FarrPoint

DEPARTMENT OF SCIENCE, INNOVATION AND TECHNOLOGY

Mobile Supplier Additionality Research

September 2025

Contents

Executive Summary

The Department of Science, Innovation and Technology (DSIT) commissioned this study to investigate the relationship between the number of available mobile networks in a location and the resulting benefits of mobile connectivity. There are currently four mobile networks operators (MNOs) in the UK, soon to be three following the merger of two of these network operators. In the absence of any prior research or evidence, a simple model might suggest that any benefits would rise in equal increments based on the number of operators present in an area; however, this approach needed to be tested using evidence-led analysis.

The UK mobile connectivity market, driven by major operators, is highly competitive and dynamic, offering extensive 4G and an expanding 5G service. In addition to commercial investment, there has also been significant public investment aimed at enhancing 4G coverage across rural areas.

It is evident that introducing mobile coverage to a rural community will bring about significant benefits. The primary impacts are:

Economic Growth	Social Inclusion	Safety and Security	Environmental Benefits
Reliable connectivity supports businesses by enabling better communication, data sharing, and access to markets, attracts investment, supports entrepreneurship, and creates jobs.	Mobile connectivity helps bridge the digital divide, providing access to healthcare, education, and emergency services. It enhances social interactions and community engagement.	Improved mobile coverage enhances public safety by enabling better communication for emergency services and lone workers.	Mobile connectivity can support environmental monitoring and management, such as smart grids and Internet of Things (IoT) applications for resource management.

While multiple operators at a national level improve coverage, competition, innovation, and resilience, the local impact of increased network diversity in rural areas is less understood. This research assesses the additional benefits of moving from one to multiple operators at a site, and how consumers gain information about new suppliers, focusing on local rural communities rather than national impacts.

This research does not differentiate between the coverage provided by MNOs' commercial deployment or coverage delivered via public intervention programmes such as the Shared Rural Network (SRN) Instead, it concentrates exclusively on the additional value created by the presence of multiple operators. As such, this report is not an evaluation of the impact of the SRN programme, or indeed MNOs' own commercial investment, and any reference to these is coincidental merely as the delivery method for network coverage.

The key finding of the research is that most tangible benefits of improved mobile connectivity in rural communities are realised once coverage is provided by a single mobile network operator (MNO). While extending coverage to include additional operators—moving from one to two, three, or four—does offer further benefits, these are generally incremental and primarily relate to qualitative factors. These include enhanced network resilience, improved reliability during emergencies, and greater user choice.

Of course, in areas where there are a significant number of transient users, such as areas with high numbers of tourists or visitors, the benefits of having coverage from multiple operators will be greater as users are likely to subscribe to a wider range of operators than those who live and/or work within the area who naturally tend to gravitate towards the network with the perceived best coverage.

The second main finding of the research is that there are several challenges which prevent accurately quantifying any incremental impact of additional operator presence, including the lack of area-specific usage metrics by the operators. Data such as the number of connected users/devices, whether these are unique or regular connections, and performance metrics such as connection speeds or data consumed would allow a profile to be created and analysed to understand the usage of the networks within a given area. Whilst MNOs did engage as part of this research, there was little appetite to capture or produce this level of localised data, instead providing only anecdotal information. BDUK is working to make such data available; however, the absence of this actual usage data must be highlighted as a caveat to this report's findings.

The four primary issues requiring a case-by-case approach to be taken when quantifying impact are:

Awareness: A lack of communication by network operators (driven by limited commercial case for marketing local improvements) means businesses and individuals often lack awareness of mobile connectivity improvements, let alone which operators are present at any time on a mast. Without this communication, the ability of local communities to benefit from any improvements is greatly diminished.

Coverage: A new mast located close to a community does not necessarily mean all residents and premises within that community will benefit from the mast. For example, Extended Area Service (EAS) sites (upon which most of the SRN additional operator activity has taken place) are primarily designed to address small coverage gaps along roads. The MNOs told us that radio equipment deployed on these mast sites is optimised to meet the specific programme requirement of road coverage, thereby providing only incidental coverage to nearby people or premises. As such, the traffic from these sites is predominantly generated by road users rather than local residents.

Uses: There are numerous economic, social, environmental, and public sector use cases for 4G connectivity, including public sector applications such as telecare, but these typically require access to only a single network, with many able to roam between operators. As such, the presence of multiple mobile network operators may have limited additional impact on service functionality, particularly in areas where fixed connectivity and WiFi solutions are already available. Nevertheless, it is important to understand the actual local use cases of mobile connectivity in order to drive benefits.

Alternatives: The availability of alternative connectivity, whether that be fixed (broadband) connectivity (enabling WiFi calling or home working etc.), or satellite, LoRaWAN (long range wide-area internet of things network), GPS, or others, may already be available in the area and thus the incremental benefit of improved mobile connectivity may be negligible for a certain use case, let alone if there are additional operators present on the mast.

In conclusion, this research indicates that, depending on local context and conditions, a **significant majority of the potential benefits** from improved mobile connectivity can be **achieved through coverage by a single mobile network operator**.

Without detailed information on specific site characteristics and take-up data from suppliers, it is not possible to quantify this majority. While the introduction of additional operators may enable the remaining benefits to be realised, these are predominantly qualitative in nature, including enhanced network resilience, improved emergency response reliability, and increased consumer choice. Together, these benefits create a more equitable user experience with urban areas, thereby helping to reduce the urban/rural digital divide.

This has important implications for future policy decisions on the prioritisation and targeting of mobile infrastructure public investment in rural and hard-to-reach areas. As indicated, the **priority should be in providing single operator coverage to all areas** before further investing in additional operator coverage of an already covered area.

Ultimately, there is little doubt that having coverage from multiple mobile network operators across a significant portion of the UK landmass has led to a highly competitive commercial market and lower prices, and this should remain an overall long-term objective for the Government and Ofcom.

1. Introduction

1. Introduction

1.1. Background

The UK mobile connectivity market is dynamic and highly competitive, driven by the major mobile network operators (MNOs), EE, O2, Vodafone, and Three. These companies provide a range of mobile services, including voice, text, and data, with extensive 4G coverage and rapidly expanding 5G networks. The market has seen increasing demand for faster speeds, more reliable connections, and better rural coverage, prompting significant private and public investment in infrastructure. Alongside the main operators, numerous Mobile Virtual Network Operators (MVNOs) offer competitive pricing and flexible plans, increasing consumer choice.

It is widely agreed that mobile digital connectivity brings a range of economic, social, and environmental benefits to communities and businesses. In addition to MNOs' commercial investment, this has also driven substantial investment from the UK Government and devolved governments over the past decade, most recently through the Shared Rural Network (SRN) programme. Launched in March 2020, the SRN programme aims to enhance 4G mobile coverage across rural areas of the UK where the business case for commercial deployment has resulted in lower levels of coverage. Developed in collaboration with the four major mobile network operators, the programme seeks to extend reliable mobile connectivity to 95% of the UK landmass by the end of 2025. The programme combines three separate projects:

- **Partial Not Spots (PNS)** – Aimed at areas without coverage from all four mobile network operators, this part of the programme focuses on increasing consumer choice in rural areas.
- **Total Not Spots (TNS)** – This part of the programme focuses on improving coverage by providing reliable 4G access in areas where there are currently no operators available.
- **Extended Area Service (EAS)** – As part of the SRN programme, UK Government funding is being made available to the Home Office and MNOs to upgrade EAS masts being built as part of the Emergency Services Network (ESN). This will make them usable by the four MNOs to offer commercial connectivity as well as emergency services coverage.

The latest Ofcom Connected Nations report indicates that 95% of the UK now has 4G coverage from at least one MNO, and 80% of the UK's geography has coverage from all operators.[1] It should be noted however that this is based on the existing Ofcom coverage mapping methodology (-105dBm outdoor signal strength/-95dBm indoor signal strength modelled at 100m2 pixel density) and current definition of 4G (95% chance of getting a download speed of at least 2 Mbit/s) which is currently under review and is expected to be updated over the coming 12 months.

A key feature of the whole SRN programme is that it adds multiple suppliers to areas that are geographically distinct and historically underserved by mobile connectivity. At a national UK level, the presence of multiple mobile operators plays an important role in creating a dynamic competitive market and leads to:

- **Improved Coverage** – Competition between MNOs typically drives investment in better geographic and population coverage, particularly in rural or underserved areas.
- **Enhanced Competition** – Greater MNO presence fosters competition, which in turn drives down prices and encourages operators to improve service quality for consumers.
- **Innovation and Investment** – Competing MNOs often invest more in infrastructure and technology – for example, the roll out of 5G networks - which further supports the UK's digital economy.
- **Resilience and Redundancy** – A diverse MNO landscape enhances network resilience, offering alternatives during outages or disruptions.

What happens at a local level is less well understood, particularly with increasing investment in rural mast infrastructure. It is, therefore, important to understand the impact that increased network diversity has on rural communities.

1.2. Scope of research

The goal of this research is to provide evidence to assess the relative additional benefits of increasing the number of operators at a site from none to one, or from one to multiple operators, as well as to review the mechanisms by which consumers gain information on the introduction of new suppliers. This report summarises the two key phases of the research:

1) Literature Review – A full and current evidence review about the marginal benefit attributable to increasing mobile suppliers within an area. This literature review considers the available national and international evidence surrounding the topic since 2020.

2) Stakeholder Engagement – Collaborating with MNOs and local communities to validate the literature review findings and assess how changes in supplier coverage affect take-up and usage.

The final output is a report presenting findings from the two phases of research. It aims to produce accurate figures for the relative additional local benefit of introducing one, two, three, or all four suppliers to an area. The report clearly distinguishes the benefit of introducing one supplier (i.e., the introduction of a 4G service to a Total Not Spot) from the introduction of each additional supplier.

The primary focus of the research is to improve the understanding of supplier uplift and consumer market knowledge and continue to build the evidence base around mobile benefits. This research focusses on demonstrating the benefits of improved mobile coverage by operators to local rural communities, rather than national aggregate impacts.

In the longer term, this research commission helps address several recommendations related to the SRN programme, including improving, reviewing, and updating evidence of the expected benefits. It will also support decision-making for any future mobile connectivity programmes.

2. Literature Review

2. Literature Review

2.1. Benefits of improved 4G mobile connectivity

It is widely agreed that reliable mobile connectivity unlocks numerous benefits by supporting a variety of technological applications. Figure 1 sets out some of the key uses of 4G mobile connectivity.

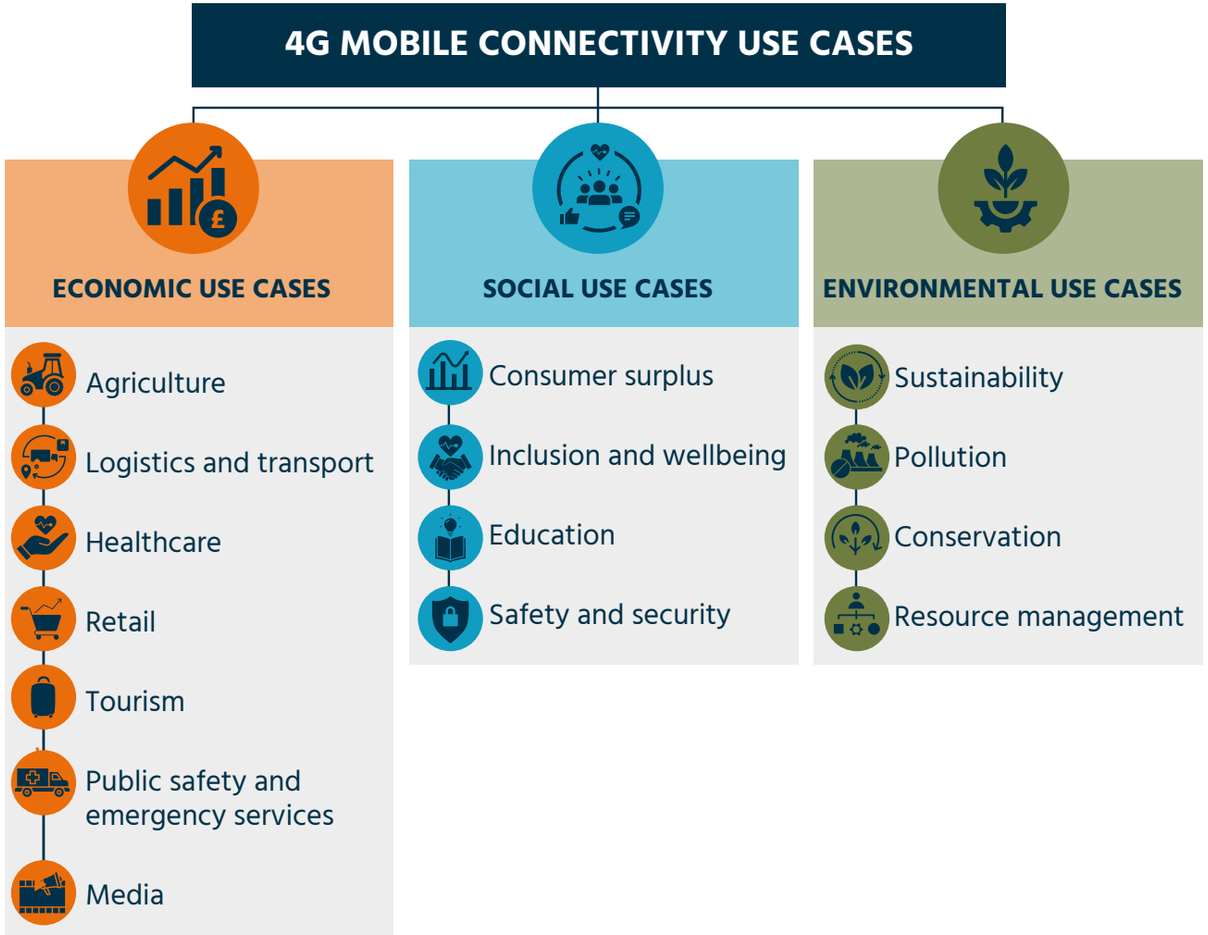
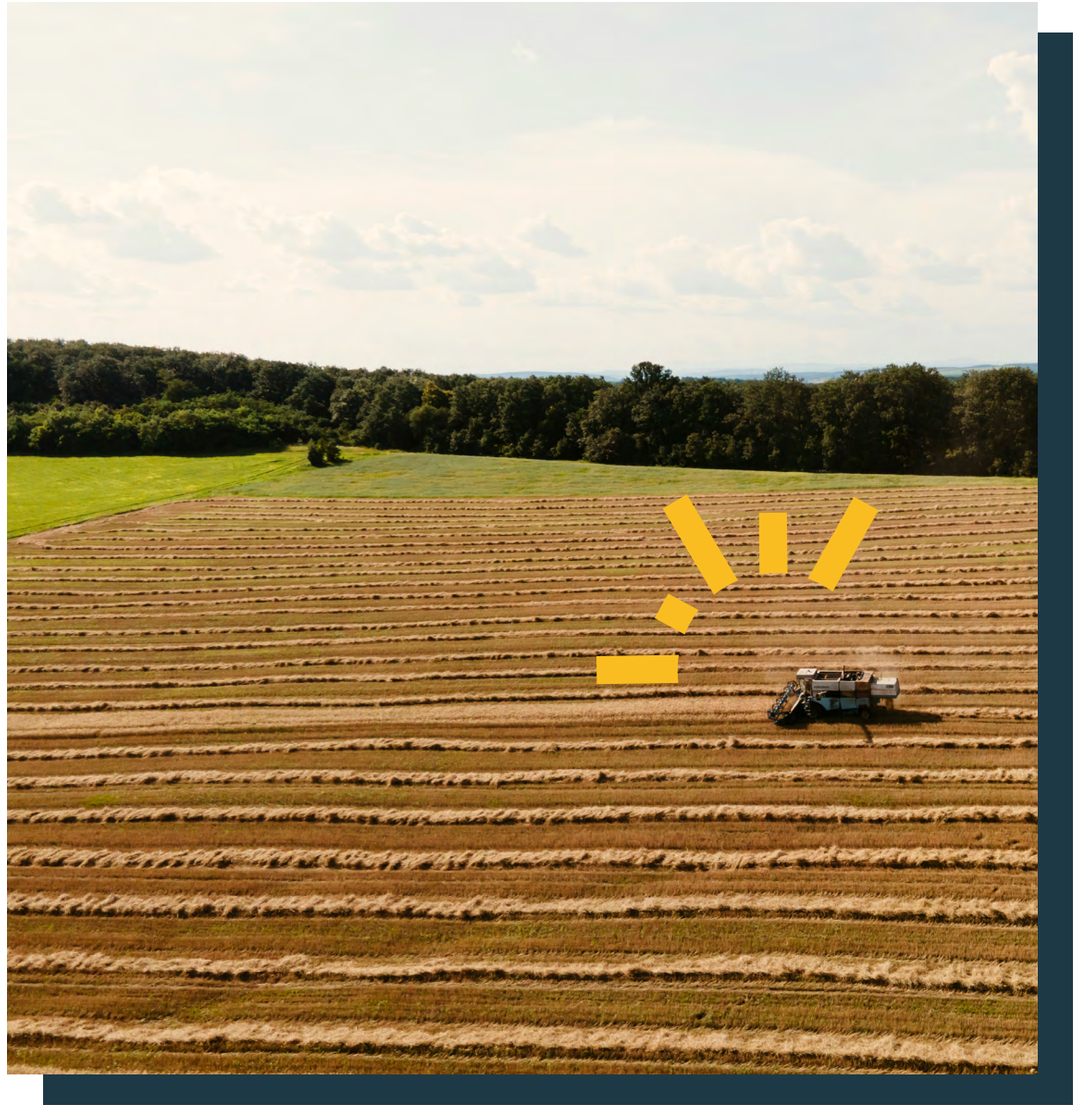


Figure 1: Summary of Use Cases of 4G Mobile Connectivity (Source: FarrPoint)



Economic benefits of 4G mobile connectivity

There is a clear link between access to mobile connectivity and economic growth, with a range of use cases that impact the performance of key sectors within the economy (Figure 2).

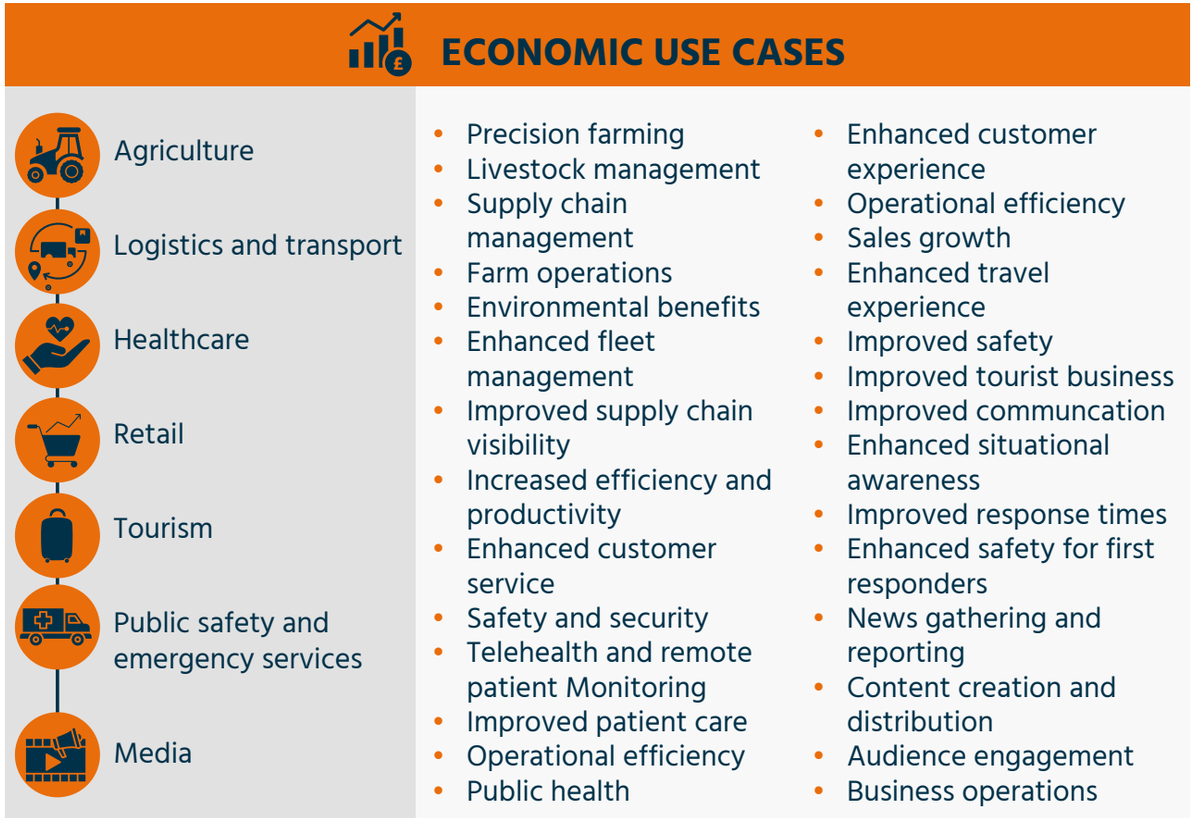


Figure 2: Summary of Use Cases of 4G Mobile Connectivity in the Economy (Source: FarrPoint)

Alongside access to good quality fixed connectivity, reliable mobile coverage enables businesses to generate, analyse, and share large volumes of data for real-time operational insights. It can boost worker productivity by enabling them to work while mobile and can be used by residents, industry, and visitors for a range of activities that all contribute to strengthening a local economy.[2] A company's decision to locate in a particular area is dictated by a range of factors, one being the availability of good digital connectivity[3]. If 4G coverage is not available or not up to an appropriate standard, companies may choose to locate elsewhere. This can result in the local economy missing opportunities for revenue generation and job creation. Previous evidence has found that mobile broadband is linked to an increase in entrepreneurship, suggesting that it supports the creation of new businesses.

While it benefits the overall economy in different ways, there are several key sectors which gain the most through access to good quality mobile connectivity:

Agriculture – Both in terms of lone worker safety and access to digital systems when working remotely, 4G enables IoT devices in agriculture, such as sensors for monitoring soil, weather, and crop health.

Logistics & Transport – Logistics companies use 4G for fleet management and real-time tracking of goods and vehicles. It is also used for payment systems on public transport and with ride-sharing apps.

Healthcare – Telehealth and telecare services often utilise mobile connectivity for remote monitoring and lone care worker purposes.

Retail – Businesses without a fixed location, such as those at markets, rely on 4G for point-of-sale (POS) payment processing. Mobile connectivity also allows for personalised marketing campaigns and customer engagement apps.

Tourism – Tourists use mobile connectivity for navigation, booking on the move, translation apps, and sharing travel experiences.

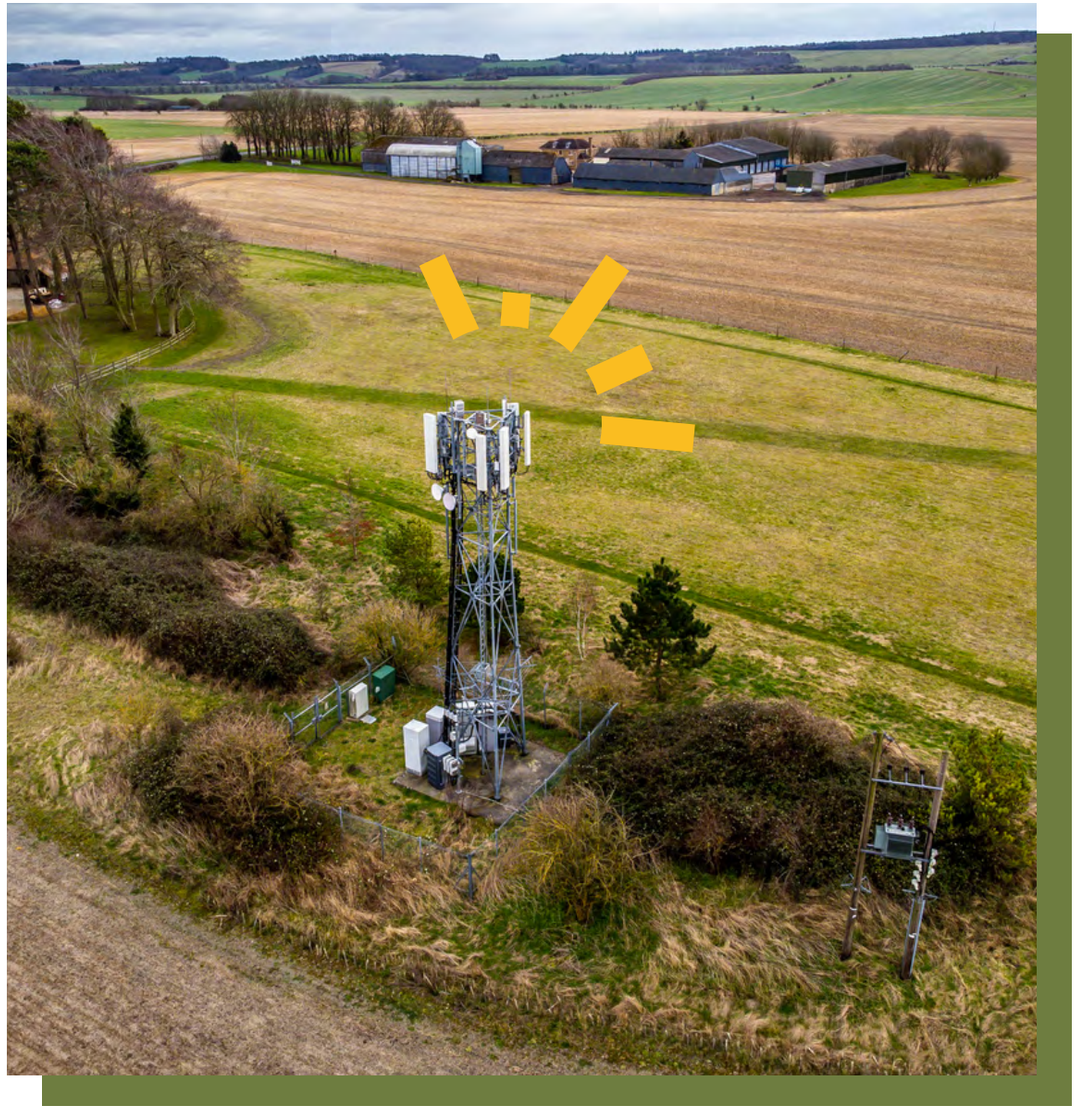
Public Safety and Emergency Services – Real-time mobile communication for first responders during emergencies, alongside improved surveillance, monitoring and management of critical infrastructure.

Media – Streaming services leverage 4G for video and music streaming, real-time interactions, live streaming, and multimedia sharing on social media platforms.

Several previous studies have been undertaken on the benefit of 4G and 5G coverage, including:

- A 2024 study, by FarrPoint for EE, showed that improving 4G connectivity could generate more than £6 million for a rural community[4].
- Research by Capital Economics found that the introduction of 4G mobile networks has added 0.5% to UK GDP, unlocking £5.5 billion in investment and creating 125,000 jobs[5].
- Research by Ericsson suggested that a 10% increase in mobile broadband adoption causes an initial 0.8% increase in GDP, with this effect gradually decreasing over time[6].
- A study by GSMA found that a 10% increase in the adoption of mobile technology drives an increase in GDP from between 0.46% and 2.55%[7].

However, many of these studies focus on the GDP impact of 4G deployment at a national scale, rather than specifically on rural areas where there are more likely to be disparities in coverage of all four mobile networks. This poses several challenges, as national-level analysis often overlooks disparities in connectivity and economic activity between urban and rural areas, potentially masking the unique benefits 4G can bring to rural regions. Rural areas, which frequently suffer from limited infrastructure and digital exclusion, could experience transformative growth through 4G, enabling specific remote use cases, particularly the benefits obtained by lone/remote workers. On the other hand, there are also density issues, i.e. the impact of upgrading a 4G mast in a high-population density area will affect more people and, therefore, have a sizeably larger GDP impact than in more rural areas. This means that it's important to consider the relative size and characteristics of the population/economy of an area served by an improvement in 4G connectivity.



Social benefits of 4G mobile connectivity

Beyond its role in the economy, 4G connectivity enables an array of societal use cases.

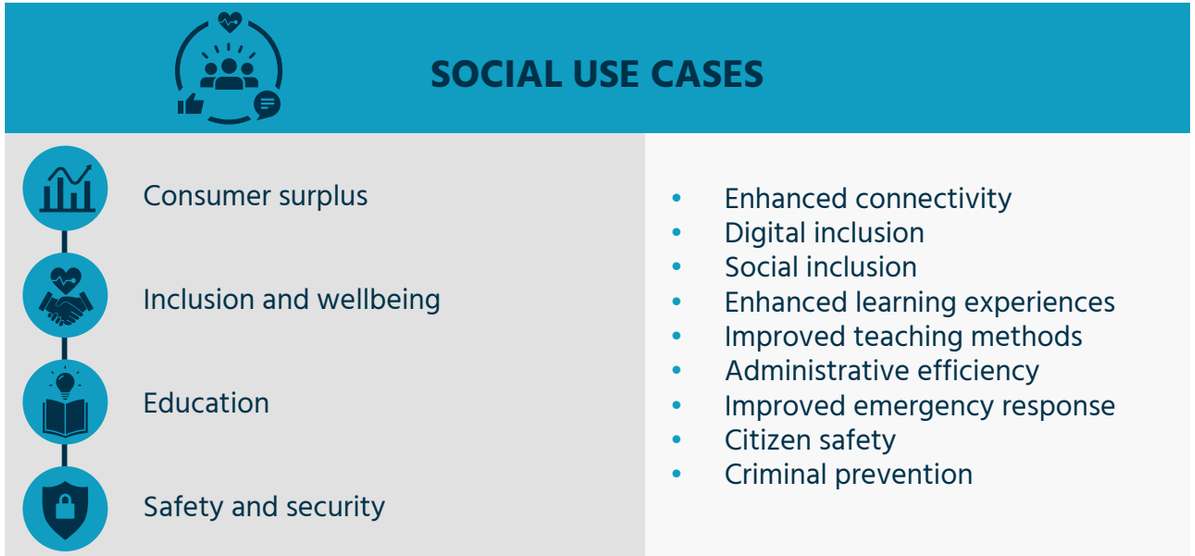


Figure 3: Summary of Use Cases of 4G Mobile Connectivity in the Economy (Source: FarrPoint)

In terms of **consumer surplus**, households derive significant value from mobile connectivity, primarily from the vast variety of mobile applications and services available to use for free or at low cost, although the evidence does not illustrate a strong consensus on the absolute value. It is also worth recognising that many of these mobile use cases are accessed by individuals using mobile devices whilst connected to WiFi networks. However, 2018 research into the benefits of 4G suggests that it delivers £20 billion consumer surplus over 10 years[8]. 4G can help industry with data generation, communication and operations, marketing and a host of other key aspects, ultimately resulting in greater efficiency, improved decision making, loss reduction, and increased revenue.

Another benefit of 4G connectivity can be seen in the role it plays in **driving inclusion and improving wellbeing**, helping reduce the digital divide in the UK. People may be digitally excluded if they do not have access, skills, or motivation to get online or use digital technology. Research shows that for these people, mobile communication plays a vital role in helping them become included or in limiting some of the challenges around digital exclusion[9]. In May 2024, 75% (3 hours 15 minutes) of the time spent online per day by UK adults, across smartphones, tablets, and computers, was on a smartphone[10]. Ofcom analysis indicates that nearly 38% of time spent online on mobile phones is on non-WiFi solutions such as 4G[11]. Research has also shown that almost one in five adults rely solely on a smartphone to get online, rising to around three in 10 of those coming from the most deprived households[12]. For these people, 4G can provide a more affordable and flexible connectivity option. In addition, digitally excluded individuals are often at an increased risk of facing economic inequalities. Therefore, 4G is also vital in helping people search for jobs, manage finances, access learning and training opportunities, and engage with support networks.

As seen during the Covid-19 pandemic, access to digital connectivity can play a significant role in enabling **remote education**. While most online learning takes place at home, utilising broadband connectivity, access to reliable 4G connectivity can help facilitate education in remote locations[13]. Furthermore, schools can use 4G for a range of digital solutions outside of the classroom such as multimedia presentations, virtual labs, fieldwork, and interactive applications to create engaging and effective learning environments on-the-move in an outdoor setting[14].

In addition, many of the **security and safety systems** we rely on depend on good 4G network coverage. The Emergency Services Network provides fast and secure voice, video, and data across the 4G network which gives first responders access to real-time critical information[15]. 4G is also used by various CCTV and video surveillance systems, enabling remote monitoring and wireless camera deployment, as well as offering a backup option to increase the resilience of security systems. Various alarm systems also use 4G, where it provides fast transmission of alarm signals, helping reduce response times for detection of intrusion, fires, or other emergencies. Many lone workers or people working in dangerous environments rely on 4G connectivity to support real-time tracking, SOS services, and two-way communication[16].

Environmental benefits of 4G mobile connectivity

The environmental use cases of mobile 4G connectivity demonstrate how this technology can be used to support sustainability, drive environmental preservation, and realise the UK's Net Zero ambitions. These include enabling smart technologies, reducing carbon footprints through remote work, and improving resource management. Below are key examples of its positive environmental applications:

Figure 4: Summary of Use Cases of 4G Mobile Connectivity in the Economy (Source: FarrPoint)

The growing proliferation of 4G connectivity can help to drive **sustainability efforts**. Smart meters and grid systems using 4G have reduced energy consumption by enabling more efficient load balancing and predictive maintenance. The use of wireless networks, such as 4G, enables smart grid systems that monitor and manage electricity usage in real time. This helps reduce energy waste and improve efficiency[17]. It also drives improved integration of renewable energy networks - supporting distributed energy resources, such as solar panels and wind turbines, by providing reliable communication between devices and central systems[18].

4G connectivity is also vital in the transition to electric vehicles (EVs), providing remote monitoring and control of EV chargers and allowing EV charging operators to track charger status, troubleshoot issues, and remotely manage charging sessions. Mobile networks allow chargers to communicate with the grid and adjust charging times to optimise grid utilisation and minimise peak demand, while also providing a secure platform for processing payments for EV charging sessions that are safe and reliable, even in remote locations. Equally important is the ability of mobile networks to power location-based services that help EV drivers find available charging stations in real-time, which is essential for planning long-distance trips and ensuring a smooth charging experience to mitigate 'range anxiety', often cited as one of the main barriers to adoption by drivers[19].

The availability of 4G connectivity, where fixed connectivity is lacking, can allow more people to work remotely, which in turn reduces vehicle emissions for commuting and business travel. Research has shown that the reduction in emissions can lead to substantial carbon reductions and make new mast sites environmentally net-positive[20].

In addition, 4G connectivity has a role in delivering smart solutions and IoT applications, to drive improved **resource management**. In forestry, 4G supports remote sensing technologies by enabling high-speed data transmission from sensors, drones, and satellites. This allows for the real-time monitoring of forest health, illegal harvesting, and wildlife movements. Additionally, 4G enhances the efficiency of sustainable harvesting operations by supporting GPS-enabled machinery and mobile apps for inventory tracking and management. Mobile connectivity can be used across a large geographic network to improve water management through smart monitoring systems. One project using 4G connectivity for smart meters in water management showed it had the potential to increase water conservation by 25%[21]. Moreover, flood prediction and early warning systems rely on 4G to transmit data from weather stations and water level sensors, providing timely alerts to prevent disasters. Likewise, in energy management, 4G facilitates the integration of renewable energy sources into smart grids. It enables seamless communication between solar panels, wind turbines, and energy storage systems for efficient energy distribution. Fuel consumption monitoring in industries

and transportation is also enhanced by 4G, as it ensures real-time tracking of energy use and supports predictive maintenance for machinery.

4G mobile connectivity significantly enhances environmental and industrial **pollution monitoring**. Although 4G can suffer from coverage gaps, it provides a cost-effective and reliable solution for data transmission within pollution monitoring solutions[22]. By enabling real-time data transmission, mobile connectivity facilitates the continuous monitoring of environmental parameters and industrial emissions, leading to more effective pollution control measures. 4G-enabled devices can collect and transmit data on air quality, water quality, and soil conditions across a large geographic area to centralised systems. This real-time data allows for prompt detection of pollution sources, enabling swift responses to mitigate environmental damage. In industrial settings, 4G connectivity supports the deployment of sensors that monitor emissions and waste in real time. This continuous oversight can help to ensure compliance with environmental regulations and facilitate the implementation of corrective actions when necessary. Industrial 4G LTE modems, for example, can collect and transmit air quality data, ensuring accurate and timely monitoring results.

4G also plays an important role in wildlife conservation, where it allows for real-time remote monitoring of **wildlife movements**, environmental conditions, and poaching activities. It empowers citizen scientists to easily collect and share data on wildlife observations, contributing to valuable conservation research. Alongside this, it can enable the dissemination of information and educational materials to raise public awareness about conservation issues[23].

So, while the deployment of 4G itself has a negative energy and carbon footprint, its overall impact on the environment can be positive when its enabling effects on other sectors are considered.

2.2 Evidence of additional MNO availability benefits

There is a body of literature examining the benefits of having multiple MNOs and adding additional MNOs to a mobile operator market. It also explores the benefits of shared infrastructure agreements. However, the focus is on national or market level benefits, not local or more granular benefits.

Research shows that despite the variety of potential positive and negative effects of network sharing, empirical research on these impacts remains extremely limited[24]. It also suggests the benefits of network sharing vary at the local level and that **"if more granular data can be gathered at a sub-national level, this would enable a more detailed understanding of the impacts of network sharing."**

There is a lack of reliable, quantifiable evidence about the benefits additional MNOs can bring to a specific area when siting equipment on the same location as other MNOs. This reinforces the importance of this research, some of the first work to offer a preliminary examination of the benefits additional MNOs can bring to an area.

Improved finances

Improved finances for consumers and mobile network operators are often cited as benefits of having multiple network operators in a market[25]. There is, however, a lack of consensus about the market dynamics of MNOs and whether consolidated or competitive markets lead to increased investment and greater user experience. Some suggest that increased market competition can reduce MNO profits[26], and therefore reduce their capital for investing in network infrastructure; others suggest the opposite[27]. The analysis of what drives investment in telecommunications found there was no substantial linkage between consolidation or higher concentration in mobile markets and an increase in investment. Instead, they note investment predominantly comes from unrelated market developments.

The competitive nature of the multi-MNO market in the UK has meant operators have continued to attract users through innovative tariffs and other offers, with reduced pricing being one component. While there is some evidence that increased competition within the UK's national mobile industry has improved service quality for users and reduced costs for consumers[28], there is currently no evidence around the incremental impact of additional MNO coverage within a specific geographic area. Traditionally, MNOS do not offer different pricing or packages for specific areas; instead, they offer deals at a UK-wide level. It should be noted that consumers are still able to negotiate individual contracts.

When examining the idea of additional MNOs in the context of area-specific infrastructure sharing agreements, there are associated financial improvements. Sharing agreements can lead to increased profit margins for MNOs and price reductions for end consumers[29]. However, these benefits are framed at an aggregated, country—wide level, and not necessarily as benefits for the local area from having multiple MNOs.

In summary, while increased competition within the MNO market can lead to reduced costs for end users, it is unlikely that this can be dictated on an area-by-area basis. Furthermore, examination of the financial benefits of shared infrastructure agreements also tends to be at a larger, aggregated level, and not in the context of benefit to users within the immediate vicinity.

Improved network connectivity

Network sharing can result in an improved end-user connectivity experience, such as better network quality and coverage[30]. It can also result in data traffic improvements for users of shared antennas, whereby sharing antennas and spectrum can allow MNOs to reduce congestion and improve capacity[31]. As before, these benefits are considered at a macro level, as opposed to individual experiences in a local area. At the local level, the difference in coverage from having more than one MNO may be small to non-existent. Any new mobile infrastructure provided by a second MNO is likely to meet the same geographic and topographic challenges that inhibit the coverage of the first MNO. Whilst a second MNO could site their equipment in a new location and potentially address some of these coverage gaps, it is likely the first MNO has already identified the preferred location within the local area to maximise coverage and users. A second MNO, therefore, would presumably just follow suit.

2.3 Factors influencing local impact of additional operators

There are two key factors that will influence the extent to which additional MNOs on a mast will have an impact on the magnitude of the local benefit realised. The first of these is the proportion of people who change network operator or take up a new service when additional operators join a mast. The second is that even if they do change providers, the size of the impact will depend on what they use the mobile connectivity for. This section seeks to explore these factors and establish what themes need to be studied further as part of the second stage stakeholder engagement.

Consumer choice

FarrPoint's 2024 report into Rural 4G Connectivity identified that the overall benefits of MNOs developing infrastructure in rural areas can be significant for the local community and economy[32]. However, it was noted that the magnitude of this impact greatly depends on the number of residents who choose to take up the improved coverage, with greater take-up increasing the cost-effectiveness of any solution.

The potential benefits of having a second MNO in an area, therefore, are influenced by the number of users/consumers who decide to use this second network. If a portion of users do not switch to this network, then it is unlikely the potential capacity, coverage, or resilience benefits that a second MNO could bring is realised. Research has shown that improved coverage by a mobile operator does not necessarily lead to people switching to that operator[33].

There are multiple factors that influence an individual's choice whether to switch network provider or stay with their current one. Some of these reasons include:

Economic factors

- **Cost of monthly plans** - Affordable and flexible pricing remains a key factor, as customers typically seek mobile networks that suit their financial circumstances without compromising on essential services.
- **International roaming offer** - Competitive and transparent roaming options are especially attractive to frequent travellers who need consistent, cost-effective connectivity while abroad.
- **Bundling deals** - Offers that combine services such as mobile, broadband, and TV into one package provide extra value and convenience, often influencing customers to choose providers with such deals.
- **Additional package benefits** - Value-added extras like streaming subscriptions, free roaming days, or data rollover can make one provider stand out over another.
- **Contractual reasons** - Long-term commitments, early exit fees, or complex terms can either lock customers in or discourage them from considering other network options.

Technical and service performance

- **Improved network performance** - Consistent speeds, low latency, and minimal service outages are crucial for customers who prioritise a reliable experience when selecting their network provider.
- **Future 5G network availability** - Many customers are drawn to networks that clearly invest in 5G infrastructure, as it signals a commitment to long-term, high-speed mobile connectivity.
- **Greater coverage** - Wide-reaching and dependable coverage is a strong determinant in customer choice, ensuring they remain connected even in rural or underserved areas.
- **Customer support** - Access to responsive, knowledgeable, and efficient support services significantly enhances trust and satisfaction, often swaying customer loyalty and decision-making.
- **Operator reputation** - A provider with a long-standing reputation for service quality, reliability, and transparency is more likely to attract and retain customers.

Behavioural factors

- **Brand loyalty** - Many customers remain with networks they know and trust, often due to consistent positive experiences and familiarity with the brand.
- **Ethical considerations** - Providers that demonstrate ethical business practices, such as environmental responsibility or fair pricing policies, often appeal to value-driven consumers.

- **Habit** - Long-term use of a particular network can lead to automatic renewal or continuation, even when better options may be available.
- **Inertia** - A general lack of urgency, time, or motivation to explore alternatives often results in customers sticking with their current provider by default.
- **Fear of worse coverage** - Worries about receiving lower-quality service or losing signal can strongly deter customers from leaving their current, reliable provider.
- **Awareness** – Customers might not be aware of the presence of additional mobile network deployments in their area, as typically there isn't any proactive marketing or awareness raising activity undertaken by operators, thereby reducing the likelihood of customers changing providers.
- **Hassle of switching** - Perceived difficulties such as porting numbers, potential service gaps, or complex processes can discourage customers from switching networks.
- **Digital literacy** – Individuals with limited digital skills may prefer to stay with familiar providers to avoid navigating unfamiliar apps, settings, or terms.

Even if consumers experience poor mobile network quality and performance at one location with one MNO and have a second MNO building equipment in their area, choosing to switch will depend on where they spend most of their day. For example, in their own home, users could mitigate poor coverage and only have one MNO option, as they may be able to use WiFi calling and benefit from good, fixed broadband connections. Furthermore, if one MNO has poor coverage in their area but good coverage in all surrounding areas, this could sway the user's decision to stay, depending on how much they rely on mobile network coverage when out of their home. Therefore, even in locations where network coverage and capacity are poor, and residents are only served by one MNO, the arrival of a second MNO may not prompt a shift of users over to this service.

Use case requirements

As shown earlier, there are many **economic, social, and environmental use cases** and associated benefits of 4G connectivity. However, whilst 4G enables all those use cases, this **only requires access to a single network**, with many of the solutions able to roam between networks. This means that the availability of multiple networks would have a limited impact on the ability of the use case to work. Consequently, the incremental impact of additional MNOs would be negligible or even zero. Also, the availability of fixed connectivity (and use for WiFi solutions) will also have an impact on the use of 4G and the difference that additional MNOs have in an area.

For many safety and monitoring use cases, the benefit of having additional MNO coverage of an area is increased resilience in case of a non-mast-related issue (such as a cyber-attack or issue with the rest of a supplier's network).

The literature does not explicitly define a minimum Mbps speed for mobile users. Instead, it suggests that optimal speeds are highly dependent on individual activities and user types. While Ofcom stipulates a that a 'decent' fixed broadband speed is around 10Mbps download/ 1Mbps upload, there is no equivalent standard set for mobile services. Therefore, for basic usage like voice calling, SMS, and other instant messaging, speeds around 2Mbps may suffice. In contrast, more bandwidth-intensive tasks such as video streaming, crucial for applications like online learning or remote working, necessitate a minimum of 5-10 Mbps. So, whilst there aren't explicit literary sources on the precise minimum Mbps speed requirement for realising all 4G benefits, general metrics can be established by using real-world performance benchmarks.

3. Stakeholder Engagement

3. Stakeholder Engagement

To validate and further explore some of the key insights emerging from the evidence review, a structured programme of stakeholder engagement was undertaken within an agreed sample of rural locations where there has been a known uplift in operator number coverage. This engagement focused on two primary groups of interest. The first comprised mobile network operators, whose perspectives were sought to understand the practical and operational implications of coverage improvements. The second group included members of the local communities (both individual residents and local businesses) whose views were critical towards assessing the social and economic impacts resulting from enhanced network coverage. This dual focus enabled a more comprehensive understanding of the effects and value of coverage improvements from both a supply and demand-side perspective.

3.1 Mobile network operator engagement

To quantify the benefits of deploying more than one mobile network in an area, FarrPoint engaged with representatives from each of the four UK MNOs. Our engagement sought to explore the experience gained by the MNOs from their deployments thus far, and to understand the types and quantities of data gathered which can be used to evidence how networks are being used and if this differs depending on the number of networks present in an area. To do this, our engagement focused on the following key themes:

- Does local take-up differ depending on the number of other MNOs present?
- How do they engage with Local Communities to inform them of new/additional coverage to increase take-up?
- Does area network data from deployments provide insights about the users of the network, for example, are residents/businesses within the local community the primary users, or it is visitors/transient users?
- In terms of deployments themselves, are these intended to cover the general area around the mast site, or are these more targeted at locations, for example, covering the road network rather than any properties?
- Are there other factors/patterns that have been observed in usage/traffic at these locations such as seasonal variations?
- What are the key benefits (to users and/or the operator) of deployment in these areas, and do these differ based on the number of MNOs present?

In addition, while we understand that consumers also consider the many Mobile Virtual Network Operators (MVNOs) to provide mobile connectivity, due to their reliance on MNO networks for their operation, we did not believe that engaging these virtual operators directly would have a material impact on the information gathered, and as such, they were excluded from our engagement.

A summary of the key findings from the MNO engagement process are provided in the sections below.

Local community awareness of coverage improvements is limited

Our engagement with the MNOs identified they have limited communication with local communities regarding the deployment of new or additional mobile network infrastructure within an area. Only one MNO stated that they provided updates to local communities of sites going live, for example via local press, with others seemingly reliant on local awareness of the planning application or seeing work taking place in the local area to know that there may be improvements.

This lack of local awareness raising is likely due to the complexities of dealing with public perception in these areas, which often attracts negative attention in terms of finding a suitable location for a mast site despite residents, businesses, and visitors wanting better coverage. In a number of cases, the specific design of the intervention is the other contributing factor that results in limited engagement with local communities. For example, where a site is built to meet the policy objective of improving road coverage there would be little incentive to engage with communities in the surrounding areas as the intervention has not been designed to improve coverage at their premises. Equally, when considered against overall subscriber numbers, these areas are unlikely to generate significant additional volume or revenue, again reducing the perceived benefit to the MNOs of any local communication campaign.

However, where local communities are aware of new or additional mobile infrastructure being deployed, this absence of engagement contributes to a lack of understanding of the planned objectives of the intervention, for example to improve road coverage, potentially leading to a perception that the intervention has made little difference to the surrounding community.

CASE STUDY:
ELIZABETH, LOCAL COMMUNITY RESIDENT[34]

Despite living just a couple of miles from a new mobile mast, Elizabeth continues to experience little to no mobile coverage at her home. The large hill situated between her property and the mast effectively blocks most of the signal. Despite her efforts to discuss the possibility of mobile signal repeaters with providers, she has been told this is not a viable solution as her residence is not a block of flats or a business. As she moves away from the village and ascends certain parts of the valley, the signal from her chosen provider becomes available.

While Elizabeth benefits from fibre broadband at home, she still emphasizes the need for reliable mobile coverage for security, safety, and everyday tasks such as providing directions to delivery drivers. Furthermore, during a recent storm that caused a power outage in the surrounding area, they were completely cut off from communication with the outside world, as the mast lost power and their digital landlines became unusable.

MVNOs also need to be included when considering local benefits

It is important to note that from a consumer (residential and business) perspective it is not only the MNO networks that are considered. The many MVNOs, who operate their services using the four MNO networks and have significant subscriber numbers, offer a wide range of different packages which communities can benefit from.

As such, when new or additional MNO networks become available within an area, the increased choice and retail competition is potentially far greater than just the network(s) themselves. For example, well-known brands such as Giffgaff, Sky Mobile, and Tesco Mobile all operate using VMO2's network, while iD Mobile, Smarty, Honest Mobile, and Superdrug operate via Three's network, with similar numbers of MVNO's operating on EE and Vodafone's networks.

Mobile operators do not undertake hyper-local analysis of network use

Throughout our discussions with the MNOs it was clear that they don't typically undertake any detailed analysis of network usage at sites. This would be to determine any increase in subscriber numbers within the area, or to understand if the traffic generated is by those living and/or working within the coverage area vs visitors (tourism, delivery vehicles, etc).

Despite the lack of granular data analysis, it was noted that MNOs had generally observed an uplift in traffic from sites that have gone live, with one MNO commenting that they had been surprised by the traffic levels from their 4G network in an area that was previously a 'total not spot' (TNS). Even though there was perhaps a greater level of traffic than expected, this is still only approximately 1/50th of the average traffic from a typical commercial mast site, which reflects the very rural nature of the TNS site compared to those with higher numbers of premises and/or users.

However, despite this and some specific case-study examples, MNOs generally still struggle internally to quantify the true benefits resulting from these sites.

MNOs told us that they had also used data from 3rd party applications to look at market share of operators across sites to assess the impact on subscriber numbers or cell site performance. However, this suggests that subscriber numbers on an MNO network would not typically be impacted by the presence of other operators in an area.

Different interventions are targeted at specific issues

MNOs all stated that the cell sites built under the different publicly funded programmes and interventions were designed and built to address specific issues. For example, EAS sites are only designed to plug small holes in existing network coverage (estimated to cover 0.03% of the UK population) which already serves most areas where people and premises exist, leaving mainly roads where coverage gaps need to be filled. To this end, EAS sites are designed so that the radios are directed and optimised to cover the target road, with minimal overspill into the adjacent area over and above any incidental coverage of people and/or premises located immediately next to the road. This can also be compounded by topological challenges within rural areas, such as valleys and hills, resulting in the potential coverage area from a mast being further reduced.

As such, the traffic from EAS sites is predominantly generated by road users rather than members of the local communities or other (non-road) users. This will likely be subject to seasonal variations like those seen with road usage more generally (holiday periods, etc). It was noted however, that road users can generate higher traffic than might be expected as a single car with four passengers might easily have up to five devices (one for each occupant plus the car itself), generating a mix of both background (app updates, location, etc) and foreground data (browsing, streaming, navigation, messaging, etc).

However, it was also noted by one MNO that 90% of road users are unlikely to realise they are in a partial or total not-spot due to their obvious focus on driving or other activities, with the example given that while travelling at 60mph, you may only be without coverage for ~3 mins before you connect to another cell site.

MNOs were very clear that these sites had been built solely to meet license obligations or to support government-funded programmes, and without these obligations or interventions, they would not have been built commercially, and these areas would have remained unserved.

New or upgraded sites can also deliver indirect benefits

All the MNOs expressed the view that by building or upgrading cell sites in these locations, irrespective of whether the site was commercially funded or as a result of public investment, there were likely to be a range of other indirect benefits to the local community. The most obvious of these was the increase in public safety resulting from being able to make/receive calls both at home and outdoors, or providing other safety-related functionality. This was in addition to the increase in consumer choice for connectivity between fixed and mobile, or between operators.

However, there are also potentially less obvious benefits resulting from the construction of the sites, such as bringing additional/upgraded power infrastructure to the local area and/or fibre backhaul, which can potentially be used to deliver other improvements to the local community.

Equally important are the potential improvements to resilience within a community. For example, when making emergency calls, having additional MNO coverage within an area can both increase the area where calls can be made and help mitigate outages of individual networks. However, any potential improvements could be limited if MNOs are sharing other infrastructure over and above a physical mast, such as power and/or backhaul, as any local outages would then likely impact all MNOs in this case.

3.2 Local community engagement

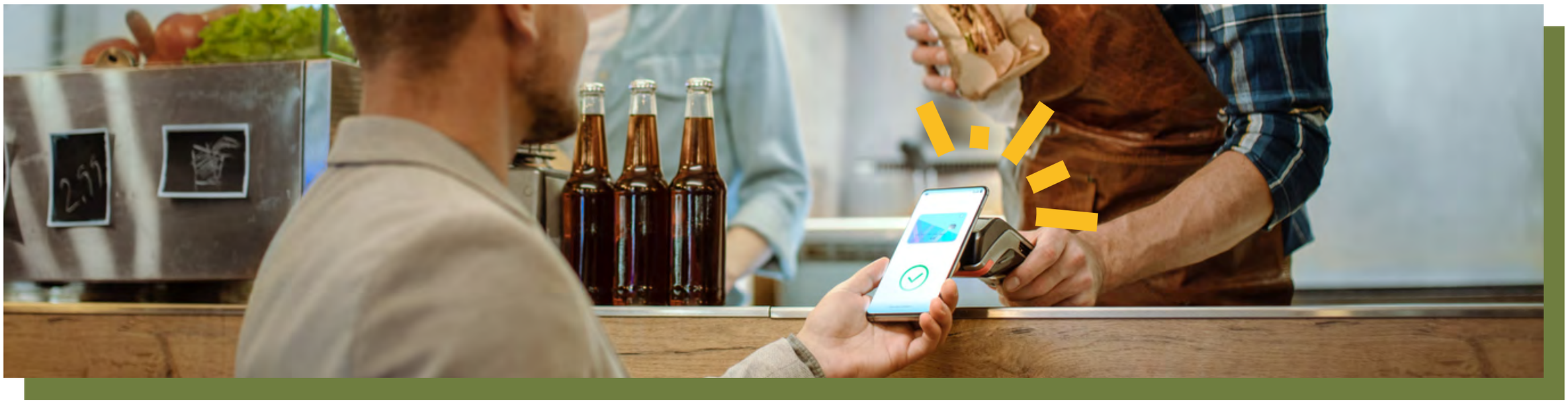
Our research sought to engage a diverse range of regional and local governance bodies to best understand the impact of new mast sites deployed on local communities.

Our stakeholder identification process began with mapping SRN sites, as this information was more readily available, to identify key locations where mobile connectivity has been enhanced. We then selected a geographically representative sample of locations across Scotland, England, and Wales. Our final step involved reaching out to town, parish, and local community councils in these areas to request interviews and support with disseminating a survey.

Insights from individuals within these organisations were crucial in understanding their engagement with and awareness of any perceived improvements in mobile connectivity. These initial contacts then facilitated further engagement with residents and businesses, the individuals most directly impacted by these changes. Data collection employed both interviews and web-based surveys, with local governance organisations playing a vital role in survey promotion.

Awareness about improvements

Conversations with local businesses and individuals frequently revealed a lack of awareness development and mobile connectivity improvements in their area. Where awareness did exist, it often stemmed from individuals holding positions on local community and parish councils, which gave them access to planning notifications. The majority of those spoken with reported no direct communication from network operators about mobile infrastructure enhancements. Consequently, their knowledge of improvements primarily came via word-of-mouth or the physical observation of new mast construction. However, this was not the case with one respondent who lived near and benefitted from a site of mobile coverage improvement, suggesting they had been aware of the upgrade through local announcements such as local press, social media, and council meetings.



CASE STUDY:
BALBEG COUNTRY HOUSES[35]

For Balbeg Country Houses, a self-catering holiday accommodation business based in Maybole, Ayrshire, they had no mobile coverage and were completely reliant on their landline. This lack of connectivity did not just impact the running of the business, where they struggled to organise bookings or stay in contact when working across the site, but also visitors to the site who regularly complained about the lack of mobile coverage or WiFi.

Andrew, the owner, however, was delighted a few years ago when they heard an operator was going to deliver network improvement in locations such as theirs through a Home Office contract. As the months went on however, Andrew grew frustrated with the lack of communication about plans to improve mobile or broadband in the area. But with decisions needing to be made in the meantime about whether to invest in connectivity solutions such as satellite, the lack of communication significantly hindered his ability to plan their business for the future.

Around three years after the initial notice about the contract award however, Andrew was pleased to turn on their mobile one day to suddenly find it had full signal. For them, the impact of this has been huge, both in terms of their business and visitor experience.

“Customers complained when we didn’t have any signal, but don’t say anything now it’s improved – but that’s understandable, it’s just expected to be available wherever you go”.

They still have some issues, however. Recent storms and a lorry accident put the mast out of action meaning they had no mobile or broadband for a period. This lack of resilience within the local network has led to the owner beginning to explore alternative options to ensure they have a connectivity backup. Furthermore, whilst mobile coverage has improved in the village and those nearby, once you leave the area signal begins to significantly drop.

Poor connectivity compounds rural challenges

Discussions underscored the major challenges of poor mobile connectivity in rural and remote areas. The impact on individuals was evident in the experience of a female farm worker who, working alone outdoors or travelling between sites, faced heightened safety and security concerns due to the lack of a reliable signal. Despite improvements at this site, persistent pockets of poor signal often remained, which continued to disadvantage rural businesses and those moving through the area, as one resident noted:

"Although it's lovely to have better reception in the area, especially from a health and safety aspect as my husband works on the hills in dangerous conditions, it's very frustrating to have no coverage at the very top of the valley and here, where we live. There are also numerous workers up this top end of the village risking their lives on machinery, working long hours with no coverage".

CASE STUDY:
SQUIRE FARM HOLIDAY HOME[36]

Squire Farm, nestled in the Redlake Valley in Southwest Shropshire, provides a variety of holiday accommodation options for visitors. For years, the farm owners have struggled with poor to non-existent mobile coverage across their site. However, they've observed improved coverage for themselves and their guests since the mobile infrastructure upgrade approximately 8km to their northwest. Whilst two networks have improved both their indoor and outdoor coverage however, a third has only seen improved outdoor connectivity. For Squire Farm, the most significant impact has been the availability of an emergency network across their property and the surrounding countryside, offering a newfound sense of reassurance.

The owners of the farm pointed out that while the previous lack of mobile coverage put them and their customers at a significant disadvantage, the installation of FTTP and WiFi throughout all the accommodations now provides a reliable and fast connectivity option.

Regarding the construction of the mobile infrastructure, they received no prior information of the mobile mast plans, nor any notification of its activation. Instead, they simply witnessed its construction one day and then experienced improved mobile coverage on their devices a few weeks later.

Improvements but indoor connectivity remains a challenge

For some residents and businesses in areas with mobile infrastructure upgrades, the benefits of improved connectivity were tangible. One small business owner noted, **"now being contactable by my employees has been invaluable,"** further explaining that enhanced mobile coverage allowed them to answer calls, respond to emails, and send messages while moving around locally. Following the infrastructure upgrade, this individual also observed a **"significant improvement in the quality of mobile coverage and capacity in the immediate vicinity"**. For others, the improved connectivity through the infrastructure upgrades meant they were able to carry out a range of tasks. As one resident noted, **"I'm now able to make and receive calls without issues, stream video content and work from home without connection issues."**

Predictably, those experiencing the most noticeable improvements often subscribed to the network operator responsible for the mast upgrade. One such resident reported being able to get a signal in previously unconnected areas, stating, **"we now have an [MNO] signal in the hills."** Another customer of the same network highlighted improvements to both outdoor and indoor connectivity, explaining, "the network upgrade to 5G was now giving us better coverage inside and out," further adding they can now "make mobile phone calls in house, when previously I had to go outside."

However, the experience was not universal. Several individuals reported that while outdoor connectivity had improved to some extent, reliable indoor mobile coverage remained an ongoing issue. One resident pointed out, **"[Although] I now get 5G, so I am able to browse on the move, I still have to use WiFi at home."**

Another resident echoed this sentiment, emphasising their reliance on WiFi calling due to poor indoor signal: **"Mobile signal is still very poor indoors at my property. There are 1 or 2 intermittent bars of signal by the window of a room. There is insufficient signal strength to make a call and not strong enough to use data—thank goodness for WiFi calling."**

Similarly, another resident acknowledged some outdoor improvement in their area but stated that their home connection had not changed, adding they **"barely get one bar and am reliant on WiFi calling for stability."** Whilst others saw improvements on the nearby roads, they still suffered from a lack of signal at home, with one resident noting: **"I have signal on the road into the village. No improvement in my home, one bar, and reliant on WiFi calling for stability."**

For others, the inconsistency of indoor coverage led them to avoid using their mobiles at home altogether, as one individual described: **"I turn off my mobile when I'm at home. In 1 room I've got 4 bars of signal and another, barely 1."**

It should be noted however that programmes such as the SRN do not obligate the mobile network operators to provide or improve indoor coverage, with the programme objectives focussed on increasing geographic (outdoor) coverage, or coverage along specific transport routes (roads) to support the Emergency Services Network.

Overall, these accounts highlight that while infrastructure upgrades brought improvements for some, the challenge of ensuring reliable indoor mobile connectivity persists for many and also highlight that end users are as expected more focussed on how improvements impact their lived experience and desire for ubiquitous coverage rather than the specific outcomes achieved as a result of any publicly funded intervention.

This also highlights the need to consider digital infrastructure holistically, as there is an ongoing need for both fixed (broadband) and mobile connectivity for most people as demonstrated by the reliance on broadband and the associated WiFi solution this provides for indoor mobile connectivity for many users and/or services such as telecare devices. This is likely to become increasingly important as the digital switchover gathers pace to its conclusion, as many 'landline' providers are suggesting users utilise mobile connectivity as a backup should their fixed telephone line be unavailable which would have the associated impact of their broadband-connected WiFi also being unavailable to provide indoor mobile connectivity.

CASE STUDY:
LOTTIE'S STONE CARVING[37]

Based in Knucklas on the Welsh Borders, Lottie has dedicated nearly 40 years to the art of stone carving. The absence of mobile coverage at her home, which also serves as her workshop, has meant she primarily relies on email and a landline for communication. This lack of mobile signal has often created difficulties with deliveries and client collections as they cannot locate her premises. Furthermore, the poor coverage has prevented the installation of smart meters in and around her home.

Despite living in an area supposedly benefiting from improvement works, Lottie has observed little to no enhancement in mobile coverage. She mentions that she doesn't depend on her mobile phone and often keeps it switched off. The village is widely considered a complete mobile blackspot, to the extent that the local community successfully campaigned for the reinstatement of the phone box, ensuring they have at least one means of communication outside the village in case of emergencies.

Issues of power

Power outages are a significant vulnerability for mobile infrastructure in rural and remote UK locations, particularly for sites in geographically challenging terrain. Their isolation not only increases their susceptibility to power disruptions but also limits access to robust grid infrastructure and prolongs repair times. When power is lost, these masts are unable to provide a mobile signal unless reliable backup power solutions are in place.

Predominantly, however, extended outages leave communities completely disconnected, as another individual emphasised during a recent storm, stating the storm meant they "had no electricity for 5 days and no mobile signal. So, contact could not be made with outside agencies ... if there was an emergency and for vulnerable people." The frustrations about a lack of backup were echoed by another resident who noted:

"The suppliers should ensure there is [adequate] generator backup to ensure mobile signal lasts longer than its current 12-hour battery life... With the rollout of digital landlines in rural communities like Boreland, we have no way of contacting the outside world when the power goes – [meaning] landline, broadband and mobile signal [are] switched off".

This lack of communication during critical times underscores the urgent need for resilient power solutions, leading to calls, as one respondent suggested, for **"The back up battery needs to last longer when the power fails in a storm,"** to ensure continuous connectivity for these often-underserved areas.

4. Discussion & Conclusion

4. Discussion & Conclusion

4.1 Discussion

The aim of this research was to assess the relative additional benefits of increasing mobile coverage at a location from zero to one operator and then from one to multiple operators.

Introducing mobile coverage to a rural community will bring significant benefits. The primary impacts being:

Economic Growth:
Reliable mobile connectivity supports local businesses by enabling better communication, data sharing, and access to digital markets. It can attract new businesses and support entrepreneurship, leading to job creation and increased local revenue.

Social Inclusion:
Mobile connectivity helps bridge the digital divide, providing access to essential services such as healthcare, education, and emergency services. It enhances social interactions and community engagement.

Safety and Security:
Improved mobile coverage enhances public safety by enabling better communication for emergency services and lone workers. It also supports the deployment of security systems like CCTV and alarm systems.

Environmental Benefits:
Mobile connectivity can support environmental monitoring and management, such as smart grids and IoT applications for resource management.

However, the benefits of expanding coverage from a single operator to multiple operators are less clearly defined. The evidence review and stakeholder engagement activities have highlighted several key issues in identifying and quantifying the additional incremental impacts associated with this improvement.

Notably, the first challenge has been that none of the MNOs routinely collect or analyse network or subscriber data at this local level/for these rural sites as the impacts are seen as negligible when considered at a national operator level (potentially only tens or hundreds of customers out of a customer base of millions). As such, obtaining quantitative evidence remains challenging, placing greater reliance on qualitative evidence. This is something that could be considered for any future government interventions, to ensure that operators are capturing the evidence required to demonstrate the success and associated benefits of any scheme, for example before and after data on the number of network subscribers in an area, volume and duration of voice calls (made and/or received) and the volume of mobile data consumed to show any uplift or changes in usage.

From the perspective of mobile network operators, there is limited commercial incentive to actively drive uptake in these local communities, as the potential revenue gains from acquiring tens or even hundreds of additional users often do not justify the required investment. Similarly, sites recently deployed through the EAS/SRN programme are focused in terms of their design and operation to meet specific intervention objectives, for example to increase coverage along the road network, with operators remaining reticent to utilise the asset to make the additional investment needed to provide broader coverage (purely road coverage vs road and surrounding areas) due to an ongoing lack of commerciality in these areas.

As a result, communication from operators regarding network improvements tends to be minimal. Evidence from community engagement revealed that both residents and businesses frequently lacked awareness of new deployments, as well as broader mobile connectivity enhancements. Respondents consistently reported receiving no direct communication from operators about signal improvements, instead learning of changes through informal channels such as word-of-mouth or by observing new infrastructure, such as mast installations. This lack of proactive communication poses a significant barrier to realising the full benefits of improved connectivity; even where technical enhancements or increased operator presence occur, their impact is likely to be diminished if users remain unaware of the improvements.

There are several direct and indirect benefits, however, ranging from the more obvious improvements to coverage and consumer choice/competition to less obvious benefits such as the potential improvements from the other enabling infrastructure to the wider area (e.g., power, backhaul). There is also a resilience benefit, especially when considered alongside the ongoing fixed telephony changes resulting from the digital switchover, both in terms of being able to use mobile telephony when fixed lines are not working, but also in having more than one mobile network present to provide additional resilience for emergency calls and other use cases such as telecare. These resilience benefits might be reduced if multiple operators share power/backhaul in addition to sharing the physical mast, so care needs to be taken not to overstate the resilience benefits.

The scale of the benefits will also vary depending on the presence of fixed broadband connectivity within communities, as the engagement demonstrated areas with good broadband connectivity likely to rely on WiFi calling indoors and only using 'true' mobile connectivity while outdoors.

For emergency calling, having one mobile network is likely to fulfil this requirement in most cases (as network roaming is enabled for calling the emergency services). As telecare or in-vehicle communications often rely on roaming-sim solutions, this supports the overall evidence that most of the benefits of building mobile infrastructure, over and above creating a competitive market and providing increased consumer choice, can be delivered by the presence of a single MNO, with negligible additional benefits derived from additional subsequent MNOs.

Many end-users however, continue to reference the poor indoor coverage experience and their desire to see this improved alongside any improvements to outdoor coverage, with most reliant on WiFi calling, which has the associated reliance on having good fixed broadband connectivity.

4.2 Conclusion

It is widely recognised that mobile digital connectivity delivers economic, social, and environmental benefits to communities and businesses. However, less is known about its impacts at the local level, particularly in rural areas experiencing increased investment in mast infrastructure and understanding how greater network diversity affects these communities.

The key finding emerging from this research is that most tangible benefits associated with improved mobile connectivity in rural communities are realised once a single mobile network operator provides coverage. While extending coverage to include additional operators—moving from one to two, three, or four—does offer further benefits, these are generally incremental and primarily relate to qualitative factors. These include enhanced network resilience, improved reliability during emergencies, and greater user choice.

The second main finding of the research has been that there is a too diverse set of challenges to quantify any incremental impact of additional operator presence accurately. The four primary issues requiring a case-by-case approach to be taken when quantifying impact are:

Awareness: A lack of communication by network operators (driven by limited commercial case for marketing local improvements) means businesses and individuals often lack awareness of mobile connectivity improvements, let alone which operators are present at any time on a mast. Without this communication, the ability of local communities to benefit from any improvements is greatly diminished.

Coverage: A new mast located close to a community does not necessarily mean all residents and premises within that community will benefit from the mast. For example, Extended Area Service (EAS) sites (upon which most of the SRN additional operator activity has taken place) are primarily designed to address small coverage gaps along roads. The MNOs told us that radio equipment deployed on these mast sites is optimised for to meet the specific programme requirement of road coverage, thereby providing only incidental coverage to nearby people or premises. As such, the traffic from these sites is predominantly generated by road users rather than local residents.

Uses: There are numerous economic, social, environmental, and public sector use cases for 4G connectivity, including public sector applications such as telecare, but these typically require access to only a single network, with many able to roam between operators. As such, the presence of multiple mobile network operators may have limited additional impact on service functionality, particularly in areas where fixed connectivity and WiFi solutions are already available. Nevertheless, it is important to understand the actual local use cases of mobile connectivity in order to drive benefits.

Alternatives: Th The availability of alternative connectivity, whether that be fixed (broadband) connectivity (enabling WiFi calling or home working etc.), or satellite, LoRaWAN (long range wide-area internet of things network), GPS, or others, may already be available in the area and thus the incremental benefit of improved mobile connectivity may be negligible for a certain use case, let alone if there are additional operators present on the mast.

In conclusion, this research indicates that, depending on local context and conditions, a **significant majority of the potential benefits** from improved mobile connectivity can be **achieved through coverage by a single mobile network operator**.

Without detailed information on specific site characteristics and take-up data from suppliers, it is not possible to quantify this majority. While the introduction of additional operators may enable the remaining benefits to be realised, these are predominantly qualitative in nature, including enhanced network resilience, improved emergency response reliability, and increased consumer choice. Together, these benefits create a more equitable user experience with urban areas, thereby helping to reduce the urban/rural digital divide.

This has important implications for future policy decisions on the prioritisation and targeting of mobile infrastructure public investment in rural and hard-to-reach areas. As indicated, the **priority should be in providing single operator coverage to all areas** before further investing in additional operator coverage of an already covered area.

Ultimately, there is little doubt that having coverage from multiple mobile network operators across a significant portion of the UK landmass has led to a highly competitive commercial market and lower prices, and this should remain an overall long-term objective for the Government and Ofcom.

Reference List

1 **Connected Nations 2024**, Ofcom (2025)

2 **FarrPoint Digital Connectivity Survey 2024**, FarrPoint (2024)

3 **17 reasons your business needs strong mobile signal**, UK Connect (2025)

4 **Rural 4G Connectivity: Analysing the community benefits of mobile investment**, FarrPoint, EE (2024)

5 **Research by Capital Economics, commissioned by Everything Everywhere,** EE (2012)

6 **Mobile broadband drives economic development**, Ericsson (2019)

7 **Mobile technology: two decades driving economic growth**, GSMA (2020)

8 **The impacts of mobile broadband and 5G**, UK Government (2018)

9 **From Exclusion to Inclusion: Guest Blog** - Mobile UK, techUK (2023)

10 **Online Nation 2024**, Ofcom (2024)

11 **Mobile Matters**, Ofcom (2023)

12 **Adults' media literacy**, Ofcom (2023)

13 **Delivery Remote Education Due to Covid-19**, Schools Broadband (2021)

14 **Enhancing Field Learning Using Mobile Technologies**, France et al., (2015)

15 **Emergency Services Network: overview**, UK Government (2023)

16 **Enhancing Construction efficiency & safety: Exploring the power of 4G LTE, 5G & WiFi 6**, UK Connect (2025)

17 **Smart Grids**, LEA (2024)

18 **A review of IoT-enabled smart energy hub systems**, El-Afifi and co. (2024)

19 **A Systematic Review Towards Range Anxiety of Battey Electric Vehicles' Drivers**, Rainieri et al. (2023)

20 **Improving Mobile Connectivity: A Rural Community Study**, FarrPoint (2023)

21 **Barcelona's Smart City Ecosystem**, MIT Technology Review (2014)

22 **Advances in Machine Learning and IoT for Water Quality Monitoring**, Essamlai et al., (2024)

23 **Digital Dividends in Natural Resource Management**, GSMA (2020)

24 **To share or not to share? The impact of mobile network sharing for consumers and operators**, Koutroumpis et al. (2023)

25 **Mobile phone network expansion in sparsely populated regions in Germany: Roaming benefits consumers**, Baake et al., (2021)

26 **Emerging Trends in Communication Market Competition**, OECD (2021)

27 **An analysis of the drivers of investment and consumer welfare in mobile telecommunications**, Ofcom (2015)

28 **Connected Nations 2021: England report**, Ofcom (2021)

29 **To share or not to share? The impact of mobile network sharing for consumers and operators**, Koutroumpis et al. (2023)

30 **Competition policy issues in mobile network sharing: A European perspective**, Papai et al., (2020)

31 **To share or not to share? The impact of mobile network sharing for consumers and operators**, Koutroumpis et al. (2023)

32 **Rural 4G Connectivity: Analysing the community benefits of mobile investment**, FarrPoint, EE (2024)

33 **Ibid**

34 **1-on-1 interview with Elizabeth, local resident covered by one of the SRN mast improvements.**

35 **1-on-1 interview with Balbeg Country Houses, a local business covered by one of the SRN mast improvements.**

36 **1-on-1 interview with Squire Farm Holiday Home, a local business covered by one of the SRN mast improvements.**

37 **1-on-1 interview with Lottie, local resident covered by one of the SRN mast improvements.**

Get in touch

farrpoint.com

contact@farrpoint.com

EDINBURGH, UK
Ground Floor West
2 Lochrin Square
96 Fountainbridge
Edinburgh
EH3 9QA

+44 131 202 6018

LONDON, UK
1st Floor
99 Bishopgate
London
EC2M 3XD

+44 203 693 7310

TORONTO, CA
151 Yonge Street
Toronto
M5C 2W7

+44 131 202 6018

BOSTON, US
100 Cambridge Street
Boston
MA 02114

+1 857 356 1414

SYDNEY, AUS
60 Martin Place
Sydney
NSW 2000

+44 131 202 6018