



Executive briefing: Small Cells

Creating connections that matter

Exploring the opportunities of deploying Small Cell infrastructure in dense urban areas



Closing the connectivity gap

According to the World Economic Forum, digital connectivity is not only a necessity in today's world, it's increasingly seen as a human right¹. Connectivity from public mobile networks has been linked to tackling the digital divide, driving economic growth, increasing public safety and more.

UK citizens and businesses are very well served by the country's four mobile network operators in this regard. 4G networks cover over 99% of the UK population and ongoing investments in 5G are seeing accelerated roll-out of this ultra-fast technology.

In some areas however, demand can outstrip supply. 92% of UK adults now own a smartphone and demand for mobile services over public networks is growing by 40% year on year. This is particularly true in the UK's town and city centres, where population growth and escalating demand for high bandwidth mobile services is putting pressure on existing public networks.



¹ <https://www.weforum.org/agenda/2021/07/central-asia-digital-future-economic-growth/>

Tackling the digital divide

Within these dense urban and high footfall areas, spectrum limitations, congestion hotspots, capacity constraints and coverage issues negatively impact the end user experience. Mobile internet speeds are reduced, the number of dropped calls increases and, in some areas, users receive a strong signal but still struggle to connect to data services or make calls.

Poor coverage or capacity issues also have a disproportionately negative effect on low-income residents, whose only access to the web is often through their smartphones.

There is, therefore, a clear case for action. Cellnex UK is working in partnership with the UK's four mobile operators, local authorities and community groups to provide street level solutions. Together, we are closing the mobile connectivity gaps in dense urban areas and giving users the fast, reliable mobile voice and data connectivity they need through our expanding Small Cell infrastructure.

² <https://www.ofcom.org.uk/consultations-and-statements/category-3/discussion-paper-meeting-future-demand-for-mobile-data>

³ <https://www.macrotrends.net/countries/GBR/united-kingdom/urban-population#:~:text=U.K.%20urban%20population%20for%202021,a%200.87%25%20increase%20from%202018>

⁴ <https://www.ispreview.co.uk/index.php/2021/03/survey-claims-54-of-uk-mobile-users-suffer-signal-woes-at-home.html>

Pressure is mounting on public mobile networks in UK urban centres

40% year-on-year growth in demand for mobile services over public mobile networks²

UK urban population has increased by over 5.6 million since 2010³

33% of urban customers report **suffering mobile connectivity issues**⁴



Empowering urban connectivity with outdoor Small Cells

The coverage map generated by Cellnex (Figure 1) illustrates the scale of the challenge within dense urban areas. In this real-world, anonymised example, the abundance of red cells shows poor signal quality in many areas of this urban environment. This indicates the level of congestion impacting the experience of users in the area.

Antenna position, distance between base stations and building design (particularly materials such as

concrete and metallised glass) all contribute to reducing signal strength or blocking the signal entirely. This, in turn, impacts voice quality and mobile data speeds.

However, in these dense urban areas, the biggest impact is often high demand from large numbers of mobile users. At peak times, for example during rush hour at station entrances, capacity is at a premium and the impact on users more evident.

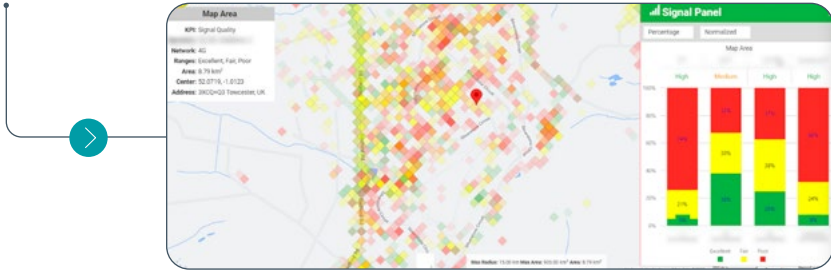


Figure 1: Mobile signal quality in dense urban settings

Expanding coverage at street level

Outdoor Small Cell deployments in these high footfall areas provides an ideal solution to deliver additional coverage and capacity, and to offload traffic from at-capacity macro sites (larger, higher power base stations situated on rooftops). Further, they help to increase network density – crucial for successful 5G deployments.

These low power, compact mobile network base stations are deployed at street level – on existing street furniture and other purpose-built assets. While transmission methods vary, the antennas are typically connected to a below-ground fibre network [backhaul] that brings the signal from the MNO's core network to the Small Cell. This is then delivered via line of sight to the user's mobile device.

The compact nature of Small Cell equipment means it can be sited in multiple locations in the street scape. Initial deployments have historically been placed on existing structures such as Local Authority (LA)

owned lampposts. This typically requires agreements between the LA and infrastructure provider. These 'neutral hosts' then provide the fully managed asset, including power, to MNOs on an equitable basis.

While Cellnex UK has entered into a large number of agreements to leverage LA street assets, it is also pioneering the use of range of privately-owned street level infrastructure including digital advertising kiosks. And, with an eye on future smart city use cases, it has developed its own multi-purpose columns.

Connecting to a smarter future

There is, of course, another dimension to the urgent need to enhance coverage and capacity: namely, the development of smart city services. From smarter and more energy efficient buildings through to connected and autonomous transport, the volumes of data passing across both fixed line and mobile networks is set to exponentially increase. Small Cells have a key role to play in delivering the 5G wireless coverage and capacity needed in this increasingly connected future.



Building the business case

Outdoor Small Cell deployments are not new. Cellnex UK, for example, has **already deployed over 1000 Small Cells** in dense urban areas across the UK. However, as demand for mobile connectivity grows, this street level approach is becoming a much more attractive proposition for both MNOs and LAS.

Cutting costs and increasing economies of scale

As the technology evolves, the cost of Small Cell hardware is becoming increasingly affordable. Also, as the market matures from pilots to larger deployments, MNOs can benefit from greater economies of scale. This is particularly the case as city boroughs, who have a vested interest in improving connectivity to drive their social and digital inclusion strategies, are now making street assets available at an affordable price across much larger areas.

The growing maturity of the Small Cell ecosystem and increasing levels of investment by 'neutral host' providers such as Cellnex UK are driving the development of industrialised and

automated deployment workflows. It is now possible to tailor service models to the specific streetscape environment and significantly compress installation timelines. This helps to reduce Small Cell installation costs below the typically quoted minimum deployment cost ratios, versus a macro installation.

Indeed, Cellnex UK has previously seen Small Cell deployments being significantly more effective for every pound spent than new macro sites.

Having made considerable investments in developing our portfolio of street level assets, **Cellnex UK now offers an expanded number of sites – over 300,000 in London alone –** to allow MNOs to deploy Small Cells in the locations where they are needed most.



Accelerating connectivity time to market

Today, a Small Cell cluster can be deployed in as little as 12 weeks as opposed to the months or even years it can typically take to site a macro. Here, the option to reduce the number of additional high-cost, long lead-time macro sites needed to serve a particular area is undoubtedly compelling for MNOs, local communities, businesses and users.

Not only do Small Cells support macro sites running at capacity by offloading traffic, MNOs are finding that these same Small Cells are picking up additional traffic from the area – addressing latent and previously unserved demand. However, there is still more work to be done.

Boosting user experience

Customer experience is, of course, central in this discussion. There are multiple defining factors here, not least the quality of customer service and handset/bundle cost. However, a seamless experience is the foundation to customer loyalty and as a result, increased revenue. With near-ubiquitous 4G coverage in the UK, and 5G availability increasing apace, subscribers simply 'expect' a great experience. In dense urban areas where capacity is a problem, Small Cell deployments will ensure

those expectations are being met – including for those more disadvantaged in society whose smartphone may be their only access to the web.

Catalyst for technology evolution

It is also interesting to see that operators are deploying for different reasons. While we see MNOs rolling out Small Cells at street level to address issues of spectrum constraint and to address areas of congestion, there is also a more strategic play going on here.

Some operators, for example, are working with Cellnex UK to pilot C-RAN deployments in the streetscape. Others are rolling out assets as part of a wider programme to prepare their networks for the future. Plus, with the telecoms sector continually looking at new ways to deliver the kind of fast, high capacity, ultra-low latency connections today's applications need, the clustered, small footprint nature of Small Cells could play a big role in adoption of mmWave 5G.

The convergence of all these factors – from lower-cost hardware, transmission and deployment, through the availability of a growing number of assets, to enhance customer experience by reducing congestion – **builds a highly compelling business case for Small Cells deployment.**





Cellnex UK – at the heart of urban connectivity

Cellnex UK sits at the heart of the urban connectivity landscape, having pioneered the development of Small Cells for over 6 years. We provide a complete solution – from design and deployment of fibre routes and street-level assets in key urban areas, through to on-going management and incident response.

This is a complex environment, with multiple stakeholders, technologies and operational challenges. As one of the UK's leading telecommunications providers, we are able to absorb this complexity, simplify the deployment process, and enable the delivery of fast, reliable connectivity to communities and businesses across the UK.

Along with our national network of larger macro telecoms sites, we have established agreements in place with 16 London boroughs to site Small Cell radio equipment on street furniture in thousands of locations across the capital.

Most recently, Cellnex UK has signed an agreement with the London Borough of Bromley in Southeast London. Here, as a neutral host, we're able to help all 4 UK mobile operators enhance their coverage and capacity across the borough in both urban and suburban areas – working closely with community groups and the Council to support local connectivity needs.



Advancing fibre connectivity

While the above ground sites are the more visible illustration of our network capabilities, it is the below-ground infrastructure that ultimately enables the coverage and capacity improvements. Here, Cellnex has started to invest in high-speed fibre. Providing dedicated connections to MNO partners' core networks, Cellnex continues to invest in extending this purpose-built infrastructure to towns and cities across the UK.

In addition to supporting current capacity and coverage demands, our fibre networks are helping to future-proof mobile connectivity through new C-RAN architectures and to support new Spectrum in mmWave bands.

Getting smart with kiosks

Cellnex UK has also secured the exclusive rights to market circa 400 Clear Channel 'smart advertising' kiosks for telecoms purposes in major urban areas around the UK. In doing so, this has extended a street level asset portfolio that already includes access to thousands of lamp posts and other street furniture.

By installing Small Cells within these existing assets – typically placed in high footfall areas – MNOs are able to target coverage and capacity. In particular, when deployed outside station, underground and shopping centre entrances, the positioning of the Small Cell antennas within the kiosks was also found to significantly extend coverage and capacity well inside these buildings.

“By using existing structures within the streetscape in a more innovative way, we can now rapidly and cost effectively extend coverage and capacity wherever demand is greatest. It's a mark of the collaborative nature of our relationship with Cellnex UK that we have been able to get the project off the ground so quickly, which ultimately means we can provide an enhanced, high quality service to Virgin Media O2 customers.”

Paul Broome,
RAN Performance
& Programmes – Trials &
Industrialisation Manager,
Virgin Media O2

Targeted coverage with Smart Poles

Cellnex UK is also offering MNOs the ability to deliver coverage and capacity at street level where local authority infrastructure is either unsuitable or unavailable with the new Cellnex Street Poles. These quick-to-deploy structures are able to host multiple operators and up to three Small Cell antennas per structure.

The poles feature metered power supplies, offering both fibre and backhaul transmission options and are fully managed and maintained by Cellnex. Also, being IoT-ready, they offer alternative forms of connectivity in addition to their Small Cells capability.

This first deployment was completed in early 2023 and offers an efficient blueprint for further roll-outs. Sited on a busy 'red route' in the capital, the groundworks and pole installation were completed swiftly to minimise traffic or pedestrian disruption. And, despite the plethora

of below ground cabling infrastructure at the location, we were able to design a special foundation solution to avoid disruption here too.

Through-life management

Alongside constantly growing fibre routes, and our flexible portfolio of Small Cell deployment options described above, Cellnex UK provides a comprehensive range of through life management services.

Managed deployment removes the complexity involved in dealing with multiple parties, permitting, and traffic management. Cellnex UK partners with MNOs to identify the best sites, coordinate all activities involved in the build and operation, while a service desk ensures a fast response to operational issues.

Collaboration and commitment

As a neutral host, Cellnex UK works closely with all key stakeholders –

MNOs, Local Authorities and Councils, and community groups. We have multiple agreements with LAs across the UK to deploy sites for telecoms purposes. And, as a neutral host, we provide our Small Cell infrastructure on an equitable basis: offering flexible commercial models that work with MNO budget cycles.

Crucially, our supply chain includes many organisations that also partner with Local Authorities – many of whom utilise local workforces and experts. This flexible structure provides the scale to operate effectively in multiple geographies across the UK.

We will continue working with a growing number of asset owners to secure additional agreements on beneficial terms, and to make more sites available – all as part of our commitment to helping MNOs plan their networks with certainty.



Evidence of success

Cellnex delivers a C-RAN first in London

In the densely populated London Borough of Hammersmith and Fulham, demand for telecoms connectivity is at a premium. To ensure the highest levels of coverage and capacity for its subscribers, Cellnex is working with Three to develop the Capital's first centralised radio access network (C-RAN) in the streetscape.

How it works

Cellnex UK holds the concession to host Small Cell telecoms equipment on existing street furniture and has deployed street cabinets in 90 locations across Hammersmith and Fulham. Cellnex has also deployed a 15km high-density dark fibre network to connect these assets via BT exchanges to the MNO's core network.

Working with Three

Utilising the Cellnex Connected Street Infrastructure, Phase 1 of the project was completed in 2022. This saw 4G radio units deployed in 15 cabinets in the borough and connected to the antenna on the lamp post via a coaxial cable. Dark fibre was then lit to provide connectivity to a baseband cabinet situated adjacent to a BT exchange.

The system is under performance evaluation, prior to further development of the solution, which may include the extending to additional locations,

the addition of 5G connectivity, or both. One option is to install additional 4G and 5G integrated units onto the lamp posts. Due to the increase in weight and wind loading, a number of the lamp columns have been upgraded in readiness.

Cellnex UK and Three continue to work together to further develop this solution – with subscribers benefiting from enhanced coverage and capacity at street level at key areas of the borough. The operator will also achieve significantly streamlined management and control; with the 'brains' of the network centralised in just one or two locations, it becomes a simple task for the MNO's engineers to maintain all the sites. Plus, should the operator wish to scale up its 4G and 5G coverage, Cellnex can quickly light up its remaining 65 sites throughout the borough.



Creating connections that matter

Cellnex is fully committed to helping customers, partners and communities across the UK connect to new opportunities at street level. Having **deployed more outdoor Small Cells than anyone else**, we're simplifying this complex ecosystem and breaking down the barriers to deployment – so communities and businesses can **realise the true potential of a more connected and more inclusive digital society**.



Driving digital inclusivity – a call to action

The accelerated deployment of Small Cells infrastructure will tackle today's coverage and capacity challenges in dense urban areas – enhancing the user experience and supporting both digital inclusion and economic development. Crucially, building the foundations today ensures innovations and improvements tomorrow. The need to work together is clear:



Mobile Network Operators – move the deployment of Small Cells up the priority list. Ramp up strategic engagements with urban connectivity partners such as Cellnex and leverage existing testbeds for trialing new technologies and architectures.



NH providers – provide for flexibility of technical architecture, provide investment and simplify processes for MNOs and other stakeholders



Local authorities and councils – address connectivity challenges that impact their local communities and economies. Increase street level asset availability for telecoms purposes and simplify and accelerate planning and approval processes for new Small Cell assets.



Cellnex UK is one of the country's largest and fastest-growing independent owners and neutral operators of wireless telecoms infrastructure. As a UK Critical National Infrastructure Provider (CNIP), our 9,000 active macro telecoms sites, over 1,100 Small Cell urban deployments, and private 4G/5G wireless solutions support public and private stakeholders across the UK.

To find out more, get in touch at:
cellnex.co.uk

www.cellnex.co.uk