

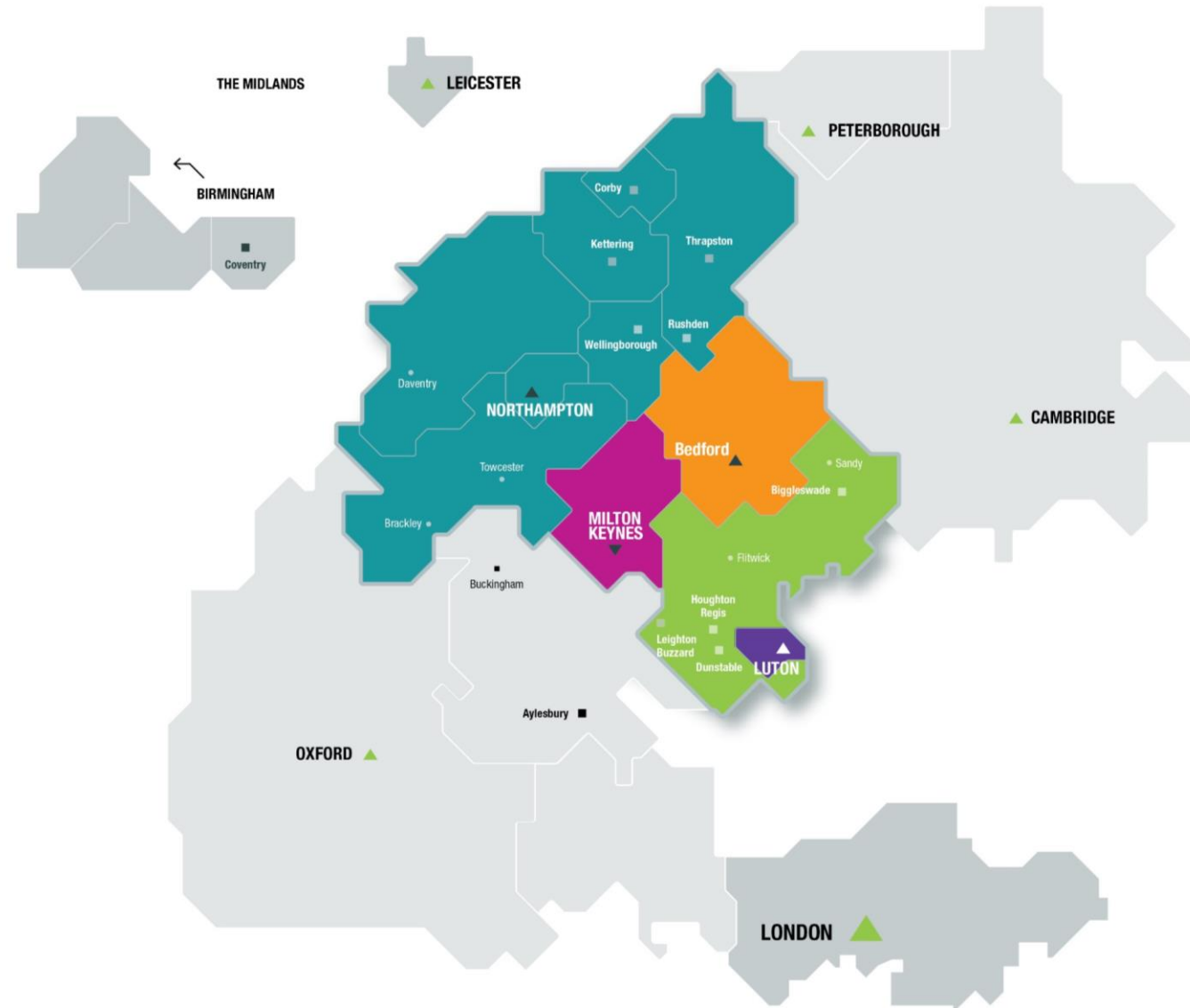


Digital Infrastructure Supporting Evidence Base - 2022

Infrastructure, skills and
access

Background

- Any underlying raw data in this document can be provided on request.
- Links have been included for interactive maps. Note that online maps are subject to change as improvements are made to the quality of the underlying data.
- Note that from 1st April 2021, the South Northamptonshire, Daventry and Northampton districts merged into the West Northamptonshire Unitary Authority. Similarly, the Corby, Kettering, Wellingborough and East Northamptonshire districts merged into the North Northamptonshire authority.

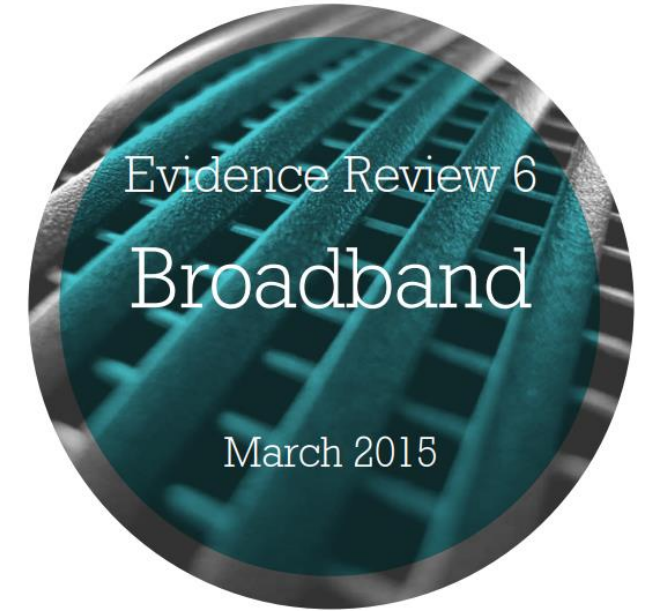




▲ Evidence of economic benefit

- Extending broadband to an area can affect firm productivity, number of businesses, and local labour market outcomes (such as employment, income and wages).
- These effects are not always positive, are not necessarily large, and may depend on complementary investments by firms (for example, training workers, or reorganizing sales strategy or supply chains to take advantage of faster internet connections).
- Effects can vary across different types of industries and workers with service industries and skilled workers possibly benefiting more than manufacturing industries and unskilled workers.
- The economic effects of broadband tend to be larger in urban areas (or close to urban areas) than in rural areas.

(Summary of digital infrastructure studies collected by the What Works Centre for Local Economic Growth [NB: pre-pandemic])



▲ Digital infrastructure impacts: broadband

According to a study by the European Commission (i) **the BCR for 5G in the UK is estimated at 2.35 in direct output effects**, based on a 2020 optimal investment level, compared to a BCR of 2 for the rest EU28. But, these benefits are mainly as a direct result of the project.

Research by Deloitte (ii) finds a potential for a **1.4% GDP per capita uplift** in response to a doubling of data consumption per 3G connection, but only in developed economies.

Research also suggests (iii) that the reduced latency of 5G is highly suitable for use of data while moving, as it enables devices to switch connectivity between different pieces of infrastructure more smoothly. Higher bandwidths can also enable providers to gather more information about usage, allowing for smart tariffs.

Sources

- (i) European Commission (2016), 'Identification and quantification of key socio-economic data to support strategic planning for the introduction of 5G in Europe'
<https://ec.europa.eu/digital-single-market/en/news/5g-deployment-could-bring-millions-jobsand-billions-euros-benefits-study-finds>
- (ii) Chris Williams, Davide Strusani, David Vincent, David Kovo: The Economic Impact of Next-Generation Mobile Services: How 3G Connections and the Use of Mobile Data Impact GDP Growth, from the global information technology report, pp. 77-80.
- (iii) Evolution of Mobile Wireless Communication Networks-1G to 5G as well as Future Prospective of Next Generation Communication Network:
<http://d.researchbib.com/f/annJcwp21wYzAioF9xo2AmY3OupTIlpl9OqJq1p3DIZQRmY1LIFGtIZQRmZGphpTEz.pdf>

▲ Digital infrastructure impacts: 5G

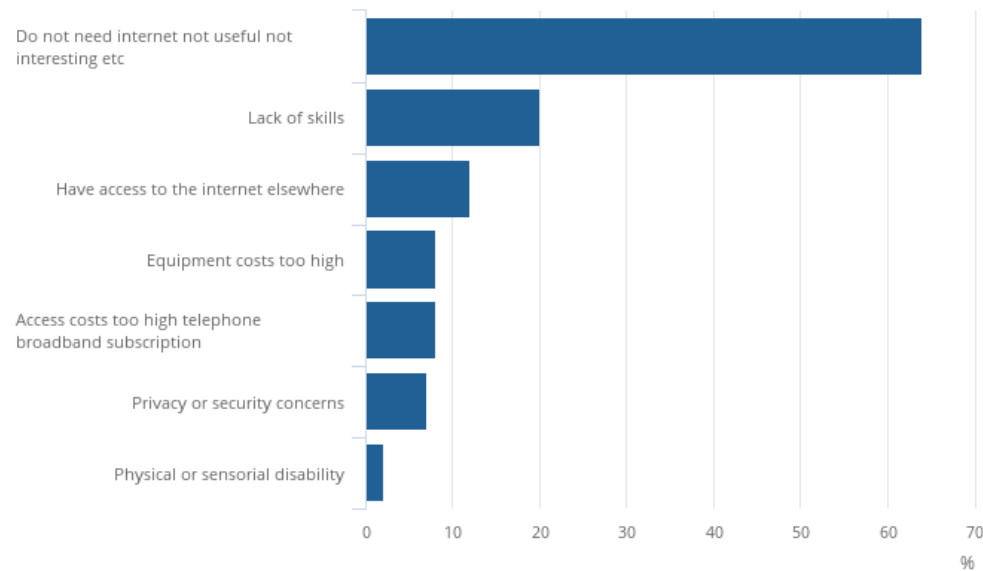
“We will enhance digital connectivity through Project Gigabit and the Shared Rural Network so that by 2030, the UK government and private sector will deliver nationwide gigabit-capable broadband and 4G coverage, with 5G coverage for the majority of the population (Mission Four).”

Source: [Levelling Up the United Kingdom: executive summary](#)

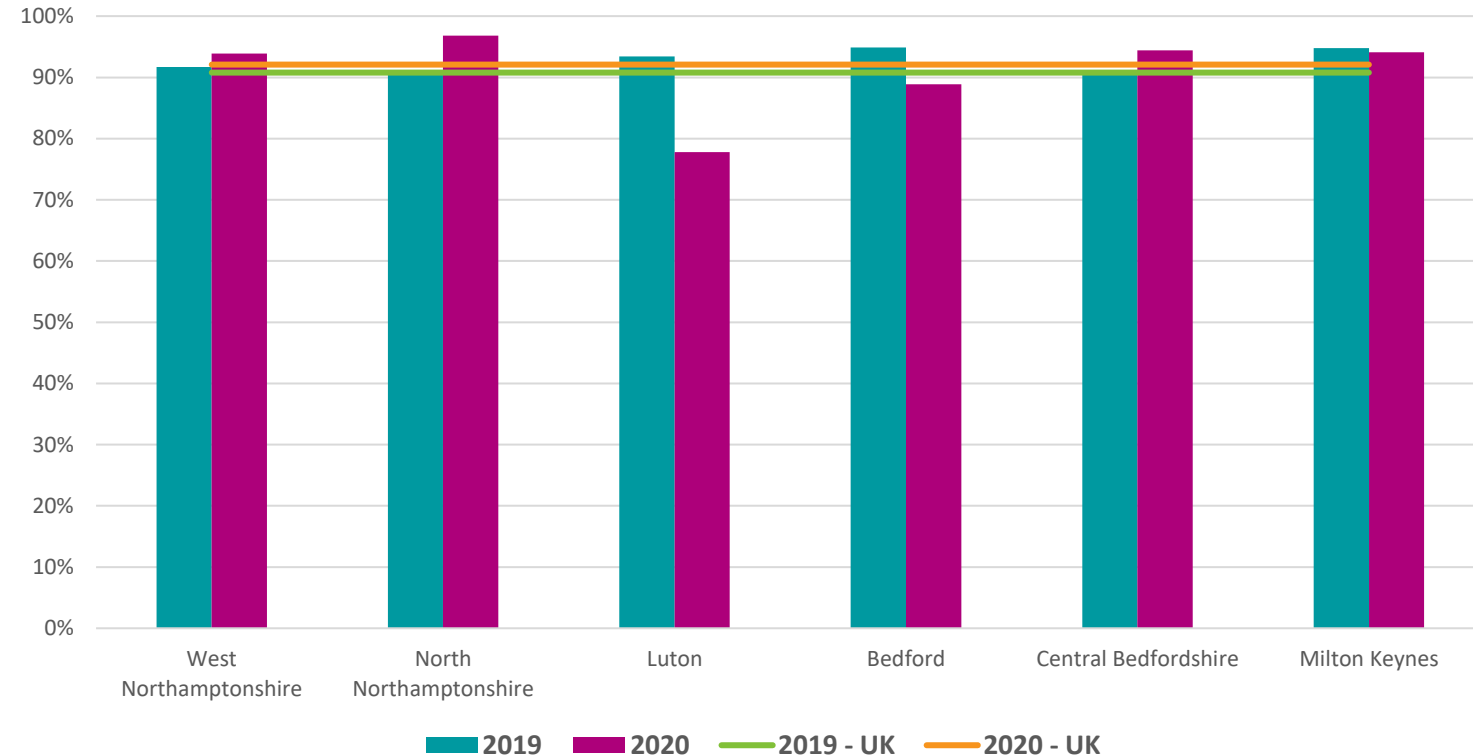
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- ▲ **Digital connectivity has also been identified as a key Levelling-up mission**

Figure 17: The most common reason for not having internet access in the household is a perceived lack of need, followed by a lack of skills

Percentage of households by reason for not having household internet access, Great Britain, 2017



Proportion of individuals reporting having used the internet in the last three months, aged 16+, in the UK and by SEM area, 2019 and 2020

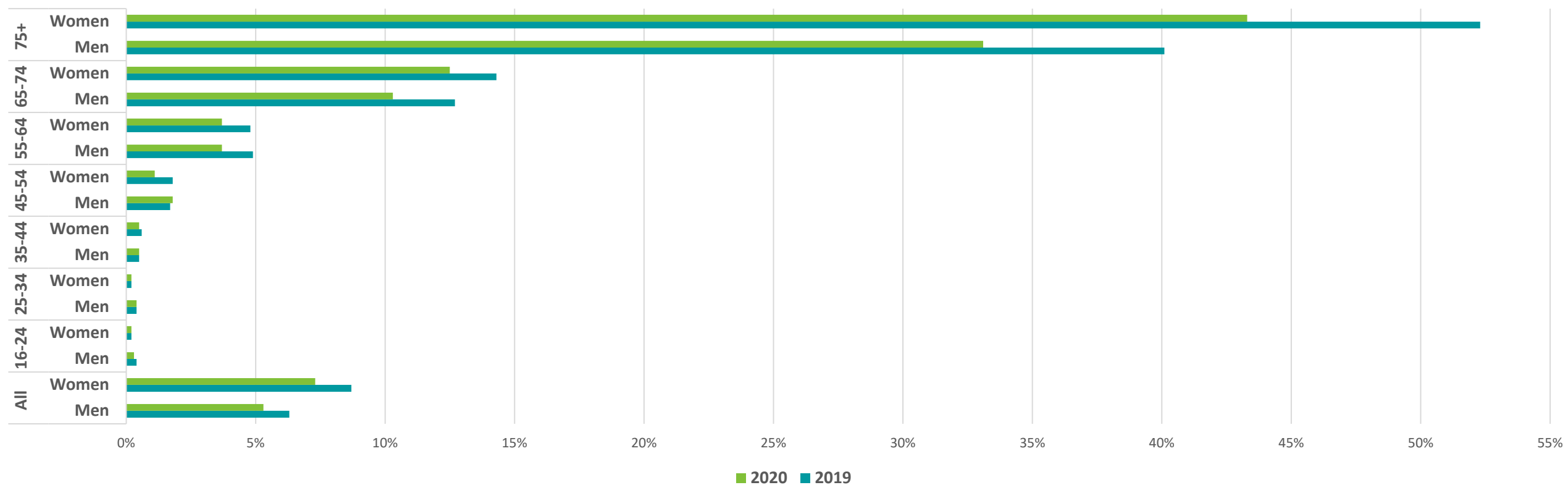


Source: Office for National Statistics - Internet Access, Opinions and Lifestyle Survey (OPN)

Source: [ONS – Internet Users, UK: 2020](#) (NB: survey period was in January to March in 2019 and 2020)

While the leading reason for a lack of internet access in the home is a perceived lack of need, some 8% of non-internet users in the UK could not afford a connection and/or hardware in their home. Recent internet use in the SEM is generally above average, but decreased in some areas during 2020.

Proportion of individuals reporting having never used the internet by gender and age group, UK, 2020




Source: [ONS – Internet Users, UK: 2020](#) (NB: survey period was January to March in 2019 and 2020)

Internet non-use is more common among older adults, but has significantly reduced across all age groups during 2020, although note that this was recorded prior to any lockdown restrictions. Women are more likely to be non-users than men.

“For adults facing digital exclusion, the challenges of social distancing are many. Our research with New Horizons, a one-to-one coaching programme for people experiencing financial issues in the East of England, reveals that digital exclusion creates additional problems for people already experiencing poverty: putting together a CV, applying for jobs, managing and keeping track of money, and applying for Universal Credit are just some of the essential activities made that much harder for the digitally excluded. ...

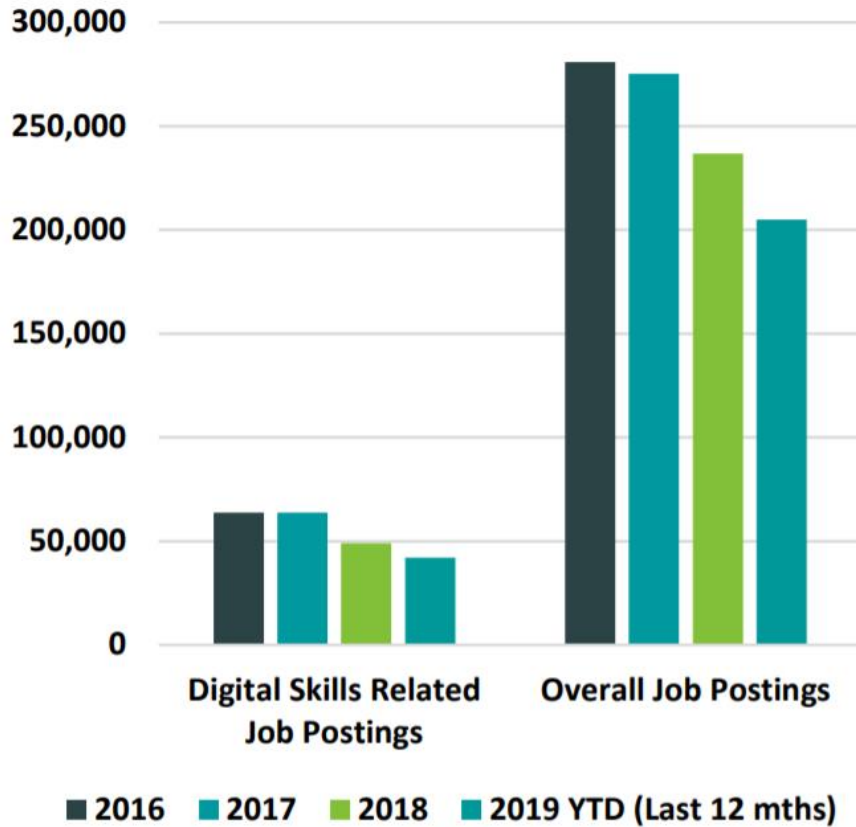
Even where a person has access to IT equipment at home, along with the necessary skills to use it, financial concerns can be prohibitive. As another New Horizons coach explained, for many digitally excluded adults, public libraries offer the opportunity to get online without placing additional strain on already stretched finances.”

Source: [Cambridge Centre for Housing and Planning Research, University of Cambridge](#)

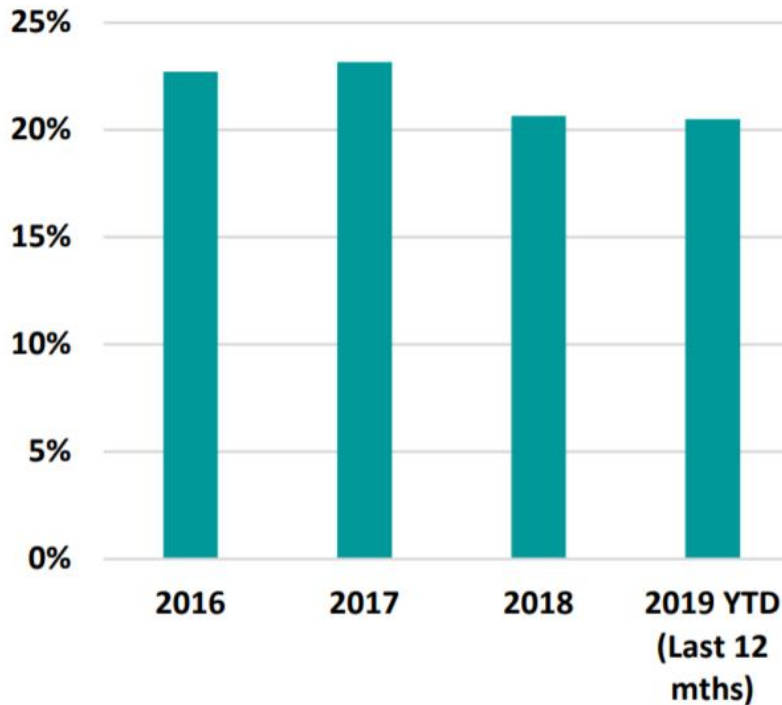


There is some qualitative evidence suggesting that poor access to digital services can cause poverty to worsen, limiting access to job hunting, CV writing and banking services. The impact of lockdown on library access may have limited digital access to households with stretched finances.

SEM Job Postings 2016-2019



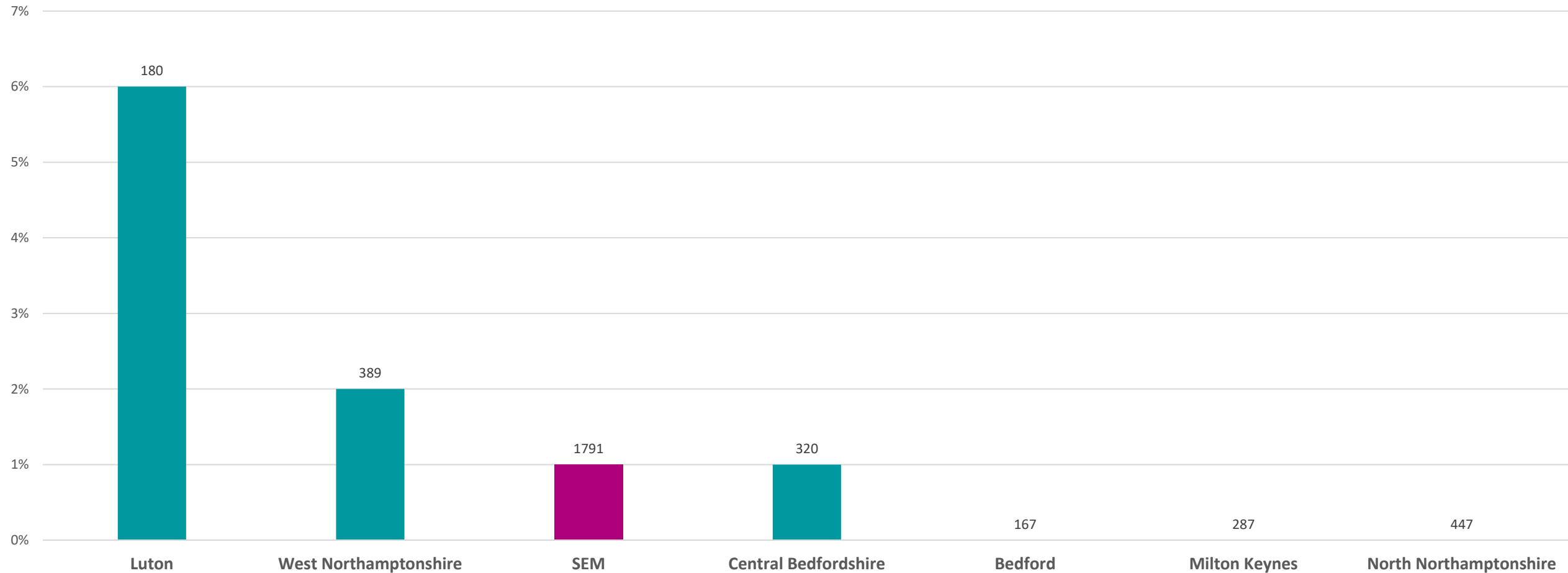
Digital Skills Related as a Percentage of Overall Job Postings



Source: [Analysis of Digital Skills in the South East Midlands December 2019, SEMLEP](#)

Some 1 in 5 job postings in the South East Midlands explicitly require digital skills


% businesses citing IT Infrastructure as a constraint on business growth (unprompted list) with sample sizes (2021)



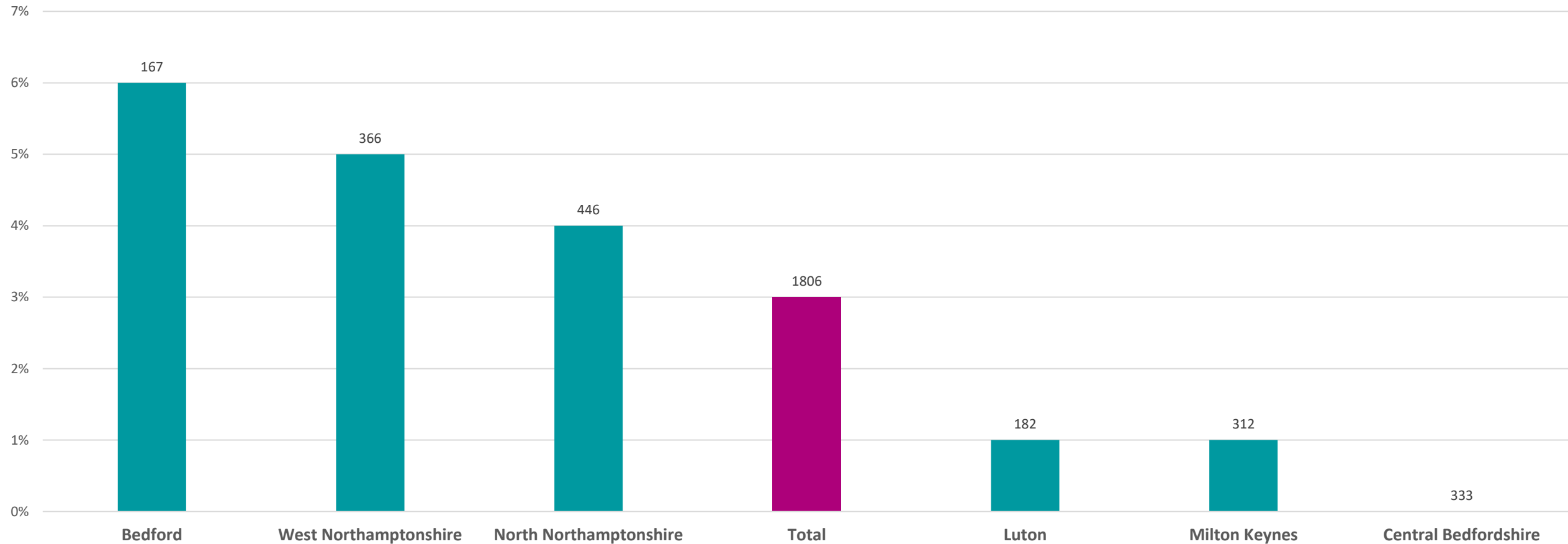
Our Business Survey suggests that digital infrastructure constrains growth for around 1% of businesses in the SEM area, mainly in Luton and West Northants. Far fewer businesses reported IT infrastructure as a growth constraint in 2021 compared to the previous survey in 2019 (3%)

Source: SEMLEP Business Survey, 2021

| Showcase sector | % businesses citing 'IT infrastructure/lack of high speed Broadband' as a constraint on business growth | Sample size |
|---------------------------------------|---|-------------|
| Creative and Cultural Sectors | 5% | 299 |
| High Performance Technology | - | 154 |
| Logistics | - | 199 |
| Manufacturing and Advanced Technology | - | 73 |


Among the showcase sectors, only businesses in the Creative and Cultural sector cited digital infrastructure as a constraint on growth

% businesses responding 'improve other infrastructure such as broadband' to the question "What are the 3 most important things your local Council and other support organisations should do to help you grow your business?" with sample sizes

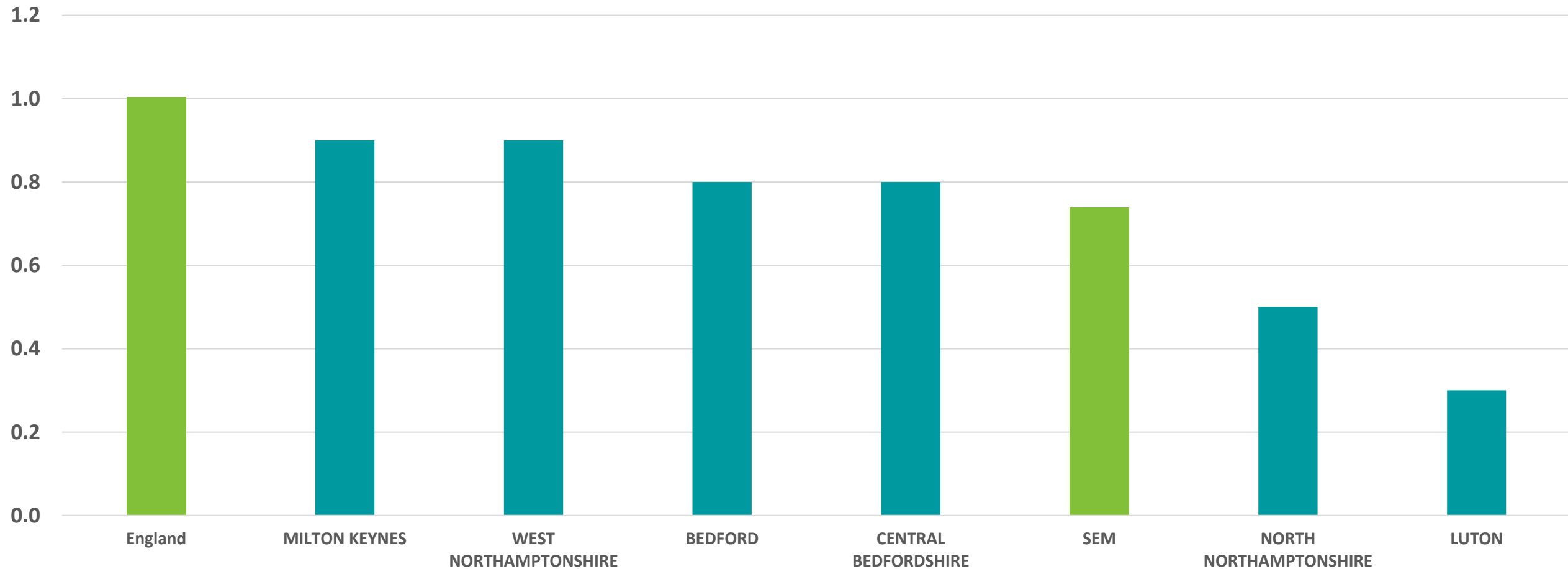


However, digital infrastructure improvements are more of a business support priority for the Bedford and Northamptonshire areas



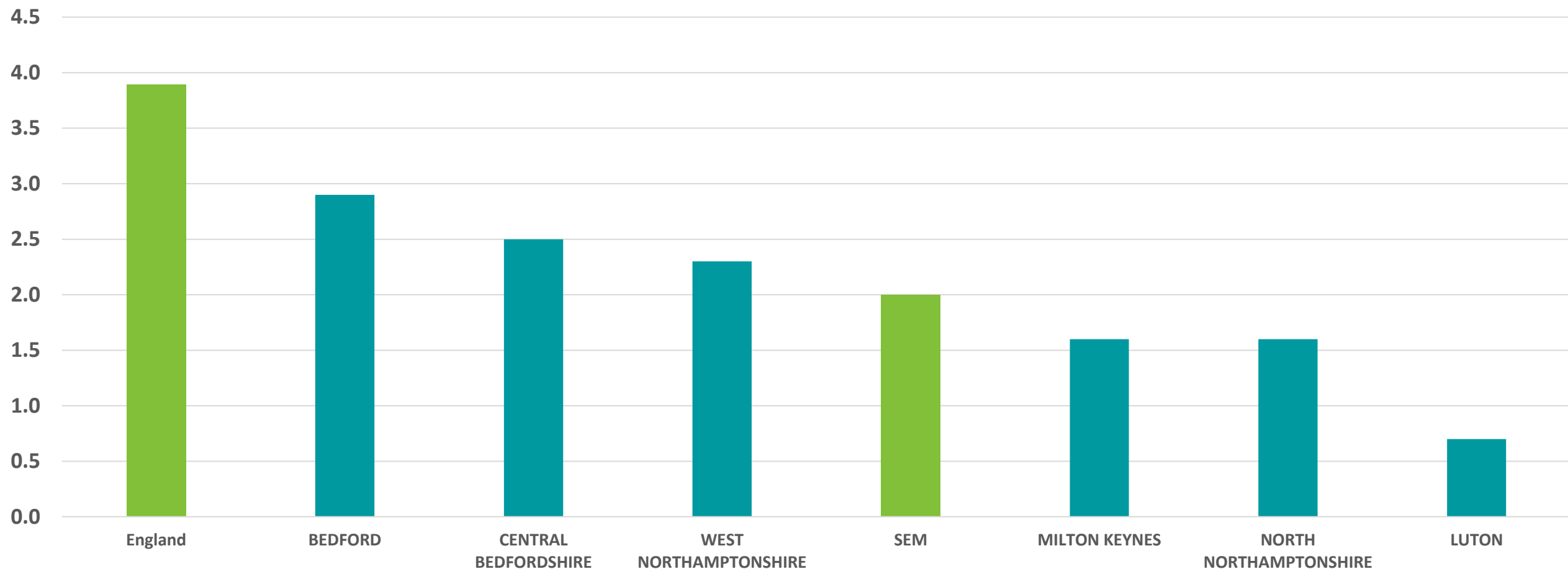
Coverage

% of residential and business premises unable to receive 10Mbit/s (Ofcom Connected Nations 2021, regardless of upload speed)



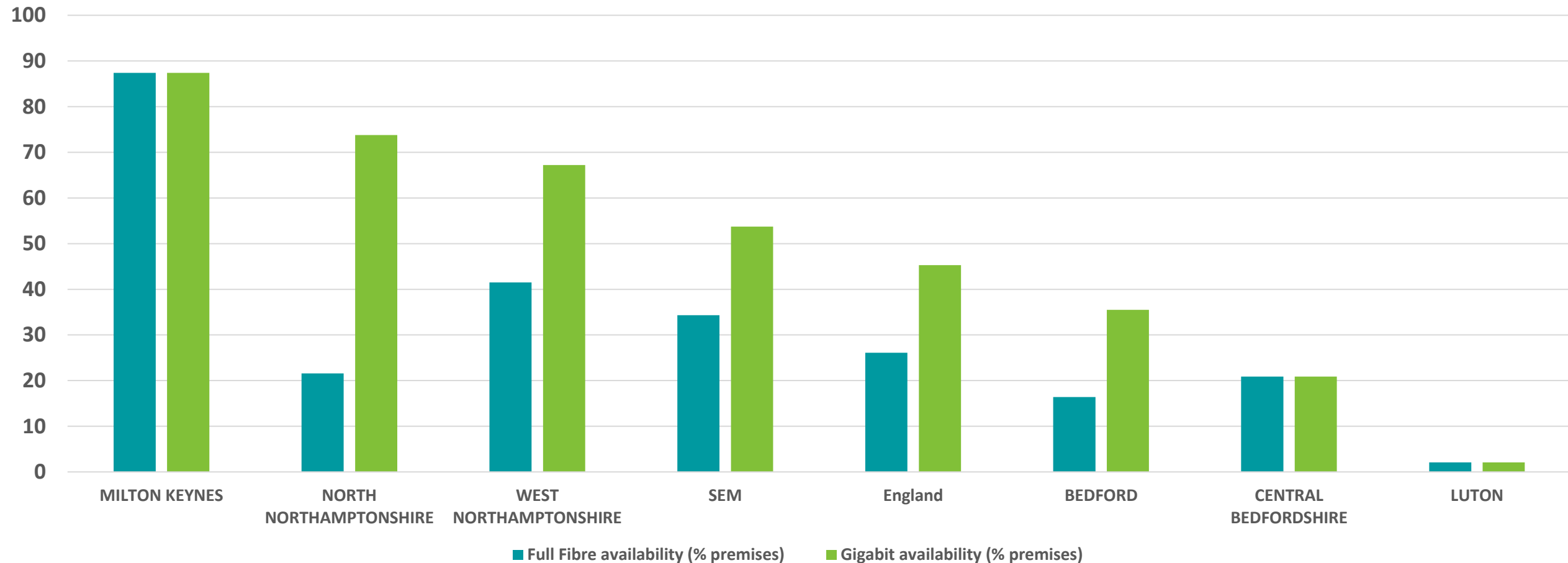
When looking at all premises, coverage is only slightly better in the SEM area than the UK average in terms of basic speeds.

% of residential and business premises unable to receive 30Mbit/s (Ofcom Connected Nations 2021)



▲ Coverage at higher speeds outperforms national averages across the SEM area

% residential and commercial premises with Full Fibre (FTTP) and/or Gigabit broadband available (Ofcom Connected Nations 2021)



Full Fibre (FTTP) and Gigabit coverage also outperform the national rate in the SEM area, although coverage in Bedford, Central Beds and Luton lags behind the national average rate of coverage. Milton Keynes continues to have the highest coverage of gigabit availability locally.

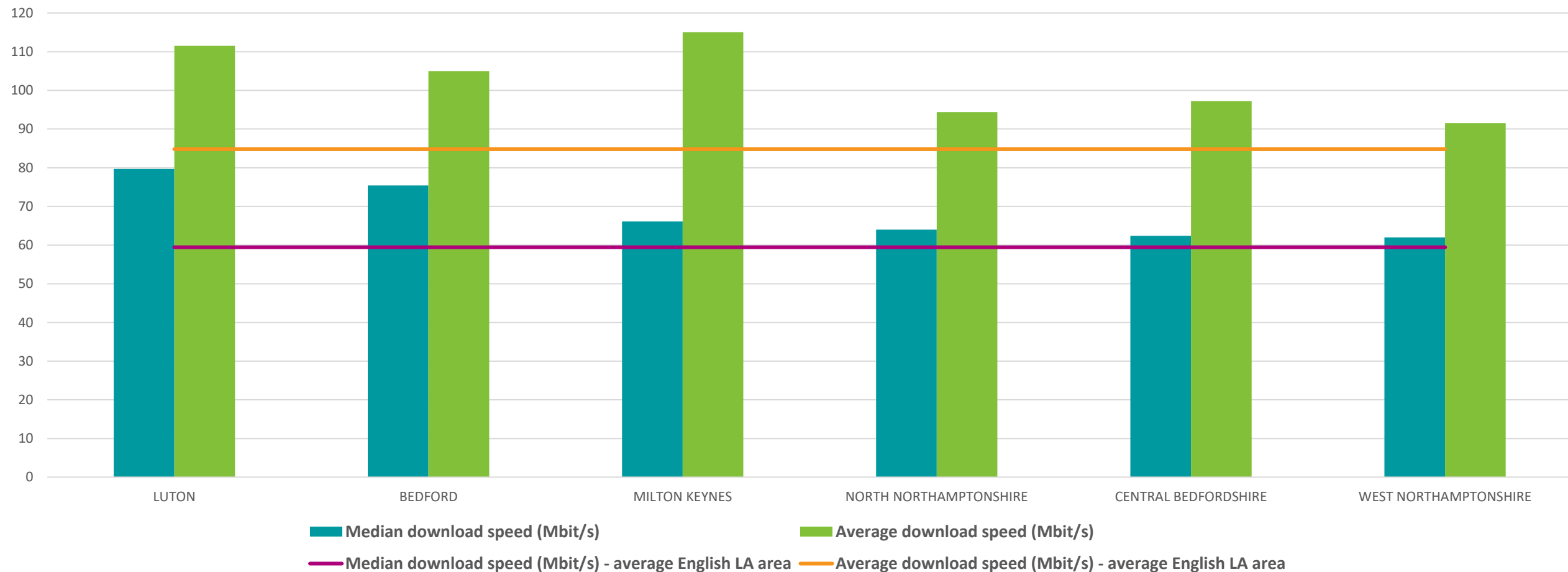
| Council | Superfast (Over 30 Mbps, % premises) | Full Fibre (FTTP, % premises) | Red: below national average |
|------------------------|--|-------------------------------------|--|
| | | | Green: above national average |
| Milton Keynes | 99.20% | 89.50% | Extracted 10 th March 2022 |
| West Northamptonshire | 98.70% | 49.30% | |
| North Northamptonshire | 99.20% | 28.90% | Source: thinkbroadband.com |
| Central Bedfordshire | 98.00% | 24.30% | |
| Bedford | 98.10% | 23.90% | |
| Luton | 99.40% | 2.40% | |
| England | 97.50% | 31.60% | |

 Coverage statistics from
thinkbroadband.com broadly align with
 what Ofcom reports

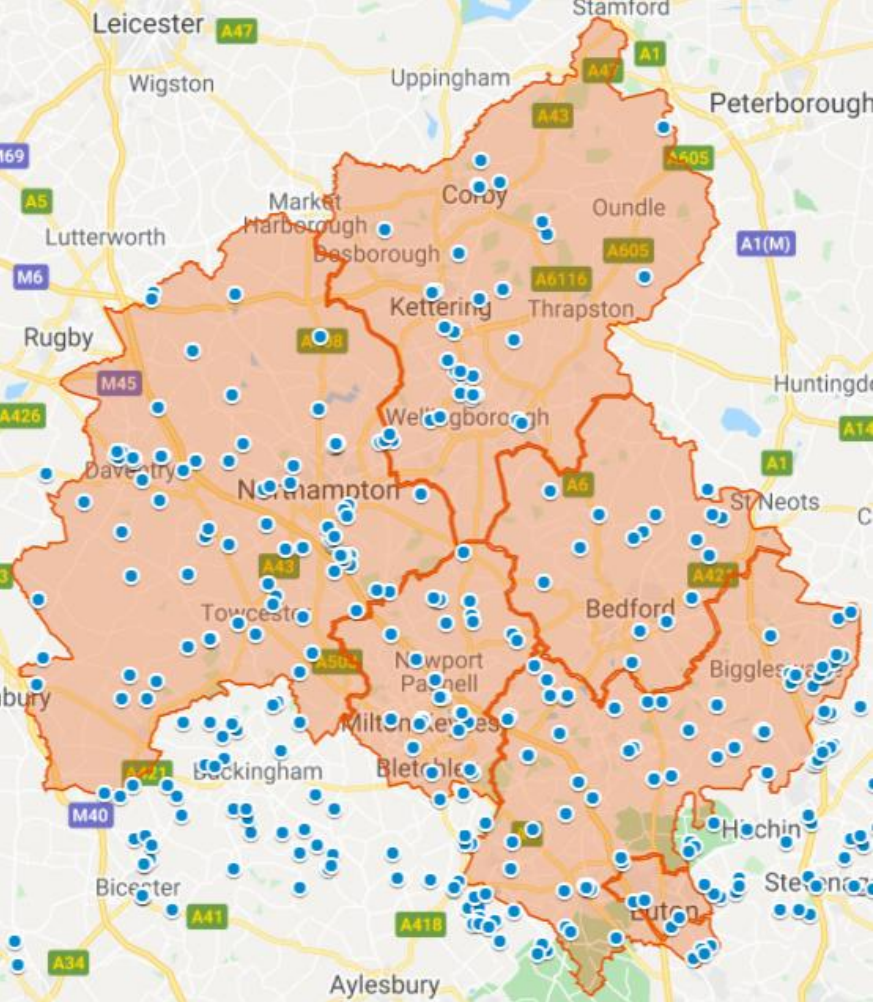


▲ Performance

Median and mean download speeds by local authority (Ofcom Connected Nations, 2021)

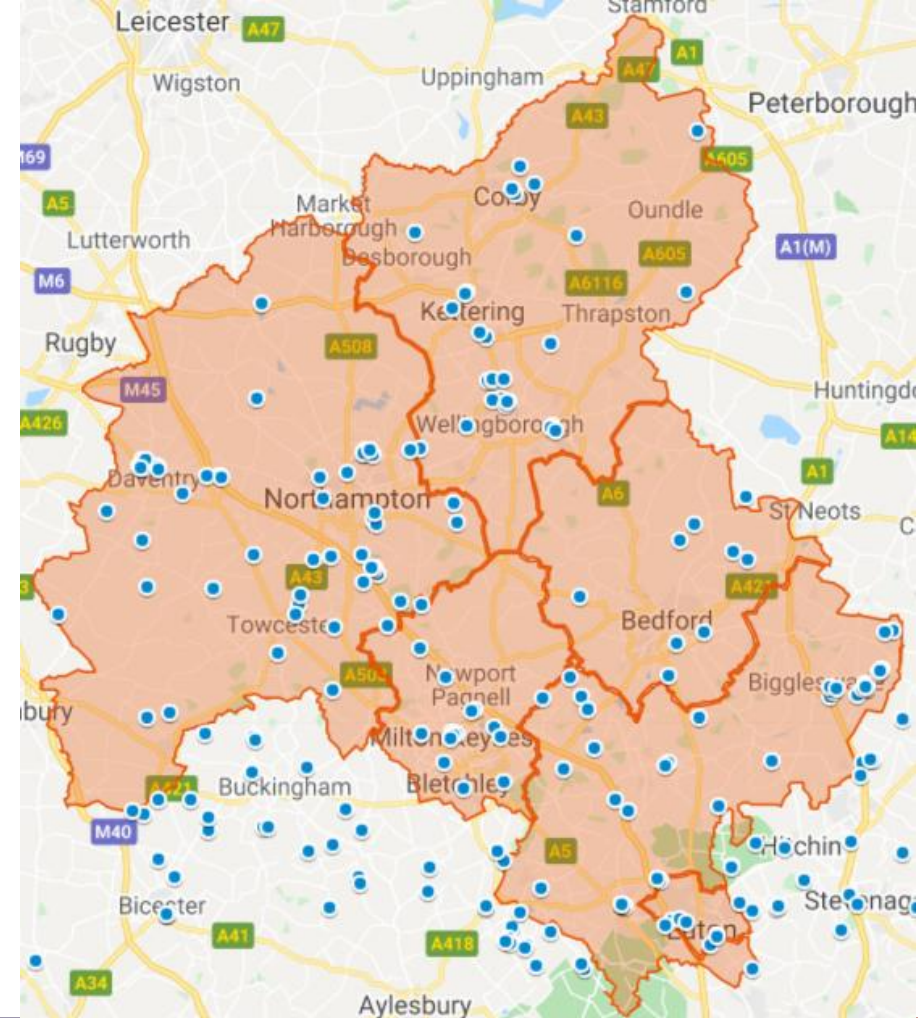


Performance is generally good, equal to or above the mean local authority in England in all SEM LA areas. Average connection performance is generally weaker in North and West Northants and Central Bedfordshire, however.



**Postcodes with
an average
(mean)
download speed
<10MBit/s, in
the South East
Midlands**

**Source: Ofcom
Connected
Nation 2020**



**Postcodes with
an average
(mean)
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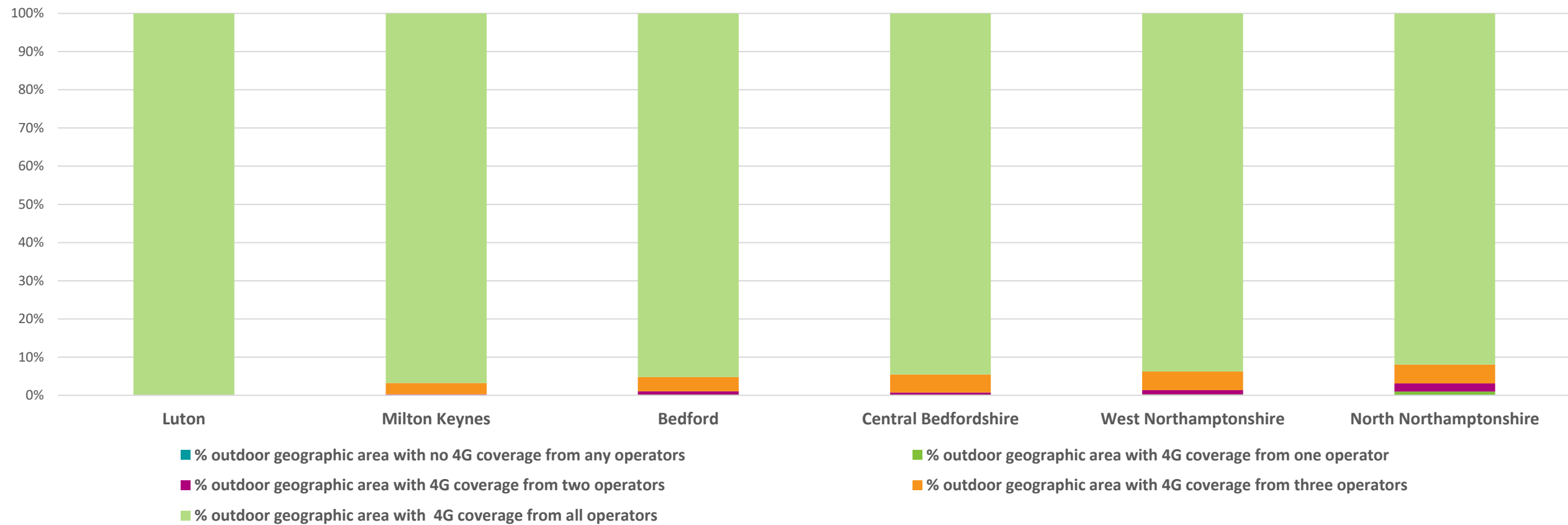
**Source: Ofcom
Connected
Nation 2021**

▲ Fewer postcodes have poor access to decent broadband speeds, compared to previous years, but some clusters of poor performance remain.



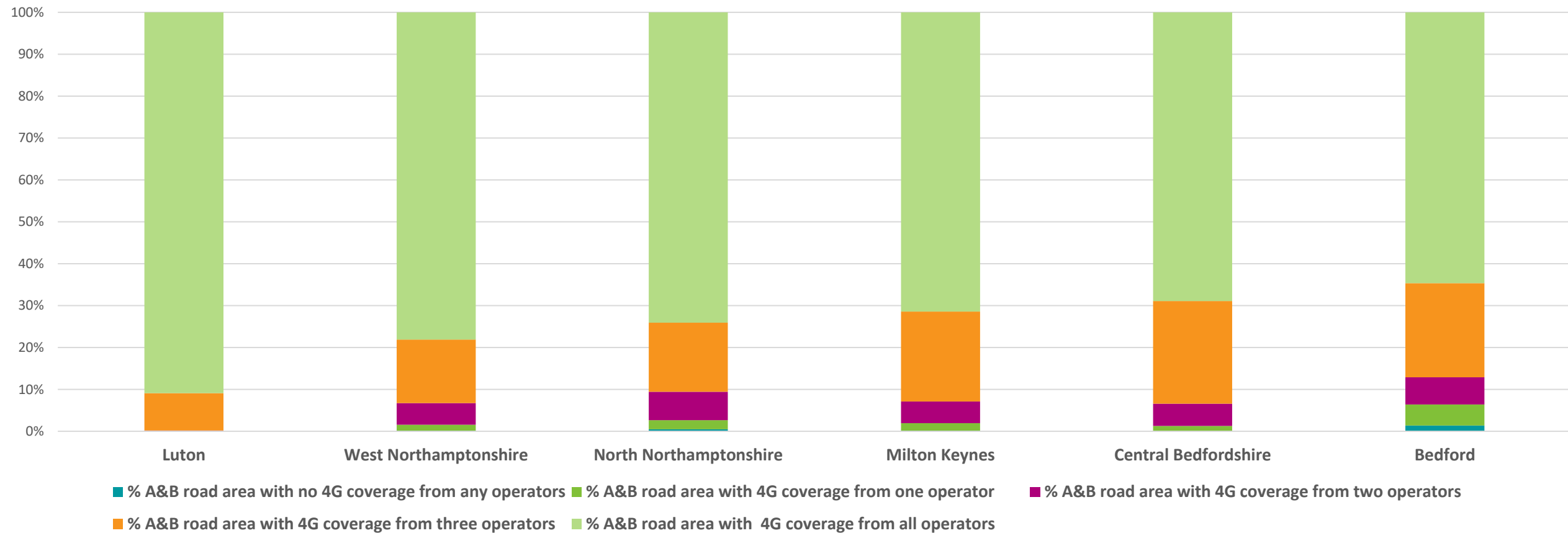
▲ Mobile connectivity

% Geographical area with no outdoor 4G coverage, by local authority and number of operators (Ofcom Connected Nations 2021)



Outdoor geographical coverage is almost perfect, with nearly all parts of the SEM able to get a 4G signal from at least one operator, although rural areas tend to have worse coverage, particularly in Northamptonshire.
(NB: 4G defined here as minimum download speed of 2MBit/S, plus ability to make a 90 second call with no interruption)

% A&B Road area with 4G coverage, by local authority and number of operators
(Ofcom Connected Nations 2021)



Basic 4G coverage on roads is generally good, but is more limited compared to outdoor areas more generally. Coverage is relatively more limited in Bedford and Central Bedfordshire.

There are patches of poor 4G coverage in Northamptonshire, and in rural areas.

The 4G coverage on the road network is more limited in Bedford and Central Bedfordshire.

A key aim should be to ensure coverage is provided from multiple operators across the area.

Focus should be given to the supporting connectivity on the road network, where 4G connectivity is more inconsistent.



Conclusions: Mobile Connectivity




▲ Delivery

Gigabit Broadband Voucher Scheme

- Allows businesses to claim up to £2,500 against the cost of installing a gigabit capable connection
- Residents can claim for vouchers worth up to £500.
- Total fund worth £67m, active since 2017
- Forms a part of government's broader [Project Gigabit](#)

Shared Rural Network

- £1bn fund, aimed at helping to deliver 95% 4G coverage of UK landmass by 2025 through targeting rural areas.
- Translates to 98% 4G coverage from at least one operator, and 90% coverage from all four operators.
- To deliver the programme, Mobile Network Operators (MNOs) will invest £532m to eliminate the majority of 'partial not-spots' – areas which receive coverage from at least one, but not all, operators. The UK Government will provide a further £500m to build new masts to eliminate 'total not-spots' – hard to reach areas where there is currently no coverage at all.
- Grant Funding Period for MNOs started from March 2021.




Delivery mechanisms and funding opportunities (I)

Community Fibre Partnerships

- Communities that are not serviced by a commercial or publicly funded broadband deployment programme, can form a community-led deployment project.
- Typically the community will fund these projects with the support from the government voucher schemes, examples include [Broadband for the Rural North \(B4RN\)](#) and [Fibre for Rural Nottinghamshire \(F4RN\)](#).
- [Openreach has a campaign](#) to make it easier for local groups and communities to co-fund digital infrastructure in their area, but this has been paused due to high demand. Individuals can register their interest in Ultrafast Full Fibre broadband in the meantime.

Superfast Northamptonshire – October 2021 update

- County Council run project, working with OpenReach and Gigaclear to deliver superfast broadband and full-fibre connectivity.
- 7,000 rural premises are due to benefit from full fibre gigabit capable broadband
- Fibre roll out due to complete by the end of 2022
- Over 750km of fibre optic cable has been laid
- Number of premises now able to take up full fibre gigabit capable broadband: 5,120. [Source](#)



Delivery mechanisms and funding opportunities (II)

Wholesale Asset Re-use Platform (WARP)

- E-commerce platform which makes public sector assets more visible to telecoms providers.
- WARP can map any and all commercial broadband networks, applying standard broadband product and process overlays, agreed with industry
- Aggregates the opportunity, making independent providers more visible. Shows what has been installed and where, and what opportunities could be to expand. [Source](#)

Openreach Hard-to-reach Full-Fibre trials

- 4 of the 13 trial locations were in Bedfordshire, including Cranfield, Shefford, Clifton and Henlow
- Opportunity for generating learning and skills required to deliver gigabit capable connections in rural areas.
- In March 2021, following the trials, Openreach committed to upgrading the following places to full-fibre: Great Barford, Heath And Reach, Oakley, Pottton, Shillington, Silsoe. [Source](#)

CityFibre Milton Keynes

- Milton Keynes was the first city in the UK to benefit from CityFibre's Gigabit City Investment Programme, which will see full fibre infrastructure rolled out to eight million premises by 2025.
- From April 2021, a multimillion-pound investment will see a further 7,000 homes added to the initial £40m project, which got underway in early 2018 and was substantially completed at the end of 2020. [Source](#)

Delivery mechanisms and funding opportunities (III)

To support the delivery of the Shared Rural Network, and remove rural mobile data not-spots, government has proposed changes to the Town and Country Planning (General Permitted Development) (England) Order 2015

- Existing mobile masts to be strengthened without prior approval, so they can be upgraded for 5G and shared between mobile operators. This would allow increases to the width of existing masts by up to either 50 per cent or two metres (whichever is greatest) and, in unprotected areas, allow increases in height up to a maximum of 25 metres (previously 20 metres). Greater increases will also be permitted subject to approval by the local authority;
- New masts to be built up to five metres higher - meaning a maximum of 30 metres in unprotected areas and 25 metres in protected areas, subject to approval by the planning authority;
- Buildings to host smaller masts (up to six metres in height above building) in unprotected areas without prior approval to accelerate network upgrades and reduce need to build new masts;
- Building-based masts to be set up nearer to public roads subject to prior approval to improve mobile coverage for road users;
- Cabinets containing radio equipment to be deployed alongside masts without prior approval and to allow greater flexibility for installing cabinets in existing compounds (fenced-off sites containing masts and other communications equipment) to support new 5G networks;
- Conditions to ensure telecoms equipment does not block pavements and access to properties.

Source: [New laws to end mobile coverage 'no bar blues'](#)



Recent digital legislation (I)

- According to the response from ‘New Build Developments: Consultation on delivering gigabit-capable connections,’ government will be **legislating for new build properties to have gigabit capable broadband as standard**. This will be achieved through amending the Building Regulations Act 2010.
- Government has also secured the following commitments from network operators to enable this policy:
 - Contribute a minimum amount to the cost of connection, between £500 and £1,400, with a developer cost cap set at £2,000 (excludes developments of under 20 premises, 99% all new build)
 - Work with developers to ensure premises which cannot be provided with a gigabit-capable connection within the above overall cost envelope can be connected with the next best technology that can be provided within the cap
 - Openreach has published a new price structure that reduces the costs developers pay for connecting two premise developments from £3,100 to £2,000, bringing all developments of two premises or more within the proposed cost cap
 - Openreach have also publicly committed to connect all new build developments over 20 premises for free, reducing this from their current offer of 30 premises
 - USO will continue to apply, where a minimum 10Mbit/s connection must be installed if possible within a £3,400 cost cap.
- Telecommunications Infrastructure (Leasehold Property) Bill, will legislate to make it easier for network operators to install broadband infrastructure in blocks of flats.

Source: [New Build Developments: Delivering gigabit-capable connections](#)

Recent digital legislation (II)



▲ Literature Review

UK: Superfast Broadband Programme

Superfast Broadband Programme – State aid Evaluation Report

- Government programme covering 5.5m business premises, supplying them with new superfast broadband infrastructure.
- Not a Randomised Control Trial (RCT), so researchers used staggered installation to compare the economic impacts on treated and non-treated firms participating in the programme.
- Benefits were evaluated over the period 2012 – 2018. However, the research ignores the potential negative consequences on businesses not included in the programme, such as employment displacement, as well as how businesses not in the programme may have responded to improved infrastructure if they were included.

Findings:

- Local employment impacts: Subsidised coverage was estimated to have increased employment in the areas benefitting from the programme by 0.6 percent, leading to the creation of 17,600 local jobs by the end of 2018.
- Benefit-Cost Ratio estimated at between £2.7 and £3.8 per £1 spent, across 2021-2019.
- Turnover per worker: There were also signals of efficiency gains - turnover per worker of firms in the areas benefitting rose by 0.4 percent in response to subsidised coverage. This was not solely driven by more productive businesses moving into areas with improved broadband infrastructure.
- Firms that did not relocate over the period also saw their turnover per worker rise by 0.7 percent by 2018, indicating that subsidised coverage has also raised the efficiency of firms.

Norway

Akerman, A., Gaarder, I., & Mogstad, M. (2013). The Skill Complementarity of Broadband Internet. IZA Discussion Papers 7762. Institute for the Study of Labor (IZA)

- Government introduced \$180m new broadband infrastructure.
- Not a RCT, researchers use uptake proportion as an instrument to capture endogeneity from selection bias.
- Instrument works as areas with low-uptake should have a weaker responsiveness to the new infrastructure, than areas with a high uptake.
- Controls for area and time fixed effects, not captured under DID.

Findings:

- Broadband augments productivity for skilled workers, doing non-routine tasks.
- Connectivity tends to replace routine tasks by low skilled labour, and thus reduces productivity.
- Effects only explain a few percent in the change in productivity.

USA Agriculture

Kim, Y; Orazem, P (2012). Broadband Internet and Firm Entry: Evidence from Rural Iowa. Iowa State university Working Paper No. 12026.

- 2002-3 US subsidised broadband infrastructure loans to increase coverage in rural areas.
- Pilot scheme ran initially in areas with metropolitan links, before being rolled out to mass market.
- Estimated a DID-PSM, controlling for bias due to wealthier areas receiving more investment.

Findings

- Positive effects in areas with metropolitan links (pilot scheme).
- Zero to negative effect during mass-roll out, suggesting broadband may replace low skilled labour or be ineffective due to a lack of complementary interventions.

Australia

Reeson, Andrew & Rudd, Lachlan. (2016). ICT Activity, Innovation and Productivity: An Analysis of Data From Australian Businesses. *Economic Papers: A journal of applied economics and policy*. 10.1111/1759-3441.12145.

- Firm level study, focusing on SMEs
- Also focuses on the manufacturing sector

Findings

- Broadband benefits only realised when implemented alongside other IT upgrades
 - Video communications
 - Virtual private networks (internal communications and admin)
 - Supply chain management applications.
- Concludes that broadband is not useful unless it is implemented alongside tools to take advantage of it.
- Corroborates with Norway, in that broadband itself only assists non-routine tasks. Routine benefits are derived from software upgrades.

UK

De Stefano, T; Kneller, R; Timmis, J (2014). The (Fuzzy) Digital Divide: The Effect of Broadband Internet Use on UK Firm Performance. University of Nottingham Discussion Papers in Economics. Discussion Paper 14/06.

- Uses a firm level regression discontinuity design, exploiting a natural boundary of broadband availability.
- Controls for firm size but not differences in skill levels or sector. Uses sales per worker as a productivity proxy.
- Should also be noted that financial businesses are excluded from the sample, and sector / organisation effects are not measured.

Findings

- No robust effect of broadband use on productivity.
- However, broadband is not a proxy for organisation change, which could be the main cause of productivity changes.
- Furthermore, the productivity impacts may have been constrained to certain sectors or organisations, which was not analysed as part of this report.

Ireland

Haller, SA; Lyons, S (2012). Broadband Adoption and Firm Productivity: Evidence from Irish Manufacturing Firms. MPRA Paper 42626.

- Not done in response to a government program.
- Uses a similar method to the Norwegian study, with a similar instrument, but ignores differences in labour skill levels.
- Observes heterogeneity in the effects of different broadband technology.

Findings

- More productive firms are more likely to use DSL connections.
- As a result, zero/ambiguous causal effect on productivity.
- Some minor evidence that urban areas benefit more than rural areas, but not significantly.

Digital Skills and access during the pandemic

- Lloyds Bank UK Consumer Digital Index 2020 estimates that 9 million people in the UK can't use the internet or their device without help, and 4.7 million people don't have any digital skills at all.
- A national survey by BT found that 43% of 25-30 year olds say their wellbeing has been impacted due to a lack of digital skills or online access, compared to 10% of over 55s
- When it comes to financial barriers to accessing online technology, the research found more than a quarter of people worry they will not be able to afford new technology if their devices break, including 27% 16-24 year olds who were concerned the most.