line of Sight Fixed Wireless Access was the best cost option. After this point the

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[25] Broadband Stakeholder Group VHTR Response (Public Version)

BSG noted that the analysis showed LEO satellite being most effective for the final 20,000 - 30,000 premises over a 10 year time frame.

8.19.　　The final cash position per premises connected at 20 years was similar for both GEO satellites and Macrocell FWA according to BSGs commercial analysis. However, they noted that GEO satellites often have limitations around latency and download performance.

8.20.　　MLL Telecoms noted that they saw the millimeter wave wireless band as '*an important technology*' which should be adopted at a '*national level*' as had been carried out in other countries such as the USA and Italy.

8.21.　　In addition, demand for 4G and 5G routers in other countries including Australia and North America shows that there is consumer interest in these products - especially where fixed broadband cannot serve individuals connectivity needs.

8.22.　　Where respondents supplied an answer, providers found that customers had been favourable to their products. Eutelsat provided evidence from a survey showing that 90% of its customers were satisfied with their connectivity, and 60-70% of customers with poor terrestrial coverage had shown a '*high interest*' in their satellite broadband product.

8.23.　　Many of the providers already have a commercial product available for consumers with some planning further updates in the next couple of years, particularly amongst Satellite and Fixed Wireless Access providers (Eutelsat and Airspan).

8.24.　　Due to the period of time involved, many of the providers with pre-commercial products are unable to provide a firm timeline due to potential regulatory or legislative barriers that may need to be overcome.

Impediments to Wider Adoption

8.25.　　Market participants noted a range of potential impediments to the wider adoption of their specific technology with providers of novel technology solutions being more likely to raise concerns.

8.26.　　Satellite provider Eutelsat noted that previous negative perceptions about satellite solutions, that were derived from previous generations of GEO satellites, persisted. These misconceptions they believed had also subsequently '*influenced public procurement decisions relating to broadband deployment*'.

8.27.　　Yorkshire Water, who are working with partners to develop a broadband fibre in water pipes solution pilot, highlighted that to date 'UK clean water infrastructure has been excluded from the [Access to Infrastructure]

regulations'. They stated that they hope the pilot will demonstrate that these solutions are workable and commercial enabling fibre deployment in otherwise very hard to reach places.

8.28.   Finally, Airspan reiterated previous concerns made throughout their Call for Evidence response that they recommend *'Ofcom take a further look at unique spectrum sharing innovations'* as well as *'the new 6GHz AFC [automated frequency coordination] [which is] in its final development stages'*.

Satellite providers continue to rollout provision to UK consumers, with many increasing their capacity over the next 12 - 24 months.

8.29.   The majority of satellite providers noted in response that they already had services available and that they would be increasing capacity over the next 12 - 24 months. This matches with the information gathered from the call for evidence survey of suppliers which showed the majority of satellite respondents were planning on launching a new service or speeding up plans for new infrastructure in the future **(Figure 8.5).** These responses included GEO constellations as well as the new LEO constellations coming in future.

8.30.   However, as was noted by the BSG (Broadband Stakeholder Group), the nature of these solutions means that *'the number of customers that can be supported simultaneously is likely to be limited'*. The BSG also states that both the *'technology and commercial offers [for LEO satellites] are still being developed'* - this means that there will be limitations over the medium term across *'wholesale bandwidth costs, contention ratios and potential usage limitations'*.

Figure 8.5: Most providers who responded to the call for evidence survey were planning on launching a new service in the future.
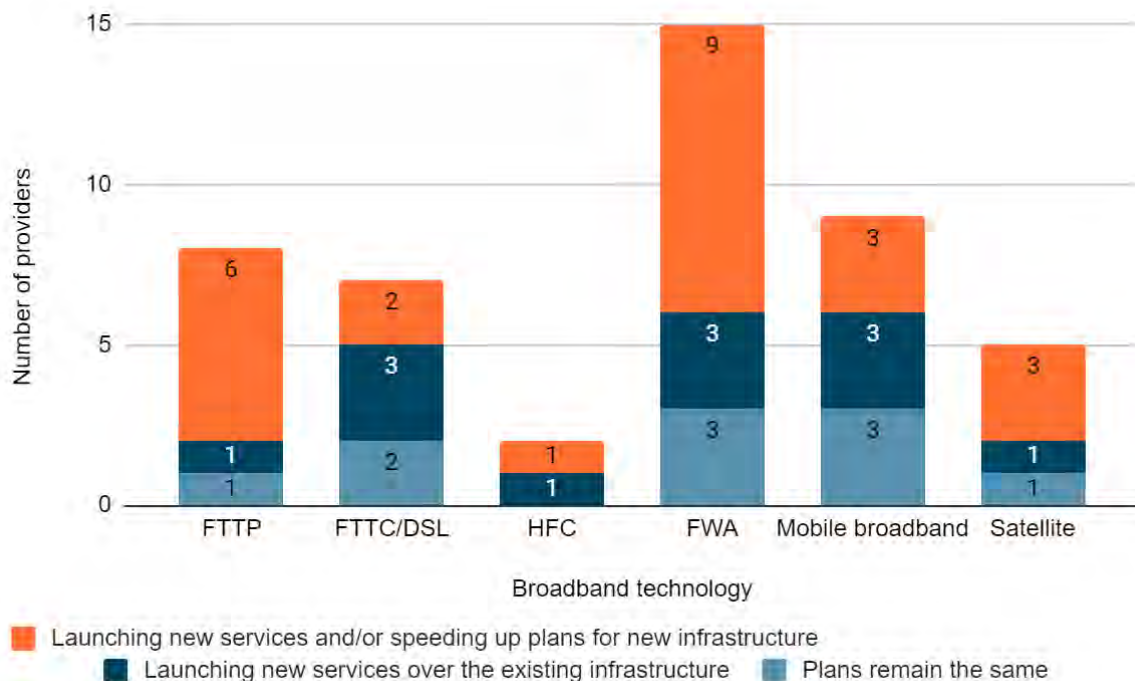
Question: Have these latest consumption patterns altered your plans for launching new services? N = 17

8.31. While many respondents were reluctant to disclose the full details of their platform's capacity, satellite providers noted relatively high download speeds (100 Mbps) and low latency could be achieved in some cases with no volume caps being applied - although it was not clear if these were available continuously.

8.32. Most satellite providers already have a commercial service available, with OneWeb, who currently do not have a commercial service available in the UK, due to launch this year. Viasat highlighted that they would be delivering further payloads in the latter part of 2022.

8.33. Amongst space-based systems and High Altitude Platform companies that responded, all indicated that they had a high level of resilience to unforeseen technical or security issues.

8.34. Eutelsat highlighted that, should it be necessary due to maintenance or an unforeseen incident, they had the ability to count on backup gateways at short notice so that there was minimal impact upon customers.

Market participants were encouraged that new technologies and physical infrastructure access (PIA) products could reduce capital costs - which could be combined with technologies requiring limited future intervention to ensure reliability and a positive user experience further reducing operational costs.

8.35.   Satellite provider Eutelsat highlighted that once a connection has been made and the user terminal is properly set up to a power source they have '*no reason to require further intervention*' with the customer.

8.36.   Openreach also believed that Fibre to the Premises (FTTP) has a comparatively low maintenance cost thus reducing overall operating costs compared to some other technologies. In its response to the call for evidence they stated that '*once we have made our initial deployment, the fibre is unlikely to require regular maintenance.*'

8.37.   Market participants also believed that new fibre deployment technologies would help to change the capital cost per metre distance when deploying new technologies.

8.38.   Quickline stated that '*Poles represent the most important deployment advance for rural areas so the use of PIA becomes more feasible.*' Although they did note in addition that '*direct buried cable remains common in rural areas, so PIA isn't expected to provide a complete solution.*'

8.39.   MLL Telecoms, a Fixed Wireless Access provider, stated that the installation of FWA requires '*less construction with civil infrastructure and laying fibre. So deploying FWA can be more cost effective than FTTP*'. It went on to state that reports by Deloitte had shown that '*FWA can reduce the cost of last mile connectivity by 40% compared to FTTP*'.

8.40.   Openreach highlights that '*pre-connectorised componentry and new civil engineering techniques*' could also have an impact on deployment costs. Although they went on to state that '*These alternative engineering techniques are often are* [sic] *heavily dependent on the terrain and geography where we are attempting to build networks.*' Particularly relevant factors listed included the width and gradient of the verge which can often only be assessed during the survey process.

8.41.   Huawei indicated that it had several technologies that would simplify optical fibre deployment. These included:

- Pre-connectorised fibre
- Uneven splitting technology to reduce the use of optical cable and improve engineering efficiency
- Innovative design to simplify the fibre management in fibre terminal box

8.42.   However, Openreach was sceptical as to whether these new innovations could bring down the cost of deployment '*sufficiently to enable premises in this cohort to become substantially more commercially viable.*'

Respondents note that there are a number of different ways to deliver improved connectivity but that inexperience of providers in identifying rural challenges can be a detriment.

8.43. Connecting Devon and Somerset (CDS) highlighted that within their region several providers had indicated to them that they lacked the experience of delivering in rural areas with their designs primarily informed by their urban experience.

8.44. CDS stated that rural areas are *'much more prone to additional costs around tree cutting, collapsed or silted ducts, road closures, D-poles or inaccurate PIA records'*. This, they state, has the potential to impact value for money estimations and overall cost.

8.45. When looking at the need for future technologies to be deployed in rural areas, techUK highlighted that LEO constellations providing Fixed Satellite Services (FSS) *'will be an important part of ensuring the UK can meet future, greater demand for satellite broadband services'*. This coverage will also enable better backhaul support for 4G and 5G services in Very Hard to Reach Areas.

8.46. The Ofcom Advisory Committee for Scotland also raised ORAN (Open Virtualised Radio Access Networks) as a future technology solution. However, they highlighted that fibre availability in the UK may hamper its adoption if fronthaul, midhaul and backhaul cannot be delivered.

8.47. Companies responded by highlighting that where they deploy both an FTTP and FWA product the delivery strategy doesn't often differentiate between general rural provision and network planning.

8.48. This was also the case for space-based system providers, with no differences between Very Hard to Reach and general rural premises. However, for solely FWA providers the number and density of premises can play a significant role in the delivery strategy for remote-rural premises.

8.49. Quickline highlighted this by stating *'a rural deployment must include technology strategies for delivering to significant numbers of premises but with low density, it must also include approaches to deliver backhaul to small remote communities and to serve isolated premises'*.

8.50. Fixed Wireless Access providers noted the use of the 3.8GHz - 4.2GHz spectrum for deploying 5G FWA to communities while others stressed the importance of OpenRAN to allow customers and network operators to have a choice of vendors for both equipment and service provision.

8.51. Openreach in its response referenced the National Infrastructure Commission which it states has previously identified that FTTP offered the best and most future-proofed solution to general deployment.

8.52. When asked what particular technologies were most important to its delivery in remote rural locations, Openreach stated that *'As part of our Fibre First strategy, we are focussed on FTTP delivery.'*

8.53. However, Fixed Wireless Access providers stated that they believed gigabit connectivity was not necessary for premises in Very Hard to Reach areas and that speeds closer to 100 to 200 Mbps would more than likely suit their current requirements. This concurs with the information gathered as part of the call for evidence survey **(Figures 8.4 and 5.2)**

8.54. The introduction of 5G FWA services at 3.8 - 4.2GHz was raised by respondents as one way that would significantly increase the availability of gigabit-capable services in rural areas. Broadway Partners raised the idea of an expansion of a *'fibre tax'* increment financing scheme or a charge to public bodies to incentivise them to enable the infrastructure.

8.55. Huawei indicated that for Very Hard to Reach Premises one of the key challenges was high operation and maintenance costs. An Optical Time Domain Reflectometer (OTDR) solution was one way they proposed to help improve the network condition diagnosis, operation and maintenance in a cost-effective way.

8.56. Respondents noted site and backhaul availability as challenges that needed to be overcome. In addition, the supply of power was also a key barrier.

8.57. As a satellite provider, Oneweb highlighted the importance of having access to the 14.25-15.5GHz and 28GHz bands as well as ensuring Ofcom enforced the global orbit/spectrum international regulatory framework set out by the International Telecommunication Union (ITU) preventing interference issues with other Non-Geo-Stationary Orbit systems.

9. Government Response

9.1.   Based on the evidence that was gathered during the call for evidence, the government will set out a series of policy proposals that will be forthcoming later this year setting out how it intends to address connectivity challenges to these premises.

9.2.   However, during the evidence gathering process, a number of issues were raised that while not directly applicable to the terms of the call for evidence, do affect rural and remote premises.

9.3.   Therefore the government has set out its response to these issues, wherever possible highlighting alternative government programmes that are available which can offer a more immediate solution.

Why are you not addressing premises that are expensive to connect but are not geographically Very Hard to Reach?

9.4.   As stated in the original call for evidence, some premises may not be geographically Very Hard to Reach but may present a potentially high cost to upgrade or service if there is a lack of economies of scale. This could be due to network deployment strategies or the availability of legacy services.

9.5.   These premises may also appear when;

   a. A new single premises is created in an area that has previously been upgraded meaning that the premises itself faces the entire cost of any works required; or

   b. A new development of premises is built with a new rollout or technology but a small number of nearby premises are not connected at the time. This may make them less economical in the future.

9.6.   However, although the government recognises that these premises do exist a number of policies have already been put in place to help either infill existing rollout gaps or ensure that such premises are able to access improved connectivity when built.

9.7.   To address issues with connectivity in new homes, we are currently consulting on amendments to the Building Regulations 2010 designed to ensure that new-build homes in England are built with gigabit-ready infrastructure and gigabit-capable connectivity. This legislation will build on the commitments that the government has already secured from network operators to work with housing developers to provide gigabit-capable connectivity to new build developments. The consultation will close on 28 February.

9.8.	Building regulations are a devolved matter, so the legislative amendments to the Building Regulations 2010 will apply to England only. However, the provision of gigabit-capable connections to new homes is a priority for the government across the whole of the UK. We are therefore working with the devolved administrations to ensure this policy is implemented across the UK.

9.9.	Many telecommunication companies are also already delivering connectivity to many of these premises, either through commercial deployments, as part of UK government-supported interventions or through a community broadband scheme.

9.10.	As such we believe that these premises will be delivered through another route and do not face many of the other challenges that have been discussed throughout this call for evidence, therefore are unlikely to be Very Hard to Reach.

Why are urban premises not eligible for the government's Gigabit Voucher Scheme?

9.11.	The voucher scheme is designed to target government subsidies towards those living and working in the hard to reach, commercially unavailable, areas of the country. Urban areas are typically commercially viable and often have 4G and sometimes 5G availability.

9.12.	The Gigabit Broadband Voucher scheme ensures that those communities and businesses in rural areas not in line for commercial rollout and those that do not want to wait for Project Gigabit procurements, can get more immediate help with the costs of installing a gigabit-capable connection.

9.13.	The government has recognised that not all areas of the country, particularly those in the most rural and remote areas, are likely to benefit from network competition and receive gigabit-capable broadband through private investment alone, which is why we are investing £5 billion to support deployment in these areas. The use of this funding will encourage a variety of rural broadband providers to deploy gigabit networks.

When will the government address the USO speed threshold so it is more applicable to modern broadband needs?

9.14.	The broadband Universal Service Obligation was introduced in March 2020, following a consultation[26] in 2016, in addition to further analysis that was carried out by Ofcom to inform the design of the broadband USO.

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[26] A New Broadband Universal Service Obligation Consultation

9.15.   Following consideration of Ofcom's technical advice to the government[27], it was determined that the minimum download speed of a connection provided under the USO should be 10 Mbps, with additional quality criteria added to ensure that the connection gave users a good experience.

9.16.   10 Mbps was believed to balance a household's typical needs with a proportionate approach that took into account the costs to industry and the potential impacts on a competitive market. The specification allows for access to common web-based services including emails, web browsing and HD video streaming across multiple users.

9.17.   BT has already built USO connections that cover over 3,700 homes and are in the process of building over 2,500 more. The overwhelming majority of these connections have been delivered using Fibre to the Premises and therefore deliver speeds well above 10 Mbps. KCOM has already substantially upgraded its network to full-fibre broadband and has consequently not needed to make connections under the USO in Kingston-upon-Hull, where it operates.

9.18.   However, the government recognises that the broadband Universal Service Obligation may need to be updated in the future. As a result, it ensured there was a review mechanism within the Communications Act 2003 once 75% of premises in the United Kingdom take up a Superfast broadband service of at least 30 Mbps. Ofcom reported in Connected Nations 2021 that the take up of Superfast broadband was 69%[28].

Will the government increase the cost threshold for the broadband Universal Service Obligation?

9.19.   The broadband Universal Service Obligation remains an important tool in getting gigabit-capable broadband to the hardest to reach communities. We received responses to the call for evidence from several respondents calling for the broadband USO cost threshold to be raised.

9.20.   However, when setting both the cost threshold for the broadband USO, the government has to ensure that costs for both industry and consumers are proportionate. When consulting on the broadband USO the government was clear that not all premises would fall below the reasonable cost threshold. Indeed such premises are likely to cost far more than the cost threshold and therefore potentially be categorised as Very Hard to Reach.

9.21.   In addition, the Government expects that recent amendments to the way that the Universal Service Providers calculate excess costs will mean that

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[27] Achieving decent broadband for everyone - Technical advice to UK Government on broadband universal service

[28] Connected Nations 2021

more consumers can benefit and have a clearer idea of the costs associated with their specific premises.

Will the Gigabit Broadband Voucher Scheme's voucher limits be raised to make it easier for Very Hard to Reach premises to access an improved broadband connection?

9.22. The government's Gigabit Broadband Voucher Scheme remains an important tool in getting gigabit-capable broadband to communities - especially as the wider Project Gigabit rollout begins.

9.23. We received responses to the call for evidence from several respondents across market participants and representative organisations that noted more premises could be served if the voucher limits were increased.

9.24. Currently, premises in 14 English Council areas, as well as Scotland and Wales, can access 'top-up' funding totalling nearly £26m. Each local authority or devolved administration is responsible for providing the 'top-up' funding at a level that they deem appropriate for their area. This is in addition to the initial £210m available through the voucher scheme already.

9.25. At the current values, the ability for households and businesses to club together to increase the total subsidy of a project has typically enabled communities to cover most or all of the costs for installation, after supplier contributions. However, all products including vouchers are reviewed every 6 months. At this juncture, BDUK evaluates performance, identifies potential opportunities for improvement, and makes adjustments where necessary with DCMS approval.

Will the government change their procurement schemes so that satellite providers are able to bid to connect premises that would otherwise not be connected by a gigabit-capable provider?

9.26. The government's approach to the BDUK Project Gigabit procurements as well the Gigabit Broadband Voucher Scheme is technology agnostic. Therefore satellite providers are more than welcome to bid for funding.

9.27. However, at present satellite broadband is unable to meet the technical specifications for funding under either BDUK Project Gigabit procurements or the Gigabit Broadband Voucher Scheme and therefore is not currently able to bid for BDUK funding under these schemes.

9.28. As the government looks at potential solutions to address Very Hard to Reach Premises we will continue to evaluate evolving alternative connectivity solutions noted in the call for evidence including satellite, Fixed Wireless Access and High Altitude Platform systems. This includes the evaluation of their offered performance, capacity and readiness for service.

Will the government increase spectrum availability in order to address challenges for Fixed Wireless Access and satellite providers?

9.29. Ofcom is the independent regulator responsible for managing spectrum in the UK. DCMS continues to work with Ofcom and other stakeholders to ensure spectrum access is supporting our connectivity ambitions.

9.30. On satellite applications, several frequency bands are available for such services. In December 2021 Ofcom issued a Statement, following a public consultation earlier in the year, on its plans to update its Non-Geostationary Satellites (NGSO) licencing framework, to best enable multiple NGSO satellite operators to provide services in the UK; within the constraints of minimising interference between such systems and within the International Telecommunications Union framework as well as to explore the limitations for this.

9.31. A variety of spectrum bands are also available for FWA technologies. In 2019, Ofcom introduced a new framework for shared, localised access to spectrum to support innovation. This framework, which provides local access to spectrum in a number of bands including the 3.8-4.2GHz, as well as local access to unused nationally licensed mobile spectrum, is applicable for FWA applications.

Topic A Questions

Consumers

A1 For basic data to analyse responses (such as household size, etc)

A2 What types of devices and services do the residents in your premises use?

A3 What broadband services do you use today, and how much do they cost?

A4 What are the current speeds that you receive, and are they what was advertised?

A5 How reliable is your current service and how satisfied are you?

A6 What broadband download speed do you think you currently require?

A7 How much would you value an improved connection speed?

A8 To what extent do you have access to and use mobile data alternatives to fixed broadband services?

A9 How has the COVID-19 pandemic affected your needs for broadband/digital connectivity?

Businesses

A10 Basic data to analyse responses (such as size and type/sector of the business)

A11 Which online applications are essential to the operation of your business?

A12 What broadband services does the business use today? (and for agricultural businesses, further details of their service provision across the farm, etc)

A13 How satisfied are you with your current broadband service?

A14 How reliable is your current service and how satisfied are you?

A15 What broadband product parameters do you think you currently require?

A16 How has the COVID-19 pandemic affected your business needs for broadband/digital connectivity?

Market Participants

A17 Which services and solutions do you offer to customers in rural, remote areas?

A18 How would you describe the awareness of customers (in rural, remote areas) of the connectivity services that you offer?

A19 What product uptake, speed choices, and usage levels do you experience from customers in remote rural areas?

A20 How has the most popular speed choice changed compared to 3 years ago?

A21 Do you supply premises level coverage data to Ofcom for the Connected Nations coverage/performance reporting?

A22 What do you project customer data consumption growth to be in these areas?

A23 How has the COVID-19 pandemic affected consumption patterns and has this changed your plans for launching new services?

A24 When planning your network expansions, how do you consider the varying needs of customers across different premises/premises types?

A25 How current and detailed would you say the data on which you can plan your investment decisions is?

A26 Do you offer a community-based partnership or allow mechanisms for consumers to group together to register interest when expanding your networks? If so, what has been your experience with this?

A27 Do you already utilise UK government funding? (and related details)

A28 Do you offer discounts to install/service costs based on customer or community labour or asset contributions to remote rural projects? (Examples: Self dig, site provision, site power). If so, how has the customer response been?

Topic B Questions

Consumers

B1 How would access to improved broadband benefit you in particular?

B2 Have you ever used or been offered a virtual health service, such as an online GP session?

      a. How would you rate this service based on your experience?

B3 Has your household made use of tele/virtual education?

      a. How has your virtual education experience compared before and after March 2020 (the beginning of the first COVID-19 national lockdown)?

B4 Do you have access to the following services (regardless of whether your premises has made use of them):

      a. Online libraries?
      b. Online medical appointments?
      c. Online learning?
      d. Online banking?

B5 How do you think better broadband would affect:

      a. Your ability to keep in touch with friends and family?
      b. Your access to online entertainment (e.g. films and TV streaming)?
      c. Your access to support services?
      d. Your ability to work at home?

B6 How do you think having access to these services would affect your wellbeing and welfare?

Businesses

B7 How would access to improved broadband benefit you in particular?

B8 Which online applications are important to the operation of your business?

B9 Which of the following does your business have access to and makes use of?

      a. Online accounting
      b. Online orders
      c. Online conferencing
      d. Online banking

B10 Does your internet connection enable or inhibit:

   a. Remote working?
   b. Customer or supplier access?
   c. Business efficiency or cost savings?
   d. Cloud data storage and security?
   e. Business flexibility?
   f. Access to new markets?
   g. Profitability?
   h. Product or service range?
   i. Access to training?
   j. Staffing and recruitment?

B11 Has digital connectivity enabled your business to enter different markets or sectors in addition to your original business activities?

Market Participants

B12 Have you made any assessment of the economic or social benefits of the provision of your services to remote rural customers?

B13 If barriers were removed, how would you rate the improvement in:

   a. Capital cost requirements?
   b. Operating expenditures?
   c. Administrative burdens?
   d. The overall business case for investment?

Topic C Questions

Consumers

C1 If you do not use a home broadband service, why not?

C2 Have you had to change your use of applications or browsing behaviour as a result of limitations of your broadband service?

C3 Have you changed package, supplier, or technology as a result of constraints with your broadband service in this remote location?

C4 If you changed technology to improve broadband, which technology did you change from and to?

C5 Have you explored the use of fixed wireless services in your area?

C6 Have you explored the use of satellite services for broadband?

C7 Where relevant:

   a. Explored new broadband services that are expected to arrive in your area
   b. Explored a community broadband scheme (such as a Community Fibre Partnership)
   c. Applied for a broadband connectivity voucher (from either the UK government, your local authority or a devolved government scheme?)
   d. Have you been advised (in writing or otherwise) that you are potentially eligible to request an improved connection through the Broadband Universal Service obligation (provided by BT, or KCOM (in Kingston upon Hull only))?

Businesses

C8 Have you experienced any of the following constraints in adopting digital connectivity for your firm, beyond any connectivity challenges:

   a. Finding external digital support
   b. Accessing appropriate digital training
   c. Recruiting people with digital skills
   d. Existing workforce lacks digital skills
   e. Other

C9 Have you changed package, supplier, or technology as a result of constraints with your broadband service in this remote location?

C10 If you changed technology to improve broadband, which technology did you change from and to?

C11 Have you explored the use of fixed wireless services in your area?

C12 Have you explored the use of satellite services for broadband?

C13 Where relevant:

   a. Explored new broadband services that are expected to arrive in your area
   b. Explored a community broadband scheme (such as a Community Fibre Partnership)
   c. Applied for a broadband connectivity voucher (from either the UK government, your local authority or a devolved government scheme?)
   d. Have you been advised (in writing or otherwise) that you are potentially eligible to request an improved connection through the Broadband Universal Service obligation (provided by BT, or KCOM (in Kingston upon Hull only))?

Market Participants

C14 What factors make it challenging to invest in remote rural areas?

C15 How do you consider 'Protected Landscapes' (for example, National Parks, AONB) when making your investment decisions?

C16 How would you describe the disposition of your investors towards investments in remote rural areas?

C17 What do you think the willingness to pay for services in remote rural areas is in comparison to more urban areas?

C18 How much higher or lower do you estimate the average capital costs to be in remote rural areas in comparison to more urban areas?

C19 How much higher or lower do you estimate the average operational costs to be in remote rural areas in comparison to more urban areas?

C20 How would you describe your level of access to information on where underserved premises in remote rural areas of the UK are located?

C21 How would you describe staffing and recruitment challenges to support remote rural network deployment?

C22 Are there other regulatory or administrative barriers to you expanding your offering/presence in remote rural areas?

C23 To what extent is the availability (or otherwise) of competitive provision of backhaul services generally an impediment to your deployment of otherwise economic solutions to Very Hard to Reach premises in remote rural locations?

C24 To what extent are any absent submarine cable (or microwave) links to islands an impediment to your deployment of otherwise affordable solutions to Very Hard to Reach premises located off the UK mainland?

C25 To what extent is the availability (or otherwise) of appropriate access to power supplies services generally an impediment to your deployment of otherwise economic solutions to Very Hard to Reach premises in remote rural locations?

C26 Previous and upcoming legislative changes notwithstanding, to what extent is the availability (or otherwise) is access to potential site locations an impediment to your deployment of otherwise economic solutions to Very Hard to Reach premises in remote rural locations?

C27 Is your organisation registered as a supplier as part of the following schemes and procurements?

     a. Superfast Broadband scheme
     b. Gigabit Voucher Scheme
     c. Public Sector Hub upgrades & Gigabit-Capable Connectivity DPS
     d. Market engagement for upcoming UK Gigabit Programme Gigabit Procurements
     e. Other

Topic D Questions

Market Participants who are **Telecommunications Equipment Vendors**

D1 Which existing products in your portfolio do you consider to have particular relevance to delivery of improved broadband connections to premises in Very Hard to Reach areas (either due to extreme rurality and/or low premises density)?

D2 What is the operator/customer response to these products today in the UK?

D3 Which elements of your future product/product development roadmap are most relevant to the challenge of delivering to these premises?

D4 To what timescales do you anticipate any new products or solutions that you can disclose becoming commercially available in the UK market?

D5 Do you see more substantive demand for these products in other countries, and why do you believe this to be the case, compared to the UK market?

D6 What do you believe are the impediments to a wider adoption of these technologies?

D7 Are the resources required to deploy these technologies in the Very Hard to Reach areas of the UK available today? (For example, industry capacity, industry skills, supply chain capacity, spectrum requirements, etc)

D8 Do you develop or manufacture substantial parts of these solutions in the UK?

D9 Are there any substantial issues relating to the importation, certification or approval of these technologies that may otherwise slow the adoption of these technologies?

Market Participants, who are **Owners and Operators of Non-terrestrial Infrastructure**

D10 Details of the portfolio of services that they currently have available in the market, and how they expect these services to develop over the next five years.

D11 Details of the capabilities of their platform and system performance, including user experience, delivered throughput, reliability, latency and system capacity.

D12 Details of the timing of availability of the services, in context of broadband service delivery in the UK market, and in particular to Very Hard to Reach locations.

D13 Details of their route to market delivery and product retail relationships

D14 Details relating to the marketing of their products to consumers, including their approach to explaining to consumers the geographic availability and the performance (and any limitations of their systems)

D15 Details of the current and potentially anticipated future pricing structures and levels for their product portfolio, and payment processing mechanisms

D16 Details relating to their resilience, security and locations of infrastructure

Market Participants, who are **Infrastructure Providers or Retailers** of telecommunication services:

D17 How does your technology delivery strategy for remote rural and Very Hard to Reach premises differ from general rural provision and network planning?

D18 Which current technologies are most important to your delivery to remote rural locations and why?

D19 Which future technologies are you considering deploying in remote rural communities and why?

D20 How do you think the services supported by these technologies compare to the current and future requirements of consumers and businesses located in these areas (where you have evidence of their needs)? To what extent do you think that they will meet, or exceed these needs and why?

D21 Given the spatial distribution of assets and equipment in serving such remote communities, how do you ensure that these technologies are deployed and maintained in a manner that ensures reliability, availability and quality of service and user experience?

D22 How have new fibre deployment technologies changed the effective capital cost per metre distance for the deployment of gigabit-capable fibre based networks in remote rural areas? How does this compare to published reference data on the typical cost of network construction?

D23 How do you anticipate newly available wireless technologies will change the potential cost of your approach to remote rural areas, and why?

D24 How do you anticipate newly available non-terrestrial technologies will change the potential cost of your approach to remote rural areas, and why?

D25 Which technologies do you think will have a further impact on such costs, by when and to what degree?

D26 Besides availability of equipment supply, is there anything impeding you from incorporating these technologies into your solution for remote rural premises today? E.g. availability and cost of wholesale or open access fibre backhaul (if you have not addressed this in questions C22-C25 on 'barriers').

D27 For infrastructure providers, does the potential use of these technologies impact the availability of wholesale propositions/products or influence choices available to consumers?

List of Respondents

The following is a list of the market participants, local authorities and representative bodies who provided a response to the call for evidence:

- Aberdeen City
- Aberdeenshire
- ACNI
- Agricultural Productivity Task Force
- Airspan (Confi)
- Allendale Parish Council, Northumberland
- Allerdale
- Amber Valley
- Angus
- Ashford
- Association of Show and Agricultural Organisations
- Atlas Tower Group (Confi)
- Barnsley
- Beguildy Community Council
- Bepton Parish Council
- Blackburn & District Outdoor Pursuits Centre Trust
- Bothel Village Hall
- Braintree
- Breckland
- Brent
- British Holiday & Home Parks Association
- Broadband Stakeholder Group (BSG)
- Broadland
- Broadway Partners
- Bromley
- Broxtowe
- BT (Confi)
- Cairngorms National Park Authority
- Caithness Chamber of Commerce
- Campaign for National Parks
- Carlisle
- Carmarthenshire
- Catterall Parish Council
- Causeway Coast and Glens
- Central Bedfordshire
- Ceredigion
- Charnwood
- Cheshire East
- Cheshire West and Chester
- Chesil Bank Parish Council
- Chesterfield
- Chichester
- Christleton Parish Council
- Church of England Parish
- Citizens Advice in Dorset
- CL Owners Group
- CLA
- CNI
- Communications Consumer Panel
- Connecting Devon and Somerset
- Connexus Homes
- Cornwall Council
- Cotswold
- Countryside Alliance
- County Durham
- Coventry
- Cumbria County Council
- Cutcombe Parish Council, Somerset
- Cwmdu and District Community Council

- Derbyshire Dales
- Dewsbury Elim Pentecostal Church
- DfE Telecoms
- Digital Derbyshire (Derbyshire County Council)
- Dorset Council
- Dorset LEP
- Dover
- Drumlough and Ballygorian Rural Development Association
- Dudley
- Dutton Parish Council
- East Riding of Yorkshire
- Elsworth Community Shop
- English Sub-National Transport Bodies
- Eutelsat
- Expia Ltd
- Farmers' Union of Wales (FUW)
- Federation of Small Businesses
- Fermanagh and Omagh
- Fife
- Finsthwaite and Lakeside Village Hall
- Fleet Parish
- Folkestone and Hythe
- Frome Valley Parish Council
- Gestingthorpe Parish Council
- Guestling C of E Church Church Lane, Guestling
- Gwynedd
- Hambleton
- Hardwick Hall, National Trust
- Harrogate
- Hawksworth Parish Meeting
- Headway Arts
- Heart of the South West Local Enterprise Partnership
- Hertford Heath Parish Council
- HEY LEP
- Highlands and Islands Enterprise
- Hill and Moor Parish Council
- Historic Houses
- Holwell Parish Council
- Huawei
- INCA (The Independent Networks Cooperative Association)
- Inverness Chamber of Commerce
- Isle of Wight AONB Partnership
- JISC
- Kent County Council
- Ketton Parish Council
- Kirklees
- Kirklington Parish Council
- Lancaster University Management School
- Langford & Ulting Parish Council
- LEADER Local Action Group - Forth Valley & Lomond
- Lincoln
- Lisburn and Castlereagh
- Lissummon Community Association, Armagh
- Littlebourne Parish Council
- Llangammarch Community Council
- Luton
- MANY (Mobile Access North Yorkshire)
- Melverley Parish Council
- Milton Keynes Council
- Mungrisdale Broadband Group
- NALC
- Nantglyn Broadband (Committee of Community Council)
- National Federation of Women's Institutes - Wales
- National Parks
- Network Rail (Confi)
- New Forest
- Newbiggin Village Hall
- Newcastle-under-Lyme

- Newstead Community Centre
- NFU
- NFU Scotland
- NMVC (Northampton Male Voice Choir)
- North Muskham Parish Council
- Northern Ireland Dept for Economy
- Northumberland County Council
- Nottinghamshire County Council
- Ofcom Advisory Committee for Scotland
- Ofcom Advisory Committee for Wales
- OneWeb
- Ordnance Survey
- Oulston Parish Council
- Oxford
- Papplewick Parish Council
- Perth and Kinross
- Plunkett Foundation
- Portsmouth
- Pupils 2 Parliament
- Quantock Hills Area of Outstanding Natural Beauty
- Quickline
- Reading
- Redditch
- Reigate and Banstead
- Ribble Valley
- Rowton Parish Council
- Rural Service Network
- Ruskin Mill Trust
- Rutland
- Saxondale Parish Meeting
- Scottish Government
- Scottish Land and Estates
- Scottish Rural Action
- Selmeston Church, East Sussex
- Sevenoaks
- Shetland Islands
- Shropshire Council
- Solihull
- Somerset West and Taunton
- South Hams District Council
- South Norfolk
- South of Scotland Enterprise
- St Mary's Church, Denbury, Devon
- Stratford-on-Avon
- Stratospheric Platforms Limited (SPL) (Confi)
- Suffolk County Council
- Surrey County Council
- Surrey Heath
- techUK
- The Community of Aberedw in the County of Powys
- The Friends of Teversal
- The Highlanders Museum Limited
- Thornbury Parish Council
- Tidbury Triangle Community Interest Company
- Tiree Broadband – Tiree Community Development Trust
- Tourism Northern Ireland
- Trallong, Penpont & Llanfihangel Nant Bran Community Council
- Ullenhall Parish Council
- Upton Parish Council
- Viasat
- Vodafone (Confi)
- Warwick
- Welsh Government
- Wessex Internet
- West Devon Borough Council
- West Farleigh Parish Council
- West Lancashire
- West Sussex County Council
- Which?
- Wyre
- Yorkshire Water
- Yscir Community Council