

GOING FOR GROWTH

Upwardly Mobile

How the UK can gain the full benefits
of the 5G revolution

BY ALEX JACKMAN AND NICK KING





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Executive Summary

The UK led the world in the previous three industrial revolutions, but finds itself behind in the fourth.

The Government's 5G strategy is based on being a world leader, but competition is intense. China will build 500,000 5G base stations this year,¹ while the South Korean giant, Samsung, spent £13 billion (bn) on Research & Development (R&D) in 2019 alone, only 25% below the cumulative R&D spending by all UK businesses that year.² Thanks to historic strengths, the UK is well placed to lead services innovation in 5G, but it is important that our networks are capable of democratising the benefits of 5G right across the country.

“The OECD states that the extent of 5G gains depends on ‘the speed at which 5G will be rolled-out, and how quickly it will be taken up by businesses and consumers’”

The OECD states that the extent of 5G gains depends on ‘the speed at which 5G will be rolled-out, and how quickly it will be taken up by businesses and consumers’.³ In the UK, nearly £50bn of private and public money is being invested to expand

and future-proof our mobile and fibre infrastructure, much of it within the next five years. How quickly and efficiently that money can be spent carries huge economic importance. Analysis from Policy Points, commissioned as part of this report, finds that, despite the impact of the Covid-19 pandemic, a potential £34.1bn of additional economic output could be created if the Government delivers its 5G target of covering the majority of the population by 2027, and more than £40bn if it is exceeded.

The gains are not just at a national level. A more extensive digital infrastructure helps local areas to attract and retain businesses and talent, thereby playing a vital role in reducing regional inequalities. Providing a supportive environment for digital infrastructure is one of the few things the Government can do that costs little, boosts growth and helps level up the UK. It is a huge opportunity. But the key is speed – the faster a network is built, the bigger the regional gains.

The telecommunications industry faces challenges on this front. The Covid-19 pandemic has increased demand on mobile networks but delayed the availability of new spectrum to provide additional capacity. It has also rendered mobile sites harder to access, due to stricter site protocols. To exacerbate matters, the UK Government's recent decision to phase out Huawei from 5G infrastructure, while fully justifiable, has removed a key supplier, which will both delay 5G rollout in some areas and significantly increase costs for

1 Evidence from Huawei to the House of Commons Science and Technology Committee, July 9, 2020

2 House of Commons, Research and development spending, June 2020, [link](#)

3 OECD, The road to 5G networks, July 2019, [link](#)



the companies building the infrastructure. As a consequence, there are valid questions over whether the Government's 2025 deadline for gigabit connectivity and ambition to be a world leader in 5G can still be met, putting the economic gains outlined in this report at severe risk.

This makes the reliability and reach of 4G more important than ever. It is needed both to quench immediate demand – three fifths of small, rural businesses still experience unreliable data connectivity⁴ – and also to facilitate future 5G rollout, as the underlying passive infrastructure will initially support both technologies.

Unfortunately, this is where a further key problem lies, the resolution of which forms the heart of this report. New rights within the 2017 Digital Economy Act were meant to 'herald a revolution in rural connectivity, bringing the digital economy to all parts of our nation'.⁵ Underpinning this ambition were reforms to the Electronic Communications Code, which governs the relationship between digital infrastructure providers and landowners. Designed to speed up the deployment of the passive infrastructure that supports 4G and lays the foundations for our future prosperity, it is instead mired in contractual disputes and legal bottlenecks, as a series of vested interests game ambiguities within the legislation.

It simply cannot be right that reforms designed to improve and increase 4G and 5G availability can be abused to slow it down, especially at a time when the country is so reliant on digital communication. Every failure to provide better coverage not only presents an immediate opportunity loss for local businesses and consumers but also has a bigger downstream economic impact. Policy Points finds that if delayed

site agreements continue to accumulate at the current rate, by 2027 over 11 million households and businesses may not be receiving the improved digital connectivity they would otherwise have experienced.

“It simply cannot be right that reforms designed to improve and increase 4G and 5G availability can be abused to slow it down, especially at a time when the country is so reliant on digital communication.”

Further, targeted revision is essential in ensuring government intent - and coverage targets - are accurately supported by the legislation. Equally crucial are non-legislative actions to effect behavioural change sooner, with enforcement bodies enhanced and empowered to crack down on vexatious behaviour. Code Operators, landlords and their respective representatives all have key roles to play in shaping a more constructive environment.

The Electronic Communications Code is not the only barrier to digital infrastructure. National planning policy and guidance consistently lag behind technology needs. 'Permitted Development' rights must keep pace with digital rollout to ensure sites are delivered more quickly in the areas that need them and economic benefits should receive greater emphasis in decision making. In addition, the provision of connectivity in some of the most rural areas needs better co-ordination across other utility and infrastructure projects in order to drive efficiencies. A reluctance among businesses to adopt new technology is

4 FSB, Lost connection, October 2019, [link](#)

5 Karen Bradley, then Digital Secretary, HC Deb, September 13, 2016, c775



also a factor; Policy Points finds that if businesses are as slow to adopt 5G as they were with 4G, the economic benefits will be a third less than if take-up proceeds as hoped.

Digital networks and services have underpinned our resilience to the Covid-19 pandemic and they will drive our recovery. By expanding them, we deliver not only immediate benefits but also the essential foundation stone for future prosperity. This is no time for the Government to be passive – the difference between the UK as a 5G pioneer and ceding leadership to others is as much as £173bn.⁶ We must ensure that digital objectives are accurately reflected and supported by legislation. This report makes it clear that productivity gains to business, equality gains for regions and economic gains for the country are only as achievable as the networks they can access.

“Digital networks and services have underpinned our resilience to the Covid-19 pandemic and they will drive our recovery.”

Chapter 1 presents Policy Points’ detailed findings, exploring the opportunities that growing connectivity and the speed of its delivery present to key business sectors and geographies.

Chapter 2 examines the state of the current 4G network and outlines its fundamental importance to the initial rollout of 5G.

Chapter 3 explores how we can ensure the Electronic Communications Code delivers the policy intentions of the Government.

Chapter 4 looks at how to ensure the planning system is future-proofed ahead of pressures coming down the line.

Main recommendations

The Electronic Communications Code and its enforcement must be updated to become fit for digital rollout, supported by interim, non-legislative interventions to speed up agreements between property owners and infrastructure providers:

- 1. To meet the UK’s need for digital infrastructure, the Government must legislate to ensure the Electronic Communications Code is the overriding legislation governing relationships and that ambiguities within it are clarified in a way that balances interests fairly but stays true to the prevailing importance of improved digital connectivity.*
- 2. To discourage vexatious behaviours that delay site works, judges should be given more powers to backdate imposed rental agreements and to grant broader rights. Notification and resolution timescales for renewals should be brought in line with new site agreements.*
- 3. A list of ‘trusted practice’ land agents that work to the intentions of the new Code should be established and promoted to landowners, alongside an awareness campaign that highlights the risk of lower imposed valuations by a tribunal and other litigation costs if no agreement is reached with a Code Operator.*
- 4. Government must encourage and support all departments and sponsored bodies to allow access to public sector properties and assets under new Code rates and conditions and continue to*

⁶ £173bn represents an incremental GDP difference from 2020 to 2030. FCCG, UK strategy and plan for 5G & digitisation, January 2017, [link](#)



provide assurance that 'best value' rules take account of the wider benefits of good mobile connectivity.

5. *The Treasury should explore whether further investment is needed to specifically support 5G innovation in local public services, to encourage councils that have incurred a shortfall in revenue through Code changes to support contiguous and continuous coverage by helping them to understand and take advantage of the benefits of that better connectivity.*

Stronger public sector leadership on the deployment of 5G is needed, across national planning frameworks and local development plans:

6. *All four UK Governments must commit to review and change planning rules by March 2021, with a commitment thereafter to formalise future reviews of planning regulations.*
7. *Government should reform the strategic planning framework to compel local authorities to ensure that the needs of future mobile connectivity are adequately addressed in Local Plans and that new developments are assessed on how they might impact, or could support, local connectivity.*
8. *A time-limited cross-government team of officials should work with the National Infrastructure Commission to better coordinate national and local infrastructure programmes, including fibre and electricity networks.*
9. *The budget, staffing and remit of the Barrier Busting Task Force inside the Department for Digital, Culture, Media and Sport (DCMS) must be ring-fenced, to ensure that the necessary resources and focus are applied solely to tackling deployment issues.*



Chapter 1 – Outlining the prize

The economic opportunity of 5G

5G offers a genuinely new source of growth to help repair the economic damage caused by the Covid-19 pandemic, promising to transform how economic interactions happen.

This chapter illustrates how the sooner 5G connectivity is provided, the sooner the economic opportunity can be realised.

What are the economic benefits of 5G connectivity?

5G promises to create economic benefits as both an evolutionary and a revolutionary technology. The evolutionary benefits arise alongside initial rollout and take-up. Increased capacity, reliability and speed is expected to improve business processes currently hindered by poor digital connectivity. The National Farmers' Union (NFU) has found that only 41% of its members believe the mobile signal they receive is sufficient for the needs of their business.⁷ Coverage will also be improved as a result of 5G. Although the new Shared Rural Network (SRN) will support more 4G availability and choice across the UK, the 700MHz spectrum over which some rural 5G connectivity will be delivered will have a greater reach. This will also help businesses – the Federation of Small Businesses

(FSB) found that almost a third (32%) of small businesses have been prevented from contacting, or being contacted by, customers due to issues with digital connectivity.⁸

The revolutionary potential of 5G – which will not be realised as immediately as its evolutionary potential – could underpin a long-lasting economic transformation.⁹ There is a long list of case studies describing how this transformation could occur across numerous economic contexts (a look at 5G's impact on the agriculture sector can be found in the box below). The varied 5G trials supported by the Government through the 5G Testbeds & Trials Programme demonstrate this. A 5G factory trial in Worcestershire using hundreds of 5G sensors to monitor machines has shown productivity gains of 2%, which if scaled nationally adds a further £3.6bn to the UK economy,¹⁰ and further innovation on factory floors, at fish farms, at tourism hotspots and on road and rail networks has also been proved.¹¹

There are also more general applications of 5G that add to its revolutionary credentials. For instance, in some areas it will become a genuine alternative to fixed broadband – 5G has already been found to be faster than Wifi in seven out of eight leading 5G countries, including the UK (4G is faster than Wifi in only two of these countries).¹²

7 NFU, Mobile and Broadband Survey, January 2020, [link](#)

8 FSB, Lost connection: how poor broadband and poor connectivity hinder small firms, October 2019, [link](#)

9 OECD, The road to 5G networks, July 2019, [link](#)

10 Daily Mail, UK to get £3.6bn boost, July 2019, [link](#)

11 DCMS, Trials & Testbeds Programme, August 2019, [link](#)

12 OpenSignal Analysis, May 2020, [link](#)



This could help companies become more efficient, with survey evidence finding a large minority of businesses (48%) agreeing that a more reliable broadband connection would enable the use of more productivity-enhancing applications.¹³

The immediate business-damaging consequences of poor digital connectivity can in some cases be addressed by delivering 4G connectivity (and 5G should not distract from the need to provide reliable 4G connectivity where it does not currently exist). Yet rural 5G will both reach further¹⁴ and enable technological advancements that 4G simply cannot. The combination of evolutionary and revolutionary promise – and ubiquitous access to it – has led to predictions that 5G could become a General Purpose Technology, spurring innovation and catalysing a fourth industrial revolution.¹⁵

Harvesting data – the productivity benefits of Agritech

As a multibillion pound sector covering more landmass than nearly any other, agriculture potentially has a huge amount to gain from 5G. Agriculture accounts for 1% of Gross Domestic Product (GDP) in the UK but covers, excluding woodland, around 72% of land.¹⁶ Ninety-one per cent of farm businesses already say that broadband is an essential tool for them to run their business,¹⁷

but as robotics, clean technology (cleantech) and the Internet of

Things (IoT) become a reality, there will be significant advantages to early adopters of 5G. Productivity benefits could arise from:

- using drones to scan crops and targeting pesticides at only those in need of them
- real-time data on heavily pregnant cattle, allowing farmers to locate and protect their stock
- tracking soil moisture levels, which could reduce the need to water certain areas
- IoT-optimised operations, which can reduce costs by 15% and increase crop yield by 13%.¹⁸

All of this is possible with other mobile networks, but 5G's high bandwidth, support for a huge number of sensors communicating simultaneously and low latency, make it perfect for farms.¹⁹ Agritech brought in £1.84bn of investment in 2019 compared with £1.06bn in 2016.²⁰ The global scale of the industry benefits makes the sector a crucial area of gain in the years ahead.

13 British Chambers of Commerce, Digital Economy Survey, 2017, [link](#)

14 The characteristics of 700MHz spectrum should allow for some improvement on the 800MHz currently used for 4G

15 Australian Government Working Paper, Impacts of 5G on productivity and economic growth, April 2018, [link](#)

16 Savills, Current agricultural land use in the UK, January 2019, [link](#)

17 NFU Broadband and Mobile Survey, 2017

18 IoT World Today, Connected farming harvests data and gives agriculture a jolt, February 2020, [link](#)

19 5G Radar, 10 ways 5G will change farming and agriculture, May 2020, [link](#)

20 Tech Nation, UK tech for a changing world, March 2020, [link](#)

Quantifying the benefits of 5G connectivity

Plenty of studies have attempted to quantify the overall economic benefits that 5G will bring.²¹ The analysis undertaken by Policy Points for this report adds three new pieces of context to the economic story of 5G. First, its projections recognise the economic impact of the Covid-19 pandemic. Second, it expresses future economic gains in the context of the Government's 2027 target for 5G coverage. Third, it highlights how economic gains vary when considering the adoption of new technology by small and medium-sized enterprises (SMEs), economic geography and specific sectoral uses of 5G.

The analysis used assumptions about the future growth of the economy, the speed and location of the rollout of 5G infrastructure, and the potential uplifts to economic output arising from both the evolutionary and revolutionary applications of 5G technology (based on assessments of the economic gains realised from previous technological advances). Low, central and high modelling scenarios were applied to look at different possibilities for the growth generated by 5G.

Like other analyses, estimating the economic gains arising from new technology involves a high degree of uncertainty. For instance, some of the productivity-enhancing uses of 5G have not yet been invented, and some of the anticipated 5G use cases may be able to occur with existing mobile technology.²² Annex 1 sets out the methodology for the analysis. Three headline messages can be drawn from the analysis.

The sooner 5G infrastructure is in place, the sooner economic gains can accrue

Getting 5G to more of the country more quickly will enable economic benefits to be generated sooner. While obvious, Policy Points' analysis expresses this in terms of economic output to be gained. The Government has a target for the majority of the population to be covered by a 5G signal by 2027. If this target is met – and 51% of the population can get a 5G signal by 2027 – the central modelling scenario suggests that £34.1bn of additional economic output could be created between 2021 and 2027.

But if the Government exceeds its target by a quarter by better supporting mobile rollout and instead of 51%, a 5G signal reaches roughly 64% of the population by 2027, it would mean that £41.8bn would be added to economic output between 2021 and 2027 – an additional £7.7bn in output. These results, and those from the high and low modelling scenarios, are set out in Table 1.

Table 1: Potential economic gains across 2021-7 under each modelling scenario (£bn)

	Low scenario	Central scenario	High scenario
Government meets 5G coverage target	£17.0	£34.1	£42.8
Government exceeds 5G coverage target by a quarter	£20.9	£41.8	£52.6

21 An often-quoted study is Qualcomm, IHS 5G Economic Impact Study, November 2019, [link](#)

22 Deloitte, The impacts of mobile broadband and 5G, June 2018, [link](#)



With speed so key to delivering economic benefits, revision of the Electronic Communications Code is essential. Explored fully in Chapter Three, the Code intends for all site agreements to be concluded within six months. When this is not achieved, there is a tangible impact on households and businesses.

Policy Points determines that the scale of this impact is broadly driven by three factors. First, how many deals are going beyond the target of six months to complete. Industry evidence gathered during this report suggests that figure is around 80% of approximately 6000 negotiations a year. Second, the average length of time beyond six months that a deal takes to complete. Again, industry evidence suggests an average of around 11 months (five months beyond the current intended timeframe of six months). Third, the number of household and business premises served by such sites. Individual site footprints vary dramatically but, for the purposes of this calculation, an average has been taken based on 36,000 mobile sites²³ serving approximately 30 million premises (which covers both residential and business premises).²⁴ Using the above data as the basis for assumptions of stock and flow of Code negotiations over the years to 2027, illustrative calculations suggest that:

- If the average time to complete a deal remained at 11 months (five months beyond the six months intended by the ECC), it would mean an accumulative 10,400 sites would need negotiations completed within 2027, affecting 8.8m premises.

- If the average time taken to complete a deal increased year-on-year at a rate consistent with current delays, then an accumulative 13,600 sites would need negotiations completed within 2027, affecting 11.5m premises.

The impacts above are of course subject to a number of variations, but what is clear is that a substantial part of the population will not be receiving the best connectivity they could be without action to reduce these delays.

“The potential for digital technology to improve productivity performance is significant.”

How quickly businesses adopt 5G will impact on the economic gains

The potential for digital technology to improve productivity performance is significant. For instance, one study found that information and communications technology (ICT) adopted with good management practices generated 20% productivity improvements.²⁵ Research by the CBI (Confederation of British Industry) suggests that 94% of businesses believe that digital technologies are a crucial driver of increased productivity and that more than half of businesses are investing in the IoT, with 42% of companies planning to devote resources to adopting artificial intelligence in the next five years.²⁶

Although businesses of every size and sector are expected to derive productivity

23 Mobile UK submission to DCMS consultation on permitted development rights, [link](#)

24 Ofcom Connected Nations Report, Summer 2020, [link](#)

25 BEIS, Business basics: attitudes to adoption, October 2019, [link](#)

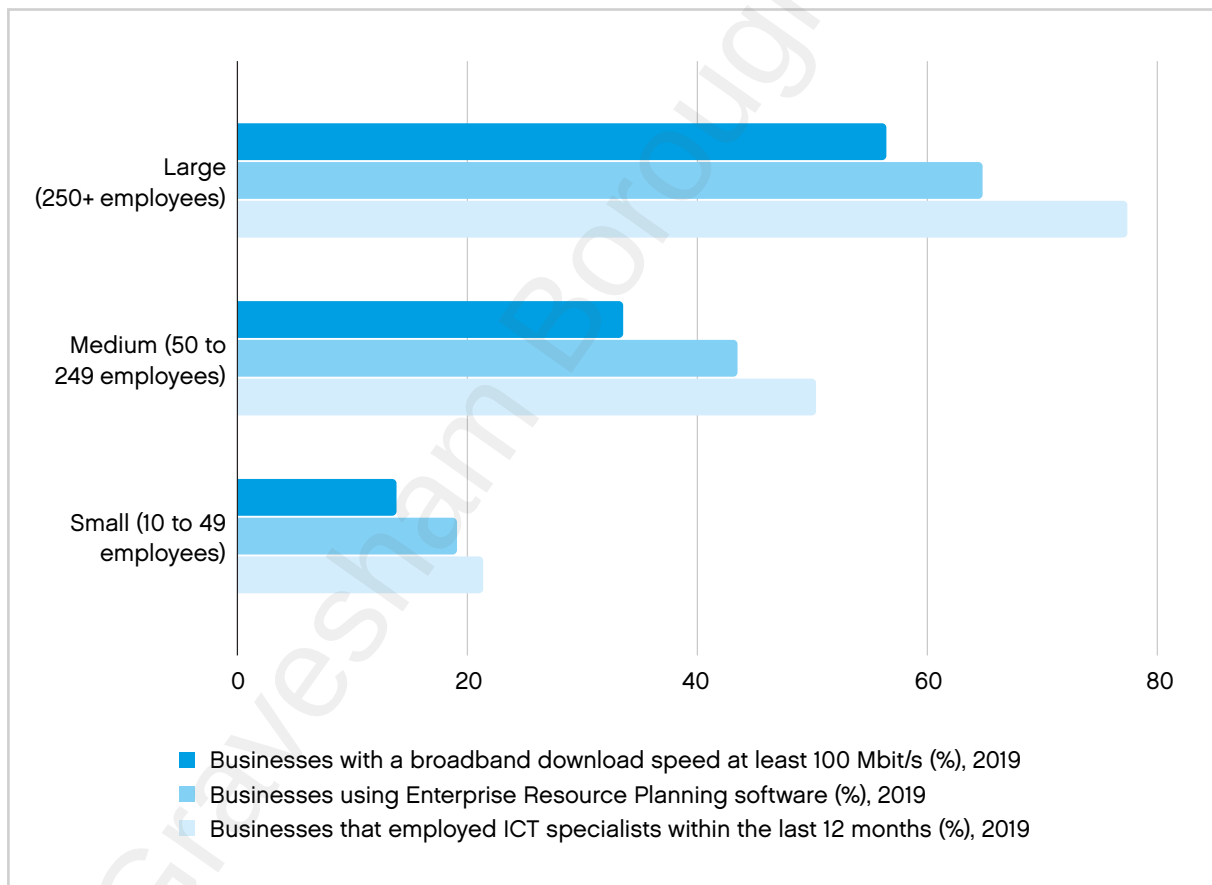
26 CBI, Ready, set, connect, December 2018, [link](#)

benefits from 5G,²⁷ larger businesses tend to be better prepared for the early identification of new technologies that can improve productivity performance. This is already evident in relation to 5G, with some of the world's largest companies, such as Ford Motors, involved in trials.²⁸

The enthusiasm and ability of SMEs to utilise technology for productivity gains, however, are nowhere near as clear cut. A small number of high-flying businesses are at the forefront of innovation and

technological adoption, but the rest are laggards in the take-up of technology (especially in the take-up of advanced technology). There is a 'long tail' of UK businesses that are not good at becoming more productive.²⁹ This can be seen in survey evidence. There are large gaps between large and small firms in the adoption of digital technology across a range of indicators, as represented in Figure 1.³⁰

Figure 1: Indicators of digital take-up by business size



²⁷ Defined as more output created for a given business input

²⁸ Vodafone, Ford unlocks potential of 5G to future-proof electric vehicle production, June 2020, [link](#)

²⁹ Bank of England speech, The UK's productivity problem: hub no spokes, June 2018, [link](#)

³⁰ OECD data, ICT access and usage by business

The analysis by Policy Points finds that if historic patterns of digital adoption among businesses of different sizes are replicated with 5G, then the economic benefits of the technology will be severely blunted. If businesses were to adopt the evolutionary benefits of 5G to only the same levels that they have adopted fixed and mobile broadband, and adopt the revolutionary benefits of 5G to the same levels that they have adopted broadband with fast download speeds, then only £21.5bn of economic benefit would be realised by the Government in meeting its 2027 coverage target,³¹ and there would be a commensurate change if the Government exceeds its coverage target by a quarter, as set out in Table 2. This underlines the importance of stimulating demand for 5G connectivity.

Table 2: Potential economic gains across 2021–7 under each modelling scenario, and adjusted for business take-up (£bn)

	Low scenario	Central scenario	High scenario
Government meets 5G coverage target	£10.1	£21.5	£26.0
Government exceeds 5G coverage target by a quarter	£12.4	£26.4	£31.9

The sectors thought most likely to benefit from 5G are not necessarily located in the places that will have the best 5G connectivity

Some sectors are thought to be more likely to gain from 5G than others. Analysts

typically identify these sectors by assessing how 5G technology can be applied in different business settings. Some of the sectors thought more likely to gain the most are those that are central to the Government's economic priorities over the coming years, including:

- **Manufacturing.** Manufacturing businesses are thought to have been particularly hard hit by the Covid-19 pandemic,³² and a return to sustainable growth post pandemic needs this sector to be in good health. 5G is expected to support productivity improvements in the sector by improving the efficiency of production processes. Manufacturers will also have a key role in making the products and equipment that are needed to provide 5G and that are enabled by 5G.
- **Construction.** The Prime Minister Boris Johnson has talked up the need to 'build, build, build' in order to support economic growth.³³ A thriving construction sector is necessary to achieve this objective. With a long history of woeful productivity performance, there is hope that 5G-enabled robotics to support the building process, drones to support site management and augmented and virtual reality technology to support training will help more output to be created from less input.³⁴
- **Agriculture.** The Government wants to strike new trade deals around the world following its exit from the EU, and sees the agriculture sector as a key consideration in negotiations, having recently convened a Trade and

³¹ These adoption assumptions are taken from the OECD dataset: ICT access and usage by business

³² Financial Times, Manufacturing areas to bear the brunt of COVID-19, April 2020, [link](#)

³³ No. 10 press release, Build, build, build, June 2020, [link](#)

³⁴ Mace, Moving to industry 4.0, October 2017, [link](#)



Agriculture Commission to advise on trade policies that will help UK farmers.³⁵

There are indications that the businesses that make up these sectors are not located in the places most likely to get 5G coverage in the initial years of rollout:

- **At the start of rollout, 5G will be built on current 4G infrastructure (see Chapter 2).** More than half of agriculture, forestry and fishing sector businesses are located in parliamentary constituencies where less than 80% of the geography has a 4G signal from all four operators, while there are 23,875 businesses in the agriculture, forestry and fishing sector spread across 29 constituencies where more than 10% of the landmass has no 4G signal.
- **At the start of rollout, 5G will mostly be available in urban areas.** A quarter of England's manufacturing businesses are located in local authority areas that are predominantly rural. More generally, the location of manufacturing businesses is relevant to political geography too, with thousands of manufacturers based in the former 'red wall' of Labour strongholds in the North of England and the Midlands (see the box below).

The more fundamental point underlying the above is that mobile technology can only improve productivity if businesses can access a mobile connection and adopt the technology that unlocks its benefits. The introduction of the SRN should help ensure that rural geographies get better 4G coverage now as well as being better served by future mobile technology.

5G and manufacturing in the 'red wall'

In 44 of the constituencies in the North of England and the Midlands that changed hands as a result of the 2019 general election, there are 9,300 manufacturing businesses that stand to gain from 5G. Previous studies have estimated the turnover improvement that manufacturing firms could realise through 5G technology.³⁷ Using these estimates as assumptions, Policy Points' analysis found that the 9,300 manufacturing firms could collectively generate an additional £161 million (m) in annual turnover by 2027, equating to £17,300 additional turnover per business. If this turnover uplift were to be applied across all such businesses in the UK economy, it would mean an additional £5bn annual turnover in the year 2027.

How the Government is responding

In recent years there has been a fundamental shift from the UK Government towards investing in connectivity – supporting capital expenditure on digital infrastructure (explored in the next chapter) and stimulating the take-up of digital services. This includes the £200m 5G Testbeds & Trials Programme referred to earlier in this chapter, which has allocated money to support 5G use cases across diverse industries and geographies. Overall, the Government has now funded 24 5G testbeds across the UK, trialling almost 70 different technologies, products and

35 DIT press release, Trade and Agriculture Commission announced, July 2020, [link](#)

36 Businesses included in the calculation are from the Inter-Departmental Business Register, which records information using VAT and PAYE records

37 Oxera, Impact at a local level of full fibre and 5G investments, September 2019, figure 2.5, [link](#)



applications,³⁸ as part of an overall 135 academic 5G projects that Digital Catapult has identified over the past five years.³⁹ How the Government chooses to move this project on in the future will be critical. To date, much of the funding for testbeds has come from government and mobile networks and not the businesses that will ultimately benefit from the services. Ultimately, what the Government would like to create is a virtuous circle, where demand is stimulated rapidly enough to meaningfully promote further investment.

“To date, the Rural Gigabit Voucher Scheme has issued more than 45,000 vouchers, worth more than £90m, to SMEs and residents.”

As well as investing in 5G use cases, the Government is looking to subsidise the take-up of new services. For example, the Rural Gigabit Voucher Scheme is in place to stimulate demand, providing vouchers of up to £3,500 for SMEs and up to £1,500 for residents in rural areas to connect to gigabit-capable broadband. A benefit analysis of a previous voucher project – the Gigabit Broadband Voucher Scheme⁴⁰ – showed some qualitative benefits for local businesses, which, through a more reliable connection and lower-cost bills, were able to move from their existing, patchy connection, as well as improving a sense of place for local businesses so that they all worked at a higher level in their local area.⁴¹ To date, the Rural Gigabit Voucher Scheme has issued more than 45,000 vouchers, worth more than £90m, to SMEs and residents.⁴² Although limited to fibre or cable at present, the widespread rollout of 5G should also be able to benefit from such a scheme were it to be extended.

38 DCMS press release, Funding boost for UK tech innovators to seize opportunities of 5G technology, July 2020, [link](#)

39 Digital Catapult, 5G nation, [link](#)

40 The purpose of the Gigabit Broadband Voucher Scheme was to increase the deployment of full-fibre networks within the UK by providing micro-grants to support the cost of new connectivity. It ran from March 2018 to May 2020 and issued more than 30,000 vouchers to SMEs and individuals.

41 DCMS, Benefits of high speed internet, July 2020, [link](#)

42 DCMS, Half a million premises now have access to gigabit connectivity, August 2020, [link](#)



Chapter 2 – The state of the network

Where we are now

Nearly £50bn will be invested in digital infrastructure by 2025.

Ensuring that money is spent efficiently is fundamentally important to the success of 4G, 5G and the levelling-up agenda.

Putting 4G on the map

Only with the advent of 4G has mobile represented a reliable connectivity solution for businesses, helping to explain why governments have become more invested in its success and reach in recent years. In 2014, the Digital Secretary negotiated the first high-profile coverage agreement with the industry – a £5bn industry commitment to extend coverage to 90% of the UK's geography.⁴³ The networks agreed to this amendment in their licence conditions in return for improved planning rules, better access to government property and reform of the Electronic Communications Code,⁴⁴ together with a review of the level of Annual Licence Fees they paid for spectrum. The 2017 Digital Economy Act made reforms to the Code, although, as we explore in the next chapter, the adoption of its principles remains far from universal, while it took the courts to settle the Licence Fees issue.⁴⁵

The 90% target was met and between 2013 and 2018 there was a 3.9m hectares

reduction in the area of the UK with no mobile signal (one a half times the size of Wales). The UK holds a leading position on 4G coverage in Europe, with around 98% of UK homes and 91% of the UK landmass able to access 4G from at least one operator. This was delivered at the same time as consumer prices continued to reduce.⁴⁸

“Between 2013 and 2018 there was a 3.9m hectares reduction in the area of the UK with no mobile signal (one a half times the size of Wales).”

Nevertheless, as a result of congestion in urban areas or patchy availability in some rural parts of the country, 4G continues to be far from universal. In 2019, Ofcom estimated that 96% of urban areas could get 4G reception from all four operators, compared with 62% of rural areas.⁴⁹ In March 2020, the Government announced a formal partnership with the four mobile network operators (MNOs) to drive coverage deeper into rural areas – the Shared Rural Network (SRN), alluded to earlier in this report. This £1bn commitment comprises £532m invested by the networks

43 The four MNOs are EE, O2, Three and Vodafone

44 The Code governs the relationship between operators of electronic communications networks (known as Code Operators) and site providers

45 Mobile World Live, UK Operators set for windfall as Ofcom loses fee fight, February 2020, [link](#)

46 Ofcom, Connected nations 2018, 2018, [link](#)

47 EU Digital Single Market release, [link](#)

48 ONS recently revised its assessment to show that prices between 1997 and 2016 fell by 95% rather than the <50% previously suggested, Financial Times, July 6, 2020, [link](#)

49 Ofcom Connected nations 2019, 2019, [link](#)



to share more mobile sites, and a further £500m (approximately) of government support for around 450 new masts in areas with no coverage from any operator, as well as use of some of the sites being delivered under the Home Office's new Emergency Services Network (ESN).⁵⁰ The SRN will deliver 4G to an additional 280,000 premises as well as stronger coverage to millions of existing properties and 16,000km of roads, creating an aggregate coverage footprint of 95% of UK geography by 2026.⁵¹

Work in the devolved nations

The SRN also includes notable coverage improvements in Scotland and Wales, for which Ofcom has set individual country targets. Overall, telecommunications policy is a reserved power but there is a considerable array of important levers that Scotland, Wales and Northern Ireland have, including planning policy (covered in Chapter 4), use of public assets and business rate relief. Both the Scottish and Welsh Governments have produced Mobile Action Plans in the past few years, with the Scottish Government committing £25m to the Scottish 4G Infill (S4GI) Programme. To date, this project has one live site and a further 35 in the build or pre-build stage, supporting coverage in some of the UK's most challenging terrain.⁵²

Moving through the gears – the growing impact of 5G

Current 5G coverage targets are outlined in the 2018 Future Telecoms Infrastructure Review (FTIR), which aims to deploy 5G to the majority of the UK population by 2027.⁵³ While this will initially favour urban areas, it is also expected to play a role in the Government's policy to deliver 'gigabit connectivity' to every home and business by 2025.⁵⁴ Backed by £5bn of Treasury money, this is one of the largest civil engineering commitments from government for digital infrastructure to date. The Government's National Infrastructure Plan is expected later this year. Ahead of any renewed timeframes in that document, the Government is working to those presented in Table 3, with approximately £7.3bn of capital expenditure on network deployment and a further £400m on stimulating demand.

The first UK deployments of 5G are already taking place (in Europe, only Switzerland launched 5G sooner). As at September 2020, industry figures show that 5G is now available in more than 100 locations across the UK. These early sites offer significantly faster download speeds (at around 10 times the current 4G averages) and resolve some of the capacity concerns in peak times by delivering up to a seven-times improvement,⁵⁵ by aggregating together the existing 4G and new 5G spectrum (which is why the early deployment of 5G is non-standalone and intrinsically reliant on 4G). In the second half of this

50 The ESN contract, awarded to EE in 2015, requires the delivery of approximately 800 new sites. Of these, 292, in the remotest areas, are being built directly by the Home Office under the Extended Areas Service part of the programme. It is intended that the SRN makes use of these.

51 DCMS press release, £1bn deal to end poor rural mobile coverage agreed, March 2020, [link](#)

52 Update on 4G Infill Programme, [link](#)

53 Future Telecoms Infrastructure Review, July 2018, [link](#)

54 Gigabit connectivity has been toned down from the original intention to deliver full fibre to all. The new definition opens up the opportunity to include Virgin's cable network as well as mobile solutions, thereby substantially increasing the number of properties that already met the definition, from, at that point in time, 9% to up to 55%, ISP Review, September 29, 2019, [link](#)

55 Enders Analysis, 5G to change the shape of UK mobile, 2019, [link](#)



decade, 5G will move from a capacity and speed upgrade to a truly revolutionary technology. Although consumer demand will continue to grow – Deloitte predicts that by 2030, UK households will have an

average of 10 video-on-demand services and up to 200m registrations⁵⁶ – the real gains will shift to businesses and the public sector, as the previous chapter explored.

Table 3: Main government sources of investment into mobile connectivity

Policy	Source	Technology	Government investment	Current timeframe
Gigabit connectivity to every home and business	Conservative Manifesto (2019)	Fibre, cable and mobile	£5bn	2025
4G coverage to 95% of the UK's geography	Shared Rural Network agreement (2020)	Mobile	£500m	2026* (milestone of 88% by 2024)
Emergency Services Network (ESN)	Emergency Services Mobile Communications Programme (ESMCP)	Mobile	c. £1.8bn	December 2022
5G coverage to the 'majority of the population'	Future Telecoms Infrastructure Review (2018)	Mobile	£200m to 5G Testbeds & Trials Programme	December 2027
Gigabit Voucher Scheme	National Productivity Investment Fund	Fibre/5G	£200m	March 2021
Scottish 4G Infil (S4GI) Programme	Scottish Futures Trust	Mobile	£25m	2022

* The deadline is six years after state aid approval for government funding in the SRN. When and who grants that will depend on the circumstances of EU exit.

More than just economic gains – 5G and broader benefits to society

Taking whatever economic opportunities arise from 5G must be an integral feature of policymaking – but there is a bigger picture. The provision of digital infrastructure can help to close regional inequalities. A wide-reaching gigabit network empowers businesses by helping them to both start and stay local. The digital sector is a case in point. Digital sector jobs already account for 2.5% to 3.5% of most regional employment and growing clusters

across the UK are closing regional pay gaps and attracting more talent. In Wales, for example, the annual average salary is around £32,000, whereas the average advertised digital salary currently stands at £43,459.⁵⁷ Hence a previous Centre for Policy Studies paper, 'Platforms for Growth', noted that 'when the Government talks of its desire to create a "high-wage" economy, these are exactly the sorts of jobs, and salaries, it should have in mind'.⁵⁸

As with the economic gains, these impacts are again dependent on the speed of delivery. Barclays outlines how speed

⁵⁶ Deloitte press release, [link](#)

⁵⁷ A 5G blueprint for Wales, September 2019

⁵⁸ CPS, Platforms for growth, July 2020, [link](#)



impacts on regional jobs growth. Under its 'pessimistic' and 'central' scenarios for the rollout of 5G, the anticipated growth in jobs and output is weighted in favour of the 'Greater South-East'.⁵⁹ However, under an 'optimistic' outlook, which sees a speedier rollout of the technology, the benefits are more widespread outside of London.⁶⁰

“ The delivery of the networks themselves is a major civil engineering project.”

There are many other public policy benefits through 5G, from achieving net zero carbon emission targets through better energy management and reduced commuting,⁶¹ to supporting the Government's moves towards 'digital by default', ensuring nobody is disenfranchised from their legal obligations because of poor connectivity. The expansion of connectivity will also help tackle issues such as adult mental health care and social cohesion, as well as supporting greater community care – issues that tend to have much more of an impact in deprived areas.

And it is not just the end product of better connectivity that matters. The delivery of the networks themselves is a major civil engineering project. With more than £7bn of public money and £41bn of private investment being spent to deliver connectivity over the next five years, the UK will be awash with local opportunities created by the build of digital infrastructure, from network architects to civil engineers, and local surveyors to project managers. 5G has the potential to profoundly change

lives and help local economies to grow and compete.

Increased demand and reduced supply put efficient investment at risk

With such sums being invested in digital networks and the opportunities on offer, their smooth functioning is now a matter of critical importance. Nothing has underlined this more than the additional strain caused by the Covid-19 pandemic. Overall, 4G networks have coped admirably, ensuring additional capacity for frontline staff and public services, insulating many businesses from more severe damage and supporting communities to help the most vulnerable. This has been delivered in the face of significant rises in network traffic and shifts in patterns of usage, as well as reducing revenues, which, at a decline of 7%, represents a greater hit than expected under the pandemic.⁶²

However, the pandemic has also posed problems that are harder to absorb. Furloughed staff meant response rates to access sites were slower, and in some sensitive sites, such as hospital rooftops, entirely new processes had to be rapidly developed. Maintenance that did take place had to be done under social distancing guidelines, and engineers, like many other professionals, have not been immune from increased absenteeism. Misinformation linking Covid-19 symptoms to 5G, a conspiracy that up to 20% of the population still believe,⁶³ led to more than 100 arson attacks on mobile sites. Government guidance listing telecoms as a critical sector with key workers helped to resolve some of this, but the pandemic has clearly exposed the greater agility needs of

59 The Greater South-East encompasses London, the South-East region and the East of England

60 Barclays, 5G: a transformative technology, 2018, [link](#)

61 CBI, Building a world-class innovation and digital economy, June 2020, [link](#)

62 Analysys Mason, Covid-19 will lead telecoms revenue to decline by 3.4% in developed markets in 2020, April 2020, [link](#)

63 University of Oxford, Conspiracy beliefs reduce the following of coronavirus guidance, May 2020, [link](#)



the sector. By accelerating trends for home working, the pandemic may also shift where the geographical demand for coverage is coming from. During lockdown there was a shift from urban to suburban and residential areas, which presents a new dilemma for the rollout of sites and impacts network demand and capacity. If expectations are that this is a longer-term shift in working demographics, then greater capacity in suburban and residential areas will be needed.

Problems for mobile are not just on the demand side. Some of the regulatory actions essential to 5G have also been affected, including a delay to next year of Ofcom's 5G auction of the 700MHz and 3.6–3.8GHz bands – vital extra capacity to cope with growing demand - and an outright rejection of proposals to allocate spectrum without the need for an auction at all. As impactful is the decision to phase Huawei out of the UK's 5G network. The industry widely considers Huawei equipment as both cheaper and technologically ahead of that of its competitors and three of the four mobile networks are heavily reliant on it for 4G and 5G.

Previous studies looking at the impact of banning Huawei have estimated that it could delay 5G access for millions of people⁶⁴ and the realisation of billions in economic benefits.⁶⁵ Although such estimates are highly uncertain given the regularly changing policy and regulatory environment, the fundamental point that delayed rollout equals delayed economic benefits still holds and the impact could escalate further. Considerable political pressures at home (the UK's volatile

political relationship with China) and abroad (through any extension of US sanctions into 4G) could have enormously detrimental consequences for the UK. If the 2027 deadline is brought forward, pressures to replace equipment at the front line cannot be met without additional costs, delays and network outages, with the follow-on impacts that will have on the UK's recovery.⁶⁶

In fixed networks, which are being relied on for the backhaul⁶⁷ to 5G sites, over 40% of existing fixed access is based on Huawei's equipment.⁶⁸ Removing it fully will delay the full-fibre rollout, as well as reducing diversity and impacting resilience.⁶⁹ As a result, the decision makes the 2025 deadline for gigabit connectivity extremely hard to achieve and complicates a crucial component of 5G networks too.

“ Previous studies looking at the impact of banning Huawei have estimated that it could delay 5G access for millions of people and the realisation of billions in economic benefits.”

No time to be passive

All this matters, as the international competition to secure earlier benefits from 5G is huge. China's five-year economic plan commits \$400bn in 5G-related investment, while South Korea already boasts a near-universal full-fibre network. In Europe, consultancy firm inCites placed the UK sixth

64 National Institute of Economic and Social Research, China and the United Kingdom: economic relationships, July 2020, [link](#)

65 Assembly report for Mobile UK: The impact on the UK of a restriction on Huawei in the telecoms supply chain, April 2019, [link](#)

66 Evidence to the Science and Technology Committee, July 9 2020

67 Backhaul is a fibre or wireless connection that links a mast to the core network

68 Enders Analysis, Recovery interrupted, UK mobile market in Q2, 2020, [link](#)

69 As a result, the National Cyber Security Centre is actually advocating for the UK government to temporarily support Huawei to manage the transition, believing that the resilience risks of a single vendor outweigh the security risks of Huawei. NCSC analysis of the May 2020 US sanction



in a 5G readiness index.⁷⁰ For all the UK's great assets that should make it a global leader in terms of 5G – its world-leading universities, history of innovation and leadership in global challenges – we are at a substantial disadvantage in building this next generation of technology.

It is beholden on policymakers not to make this process even harder by failing to resolve other barriers to getting these networks extended. Emerging evidence suggests that countries with better connectivity infrastructure can mitigate up to half of the negative economic impact of the Covid-19 pandemic.⁷¹ Central to the Prime Minister Boris Johnson's 'build, build, build' agenda must be the broadband and mobile coverage a modern society needs. Government is naturally conditioned to regulate retrospectively, but with telecommunications constantly innovating to meet growing consumer demand,⁷² this has resulted in a policy environment that consistently lags behind industry's deployment needs. With the business community requiring fast, reliable and ubiquitous connectivity now, levelling up being dependent on tools that people

can access locally, and the future 5G network needing the base layer of passive infrastructure in place, the economic and social gains of better 4G and world-leading 5G are big enough for the Government to act bold and early.

“It is beholden on policymakers not to make this process even harder by failing to resolve other barriers to getting these networks extended.”

Central to this is revision of the Electronic Communications Code, which, despite being amended three years ago, is still subject to legal interpretation and litigation, with the net effect that site negotiations are being delayed. The costs of inaction outweigh any short-term political difficulties of further intervention in this complex market – the right policy environment is needed to facilitate extensive, resilient and agile networks, not just for 4G now, but for 5G and future generations of network technology, as the next chapter makes clear.

70 inCites Consulting, Europe 5G Readiness Index, 2019, [link](#)

71 Economic impact of Covid-19 on Digital Infrastructure, Economic Experts Roundtable organised by the ITU, July 2020

72 In 2018, telecommunications was the fastest-growing sector for R&D spending

Chapter 3 – Ground to a halt

Revising the Electronic Communications Code

Some of the biggest beneficiaries of 5G lie in areas that require better 4G mobile coverage now.

To expand coverage, mobile networks need to attach equipment to existing structures and build new sites. The Electronic Communications Code underpins the relationship between this passive infrastructure and the land on which it sits. However, it requires essential, targeted changes to cope with the additional demand and supply pressures that mobile networks are facing.

Implementation of the new Electronic Communications Code

It is estimated that there are around 12,000 unique visits to mobile sites every year, encompassing improvement works, maintenance, the sharing of sites and contract negotiations (such as renewals or Notices to Quit).⁷³ The Electronic Communications Code,⁷⁴ which governs the relationship between operators of electronic communications networks ('Code Operators') and site providers, underpins most of these interactions. Described in one judgment as 'one of the least coherent and thought-through pieces of legislation on the statute book',⁷⁵ the Code was reformed through the

Digital Economy Act in 2017 to deliver clarity and consistency, supporting site owners and users to reach site agreements and resolve disputes more quickly.

“To expand coverage, mobile networks need to attach equipment to existing structures and build new sites.”

The reforms enacted in 2017 boil down to two key purposes:

- a reduction in infrastructure costs, with the outcome of more sites and increased coverage
- a strengthening of Code Operators' powers over their sites, intended to allow quicker upgrades, sharing and maintenance, as well as providing a longer notice period for a site's removal, ensuring more reliable connectivity.

Where disputes arise, the Code allows for either party to apply to a tribunal for an agreement to be imposed or for resolution of the disputed matter.

The Government was clear on these intentions, citing the need 'to cut costs and simplify the process of building mobile and broadband infrastructure on private land'.⁷⁶ It was also aware

⁷³ Analysys Mason, Financial impact of ECC changes, May 2016, [link](#)

⁷⁴ First introduced in the Telecommunications Act of 1984

⁷⁵ *Geo Networks Ltd v The Bridgewater Canal Company Ltd*, cited in House of Commons Briefing Paper CBP7203, 2016

that changes risked temporary market uncertainty, a ‘freeze’ that Analysys Mason confirmed seven months later.⁷⁷ In August 2018, the Government convened parties to try to forge a way forward,⁷⁸ but despite a joint statement⁷⁹ to work collaboratively and professionally to deliver the intentions of the Code, a further two years on and there is little progress. In fact, a recent tribunal case specially criticised the ‘startling level of mistrust and animosity’ between the site provider and Operator.⁸⁰ This matters; sharing and improvement work to thousands of sites are currently delayed because of negotiation failures, and poor relationships with one Code Operator could inhibit the ability of other Operators to access a site.

“The UK must have a functioning network to support the recovery from the pandemic, empowering businesses and communities with wider coverage, and preparing the ground for the services that 5G can provide.”

It is in the interests of all parties to resolve current problems. Mobile infrastructure has shown its value in supporting communities and businesses during the Covid-19 pandemic.^{81,82} The UK must have a functioning network to now support the recovery from the pandemic, empowering

businesses and communities with wider coverage, and preparing the ground for the services that 5G can provide. While there are legitimate concerns around some contracts, in the main, it would appear that the current market is less about adaption and more about circumvention, aided by a lack of clear legislation, an opportunistic land agent market and costly and inefficient legal processes. There are a number of pinch points that need resolving.

Passive aggression

At their heart, ongoing disputes remain substantively about money. It is estimated that in 2015, Code Operators paid a combined total of £187mn in rent to landlords, rising substantially by 2020 without intervention.⁸³ In addition, around 30% of sites required some form of consent for upgrading work, providing further opportunities for landlords to seek additional payments. In a minority of cases, this led to ‘ransom’ demands, with some landowners physically blocking access to sites that needed maintenance until such payments were made.⁸⁴

The Government changed the framework for the valuation of new sites from a market approach to a regulated one, with the ‘value of land ... assessed on the basis of its value to the landowner, rather than the network operator’, producing yearly savings to MNOs of up to £53m by 2020 if rents equivalent to utility regimes were implemented.⁸⁵ Overall, the Government estimated that these changes would result in more than £1bn of savings over a 20-year period.⁸⁶

⁷⁶ Hansard, 12 October 2016

⁷⁷ Analysys Mason, Lowering barriers to 5G deployment, July 2018, [link](#)

⁷⁸ Mobile UK, The Country Land and Business Association, the Royal Institution of Chartered Surveyors and DCMS

⁷⁹ DCMS, Joint statement on the reformed Electronic Communications Code, August 2018, [link](#)

⁸⁰ *CTIL v London College of Communication*, August 2020

⁸¹ NFU, Government must make rural broadband and mobile coverage a priority, January 2020, [link](#)

⁸² CLA, Rural areas still lacking 4G at risk of being side-lined amid 5G rollout, August 2019, [link](#)

⁸³ Analysys Mason, Financial impact of ECC changes, May 2016, [link](#)

⁸⁴ Daily Telegraph, Mobile operators could be held to ransom by farmers, January 2016, [link](#)

⁸⁵ Analysys Mason, Financial impact of ECC changes, May 2016, [link](#)

⁸⁶ DCMS, Impact assessment for changes to the ECC, 2016, [link](#)



Compensation and consideration payments under the new Code⁸⁷

Compensation payments allow landowners to recover loss or damage that has been sustained or will be sustained as a result of an agreement to host infrastructure on land or buildings. This could include surveyor fees, legal expenses, access, disturbance or injurious affection. Consideration payments represent the market value of the relevant person's agreement to confer or be bound by the Code. Compensation and consideration are calculated separately and tribunals can make awards of both.

That reforms to the Electronic Communications Code would lead to downward pressure on rents was generally accepted, if not welcomed, by representatives of the landowning community. Securing Code agreements on new sites is now reportedly less of a problem, reflecting that many landowners see the benefits of connectivity as more than a fair trade-off for lower rent. One study of the impact of IoT on farming suggests that the automatic guidance on equipment will typically achieve savings of between £5,000 and £10,000 a year on a 500-hectare arable farm.⁸⁸

However, for many landowners with existing sites, the substantial drops in rental income being requested under the new Code are more sudden and more sizeable than expected.⁸⁹ There is little

doubt that in some cases this will have the potential to cause temporary economic difficulties and low rent offers are often cited as the key reason that new agreements are not being reached.⁹⁰ Nevertheless, data suggest that new rents being offered, while significantly lower, remain above the level that a tribunal may impose under a 'no-network assumption' valuation.⁹¹

Ambiguity of the rules

Despite the reforms, the Code remains a complex piece of legislation, with too many legal ambiguities to deliver the outcomes that the Government sought. For example, the new Code provides rights to Code Operators to automatically upgrade and share sites. Reference is made to two conditions: changes must have a minimal adverse impact on the appearance of apparatus *and* not impose an additional burden on the site provider. What constitutes an 'adverse' impact or a 'burden' is left open to legal interpretation. Affixing 5G antennae to an existing site clearly adds to existing apparatus, but given that the larger structure is already in place, is it really right to be considered as 'adverse'? Likewise, new antennae on sites require engineers to access land to fix them, but what constitutes a 'burden' regarding that access is unclear.

The growth of site-sharing

The twin impact of increasing costs for more rural sites and decreasing revenues from the very low traffic that flows over them, is the historic reason that rural coverage has lagged behind more urban coverage. More than half of all mobile sites make a

⁸⁷ DCMS Digital Portal, [link](#)

⁸⁸ LandMobile, Making IoT more effective, October 2016, [link](#)

⁸⁹ One quoted example is the drop of a mast rent from £4,650 per year to £32 for a 10-year period, [link](#)

⁹⁰ Scottish Field, Scots landowners calling out telecoms giants, December 2019, [link](#)

⁹¹ A 'no network assumption' is the term used by Martin Roger QC during the *EE & H3G v LB Islington* tribunal case, [link](#)

loss⁹² and there remain some masts in the UK that carry fewer than 15 minutes of calls a day. As a result, the use of site-sharing is growing. Network-sharing arrangements support wider services by reducing some of the fixed capital and operational expenditure costs. In the UK, sharing a site takes two main forms:

- joint ventures: MBNL (Mobile Broadband Network Limited) (encompassing the EE and Three networks) and Cornerstone (encompassing the Vodafone and O2 networks)
- wholesale infrastructure providers (WIPs) or towercos, such as Cellnex (following the sale by Arqiva of its telecoms business) and WIG – by acting as the tenant with a landlord, and as the licensor of the site infrastructure for the MNOs, WIPs provide economies of scale for networks, with the premiums they charge for that service lower than the costs of individually built masts.⁹³
- Increased sharing has reduced the number of mobile sites from around 52,000 at their peak to the current level of around 36,000,⁹⁴ with around a third of those provided by WIPs. As networks seek to deliver more indoor coverage, use of neutral hosts will likely increase further given the physical limitations of space to host multiple networks.

The practical impact of uncertainty around such phrasing will be substantial. In urban areas, the first iterations of 5G will run over high-frequency waves covering small distances, delivered through new massive multiple-input, multiple-output (MIMO) technology, which will need to be installed. In rural areas, 5G will run on a similar frequency to 4G, meaning initial deployment will consist of upgrades to, or additional, antennae on existing sites. For both types of site, rollout will be easier if existing sites can be adapted without unnecessary delays.

However, while the Code's intention is that an agreement is reached within six months, the industry claims that the current average time for negotiation and completion is 11 months and rising, with nearly a third of current negotiations stalling. With thousands of sites needing first to be shared under the new SRN and then to be upgraded to 5G over the coming years, a failure to clarify now will inhibit the ability of the networks to roll upgrades out economically. Vodafone has already committed publicly to making the SRN sites 5G ready,⁹⁵ while Three's former chief executive, David Dyson, recently confirmed his company's plans to upgrade 40% of its sites by 2021.⁹⁶ Cellnex (which recently bought Arqiva) also has thousands of 5G upgrade projects planned, around half of which require estate intervention.

Chapter One outlines the impact this could have at a coverage level. If the average time to complete a negotiation remained at 11 months (five months beyond the six months intended by the ECC), it would mean an accumulative 10,400 sites would need negotiations completed within 2027, affecting 8.8m premises. If delays continue to grow at

92 Mobile UK evidence to the House of Lords Select Committee, 2018

93 Analysys Mason, Financial impact of ECC changes, May 2016. NB: exact benefits are hard to establish, given the ability for MNOs to offset the depreciation of self-built sites in their profit and loss accounts.

94 Mobile UK submission to DCMS consultation on permitted development rights, [link](#)

95 Vodafone, Landmark agreement on SRN, 2019, [link](#)

96 Media and Telecoms 2020 & Beyond conference, March 5, 2020



the current rate, then an accumulative 13,600 sites would need negotiations completed within 2027, affecting 11.5m premises.

By removing ambiguities in the Code, less cases will be listed for Tribunals and those that are should receive quicker decisions, easing the logjam in the wider market. With negotiations concluding more quickly, the result will meet the Government's intended policy priority of better digital connectivity. Without resolution, the Government could miss its 5G rollout target.

'Cutting in' the middlemen

The Government's expectation that consensual negotiations would be successful relies on the assumption that site providers will not fight cases that are uneconomical or stand little chance of success. However, some of the early tribunal cases show how intermediaries are seeking to delay, obfuscate and inflate the costs of individual sites, aided by ambiguities outlined previously.

A number of factors are driving this behaviour. Included within the 'compensation' element of payments are surveyors' fees and legal expenses, incentivising land agents to drag disagreements out, before and after they reach court. This works for landlords too, as under current law any imposed, lower valuation is not retrospective. The situation is exacerbated by Code Operators lacking the resources to litigate on every site and tribunals lacking capacity to make a judgment on every case. Therefore, under the current system, sitting tight on an existing rent until, first, litigation commences and, second, it is selected to go before a tribunal, both of which mean that odds are stacked in the site provider's favour, makes financial sense. Without

further amendment, the current system disincentivises deals until the threat of tribunal is realised, at which point a landlord can settle under the new terms, avoiding the costs of a tribunal, but having significantly delayed vital infrastructure work.

“The Government's expectation that consensual negotiations would be successful relies on the assumption that site providers will not fight cases that are uneconomical or stand little chance of success.”

That is not to discount the importance of intermediaries in carrying out negotiations with Code Operators. Not only does this reduce the workload imposed on the landlord, it also provides them with specialist expertise. But the disputes reaching tribunals do not back this up; they are often highly technical and largely designed to delay a conclusion to an agreement being reached.

A tribunal outcome this year - *EE v Meyrick* - gave short shrift to such behaviour, first dismissing redevelopment plans as a 'smoke screen', before then criticising last-minute attempts to contest further as 'cynical conduct with mischievous intent' and, finally, in light of the high degree of unreasonableness, awarding indemnity costs to the mobile network.⁹⁷ The case, which debated a seemingly minor procedural point and was hard fought given the knock-on impact it would have had across other sites, provides a faithful interpretation of the Government's intent of Code reform, sending a warning shot to the extent that 'the number of instances of such conduct coming before the Tribunal in future will reduce significantly'.⁹⁸

⁹⁷ *EE v Meyrick* [2020] UKUT 0105 (LC)

⁹⁸ DAC Beachcroft summary of the *EE v Meyrick* case conclusions, [link](#)



While land agents are seeking to maximise income, there is another set of intermediaries interested in using the Code to protect their asset. ‘Land aggregators’ span world markets, using a ‘lease premium’ model to buy out expiring leases from landowners, typically with a lump-sum payment based on annualised rents, and then directly collect revenue from the Code Operators on the land. In addition to buying up the lease, they often enter into additional restricted covenants, to prevent site providers from offering additional land within a certain distance.

“ The lease premium model is exploiting an entirely legal gap in the market and the benefits for both parties are clear.”

The lease premium model is exploiting an entirely legal gap in the market and the benefits for both parties are clear. Landowners get security of income, at higher levels than are being offered under the new Code – testimonials from those who have sold off leases are open about the reduced Code rents being the key driver.⁹⁹ For the aggregators, the sites constitute a growing portfolio, providing an assured revenue stream funded by rent from well established businesses. As a result, the model is growing rapidly in South America and some European countries, including France and Switzerland.

One of the main players – APWireless – had annualised revenues from lease agreements in excess of \$60m, and its parent company – the Digital Landscape

Group based in the British Virgin Islands – grew UK sales by 23% last year.¹⁰⁰ In the UK, the Electronic Communications Code is helping to stunt the growth of this model seen in other countries, but there are still thousands of sites. Instead, the model poses different problems. As businesses that operate across a global market,¹⁰¹ the land aggregation model focuses on exploiting market opportunity to demonstrate continuing revenue growth and a strong asset base. As such, these businesses are divorced from the digital ambitions of any individual country in which they operate. That means they are reluctant to work within the new Code, which threatens their business model. This is causing problems for operators to add capacity to sites ‘in term’ without recourse to either litigating or settling at terms outside of the new Code. One such tribunal is explored in the next section. The model is a further example of why Code revision is so important, to ensure the driver of every agreement is better connectivity, not protection of artificially high income streams.

Lack of adaptability

The reformed Code was designed to benefit sites as and when lease renewals came up. But, as the Covid-19 pandemic has demonstrated, events often necessitate additional capacity or maintenance work to be carried out sooner. Operators have therefore had to seek additional Code rights ‘in term’. Although the Code intended for these to be allowed, there are again significant problems to it being achieved. It has been successfully argued that some agreements that were made prior to the new Code (under a 1954 Land Act) must be treated under that older law, meaning they neither benefit from automatic rights in

99 See examples of local authority testimonials on one such aggregator site, [link](#)

100 Digital Landscape Group accounts, [link](#)

101 APWireless has expanded operations to 20 known locations around the globe

the Code nor can be adjudicated upon by the Code-designated Upper Land Tribunal, instead being overseen by a County Court.

As has been pointed out, this ‘appears to consign some sites to be forever locked into terms that predated the introduction of the Code unless a new agreement can be voluntarily agreed between the site provider and the operator’, which of course the site provider has no incentive to do.¹⁰² At the time of writing, this decision is subject to current proceedings and, if validated, Code Operators estimate that around 50% of sites could be deemed outside of the new Code. According to one site provider, this has led to a ‘dead stop of negotiations being concluded on a number of sites without recourse to costly and timely litigation’.¹⁰³

The need to resolve this impasse is sharpened by the decision to limit and then ban Huawei equipment in the 5G network. In city areas where replacement equipment will often be located on rooftops, strengthening work or even relocated sites may become necessary,¹⁰⁴ which themselves may require additional planning costs and delays. In addition, because early 5G rollout is ‘non-standalone’ and works with existing 4G, the work to replace Huawei may be more extensive. The timeframes over which individual networks choose to replace Huawei are commercial decisions, but as an example, the 35% cap on equipment necessitates an additional 4,000 site visits for one network to meet the 2023 deadline.¹⁰⁵ If companies choose – or are forced – to go even quicker in replacing equipment, then many additional site visits will be required across the UK. A failure to define ‘in term’ Code rights would place

a significant, additional drag on this work, given the strong negotiating position of landlords who will be aware of the deadline for such work taking place.

Swift and supportive legal channels

With uncertainties in the legislation and distrust between key players, the legal interpretation of the new rules is key. The designated courts to adjudicate in Code matters have two roles to play: to deliver judgments that reflect the Government’s intention and to do so expeditiously.¹⁰⁶

“With uncertainties in the legislation and distrust between key players, the legal interpretation of the new rules is key.”

Presently, contract renewal cases are typically being listed for a hearing up to 12 months after an application has been made, with judgments that have ranged widely between supporting and debilitating network rollout, coupled with the challenge of decisions not being reached quickly enough. The capacity of the tribunals is a natural bottleneck when a number of concurrent cases are registered. In Scotland alone, there has been a 10-fold increase in cases going before the Land Tribunal, with 77 cases over the past two years compared with five tribunal cases over the 33-year period under the old Code.¹⁰⁷ The Covid-19 pandemic has served to amplify these problems, although some virtual hearings are taking place. The Land

¹⁰² The good, the bad and disclosure – *Arqiva Services Ltd v AP Wireless II (UK) Ltd*, [link](#)

¹⁰³ Evidence given to the CPS during research for this report

¹⁰⁴ For example if the higher load exceeds the capacity on a roof

¹⁰⁵ EE’s underlying 4G network is currently two thirds Huawei and being gradually reduced to meet the 35% cap by January 2023 at a cost of £500m, [link](#)

¹⁰⁶ A variation on land tribunals in each of the four nations

¹⁰⁷ Scottish Field, Scots landowners calling out telecoms giants, December 2019, [link](#)



Tribunal is setting up a new User Group to help with this, but at a time when the UK requires clarity on the rules to deliver next-generation infrastructure, a legal bottleneck poses a significant threat. Such backlogs are also visible in the County Courts, which the previous section notes are currently adjudicating over some cases.

Furthermore, there is a discrepancy between the listing times of cases. New site agreements can see proceedings commenced within 28 days and a need to conclude within six months, while renewals must provide six months' notice and have no resolution deadline. The result is that Code Operators' route to upgrading sites to facilitate 5G when litigation is involved could be in excess of 18 months, before appeals. *EE v Meyrick*, referenced earlier, took two years to conclude, despite finding in the Operator's favour. When combined with delays caused by Huawei, these could set 5G back in some rural areas by more than three years, significantly delaying the benefits it will bring.

This issue is not one-way traffic. Landlords can serve a Notice to Quit (NTQ) on existing sites but the new Code has lengthened the time it takes to remove network infrastructure due to the consequential impacts on local services and the time it takes to locate and build a new site.¹⁰⁸ From a network perspective, the more time allowed the better, and the landlord community have been clear that networks have not been above their own obfuscation practices.¹⁰⁹ Even once relocated, redundant equipment left on sites is not always removed expeditiously and some case studies show that land is not restored

to a satisfactory state. These elements lie within the non-legally binding Code of Best Practice rather than the Electronic Communications Code.

How the public sector can help

National government and local authorities, together with an array of non-departmental bodies, play a central role in connectivity.¹¹⁰ In England, the public sector owns around 8.5% of land¹¹¹ and it is estimated that a significant percentage of mobile sites are located on the public sector estate. However, the problems in dealing with the public sector often mean that Code Operators choose the sector as a landlord as a last resort, despite better access to public buildings being a key component of the 2014 deal struck between Operators and the Government.

“National government and local authorities, together with an array of non-departmental bodies, play a central role in connectivity.”

The DCMS Barrier Busting Task Force has developed a Digital Infrastructure Toolkit for government sites to help address barriers to deployment on government buildings, but the failure to fully appreciate the benefits of 5G may underpin why some local authorities have also yet to adopt the principles of the new Electronic Communications Code. With access to roof space in major cities at a premium, this historically led to extremely high

¹⁰⁸ Although it's estimated a fifth of NTQs issued every year are designed to force a variation in the contract, given the high costs of relocation, [link](#)

¹⁰⁹ One operator that received an NTQ left it months before discounting the NTQ as invalid, for being served verbally rather than formally. There is no evidence that the operator in question used the additional time to seek an alternative site

¹¹⁰ The various levers that councils can use to help digital infrastructure are well explained in Lowering barriers to 5G deployment, 2018, Oxera, [link](#)

¹¹¹ The Guardian, Who owns England, April 2019, [link](#)

charges on mobile sites, which, at a time when the industry was significantly more profitable, the networks were prepared to pay. As a result, local authorities represent some of the biggest losers in terms of rental income from the reformed Code. A tribunal assessment from 2019 found a rooftop site to be worth 95% less than had been agreed under the old Code,¹¹² with the judge citing the public interest and parliamentary edict to impose significantly lower agreements on unwilling parties.¹¹³ At a time when the squeeze on council income is well reported, such impacts will matter.

“One of the reasons cited for councils seeking higher rents is obligations under the 1972 Local Government Act to achieve ‘best consideration’ when disposing of assets. This condition lies in conflict to the reformed Code.”

However, a mind shift among many local councils is needed to recognise that the benefits of 5G come not from short-term rental income but longer-term worth to local residents and businesses (as highlighted in Chapter 1), as well as efficiency gains for councils themselves. O2 estimates that 5G-enabled efficiency gains could help councils realise £2.8bn in savings,¹¹⁴ while an Oxera study for the Broadband Stakeholder Group lists the many ways that councils could benefit.¹¹⁵ With a vested interest in supporting the rollout of 5G, the public sector must prioritise the value

created by mobile and digital networks, rather than extracting it via rent-seeking.

One of the reasons cited for councils seeking higher rents is obligations under the 1972 Local Government Act to achieve ‘best consideration’ when disposing of assets. This condition lies in conflict to the reformed Code. It is therefore welcome that the Government has made it clear that allowing access to rooftops and other sites at rates below those previously achieved is still compatible with the duty to obtain ‘best value’ by delivering a communications network that benefits the wider council area.¹¹⁶ Ensuring these sites are more easily accessible and affordable will help steer the wider market and provide better support for digital networks. Ongoing public sector leadership is needed to drive that message.

Recommendations

In 2017, the Government amended the Electronic Communications Code with good intent. However, ambiguities within the regulations are emboldening a growing middle market that gains in defending the status quo. A tribunal system designated to deliver consistency in line with government intent is failing to do so and is ill-equipped to deal with a growing backlog. As a result, better coverage is being delayed, leading to growing digital impoverishment. Such is the problem that only further intervention to amend the Code can resolve it. With the demand issues as a result of the Covid-19 pandemic and supply problems caused by the Huawei ban, there is an urgent need to remove this unnecessary and damaging impasse at the front line of deployment. By

¹¹² *EE/H3G v London Borough of Islington*, [link](#)

¹¹³ GSC Gray, New ECC first tribunal case decided, 2018, [link](#)

¹¹⁴ O2, The value of 5G for cities and communities, March 2018, [link](#)

¹¹⁵ Oxera, Impact at a local level of full fibre and 5G investments, September 2019, figure 2.5, [link](#)

¹¹⁶ DCMS, Ministers call on councils to help deliver connectivity ambitions, August 2020, [link](#)



so doing, the economic opportunities of 4G and 5G will be realised sooner.

- The announced consultation on changes to the Electronic Communications Code must have a bias towards further action in key areas. The application of terms such as 'adverse impact' and 'burden' must be qualified to ensure critical upgrades are not held up, and the Code must allow Operators to amend existing agreements to add new rights in the public interest and move expired agreements into the new regime regardless of the previous legal framework.
- Code revision will take time. In the interim, the Government should explore ways of reducing delays. Tribunals and, until legislation removes their role, County Courts, should be empowered to backdate any imposed rental agreement to the date at which a matter is listed if the case merits, and in the absence of agreement between the parties, impose such broader rights as are appropriate on the merits of each case.
- It is crucial that the tribunal provides timely decisions and is appropriately resourced to do so. Necessary funds must be made available for this and, where possible, matters should be disallowed without a hearing. Notification and resolution timescales for renewals should be brought in line with new site agreements, to formally recognise the importance of timely upgrades.
- Consideration needs to be given as to whether to make the Code of Best Practice more binding, ensuring both parties commit to and fulfil their obligations to one another. MNOs need

to be held accountable for ensuring better communication with – and support for – site providers under a refined Electronic Communications Code.

- Industry and membership bodies such as the NFU, the Country Land and Business Association (CLA), the Central Association of Agricultural Valuers (CAAV) and the Royal Institution of Chartered Surveyors (RICS) should be tasked to develop a list of 'trusted practice' land agents, which work to the intentions of the new Code and which are then recommended and promoted to their memberships.¹¹⁷ In tandem, representative groups and intermediaries should carry out an education awareness campaign to highlight the risk of a lower imposed valuation by a tribunal and litigation costs if one is not agreed with a Code Operator.

“The announced consultation on changes to the Electronic Communications Code must have a bias towards further action in key areas.”

- The Government must continue to lead by example in setting out and disseminating best practice, encouraging and supporting all departments and sponsored bodies around allowing access to assets under new Code rates and conditions. As part of this, HM Treasury should provide continuing assurance that local authorities can take a holistic view of the community benefits of high-quality telecoms services and

¹¹⁷ The regulated service for approved practitioners in immigration advice may be a good template to use, [link](#)



still be compliant with the 1972 Local Government Act.

- The Treasury should explore whether further investment is needed to specifically support 5G innovation in local public services, to encourage councils that have incurred a shortfall in revenue through Code changes to support contiguous and continuous

coverage by helping them understand and take advantage of the benefits of that better connectivity.

- The budget, staffing and remit of the Barrier Busting Task Force inside DCMS should be ring-fenced to ensure that the necessary resources and focus are applied solely to tackling deployment issues.

Chapter 4 – Planning ahead

Co-ordinated support for digital infrastructure

A variety of digital infrastructure projects will mean that thousands of new mobile infrastructure sites are needed across the UK over the next five years.

It is strategically important to ensure planning regimes support the delivery and upgrading of this infrastructure.

Planning support to support digital technologies

Mobile has a network architecture that needs to be planned, built, maintained and upgraded over time. Every new site that is capable of providing coverage to an area is a logistical challenge, requiring power, backhaul and landlord agreement. From initial surveys to a working signal, it is estimated that a new macro site can often take in excess of 18 months to deploy.

Misinformation campaigns on the health impacts of 5G are making this even harder, as vigorous opposition from a minority within communities is leading to a growing number of councils seeking to limit the deployment of new infrastructure.¹¹⁸ This is a significant problem. As it stands, for the Government to deliver its digital connectivity targets, there is a substantial

amount resting on communities accepting new sites – targets for the SRN, for example, are subject to localities accepting new infrastructure.

“ Mobile has a network architecture that needs to be planned, built, maintained and upgraded over time.”

As a devolved matter, different nations offer inconsistent regimes for mobile infrastructure. This difference is not a problem in itself – the topography of Snowdonia differs from that of Suffolk, for instance – but the processes for reforms are sporadic and lengthy. The first 4G services were launched in 2012 but the first UK nations to reform planning to ease the 4G rollout – England and Scotland – did this only four and five years later, respectively. In Wales, planning reforms to support 4G were delivered only a matter of months before the first 5G sites went live in Cardiff. And in Northern Ireland, where until January the Assembly had not sat for three years, a consultation on planning changes was held in 2016 but no further action has yet taken place, leading to concerns from Ofcom, which notes that the ‘tougher’ system has the ‘potential to slow things down’.¹¹⁹

¹¹⁸ Daily Mail, Town’s war with 5G, October 2019, [link](#)

¹¹⁹ BBC, Call for planning reform to speed up installation, February 2020, [link](#)



The same mistake cannot be made with 5G. More substantial towers will be needed to support heavier equipment, and a larger number of cells will be required to deliver the capacity and latency needed in city centres. The 2023 deadline to limit Huawei equipment in parts of the network, together with the complete rip and replace of it ahead of the full ban in 2027, will necessitate larger sites or relocations, shifting applications from 'permitted development' to full planning as a result. This not only costs networks time and money – one operator estimates that masts in excess of 20m suffer a 50% planning failure rate – but also adds complexity and workload onto planning departments, gumming up the system. It is beholden on all national governments to amend planning rules now and introduce a degree of structure into future changes as well, to ensure the planning regime reflects technology changes and government policy priorities in a more consistent and timely manner.

How planning laws need to keep pace with 5G

- 'Permitted development' changes allow masts of up to 25m in the UK, but this is still below equivalent heights across much of the EU. Taller masts provide wider coverage, meaning fewer sites are needed to deliver geographic improvements.
- Lifting restrictions on the width of new and existing masts will enable strengthened structures that both support operators to share sites and also support new, often heavier, 5G equipment, ensuring that expensive retrofitting is not a barrier to delivery.

- Anomalies that allow cabinets and polls for fixed-line infrastructure but not the equivalent for mobile need to be removed; planning rules should be technology agnostic as far as possible.
- Relaxation of the use of small cells will be important in the later iteration of 5G deployment, especially in city centres. Defining these smaller sites as *de minimis* will help reduce council workloads and increase the speed of local rollout.

Mindful of this, DCMS, in collaboration with the Ministry of Housing, Communities and Local Government, recently committed to press ahead with enhanced permitted development rights, to smooth the delivery of new sites under the SRN, make sharing and upgrading existing ones easier and ultimately ensure the system is 5G ready. Changes under secondary legislation will deliver up to 10,000 days in time saved for mobile operators as well as substantially eased burdens on local authority planning departments¹²⁰ and are supported by both the mobile industry and landowners.¹²¹

Equivalent planning changes in Scotland and Wales must follow, and indeed go even further. New sites are disproportionately needed in these two countries, and with the paucity of fibre in hundreds of remote locations, will necessitate those sites to be taller, in order that they can backhaul through the line of sight instead. With political will, there is time for all four UK nations to have renewed rules in place by March next year, ahead of the important summer construction window.

¹²⁰ Mobile UK submission to DCMS consultation on permitted development rights, [link](#)

¹²¹ NFU response to consultation on 5G, January 2020, [link](#)



The Scottish Government looks the most advanced of the devolved nations, having published a proposed work programme and also opened a consultation into enhanced Permitted Development Rights last year.¹²² In Wales, a Government-commissioned report from 2019¹²³ noted the ‘severely time-limited window of opportunity’ around 5G and called for an easier system to implement new sites and infrastructure, but progress is slower. This is despite an imminent opportunity to deliver improvements as part of the mandated transposition of an EU Directive,¹²⁴ which requires promotion of permitted development rights for small cells before the end of the year. Finally, in Northern Ireland, where the planning regime is substantially behind, the Assembly must prioritise significant improvements or risk being left behind when 5G rolls out.

“The Scottish Government looks the most advanced of the devolved nations, having published a proposed work programme and also opened a consultation into enhanced Permitted Development Rights last year.”

Of course, there are areas that require a more sensitive approach. For example, there is significant overlap between poor

coverage and National Parks, where there are additional planning protections. Covering these areas is a straight choice between fewer, taller sites that support all operators but may be perceived to impact detrimentally on visual amenity versus numerous individual, smaller sites, which aside from the considerably higher costs, would impact more environmentally. The problem in these areas is getting more acute. The Government’s extension to the Lake District and Yorkshire Dales National Parks in 2016 created an additional 188 square miles of geography with enhanced planning protection,¹²⁵ while submissions to the 2019 Landscapes Review proposed a further 1,700 square miles, equivalent to four times the size of Greater Manchester.¹²⁶ Both reviews fail to mention the importance of digital infrastructure in creating viable communities within these areas

Planning co-ordination across local and national infrastructure

Support is needed beyond just planning reform. On average, a new macro site costs more than £100,000 to build and tens of thousands to maintain every year,¹²⁷ but these costs can increase substantially in remoter areas with the associated complexities in delivering mobile infrastructure there.¹²⁸ There are a number of actions that national government, local authorities and private companies can take to better co-ordinate this work.

122 Reviewing and extending permitted development rights: consultation, Scottish Government, Nov 2019, [link](#)

123 A 5G blueprint for Wales, September 2019

124 The European Electronic Communications Code Directive, 2018, [Directive 2018/1972](#)

125 BBC, Yorkshire Dales and Lake District national parks to be extended, October 2015, [link](#)

126 Defra Landscapes Review, 2019, annex 4

127 Analysys Mason, Financial impact of ECC changes, May 2016, [link](#)

128 For example, in 2018, [EE deployed a helicopter](#) to airlift in 16 cubic metres of concrete and 18 tonnes of stone to deliver a mast that served a per-manent population of approximately 200 people in the village of Carsphairn, in Scotland



Fibre

With the revolutionary benefits of 5G partly dependent on its latency, building more sites backhauled and fronthauled through fibre is particularly important.¹²⁹ Significant numbers of sites will need to be upgraded to support higher capacity connections. This is not just a rural need – urban 5G cell networks will also require denser fibre networks – but it is specifically a supply one in rural areas. The ‘outside in’ principles within the 2025 gigabit connectivity pledge will naturally deliver fibre closer to sites and reduce the costs of getting it to sites; co-ordination to ensure the rollout is complementary is essential.

Utilities

Costs relating to the provision of an electricity supply have led to many sites at the extremities of networks running on generators. Generators are part of many modern mast compounds as a backup for power cuts, but running a site entirely on a generator presents greater resiliency issues. In some parts of the UK, a lack of available fibre or power source can by itself cost in excess of £1m to source. Programmes such as the National Grid’s £500m project to dismantle pylons across National Parks in England and Wales, burying the cables underground in order to enhance the landscape, provide construction work that can concurrently create easy access points for new masts.¹³⁰

Rail

The costs of retrofitting the rail network with connectivity are substantial. Digital networks consistently complain of the time and costs in accessing trackside

infrastructure and the Government halted efforts to test passive infrastructure along a section of the Trans Pennine railway over emerging value-for-money questions.¹³¹ Frequent ministerial changes and confused departmental responsibilities have also not helped.¹³² Nevertheless, barriers to delivering mobile coverage along railways are not technical and the common characteristics of successful rail connectivity in other countries lie in a combination of public subsidy, organisational accountability and political will.¹³³ There is some limited progress; a trial next year will assess the practicalities of placing communication antennae on gantries, which would deliver improved coverage to around a third of the network,¹³⁴ and mobile networks are due to pilot full 4G coverage on a section of the London Underground’s Jubilee Line, but greater impetus is clearly needed.

“Digital networks consistently complain of the time and costs in accessing trackside infrastructure. The Government halted efforts to test passive infrastructure along a section of the Trans Pennine railway over emerging value-for-money questions.”

Local development

While the Government’s recent ‘Planning for the Future’ White Paper extols the benefits of digitised processes,¹³⁵ the fact remains that digital infrastructure must also sit at the heart of local development. Some of

129 Unlike backhaul, which links a site to the core network, fronthaul relates to the portion of the wireless network connecting the radio equipment with the radio control equipment (effectively the top of the tower connecting with the bottom of it)

130 The Telegraph, Electricity pylons removed, April 2020, [link](#)

131 ISPreview, Government scraps 5G mobile trial on Trans Pennine rail route, January 2019, [link](#)

132 With nine Secretaries of State since 2010, DCMS has seen the most disruption of any department, [link](#)

133 NIC, Connected future: getting back on track, February 2020, [link](#)

134 The Times, Gantry masts signal end to rail commute phone misery, July 2020, [link](#)

135 Ministry of Housing, Communities and Local Government, August 2020, [link](#)



the more progressive county councils, such as those in North Yorkshire, Shropshire and the wider West Midlands region, have made mobile a core part of their work, and at their best, proactive authorities develop strategies for supporting and benefitting from mobile connectivity, carrying out audits of council-owned or other public assets that could support infrastructure and making this available online. But overall, digital adoption and the benefits it brings have yet to be fully recognised and adoption can be wildly inconsistent across different councils. In 2018, just over one in 10 councils had audited their assets to assess the suitability to support mobile infrastructure and only 10% referenced the importance of mobile connectivity in local economic strategies.¹³⁶ Impetus must be placed behind this work to drive change.

“ In 2018, just over one in 10 councils had audited their assets to assess the suitability to support mobile infrastructure and only 10% referenced the importance of mobile connectivity in local economic strategies.”

Wider economic groups are helping to drive some change. The Midlands Engine's Independent Economic Review notes that a 'digital divide' is 'acting as an anchor on productivity growth in some areas ... and without intervention, it is likely to become more of an inhibitor to the region's long-term competitiveness'.¹³⁷ The Northern Powerhouse Partnership has noted that a number of combined authorities have taken

an evolved view of how they want to work in partnership to make themselves more attractive and has worked with them to create a network of chief digital officers who work closely together. Such partnerships need to be more formal and widespread.

Recommendations

- The UK Government should aim to enact changes to permitted development this year. The Scottish, Welsh and Northern Ireland parliaments must all commit to review and improve permitted development regimes, with changes implemented by March next year. In addition, all national governments should commit to formalise regular future reviews of planning regulations to ensure digital infrastructure is appropriately supported.
- A focused effort must be made to deliver mobile coverage in National Parks, building on the statement of commitment contained within the National Parks England and Mobile UK Joint Accord,¹³⁸ and additional public subsidy must be considered to recognise the additional costs of deployment there.
- Reform of the strategic planning framework could compel local authorities to ensure the needs of future mobile connectivity are adequately addressed in Local Plans, including an audit of public sector assets as potential sites for new mobile equipment. As part of this, new development should be assessed for connectivity of both fixed and mobile elements, including suitability to host equipment and whether that development directly (through needing a mobile site) or

¹³⁶ Mobile UK, Councils and connectivity, May 2019, [link](#)

¹³⁷ Midlands Engine, Independent economic review, February 2020, [link](#)

¹³⁸ National Parks England and Mobile UK Joint Accord, June 2018, [link](#)



indirectly (through potential interruption of wireless transmission) impacts on local connectivity.

“In rail, accountability to improve access to trackside infrastructure should sit with a transport minister to ensure Network Rail is directed to provide a series of benchmarked improvements in supporting connectivity.”

- A time-limited cross-government team of officials should work with the

National Infrastructure Commission to better coordinate national and local infrastructure programmes, including fibre and electricity networks.

- In rail, accountability to improve access to trackside infrastructure should sit with a transport minister to ensure Network Rail is directed to provide a series of benchmarked improvements in supporting connectivity. If ‘duty of best value’ or similar is a current binding requirement on accessing Network Rail’s assets, it should be clarified, recognising the economic gains to passengers that may fall outside of Network Rail’s own assessment criteria.



Conclusion

Just as emerging railways, primitive electricity grids and formative investment into digital infrastructure helped to democratise the benefits of the first three industrial revolutions, a 5G network will sit at the heart of the fourth, delivering immediate but evolutionary benefits to consumers and longer-term revolutionary services to business.

Although an FSB survey found that around a third of small businesses will upgrade to 5G when it becomes available in their area,¹³⁹ there does remain low technological take-up among small businesses. Demand stimulation will be important, but the customer experience is equally crucial. Wider availability and greater reliability will help to drive greater digital adoption.

However, 5G's game-changing services are not immediate and 4G will remain a key connectivity solution for a substantial part of this decade. Cisco predicts that the UK, at 19.5%, will be behind only Japan and China in the percentage of devices and connections share on 5G by 2023,¹⁴⁰ but it is still estimated that 4G connections globally will outnumber 5G ones by four to one.¹⁴¹

As a result, over £2bn of public money is supplementing sizeable private investment in civil engineering projects to support 4G mobile networks. The impact of that investment has already been depleted and delayed by the phased exit of Huawei,

a geopolitical problem that could yet grow in magnitude. But pressures such as the Covid-19 pandemic are increasing the importance of the connectivity being delivered. From remote working, to online courts, to supporting innovation to tackle the virus, mobile networks – and the technology that relies on them – are helping the UK to ride out the ongoing pandemic and lie at the heart of rebuilding our economy.

“Although an FSB survey found that around a third of small businesses will upgrade to 5G when it becomes available in their area, there does remain low technological take-up among small businesses.”

Our communication networks can only deliver better speeds as quickly as they can deliver better infrastructure. The faster a network is built, the bigger the national prize and the greater the chance to reduce regional disparities. It is beholden on government to ensure it delivers solutions to any blockers that hold back investment in the passive infrastructure that underpins our current recovery and future prosperity.

Central to this is the Electronic Communications Code, where recent reforms pitch the policy goal of better

139 FSB, Lost connection, October 2019, [link](#)

140 Cisco, Annual internet report, updated March 2020, [link](#)

141 Cisco, Annual internet report, updated March 2020, *ibid*



coverage against historic, landowner incomes. Ambiguities contained in the reformed Code are being systematically exploited across an ecosystem of professional advisers and this is exacerbated by a tribunal system that lacks the capacity to clamp down effectively on such behaviour, but which is also delivering interpretations that are inconsistent with the Government's policy intention. Without prompt disambiguation to fix the issues, valuable investment to maintain, improve and extend networks will be delayed, and the UK will continue to lose ground on 5G at a critical time. The connectivity benefits for the wider community must override the protection of historic revenue streams.

“The faster a network is built, the bigger the national prize and the greater the chance to reduce regional disparities.”

To meet the urgent and rising connectivity needs of the UK, to mitigate the myriad of mounting impacts that networks already face and to have any chance of realising the £40bn of economic gains from 5G outlined in this report, urgent intervention is needed to support mobile infrastructure.

Annex 1:

Modelling methodology

This annex sets out the approach to the quantitative analysis undertaken by Policy Points.

The modelling of future economic gains arising from 5G used the following four assumptions:

1. **Path of future UK output growth.** To take account of the Covid-19 pandemic, projections for the drop in economic output in 2020 and a subsequent recovery in 2021 and 2022 were taken from the Bank of England's August monetary policy report. Output growth projections beyond this date were assumed to match the Office for Budget Responsibility's near-term forecasts.
2. **Proportion of economic output that can be affected by the 5G signal up until the end of 2027.** This is based on the initial rollout of 5G being largely in urban areas. Given that urban areas are responsible for a disproportionate amount of economic output, a weighting was applied to the Government's 5G target for population coverage, that is, 51% of the population covered equates to more than 51% of gross value added (GVA) covered.
3. **Business take-up assumptions split by size of business.** The take-up of 5G was assumed to have both evolutionary and revolutionary economic benefits. Take-up of the evolutionary benefits was assumed to reach the levels of those seen for fixed and mobile broadband. Take-up of the revolutionary benefits was assumed to reach levels of those of fast broadband (more than 100 megabits a second). These take-up

assumptions were split by business size and were sourced from OECD surveys.

4. **Output uplift arising from technological advancement.** This was taken from the estimated output uplift from previous technological advancements. The figures were taken from collated data in a report published by the Australian Government entitled, 'Impacts of 5G on productivity and economic growth'. These output uplift figures were also the basis for the scenario analysis, that is, the low scenario used the lowest output uplifts from previous technological advancements.

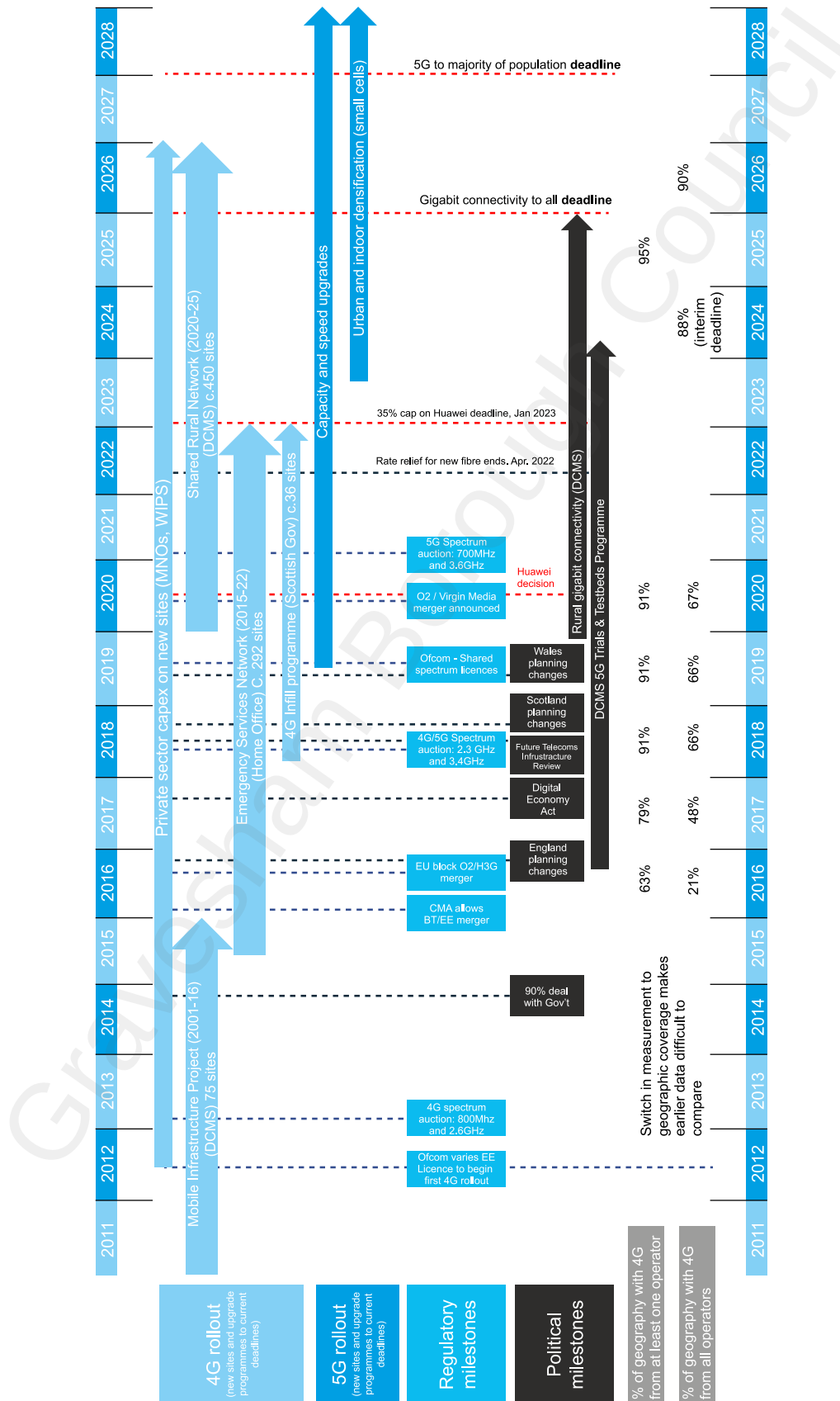
The process for the modelling was broadly as follows:

- Project the path of UK economic output.
- Using the assumptions above, calculate how much output would potentially be affected by 5G technology if it were available.
- Apply economic uplift to this economic output (on both an evolutionary and a revolutionary basis), taking account of business adoption and growth in coverage.

The calculations looking at the location of sectors that are most likely to benefit from 5G coverage used the following datasets:

- urban/rural categorisation of local authorities produced by the Department for Environment, Food and Rural Affairs (Defra)
- current 4G coverage statistics produced by Ofcom for its 'Connected Nations' work
- business sector count statistics from NOMIS.

Annex 2: Timeline of the rollout of 4G and 5G





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