Addressing the rural connectivity conundrum

Access to digital infrastructure can be transformative, helping citizens to improve their livelihoods and enabling businesses to flourish. Fast, reliable, connectivity is a necessary asset for economic growth and social well-being, and is essential to harnessing the benefits of new technologies.

For rural economies, next generation networks are the critical infrastructure that will provide opportunities to create new jobs, improve agricultural productivity and enhance local public services.

GDP

10% increase in broadband penetration is associated with an increase of **GDP growth of 0.6% - 2.8%**

A review of 5G use cases conducted by IHS Markit estimated that global rollout of **5G could enable an approximate €11 trillion increase in global cross-sector output by 2035.**

Rural business

Rural firms in the Province of Trento, Italy, increased their annual turnover by **increased their annual turnover by c.40% and value added by c.25%** following the roll out of a public broadband delivery programme

Jobs

80 new jobs created for every 1,000 new broadband users

In rural areas specifically, next generation networks contribute to the economic and social benefits by enabling access to innovative applications and services that rely on connectivity solutions, including IoT and video streaming as well as more traditional forms of communications. These applications enable rural communities to benefit from a wide range of productivity tools, entertainment apps, health solutions, mobility tools and communications services:

Use cases for next generation networks in rural areas

Local businesses

Shops and restaurants can more easily take card payments using point of sale (POS) terminals, boosting sales and facilitating the shift to a cashless society

Agriculture

Farmers can digitally manage their livestock and resources to drive efficiency and productivity gains

Mobility

Drivers can access live traffic information, online route planners and take hands-free calls on the road, shortening journey times between dispersed rural communities and increasing productivity

Mobile and fixed

Mobile connectivity is linked to improved digital inclusion, which helps people to **overcome feelings of isolation, loneliness and boredom**

Healthcare

Smartphone record-keeping by nurses **can reduce their paperwork time by 60%**, allowing them to see an extra two patients per day

In this context, and as President von der Leyen noted **in her State of the Union speech**, it is unacceptable for 40% of people in rural areas not to have access to fast broadband connections.

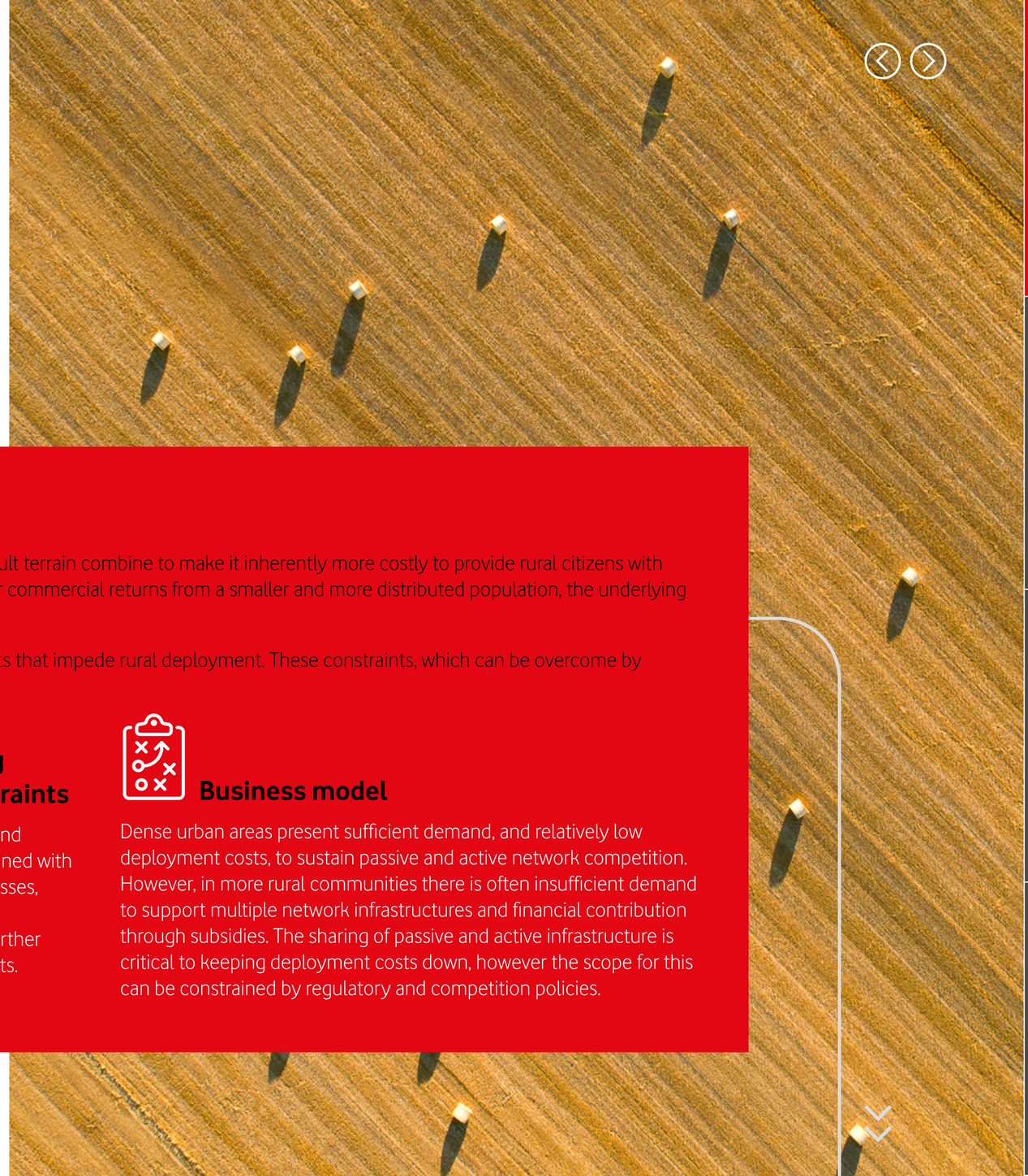
More broadly, a lack of connectivity in rural areas risks creating an enduring digital divide with significant consequences for the rural economies and public services. **42% of European citizens lack basic digital skills, and 37% of people in the workforce are among the digitally illiterate.** Rural areas contribute disproportionately to these figures as they are more likely to lack the infrastructure to enable citizens to get online and access digital tools.

Poor connectivity makes it harder for rural businesses to connect to their customers and other parts of the value chain to leverage IoT productivity tools. It also makes it harder for schools to teach digital skills, and healthcare professionals to exchange knowledge with central facilities.

The challenges arising from the digital divide between urban and rural areas across the EU have been brought into sharp relief by COVID-19, as those with reliable, high-speed connections have been better positioned to minimise their sense of social isolation, interruption to work and education to get essential items. Rural regions have been particularly vulnerable to COVID-19 disruption due to a less diversified economy, fewer workers being able to work from home, lower income and saving rates, and insufficient healthcare facilities. Improved next generation network coverage in rural areas could help to transform rural economies by enabling more remote working, attracting more well-paid workers who have previously had to reside in urban areas, and helping to close the digital divide.

The rural connectivity conundrum

As Ericsson has noted, in areas that cannot be reached by fixed connectivity, mobile broadband access can help to sustain rural living and aid remote working. Ericsson estimates the gross value add distribution for Smart Rural in Europe at €73bn. However, mobile connectivity has its own rural challenges. To overcome this, national and local authorities and mobile network providers will need to collaborate and public subsidies may be required.



Geography and demographics

Lower population densities, longer network route distances and occasionally difficult terrain combine to make it inherently more costly to provide rural citizens with mobile connectivity in comparison to city dwellers. When combined with the lower commercial returns from a smaller and more distributed population, the underlying network economics can be challenging.

However, these factors are then reinforced by a series of further artificial constraints that impede rural deployment. These constraints, which can be overcome by collaboration between public authorities and network operators include:

Local sites access and planning policies

Access and planning restrictions, particularly relating to limits on cell tower heights, significantly constrain efficient network deployment and create unnecessary additional cost pressures on rural deployments.

Local planning capacity constraints

Under-capacity in local planning and construction permit offices, combined with often burdensome approval processes, create delays in site planning and construction timeframes, which further contribute to already elevated costs.

Business model

Dense urban areas present sufficient demand, and relatively low deployment costs, to sustain passive and active network competition. However, in more rural communities there is often insufficient demand to support multiple network infrastructures and financial contribution through subsidies. The sharing of passive and active infrastructure is critical to keeping deployment costs down, however the scope for this can be constrained by regulatory and competition policies.

Addressing the rural connectivity challenge

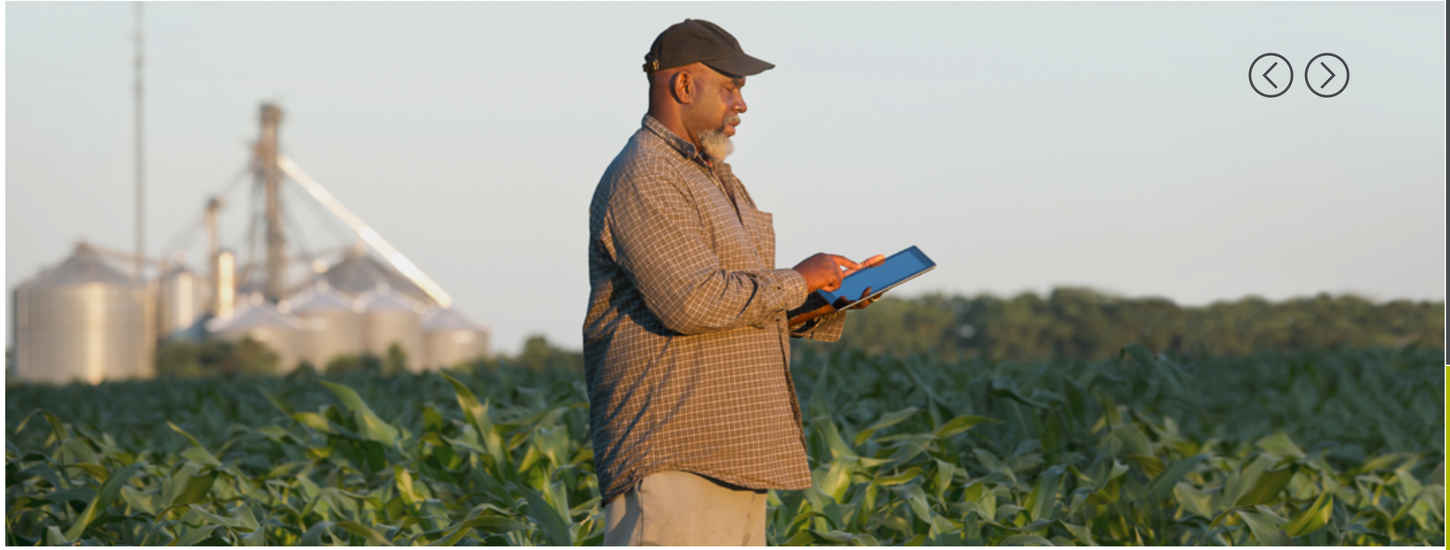
To help address these challenges, the EU is in the process of updating the Broadband Cost Reduction Directive, including provisions to help address the relatively high cost of providing mobile broadband connectivity in rural areas.

In this context, Vodafone has identified six key policy areas that impact investors' ability to deploy competing fixed and mobile broadband networks. Governments and policymakers can stimulate investment by examining their policies in each of these areas and making choices that enable private investment and public subsidies to go further and have a greater impact. Figure 1 highlights our policy recommendations across each of the six areas:

Figure 1

Case studies for support to rural mobile connectivity

Subsidy schemes and policy reforms to enhance rural mobile connectivity have been adopted in Germany and the UK to improve next generation network coverage in rural areas, and thereby boost local economies:



Case study 1
Germany

In Germany, Federal and State governments have concluded that public funding is required to provide coverage in areas previously beyond coverage obligations. Subsidy schemes in Bavaria, Hesse and Lower Saxony have already been approved by the EU Commission.

Bavaria was the first federal state to support the expansion of critical mobile network infrastructure with grants for the construction and equipping of radio masts. An agreement was signed in 2017 by all operators to establish a €135m subsidy framework with five main pillars:

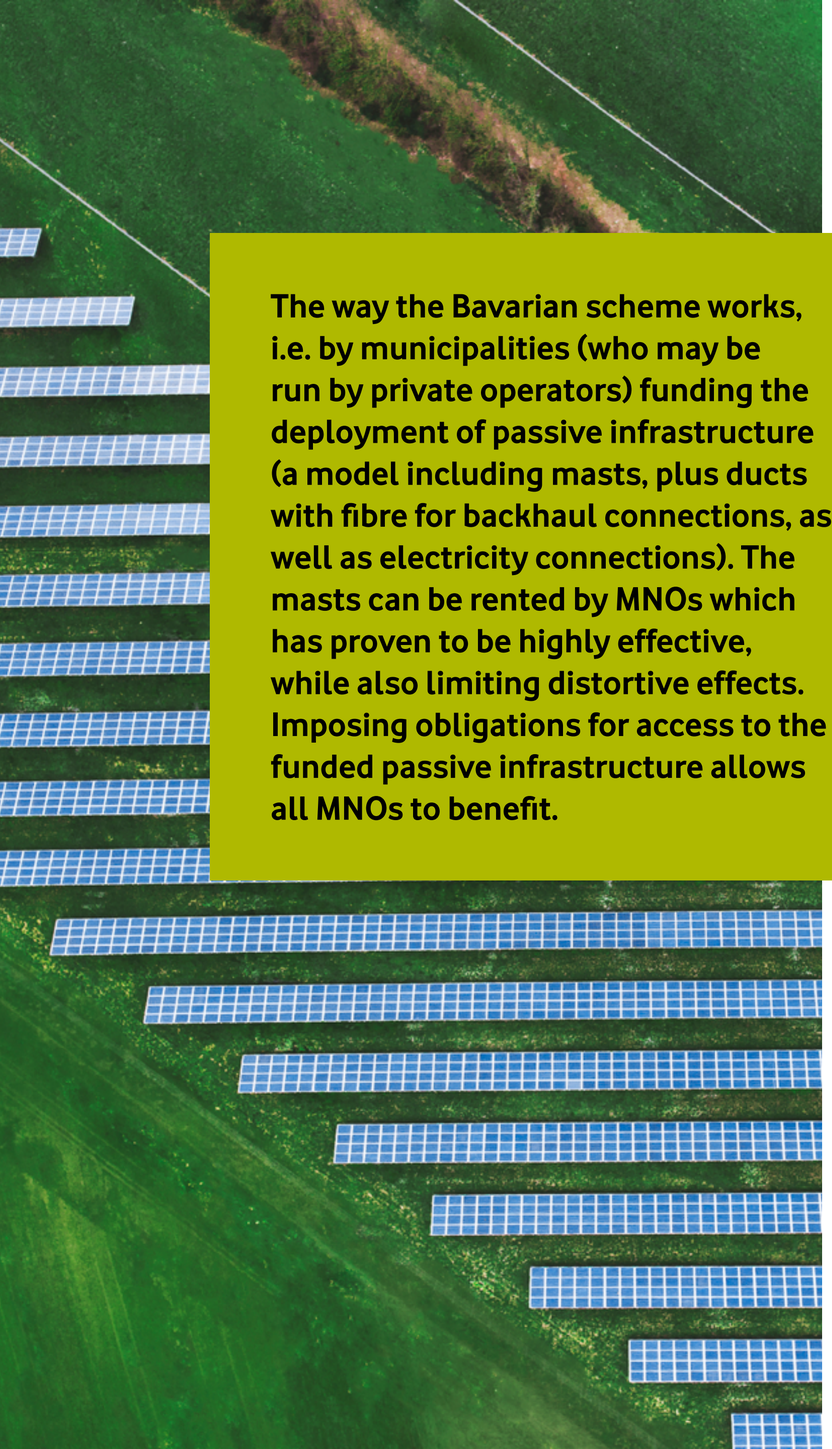
Operator-led model – municipalities receive the funds and own the passive towers, which then can be rented by the network operators. These passive towers, which can be erected by network operators, tower companies and other construction companies, can receive up to 100% public funding.

Tender process for existing white spots – network operators have to disclose their plans for the upcoming year, and remaining white spots are identified and offered out to tender by the Bavarian government. The best offer wins – which is not necessarily always the cheapest.

90% subsidy quote including mobile backhaul on Fibre/Ducts/Energy connection, and all construction related expenses provide a worry-free model. Only active equipment needs to be installed by network operators.

An Open Access obligation enables all operators to benefit, not just the operator to whom the funding is awarded. Other operators can deploy active equipment on the subsidised mast, the other operators receive indirect benefit via reduced monthly rental fees (for seven years at no profit on a certain site)

The option to purchase the base station infrastructure after 7-10 years, if included in the contracts with asset holding municipalities.



The way the Bavarian scheme works, i.e. by municipalities (who may be run by private operators) funding the deployment of passive infrastructure (a model including masts, plus ducts with fibre for backhaul connections, as well as electricity connections). The masts can be rented by MNOs which has proven to be highly effective, while also limiting distortive effects. Imposing obligations for access to the funded passive infrastructure allows all MNOs to benefit.

The German Federal Ministry of Transport also adopted a rural infrastructure subsidy model in 2020 and dedicated €1.1bn of funds into the first EU-wide mobile subsidy programme. The scheme still requires approval from the European Commission under the EU State Aid rules, but it is expected that tenders will start in 2021.This federal model includes many positive features:

A bold programme designed for **5,000 base stations covering one million households** (sufficient to cover all 'white spots' in Germany).

An upgrade option from **2G to 4/5G.**

90% subsidy quota, but in some cases up to 99%.

The scope of the subsidy programme goes **beyond the connection to passive infrastructure** to cover the associated services e.g. planning, access routes, infrastructure maintenance etc., and optical fibre.

Microwave technologies are also eligible for subsidy, **enabling equality of opportunity across a range of potential bidders.**

A key improvement on the Bavarian model is that the **federal scheme grants direct subsidies** to MNOs and tower companies, who then own the towers.

In addition, a federal agency will support roll-out in **helping to speed up permit granting procedures or aiding acquisition of sites.**

Case study 2

UK Shared Rural Network

The UK government had two main concerns when it came to rural mobile coverage. Firstly, that areas of the country had coverage by at least one but not all MNOs ("partial not-spots"), and secondly that there were parts of the UK, often in the most rural areas, that have no 4G coverage from any operator ("total not-spots").

Created by industry and Government, the Shared Rural Network (SRN) will transform mobile coverage in much of the UK, offering an improved 4G service in remote locations. This will be done through:

Addressing **partial not-spots** with MNOs committing to upgrade their existing sites, build new sites and share infrastructure. The MNOs have autonomy to determine how to achieve coverage targets as this will be achieved at their own cost. The government, however, expects the MNOs to share infrastructure as much as possible.

Addressing **total not-spots** with the development of new sites to be built jointly by the MNOs and overseen by Digital Mobile Spectrum Limited. These sites are otherwise unviable from a commercial perspective and therefore require government investment. Subject to state aid approval, the MNOs will have six years to work together to deliver the coverage improvements. Each Host MNO will be responsible for:

- delivery of the passive infrastructure, power and transmission for each site;
- granting access to the other MNOs; and
- operating the site for the duration of the programme.

The SRN will provide high-quality 4G coverage to 95% of the UK landmass by 2025-26, resulting in additional coverage for 280,000 homes and 16,000km of roads. To achieve this, it is expected that MNOs will contribute £532m, which will be supplemented by government spending of up to an additional £500m to help upgrade existing sites and to help build new sites.

The SRN will achieve better coverage than that originally proposed by the regulator in its spectrum auction obligations for the UK as a whole, and for England, Northern Ireland, Scotland and Wales individually. As a signal of their mutual commitment to the SRN, all four UK MNOs have signed binding license coverage conditions.

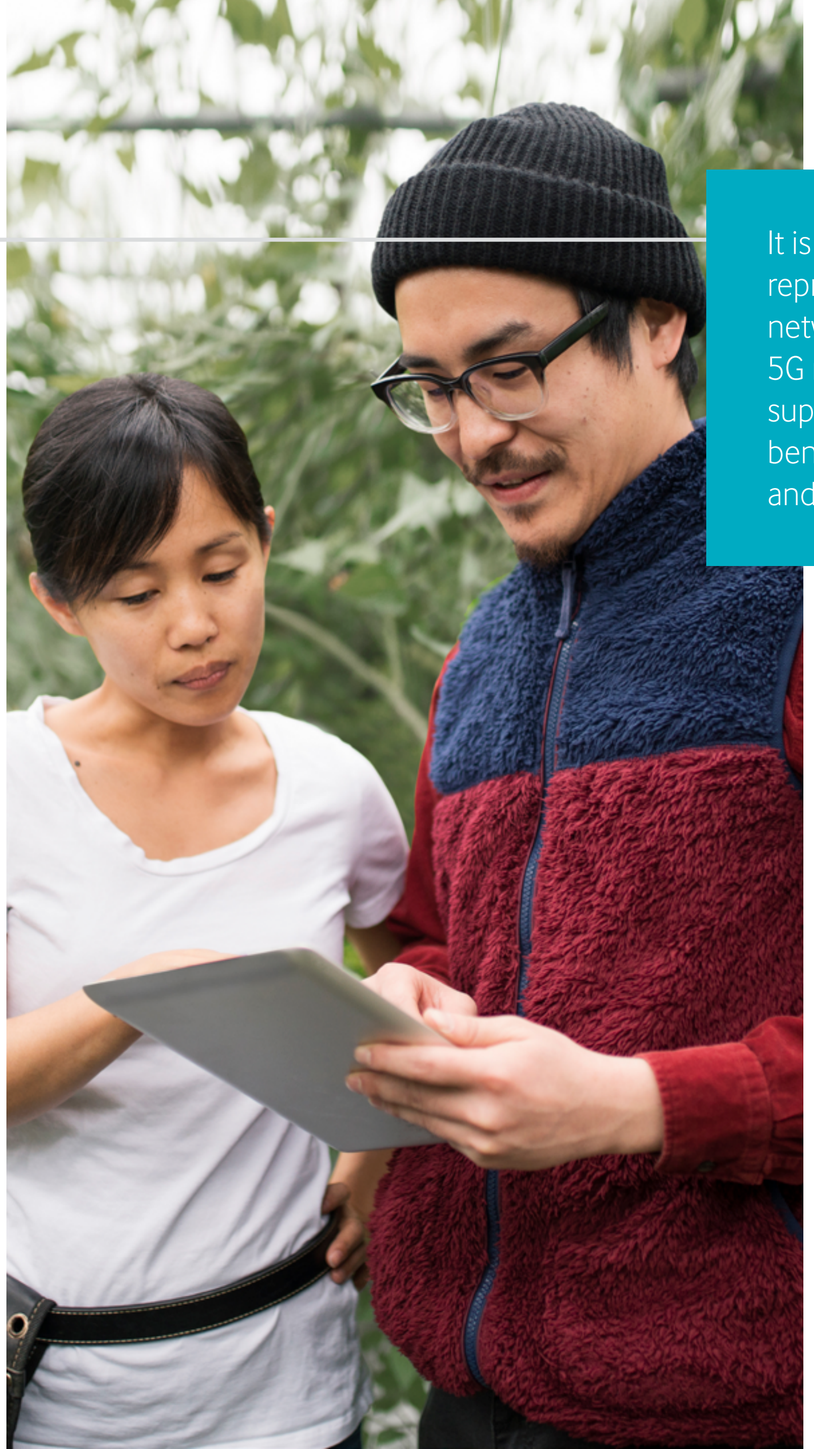
The opportunity for Europe

The availability of subsidy programmes similar to the German model and a partnership between industry and Government as outlined in the UK model would help provide rural areas with next generation networks. These networks would create new jobs and services, as well as improve agriculture productivity, while at the same time reducing pressures on natural resources and the environment through the use of smart technologies. Delivering fast connectivity to rural areas is essential in ensuring these regions are not left behind. Expanding LTE coverage in rural areas to provide 99% availability in each EU member state could lead to:[1]

A cumulative increase in GDP of **€192 bn over the next decade**

340,000 more jobs by 2030.

[1] This illustrative estimation is based on GDP in rural NUTS-3 areas of the EU, and 4G availability estimates for European countries, applying an elasticity of 0.075% increase in GDP per 1 percentage-point increase in mobile broadband penetration, selected from the literature linking digital indicators and economic output. The elasticity has been scaled down to account for potential diminishing returns in expanding coverage to remote areas that may exhibit lower productivity. GDP is assumed to grow at 2% per year to estimate benefits in future periods. The estimated increase in rural GDP is divided by GDP per employee, to estimate number of jobs supported.



It is worth noting that these estimates only represent benefits from the rollout of LTE networks to rural areas. The development of rural 5G networks, either for mobile connectivity or to support fixed wireless access could lead to further benefits from increased speeds, reduced latencies and the potential 5G offers for new services.

As mobile connectivity is rolled out in rural areas across Europe, the digital and the green transition should go hand in hand. Hybrid renewable systems (e.g. solar, wind or even hydrogen), can replace traditional means of energy supply, particularly in remote areas. An example is the deployment of wind turbines on towers allowing for a decentralised energy supply of mobile sites. In Germany, the start-up Mowea has teamed up with Vantage Towers to install micro turbines in a pilot on a tower. One set of eight turbines can **reduce CO^2 emissions by 3,200 kg/year.**

Similarly, investment in digital skills will be essential to make the most of the improved connectivity. This means investing in skills to foster and attract necessary digital talent. By doing so, citizens in rural areas will obtain the skills needed to realise their potential in a digitalised recovery, while investment in connectivity will be maximised, driving growth and jobs.