



# Creating a Gigabit Society: the role of EU funding

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## Executive summary

The Commission wants Europe to become a Gigabit Society<sup>1</sup>. Vodafone endorses such a vision: where citizens and businesses benefit from widespread connectivity of 1 gigabit per second, low latency and reliable performance. But the reality is that there is now a two-speed Europe when it comes to broadband connectivity. In some Member States, such as Denmark, Portugal, Spain and Sweden, more than 50% of households can subscribe to fibre. In Austria, Germany and the UK, the figure stands at less than 10%<sup>2</sup>. In 2016, the Commission estimated that the level of investment needed to achieve Europe's gigabit targets for 2025 is €500 billion<sup>3</sup>. Governments do not have the resources to make this level of investment; the majority of the money for fibre and 5G infrastructure has to come from private investors.

Vodafone is one of the largest gigabit infrastructure investors in Europe. Over the past four years, Vodafone has invested over €45 billion in Europe. In 2017, Vodafone announced substantial fibre investments and new strategic partnerships across its European footprint. In Germany, Vodafone launched plans to deliver approximately 13.7 million new gigabit connections to consumers and enterprises by 2021. In Portugal, Vodafone signed an agreement with NOS to deploy a fibre-to-the-premises (**FTTP**) network for 4 million homes and businesses, 80% of all homes in the country. In the UK, Vodafone signed a partnership with CityFibre to deliver fibre to 5 million homes and businesses by 2025. As a result of multiple and continuous investments, Vodafone's next generation broadband network is Europe's largest, and covers 104 million households.

These commercial investments do not happen in a vacuum. It is critical that regulation promotes competition between network operators to be the first to rollout new technologies and services, encourages co-investment on the basis of sustainable competition, and lowers the costs of deployment. In Vodafone's view this could make a substantial reduction in the investment challenge identified by the Commission to meet the Gigabit Society targets. But even with the best regulation in place, there will be areas which require additional support. Public money can and should be used where it matters the most – to connect the unconnected in areas where investors will struggle to make a convincing business case. Over the next 10 years, technological innovations such as big data analytics, artificial intelligence, and the Internet of Things will have a profound positive impact. Together, network investors and government institutions have an opportunity and a responsibility to ensure this includes every European citizen.

Given the pivotal nature of this moment, the Multiannual Financial Framework (**MFF**) review comes at a good time to reconsider the European Institutions' place in providing public funding where it is necessary. In Vodafone's view, **it is time for the EU to take a bigger role**. This is for two simple reasons. First, given the fundamental role of network competition for meeting the investment challenge, it is essential that public funding is deployed in a way that encourages a competitive market structure overall, as well as competitive allocation of funding. The **Commission is in a unique position to be a champion of competition** in this context given the significant part that it plays already in upholding the values of the EU and approving State aid schemes. Second, there is **positive EU-wide externality from the rollout of gigabit infrastructure that will not be taken into consideration if only national budgets are used**. Europe stands to benefit from added value when funds are distributed at a European level. By bringing an inclusive and innovative Gigabit Society to areas of Europe that would otherwise be left behind, by giving EU enterprises the digital infrastructure that they

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<sup>1</sup> Communication from the Commission, [Connectivity for a Competitive Digital Single Market – Towards a European Gigabit Society](#) COM(2016) 587

<sup>2</sup> European Commission, [Europe's Digital Progress Report 2017](#)

<sup>3</sup> COM(2016) 587



need to innovate, scale and trade within the internal market, EU funding can support greater economic growth. It can also help to ensure that the bloc is a strong and competitive player in the global digital economy.

The paper below makes three central submissions, aligned with overarching public policy objectives:

1. A **greater proportion of funding** for gigabit infrastructure should be undertaken at the EU level given the value-add it brings for the European economy.
2. The Commission must take an **active role in ensuring pro-competitive outcomes** in relation to all public funding, whether provided through the MFF or national State aid.
3. Models for funding should **prioritise connecting communities to a 'digital spine' of high-capacity fibre**, where fibre is deployed right up to the hubs of the economy and society – such as schools, health centres and educational facilities – and high-capacity backhaul is available for network operators to deliver FTTP, 5G and other wireless services. Such open access, passive networks provide an efficient model for directing public funding to get high impact for expenditure, leveraging competition among private investors.

Vodafone welcomes the opportunity provided to respond to the Commission's consultation on EU funds in the area of strategic investment. Vodafone shares the Commission's vision for the digital future for Europe and will continue to play its part in delivering inclusive and innovative transformation towards the Gigabit Society.



## To build the Gigabit Society, Europe-wide fibre is needed for enterprises, citizens and to support 5G

Europe's businesses will need to have access to the best and most innovative digital services delivered over future-proof, reliable networks if they are to serve European customers and to allow them to compete in the global marketplace. European citizens are growing ever more reliant on digital services, for entertainment, and to engage with other citizens, public services and the democratic process. The future of 5G services will rely on an extensive reach of fibre networks to provide high-capacity, low latency backhaul.

### Benefits of the Gigabit Society

Sector	Benefits and applications
Healthcare	<ul style="list-style-type: none"> <li>• High throughput fibre networks are required to work with and transmit the huge amounts of digital patient data generated in hospitals by new equipment and techniques. E.g. <b>next generation genome sequencing</b> – the human genome requires approximately 3 GB storage, when compressed.</li> <li>• Digital healthcare technologies offer <b>opportunities to new entrants</b>. Globally, the digital health market is expected to double in the next three years, surpassing USD 200 billion by 2020. This is driven in part by digital patient data, e.g. electronic medical records and digital X-rays, telehealth and wireless health.</li> <li>• <b>Telehealth technologies (remote healthcare)</b> and wireless health will change the healthcare industry. Secure and low latency networks are essential to deal with these health-critical applications.</li> </ul>
Education	<ul style="list-style-type: none"> <li>• <b>Immersive virtual reality training</b> for professionals and remote interactive learning. Increased digitisation within the classroom so that <b>education can become more personalised and tailored</b> to the need of each individual student, increasing buy-in and motivation.</li> <li>• A larger network of students will be reached with teaching tasks distributed and <b>education delivered in a more efficient way</b>.</li> <li>• Universities will be able to reorganise the way they teach, moving towards a decentralised business model with '<b>à la carte</b>' <b>curriculums</b> where students can attend classes from different universities across the world.</li> </ul>
Energy and utilities	<ul style="list-style-type: none"> <li>• <b>Distributed power generation</b> including renewable energy and edge-of-grid generation and smart solutions need reliable communication networks.</li> <li>• The National Infrastructure Commission in the UK estimated that <b>by managing the use of electricity</b> there is potential for savings of up to £8 billion p.a. Smart grid is an element of this along with efficient energy storage.</li> <li>• Energy networks become more secure against cyber threats.</li> </ul>
Agriculture	<ul style="list-style-type: none"> <li>• <b>Sustainable farming</b>, e.g. reducing net carbon emission per unit of food, and reduced use of pesticides.</li> <li>• <b>Real-time information systems to monitor the harvest</b> and take informed decisions on treatment e.g. pesticides. NB IoT technology, which is already launched and is expected to integrate into 5G networks, will enable rollout of <b>millions of connected sensors on a large scale</b> to increase monitoring capabilities of harvest and soil.</li> </ul>
Public sector (e-Government)	<ul style="list-style-type: none"> <li>• New communications platforms to facilitate the <b>dialogue between citizens and Government</b>.</li> <li>• The global smart city market will increase from USD 0.95 trillion in 2014 to USD 2.1 trillion in 2020 (13.9% CAGR).</li> <li>• In addition to the social benefit from the investment in smart cities, enterprises will be able to reap significant benefits.</li> </ul>



<b>ICT</b>	<ul style="list-style-type: none"><li>• <b>Advanced cloud computing</b> - high bandwidth is necessary to deal with enormous sets of big data, low latency to perform distributed cloud computing in real time, and increased security of the network when dealing with mission-critical or customer-sensitive data.</li></ul>
<b>Media and entertainment</b>	<ul style="list-style-type: none"><li>• Gigabit fibre networks are needed to support the <b>data growth in the media and entertainment industry</b>, where there is relentless adoption of new device formats and services.</li></ul>
<b>Manufacturing industry digitisation</b>	<ul style="list-style-type: none"><li>• <b>5G networks have the potential to become the future communications platform in the factory.</b> They will be able to cope with increased bandwidth requirements coming from more connected equipment and more data being transmitted on the factory floor, as well as the millisecond latency needed for real-time remote control of robotics.</li><li>• Critical applications such as <b>production line robotics will require highly resilient and secure connectivity</b>, another advantage of 5G achieved through network slicing.</li><li>• Elimination of wiring allows <b>flexible production line configurations</b> instead of linear manufacturing processes.</li></ul>

Source: Arthur D Little reports on the [Gigabit Society](#) and on the [role of 5G](#) commissioned by Vodafone

### ***5G: its role in the Gigabit Society***

5G networks will be transformative in their resilience, reliability and immediacy. 5G will have the ability to provide dynamic, specialised services depending on the needs of particular types of users. It is the first mobile technology designed from the outset with input from end-user vertical industries e.g. manufacturing, agriculture, and automotive. The emergence of 5G will be evolutionary, as standards will co-exist with 4G and change over time. This is an efficient way to invest in the future as it allows new services to be tried and tested, with the business case being built alongside network improvements.

The success of 5G will depend on, among other things, the deployment and availability of fibre networks. Fibre will be critical for moving the enormous amounts of data generated by 5G connected devices and objects between cell towers. Without fibre, 5G will simply not be able to deliver the ultra-fast, reliable low latency connections on which new applications will depend. Considering a physician will rely on a 5G connection to monitor the application of bioelectronics medicine, or a driver will rely on it to be immediately informed of a road hazard, it is clear that nothing less than fast and robust fibre backhaul will do.



## 5G case study: automotive

**Applications:** The automotive industry is at the forefront of driving innovation in preparation for 5G networks, conducting trials across Europe. Global revenue for the connected car industry is predicted to increase to USD 151 billion by 2020, driven so far by new safety and security features, infotainment and navigation<sup>1</sup>. As 5G networks have the potential to be configured in a dynamic way to address different user demands, myriad new applications become possible. 'Blue light first responders', general road traffic, maintenance units and freight trucks all have different needs and requirements to be met. 5G networks will be used in combination with sensors, global positioning systems and artificial intelligence, to operate autonomous vehicles<sup>2</sup>. Safety applications related to 'Cooperative Intelligent Transport Systems' are a priority for the Commission in its mobility strategy<sup>3</sup>. Allowing 4G/5G technology to deliver these safety services could save the EU and/or Member States €4.9 billion across the EU in deployment costs as they can use existing mobile networks which WiFi solutions cannot<sup>4</sup>.

**Public funding:** Business models for network investment are expected to change in the move towards 5G as business cases for coverage, driven so far by mobile broadband usage, start to take into account other demands and revenues, such as from the connected car. However, in the least travelled regions, ubiquitous coverage for road users could require public funding in order to provide the network coverage required for the same use of connected or autonomous car services as in the rest of Europe. Savings will be made where this means that cellular technology can be used for all users across Europe simply by upgrading 4G networks, rather than deploying a separate infrastructure for automotive (which would be the case with WiFi).

<sup>1</sup> GSMA: [Transforming the Connected Car Market](#), 2016

<sup>2</sup> Arthur D Little [Creating a Gigabit Society: the role of 5G](#), 2017

<sup>3</sup> European Commission, [A European Strategy for Low-Emission Mobility](#), 2016

<sup>4</sup> Advice from Analysys Mason provided to the 5GAA in 2018, consistent with its [cost-benefit study](#) on this technology

## Encouraging private investment, supporting with targeted public investment

The Commission has identified an investment requirement of €500 billion to meet its targets for a Gigabit Society by 2025:

- 1 Gbps for all schools, transport hubs, main providers of public services and digitally intensive enterprises
- 100 Mbps download speeds upgradable to 1 Gbps for all European households, rural and urban
- 5G coverage in all urban areas, and for major roads and railways, starting with fully-fledged commercial service in at least one major city in each EU Member State by 2020

Governments do not have the resources to make this level of investment. Engaging the private sector will be paramount, as the majority of the money for fibre and 5G infrastructure has to come from private investors. It is essential that a policy and regulatory environment is created that is conducive to private sector investment and that will produce outcomes aligned with these objectives. Positive measures include regulation that promotes competition between network operators to be the first to rollout new technologies and services – infrastructure competition is the only proven trigger for rapid deployment of state-of-the-art fibre networks without using public funds. Competitive investment can be encouraged by reducing the costs of rolling out gigabit networks and by incentivising co-investment between operators where it delivers sustainable competition. In Vodafone's view this could make a substantial reduction in the investment challenge identified by the Commission to meet the Gigabit Society targets.

But even where the best regulatory regime is in place, there will be areas in which commercial investment alone will be insufficient to secure ubiquitous gigabit networks. Typically, this will encompass the more rural



areas with challenging topographies and low population densities. These areas will only become part of the future digital Europe if public funds are made available towards network build.

The recommendations that follow are made in alignment with the following **overarching public policy goals**, priorities when it comes to using public funds for gigabit infrastructure:

- **EU added value:** Gigabit infrastructure enables companies to operate in an advanced digital economy, leveraging large data analytics in the cloud and trade with the customers and suppliers of digital services across regions and borders. Widespread availability of gigabit infrastructure provides a platform for European economic growth and competitiveness in the global economy.
- **Ubiquitous coverage of future-proof networks:** Digital connectivity is central to participation in the economy and society – it will not be a desirable outcome to allow some areas to be excluded. Public funding must be used for networks that are fit for the future – not to prop up the old, copper technologies that will keep Europe in the slow lane of digital connectivity.
- **Consistency with State aid rules and better regulation principles:** Aid will, for example, need to be the minimum necessary to remedy the failure, focusing public funding only on those areas where commercial investment will not be forthcoming.
- **Efficient use of public funds:** Design principles should ensure maximum impact for each cent of public money spent on the extension of digital networks into uneconomic areas.
- **Competition and contestability:** Public funding needs to support networks that ensure Europe can reap the huge dividend that comes from intensive competition for customers.
- **Digital Single Market:** The approach to public funding must support the transition to a Digital Single Market and avoid exacerbating fragmentation.

### **Time for the EU to play a bigger role in public investment: funding gigabit networks through the MFF**

There is positive EU-wide externality from the rollout of gigabit infrastructure that will not be taken into consideration if only national budgets are used. Europe stands to benefit from added value when funds are distributed at a European level. EU funding can ensure that an inclusive and innovative Gigabit Society reaches areas of Europe that would otherwise be left behind. By providing EU enterprises across different Member States with the digital infrastructure that they need to innovate, scale and trade within the internal market, EU funding can support greater economic growth. For the full economic benefits of the Gigabit Society to be realised, it is not enough merely for individual enterprises to have gigabit connectivity; their customers may need gigabit connectivity as well.

This can be the case, for example, for media and tech start-ups and SMEs that transfer and analyse data in the cloud. A start-up with gigabit connectivity in Stockholm may not be able to do business with a potential customer or partner in another Member State without the same high-quality, high-capacity services.

In an era of global competition for trade, business and investment, there is no question that Europe must be at the forefront of state-of-the-art digital infrastructure. Taking a view at a European level, it is clear that Europe needs the infrastructure that will set it up as a serious player in the global digital economy. Quick-fixes and second-best are not an option when making investment decisions for the future of Europe. This indicates the need for a European level approach above and beyond the immediate considerations at a national level. This is required to ensure that investments made now will bring the significant value that Europe stands to benefit from as a strong and competitive player in the global digital economy.

In this context, Vodafone agrees with the Commission's views in its Communication on the MFF<sup>4</sup>:

*State-of-the-art connectivity of digital [...] infrastructure is key to Europe's territorial, social and economic cohesion. Europe must embrace the potential of innovation and seize the opportunities it*

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<sup>4</sup> Communication from the Commission, [A new, modern Multiannual Financial Framework for a European Union that delivers efficiently on its priorities post-2020](#), COM(2018) 98



*brings. In particular, technological change and digitisation are transforming our industries and the way we work, as well as our education and welfare systems. Europe lags behind on the road towards a digital economy and society. The digital investment gap not only undermines Europe's innovation and growth capacity but also its potential to respond to emerging societal needs. Unlocking online opportunities and completing the Digital Single Market is therefore a key priority of the Union.*

## **The Commission must be the champion of competition in relation to public funding**

Given the fundamental role of network competition for meeting the investment challenge of the Gigabit Society targets identified by the Commission, it is essential that public funding is deployed in a way that encourages a competitive market structure overall. The Commission is in a unique position to be a champion of competition in this context given the significant part that it plays already in upholding the values of the EU and approving State aid. This applies not only to EU funding, but to the Commission's role in overseeing the design and implementation of national State aid schemes.

In order for public funding not to distort the overall competitive landscape, there must be a competitive process for tenders, which enables challengers to the incumbent fixed operator to participate on a fair basis. The process must also give sufficient weight to pro-competitive business models and infrastructure.

Competitive end-to-end networks will always lead to the best outcomes. Where these exist, challengers will be able to compete for customers without depending on others with monopoly control over key bottlenecks – a poor situation when the monopoly owner is also a competitor in the quest for customers. However, in the most challenging areas, where there is no viable business case for even a single privately-funded network, it is unlikely that multiple end-to-end networks will be sustainable, even with public funding.

In these geographies, it is essential that the method for allocating public funding still supports competition wherever possible, and in the areas where it matters most for innovation. In that regard, the public funding schemes should:

- **Ensure fair access to the incumbent's physical infrastructure:** In these areas the incumbent will usually have superior network reach and a dominant position as a result of legacy advantages.
- **Prioritise wholesale-only and passive infrastructure models:** investment in passive infrastructure (e.g. ducts and dark fibre) that supports competition based on wholesale services allows for greater innovation and better tailoring of communications services to the needs of each community. A well-governed structurally separated entity is pro-competitive as it is relieved of any incentive to discriminate in favour of its own retail arm.
- **Balance the weight of tender criteria to reward future-proof and pro-competitive models:** Criteria should take due account of speed and quality of service, cost considerations covering initial capex, opex and annualised cost over the asset lifetime, sustainability of the investment, and impact on competition. A short-term view focused on capex cost can preclude competition to invest in future-proof technology.
- **Mandate wholesale open access at cost, with fit-for-purpose wholesale products:** In order to maximise the benefits that can be achieved through public investment, wholesale access at cost is a fundamental condition. The allocation of public funds must support competition for customers connected to the networks benefitting from public funds. Competition for customers supports digital innovation and value; dominance stifles progress.

In its Communication on the MFF, the Commission raises the possibility of strengthening the link between EU funding and respect for the EU's fundamental values. Vodafone welcome's this question. A prime area for consideration in relation to digital connectivity is the proper implementation and enforcement of State aid rules in relation to existing schemes before EU funding is delivered. In particular, that tenders are being conducted and awarded in a pro-competitive manner and that fit-for-purpose wholesale access is being offered on infrastructure funded with public money.



## **Public funding models should prioritise connecting communities to a 'digital spine' of high-capacity fibre**

A model to deliver targeted, effective and pro-competitive gigabit infrastructure and services, through EU and national public funds, is to invest in a 'digital spine'. A digital spine connects communities to high-capacity fibre by bringing fibre right up to the hubs of the economy and society – such as schools, health centres and educational facilities – as well as base-stations for high-quality wireless services, including 5G. From each of these points, network operators are able to deliver FTTP, 5G and other wireless services using the open access, passive network built as part of the digital spine.

This model extends high-capacity backhaul so that operators can more readily compete to deliver fibre and 5G. It provides an efficient model for directing public funding to get high impact for expenditure, leveraging competition among private investors. But most importantly, it prioritises and maximises the investment in Europe's engines of growth, as intended in the Commission's Gigabit Society targets.