etno

European Telecommunications Network Operators' Association

THE STATE OF DIGITAL COMMUNICATIONS 2020

ANNUAL ECONOMIC REPORT

Contents

In summary

Europe is changing at the speed of digital opportunity

Fresh digital opportunity is happening, and telecom innovation is driving it. As Europe works on a new, sustainable growth model for its society and economy, this Report provides you with the latest on one of the most important enablers of innovation and progress: digital communications. Here, in summary, our main findings.

" 5G is happening and fibre is making the European internet significantly faster. "

Some of the world's first **5G** networks were launched in Europe in 2019. At the end of last year, 14 European telcos had launched 20 5G networks in 9 European countries, making Europe one of the most advanced regions in the world for 5G deployment. By the end of 2020 there will be over 80 networks in operation across the region, bringing next-generation wireless connectivity to millions of people. What is more, average speeds on mobile are high too, with ETNO companies registering higher average downlink speeds than the global average. This is happening against a challenging scenario on **spectrum** prices imposed by national Governments, whereby some European telecom operators are being charged up to 14x higher than global peers. **Fibre roll-out** is increasing across the region, with 41 million households directly reached by fibre in 2019, up from 34 in the previous year.

" Telecom is Europe's major technology business, with a €136.9bn/year value added and training on the rise. "

Of the 17 Europe-based companies figured in the 2019 Forbes Digital 100 index, 11 are either telecoms operators or telecoms equipment vendors, and more than half of them are ETNO members. The estimate for the value added of ETNO's footprint is €136.9 billion, which captures indirect contribution to society and economy in terms of tax, rewarding employment, shareholder value and others. What is more, spend on **training** is on the rise: our companies are delivering 33 hours per employee of skills training, up from 30 hours last year, and with some members delivering close to 80 hours per year.

" European telecom markets need to become stronger. Investment is still too low, despite high capital intensity and investment leadership by ETNO companies. "

The total investment in European telecom networks was €48.6bn in 2018, with ETNO companies deploying 70.5% of the **total network investment** in Europe (€34.4bn, fixed and mobile). ETNO companies have the highest proportion of revenues dedicated to investment among global peers in Japan, US and South-Korea. However, investment per capita in Europe remains lower than those of such global peers, with Europe investing around €89 per person, as opposed to global peers' average at €177 per person. European markets remain fragmented, with 47 main MNOs in Europe, as opposed to 7 in the USA, and 3 in South-Korea and Japan respectively. Europeans **use and spend** less in connectivity services as compared to their global peers. Telecom service

revenues is stuck at around €165bn for the past 5 years as are mobile and fixed Average Revenue Per User (ARPU) at €14.9 and €21.5 in 2019 respectively. This means European telecom markets must become stronger before they can deliver a significant leap in network investment. Against this challenging scenario, European telcos are also becoming more efficient in deploying investment, with many European countries having between 1 and 3 examples of **network sharing** agreements.

" Networks are becoming greener, with both carbon intensity and overall emissions decreasing and aggressive climate targets. "

Consumers demand data-driven services, which are in turn driving the digital revolution. However, data also means an increase in **energy demand**. In the telecoms sector, such demand grows at an estimated 5% per year. Despite this, European telecom companies are radically changing the way they work. By 2019, almost 50% of the energy used by ETNO companies came from **renewable** resources. This reflects positively on the green performance of the sector, which in 2019 reduced its overall emissions by 8.5% with respect to the previous year. Also **carbon intensity** is decreasing, with ETNO companies reducing emissions from 32 grams per EUR earned in 2018 to about 29 grams in 2019. What is more, the CO_2 emission targets by leading ETNO companies are overall more ambitious than those indicated in the EU Green Deal.

" Digital services, cloud and Artificial Intelligence: telecom operators are enablers of European trust-based innovation. "

The scope and opportunity for launching and providing more European digital services is significant. EU users appear to prioritise trust and to demand speedier, locally-tailored cloud services. 2019 telecom revenues from **B2B** are forecasted to be back in the positive area and the overall market for **IT services**, which includes cloud, is growing and competition is becoming more intensive.

Similarly, IoT growth is going to continue, with telcos empowering a diverse range of **industrial sectors** and Europe expected to reach 740 million active IoT connections by 2026. On the consumer end, telecom operators are increasingly competing with **OTT video services** by launching their own OTT services: by 2024 revenues of the operators' own OTT services are projected to reach €5.5bn/year, up from €1.8bn/year today. However, service and data-based innovation is also improving networks are their core, with **AI** being increasingly rolled out to make telecoms network more responsive to customer needs and more efficient, including from the energy consumption viewpoint. AI is also dramatically improving customer service.

As Europe strives to gain fresh leadership in global digital markets, telecoms innovation in 5G and data-driven services play a crucial role. Not only they are empowering consumers and users across economic sectors, but also they are addressing major socio-economic challenges that require a greener way of producing, more opportunities for economic growth and increased social inclusion.

" Regulation and its implementation should support European investment and innovation. "

The report also highlights how regulatory pressure still risks holding back European investment and innovation on many fronts. The speed of 5G roll-out is significantly slowed by excessive spectrum prices and challenging license conditions. The opportunity of fully unleashing fibre deployment awaits a pro-investment implementation of the European Electronic Communications Code. Regulatory asymmetries, especially in the field of data, still hold back European innovation. Market fragmentation still affects Europe's full potential in network investment. European institutions and national governments both have a major role to play in removing such barriers.

Introduction

This report has been commissioned by ETNO to provide market context and a qualitative assessment of digital communications providers within Europe* and beyond. Digital communications providers are so pivotal to modern economies that it cannot be considered in isolation from broader global economic forces and societal demands.

---

* Throughout this report Europe is taken to mean the EU28 (including at the time of writing the UK), plus Albania, Andorra, Bosnia, Iceland, Kosovo, Liechtenstein, Monaco, Montenegro, North Macedonia, Norway, San Marino, Serbia and Switzerland.

The great challenge faced by economies today is to integrate environmental sustainability and citizen welfare with economic growth, using smart, efficient, new connected technologies to do more with less. This is one of key objectives of European countries. Environmental policies that enable a sustainable industrial base through uptake of digital tools, while reducing travel, providing more efficient homes and smarter ways to work.

Europeans are intense users of digital services and technologies. As their use becomes more intense, and as new [5G-based] networking paradigms emerge that reconfigure the worlds of the datacentre and the telecoms network, so the inter-related issues of trust, security and transparency become more critical to users. Citizens have to be at the empowered centre of the digital economy, not its raw material.

The digital technology and services ecosystem, with only a handful of exceptions, resides outside Europe. Out of the Forbes 'Digital 100' ranking of the top 100 public companies shaping the global digital economy, only 17 are from Europe, and only one features in the top 20. A particular challenge, then, for Europe is to develop a stronger domestic position in the ecosystem of these technologies and services so as to make Europe a world-leading innovator and producer as well as consumer. These ambitions for digital leadership are discussed within ETNO's Europe 2030 report[1], which places connectivity, European made technologies and European citizens at the centre of a digital future. In addition to the direct economic benefits, this could help to steer the development of digital services in a way that fully embraces values and that adequately responds to the environmental and trust issues raised by consumers, businesses, and national and European-level governmental bodies.

Digital communications providers already support knowledge-based economic growth and societal well-being by ensuring every European citizen and business is supported through reliable, affordable high-bandwidth communications delivered efficiently. This remains vital. But the scope of their engagement has dramatically broadened on two fronts.

Data and networking extend to every corner of the economy. 5G and related technology open up an industrial Internet with the potential to deliver new digital services for long-term economic growth.

Digital communications providers are, increasingly, more than simply an underpinning to the broader digital economy; they are increasingly collaborators and players within that world.

As the scope of their business increases, European digital communications providers have a role in ensuring that end-users' engagement in that world is supported through educating subscribers in the use of digital services, helping to ensure complete inclusion of the total population. They can foster parts of the digital economy that are currently dominated by non-European players. Digital communications providers can also support the consumption and production of services and technologies that either directly or indirectly address environmental challenges. In fact, already telecoms are one of the most significant sectors in supporting the reduction of global greenhouse gas.

The changing nature of the customer expectations and governmental requirements drives digital communications providers constantly to innovate. This has limits; they still have to deal with a tough regulatory environment, to pay their taxes and at the same time to ensure the long-term viability of their business for all stakeholders: staff, shareholders, pensioners, suppliers and of course customers.

This report investigates three key areas:

Section 1 looks at what digital communications providers are doing, directly and indirectly, to support European economies and citizens
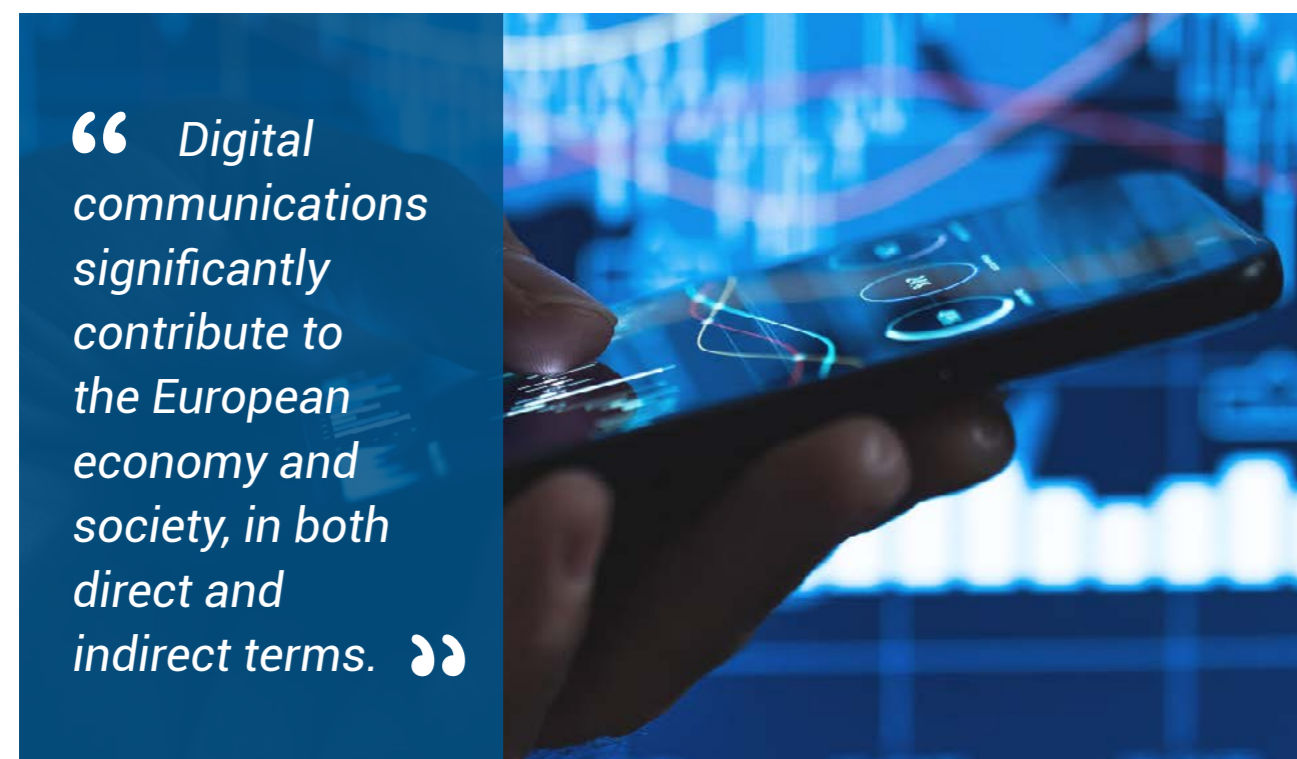
Section 2 investigates how they are currently addressing evolving customer demands

Section 3 considers how digital communications can provide support for future economic growth and be even more responsive to demands for sustainability and trust. Moreover, it asks what the best balance of policy priorities should be to support that goal.

> **"** *Digital communications significantly contribute to the European economy and society, in both direct and indirect terms.* **"**

---

[1] https://etno.eu//downloads/reports/etno%20policy%20agenda_2019_web.pdf

Digital service providers are supporting the socio-economic needs of Europeans

① Direct impact for Europeans

The first mission of telecoms operators is to provide capacity and coverage for trusted and secure communications. This is the fundamental underpinning of the digital society. In this respect, the European Commission has set two sets of ambitious targets aimed at ensuring that all European citizens, businesses and institutions benefit:

Figure 1.1: The two Commission targets

European Digital Agenda – Target 2020	Connectivity for a European Gigabit Society – Target 2025
Coverage of 30 Mbit/s or more for every citizen	Access to 1 Gbit/s for all schools, transport hubs and main providers of public services and digitally intensive enterprises
Usage of 100Mbit/s or more by 50% of households	Access to download speeds of at least 100 Mbps to be upgraded to 1 Gbit/s for all European households
	Uninterrupted 5G wireless broadband coverage for all urban areas and major roads and railways

Source: Analysys Mason, 2019

FIXED ACCESS AND FIBRE INFRASTRUCTURE

Fixed fibre-based bandwidth is vital for economic development. These include:

- To overcome geographical limitations of other physical mediums and thereby to break down digital divides

- To supply the growing bandwidth needed to support new applications

- To support new architectures based on cloud resources, and to give access to affordable and most-efficient cloud resources

- To supply very low latency for new applications

- To facilitate the development of denser mobile networks

Fixed networks capable of delivering gigabit speeds are primarily fibre to the home, fibre to the building with LAN cabling, or cable HFC with DOCSIS3.1. The Gigabit Society objectives are also increasingly being delivered across Europe thanks to a diverse range of technologies, such as FTTC. Similarly, Fixed Wireless Access (FWA) also constitutes a promising development, especially in terms of inclusion.

Other advanced economies had a head start on Europe in terms of the coverage of fixed network infrastructure suitable for supporting ultra-highspeed networks. In the USA cable network infrastructure, rolled out mainly at the end of last century, reached over 80% of properties, whereas in Europe the figure was under 50%. Some countries, like Italy, have never had cable networks. Japan and South Korea also had higher cable coverage than in Europe, and these countries' higher density of housing enabled them to achieve faster roll-out of fibre networks.

Figure 1.2: NGA and FTTP coverage, Europe, USA, Japan and South Korea, 2012−2019f

Europe NGA ---   USA NGA − FCC ---   Japan NGA ---   S. Korea NGA ---
Europe FTTP ——   USA FTTP ——   Japan FTTP ——   S. Korea FTTP ——

Note: FTTP is used to mean full fibre only. NGA also includes FTTB+LAN, FTTB+copper, FTTC+copper, cable. FCC data for USA is available only up until 2017
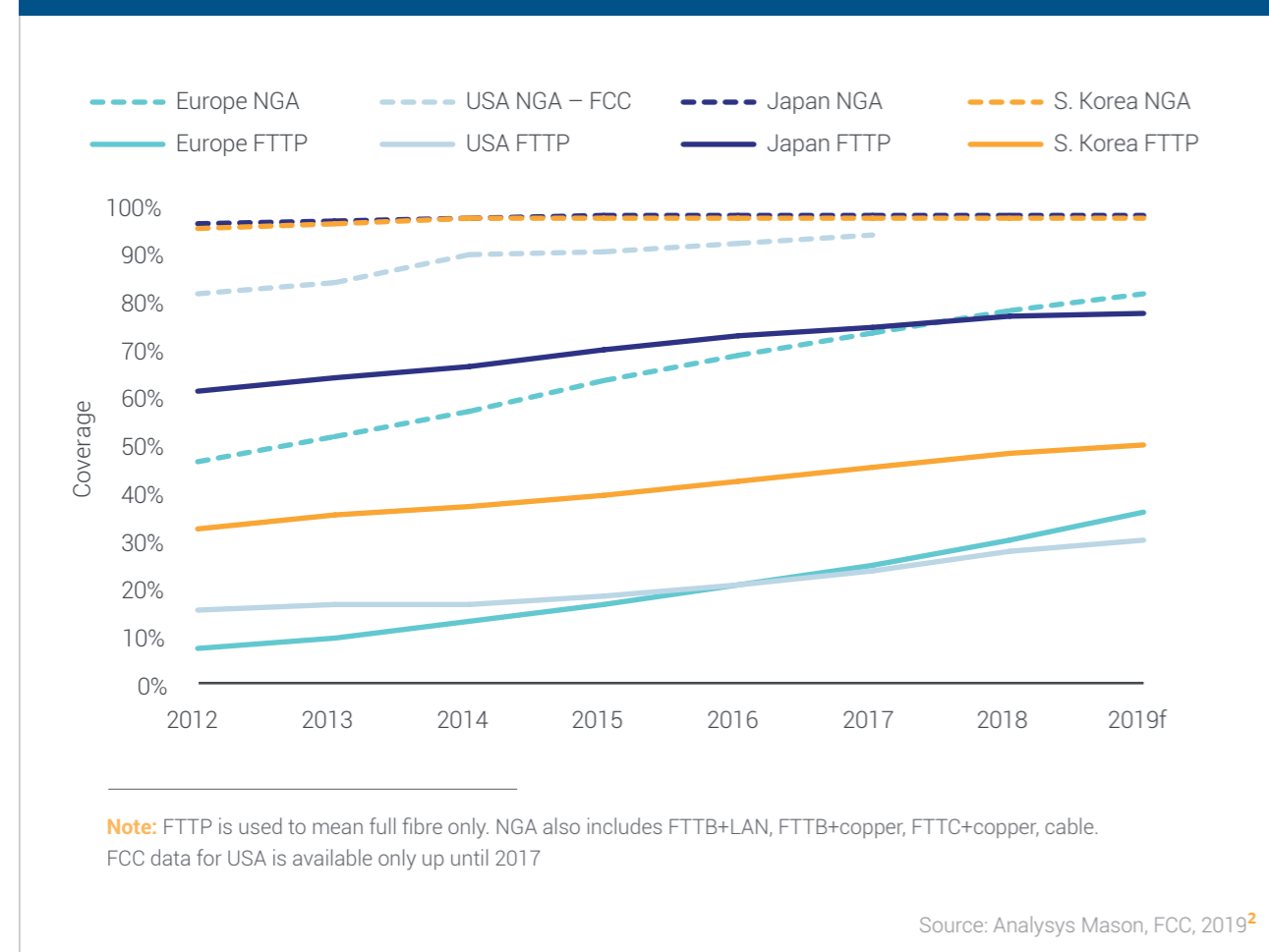
Source: Analysys Mason, FCC, 2019[2]

Figure 1.2 shows that European investment in FTTP is robust and growing. However, an extra effort will be needed to meet the Gigabit Society targets.

FTTP is economically efficient, in three key respects:

- OpEx is significantly lower than all alternatives
- Additional bandwidth, when required, is almost limitless and ultra-low cost compared to all alternatives
- It delivers high bandwidth into and out of buildings more effectively and efficiently than wireless

FTTP also has a lower environmental impact than copper, hybrid fibre-coax (HFC) or wireless alternatives. By decommissioning copper networks and shifting to FTTP/GPON, absolute energy savings of about 60% can be made, according to Telefónica.[3] From the end-user perspective, powering an optical network terminal is far less expensive and more efficient in energy terms than powering indoor mobile network customer premises equipment (CPE).

However, even though its long asset life will make the Total Cost of Ownership (TCO) attractive, FTTP is a major one-off challenge in purely CapEx terms. If the European Gigabit Society 2025 targets are to be met, this will inevitably have to be accompanied by strong demand-side policies and in part financed through partnerships with the public sector or through innovative new business models. [See   Section 3   ]

Some European nations are among the leaders in terms of average downlink speed on fixed networks, although the weighted European average is lower than that of South Korea, Japan or the USA.

Figure 1.3: Average fixed broadband downlink speeds, Europe, the USA, Japan and South Korea, September 2019
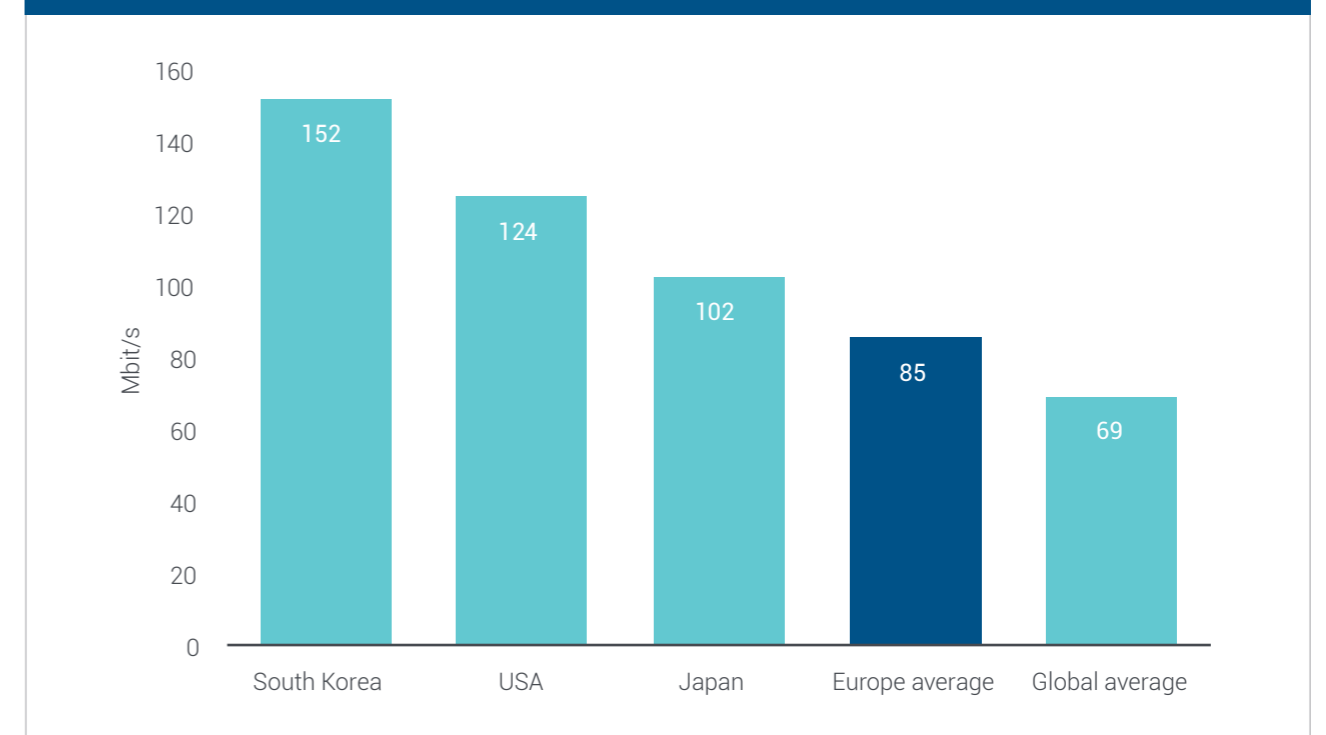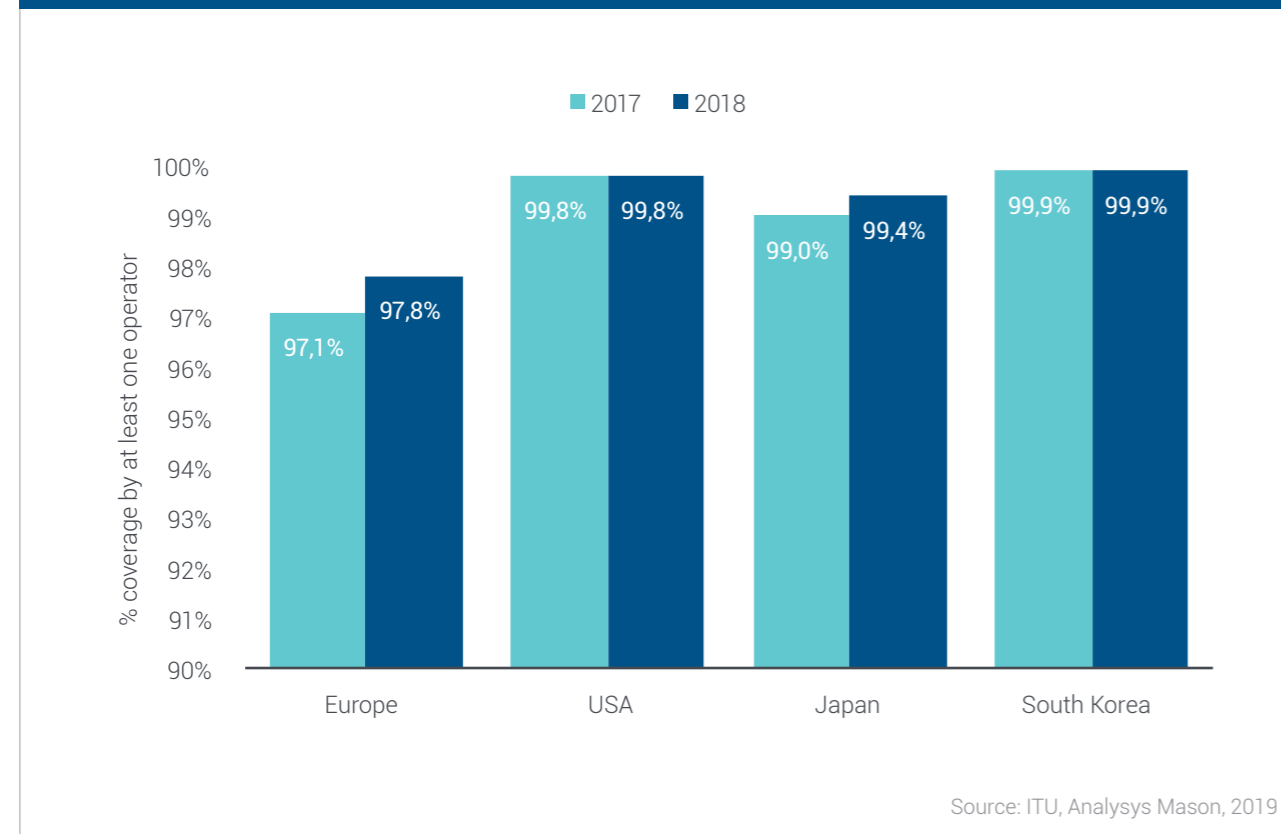
MOBILE AND 5G

Some of the world's first 5G networks were launched in Europe in 2019. As of November 2019, 14 operating groups (including 9 ETNO members) had launched 20 5G networks in 9 European countries, making Europe one of the most advanced regions in the world for 5G deployment. By the end of 2020 there will be over 80 networks in operation across the region, bringing next-generation wireless connectivity to millions of people.
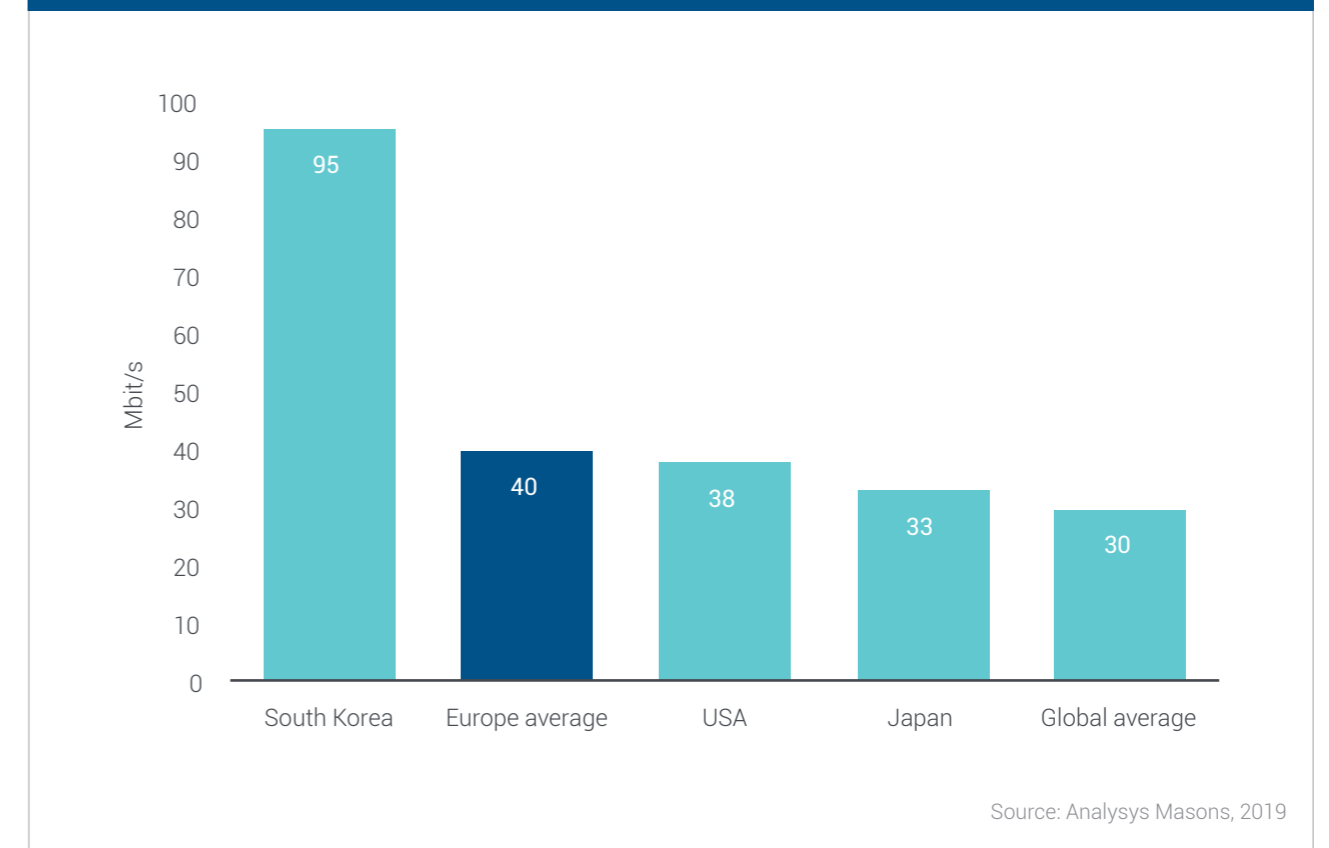
However, in those countries where 5G has been launched, the work to ensure adequate coverage is still ongoing, and from a social and economic good perspective it still makes sense to use 4G as the benchmark for inclusion. Europe has quite good outcomes in mobile coverage and the overall number disguises several markets with 100% population coverage.

Moreover, average speeds on mobile are high too. All but one of the countries in the ETNO footprint recorded higher average downlink speeds than the global average, and all but two were higher than Japan. The weighted average for Europe is lower than South Korea (where 5G was launched early), but higher than the USA (where 5G coverage was limited to small urban pockets) or Japan (where 5G had not been launched). 5G is expected to further boost this trend: for example, in Italy, TIM and Ericsson recently tested a 5G connection able to exceed the 2 Gigabit/s speed with millimetrics frequencies (mmWave) in the 26 GHZ band.[4]

Figure 1.4: Percentage of the population covered by at least one LTE mobile operator, Europe, South Korea, Japan and the USA, 2018

Source: ITU, Analysys Mason, 2019

Figure 1.5: Average mobile downlink speeds, Europe, the USA, Japan and South Korea, September 2019

Source: Analysys Masons, 2019

4 https://www.ericsson.com/en/news/2020/1/tim-european-5g-record

PRICES AND SPEND

The level of competition in fixed access at an infrastructure level is strengthening in Europe. At the end of 2019, alternative operators (excluding cable) had 25% coverage of gigabit capable or upgradeable access networks (FTTP or FTTB/LAN). This has risen fast over the past three years and European consumers have a significantly larger variety of infrastructures and ownership than in the USA, where the equivalent figure is just 6%.

Figure 1.6: Coverage of gigabit-capable or gigabit upgradeable networks, plus other FTTx, leading, alternative and cable operators, Europe, USA, Japan and South Korea, 2019f

Source: Analysys Mason, 2019
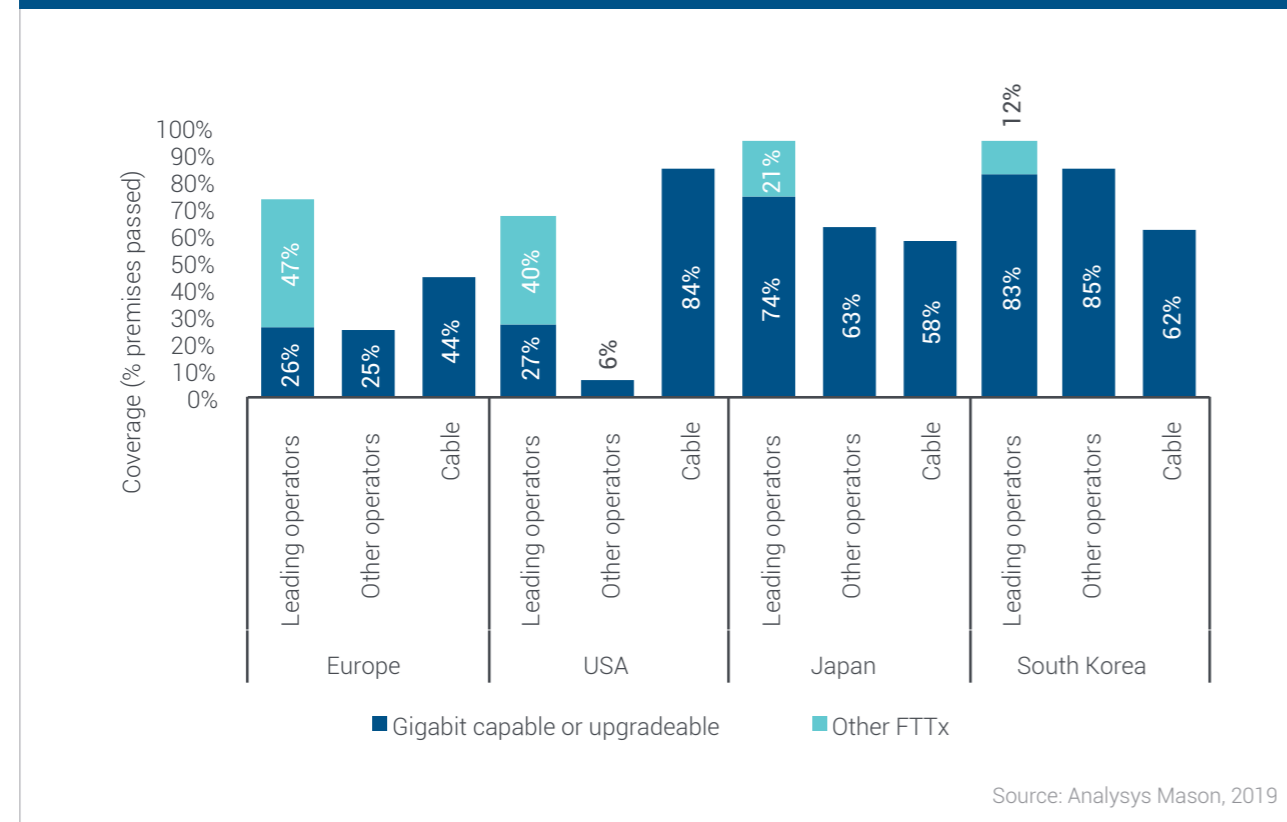
This choice of infrastructure is supplemented by regulation that creates retail opportunities for players with lower levels of their own infrastructure. This results in Europeans paying extremely low retail prices for broadband.

The average spend per gigabyte of mobile data in the ETNO perimeter in 2018 was lower than that in USA and Japan, and comparable with that in South Korea. The average mobile data usage per capita in the ETNO perimeter was lower than that in all three other countries, despite low prices and spend. There is, however, huge variation between European countries in terms of average usage: many have average mobile data usage significantly higher than the three comparator countries.

Figure 1.7: Average spend per gigabyte of mobile data used and average mobile data usage per capita, Europe, South Korea, Japan and the USA, 2018

Source: Analysys Mason, 2019
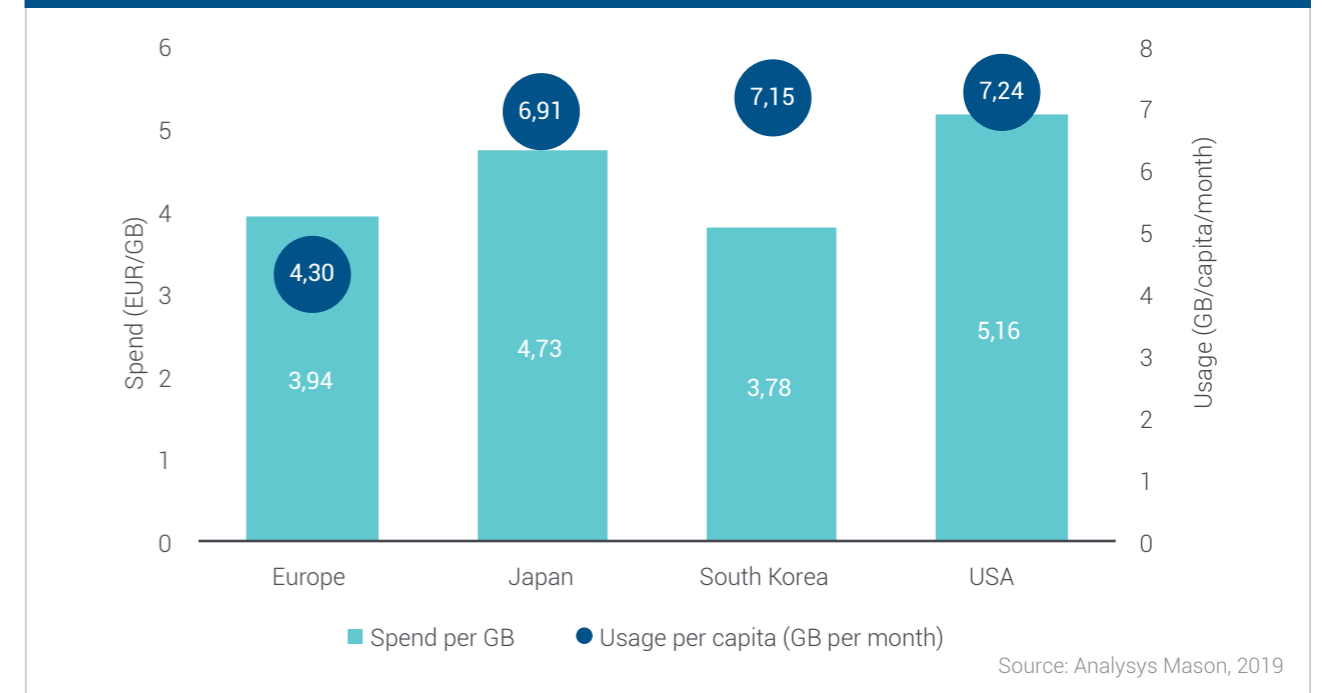
These figures have to be seen in the context of operators' ability to monetise data. Operators in the USA, Japan and South Korea are able to achieve much higher revenue per user than European operators.

Figure 1.8: Mobile ARPU (excluding IoT SIMs), Europe, USA, Japan, South Korea, 2018

Source: Analysys Mason, 2019
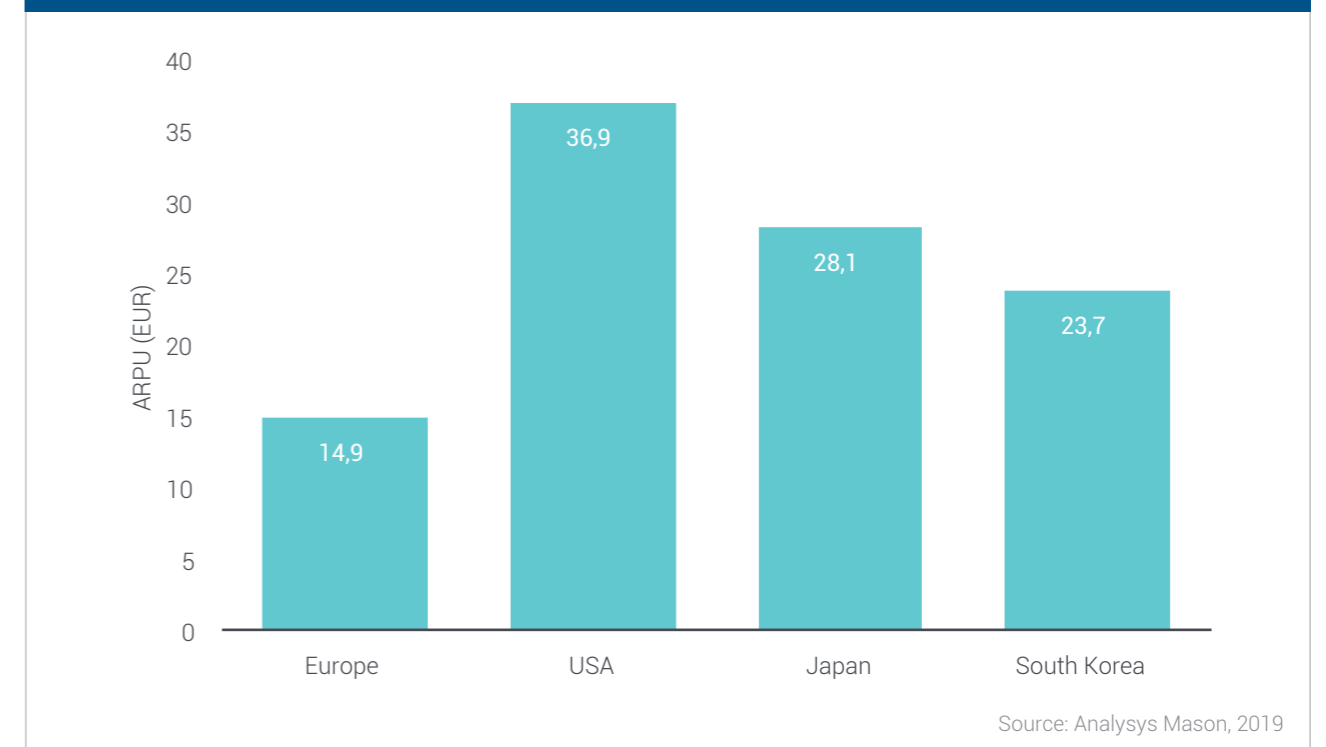
This applies not only to mobile. Overall spend on telecoms, as opposed to price, is lower than elsewhere, and this remains the case even when set against GDP.

Figure 1.9: Average mass-market telecoms spend per capita, Europe, USA, Japan and South Korea, 2005, 2012 and 2019f
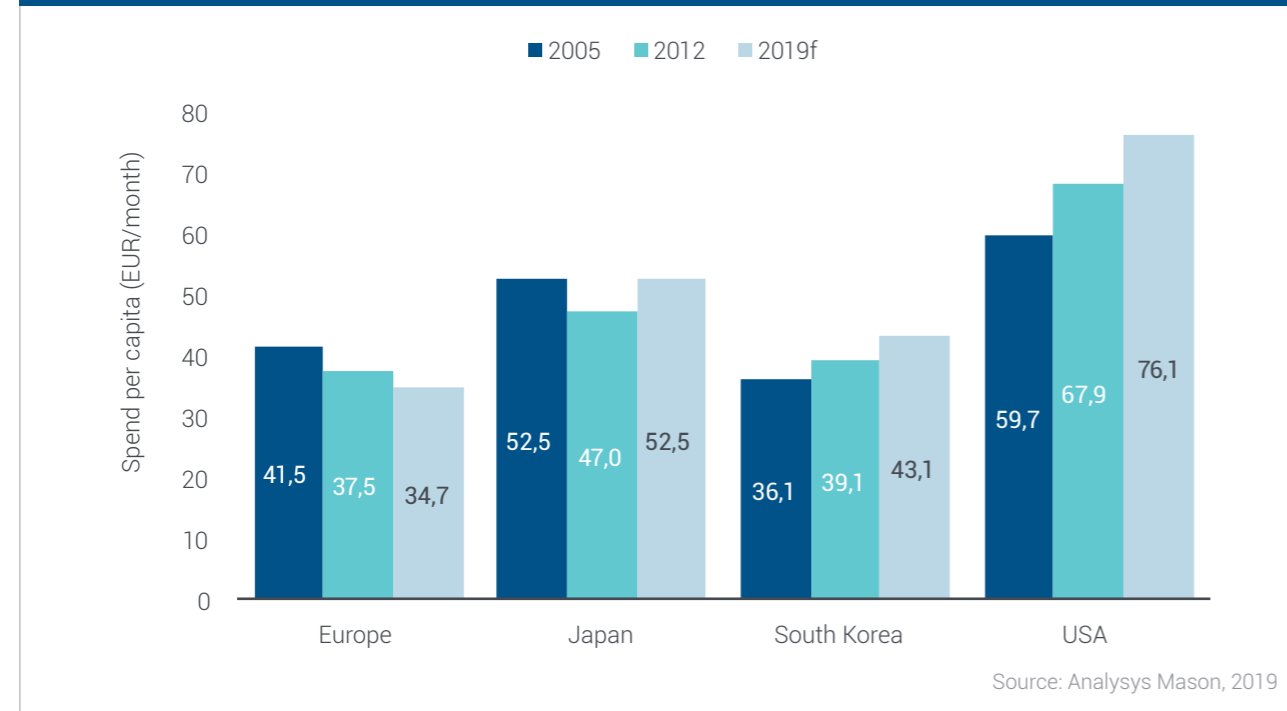

Source: Analysys Mason, 2019

Figure 1.10: Mass-market telecoms spend as proportion of GDP, 2006–2019f

Source: Analysys Mason, 2019
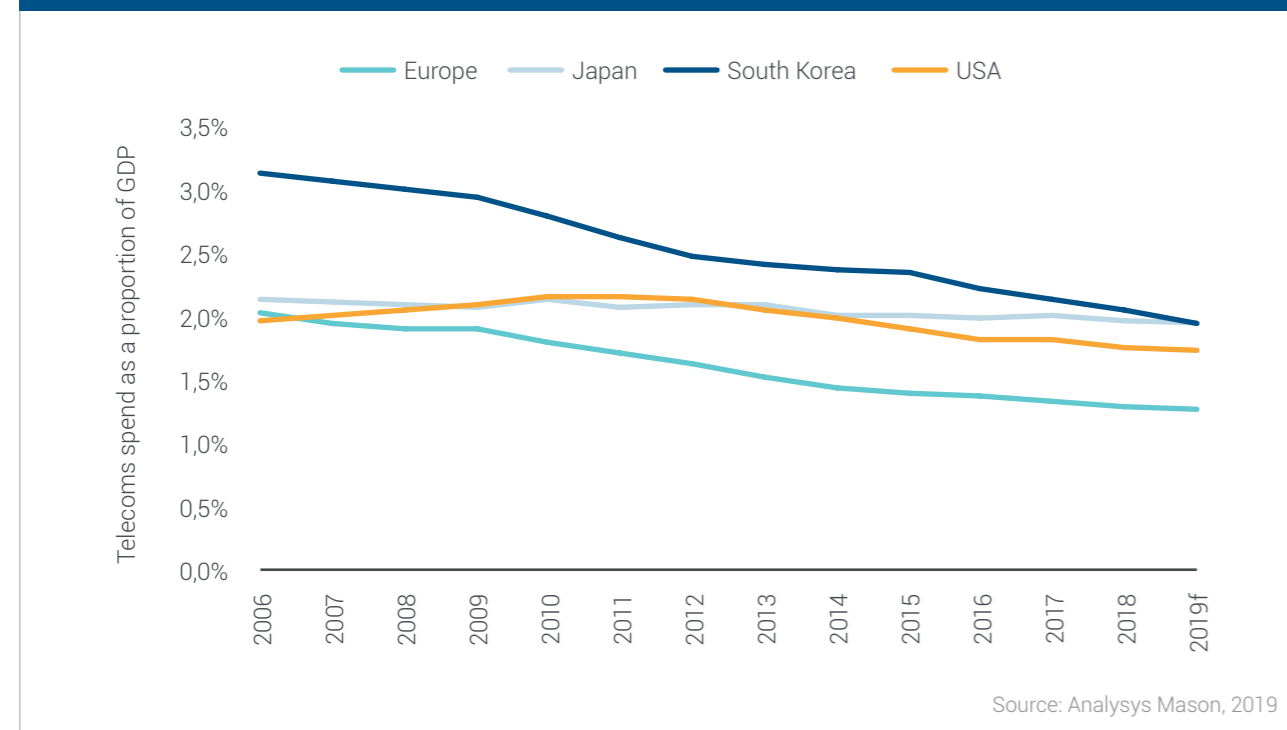
A further way of looking at this is to index communications prices against other infrastructure-based service industries.

Figure 1.11: Harmonised index of consumer prices (HICP) for infrastructure-based services, Europe, 2008–2019 (mid-year values)

Sources: Eurostat, OECD, Analysys Mason, 2019
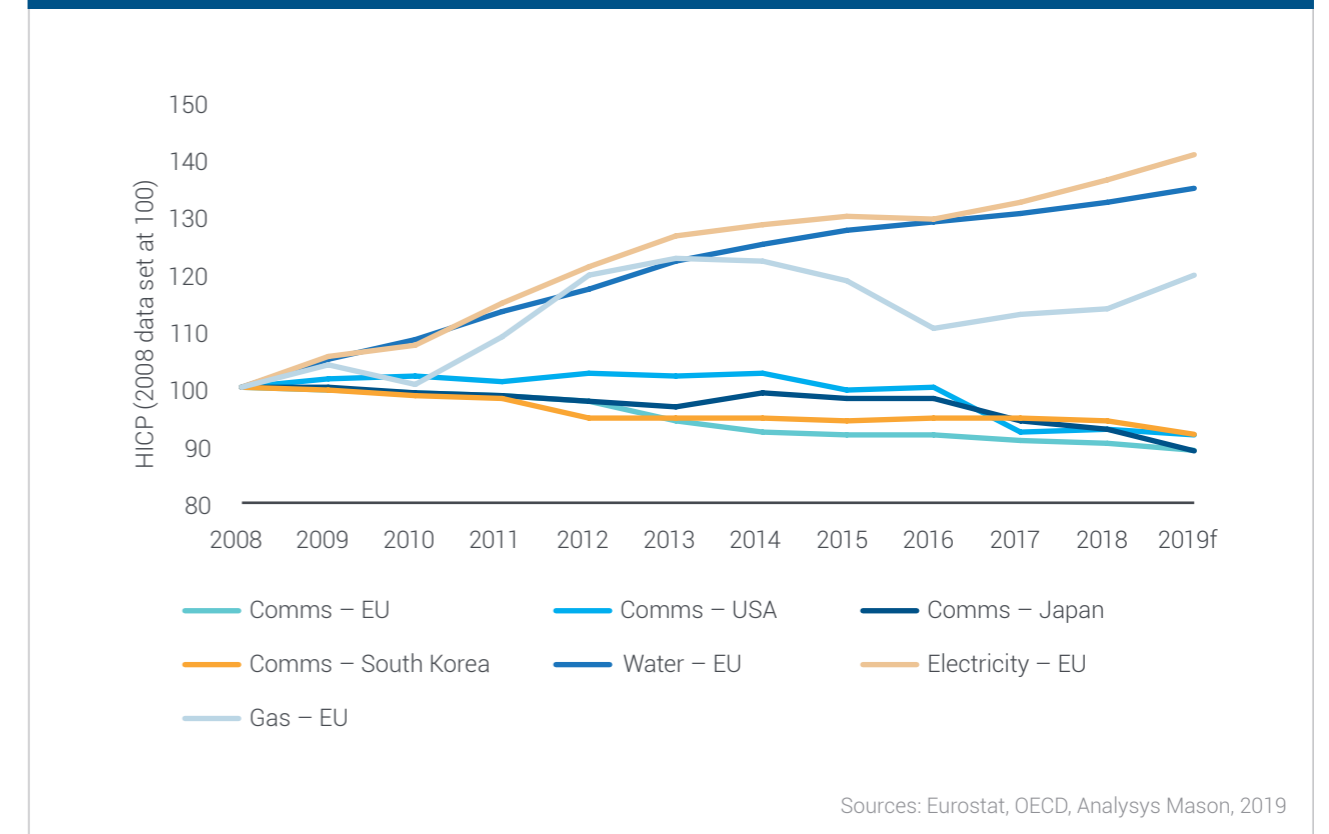
Compared with other infrastructure-based services in Europe, the telecoms sector has suffered a decade of deflation, which is also observable in telecoms worldwide. Between 2008 and 2018, European telecoms has suffered 2 percentage points more deflation than telecoms in USA, Japan and South Korea; the bulk of the price erosion happened earlier in Europe than in these countries in the context of significant market fragmentation.

Furthermore, affordability needs to be weighed against telecoms' profitability. A decent margin is needed for investment and continuity of appropriate supply of telecoms services, and ultimately to keep the European economy competitive. [This is discussed further in Section 3]

② Indirect impact for Europeans: taxes, skills, employment and the environment

ETNO members contribute also indirectly to European well-being in several ways: tax, capital investment, investment in skills and rewarding employment. In addition, they can help to reduce the impact of climate change.
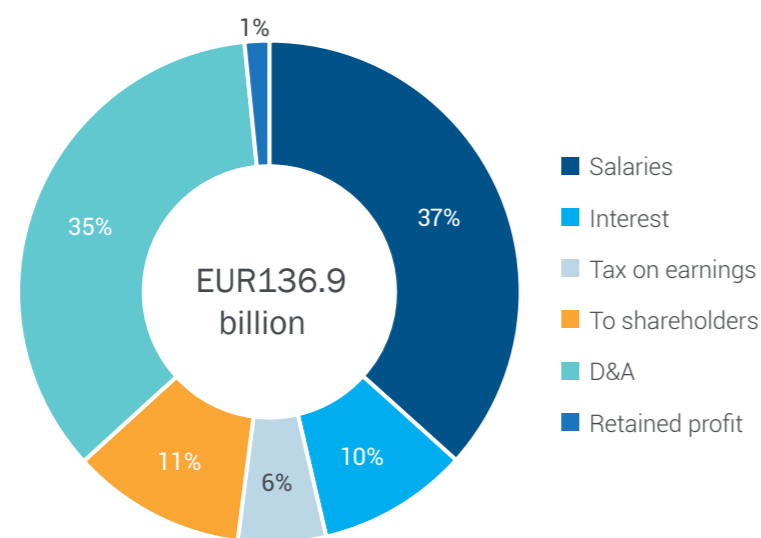
TAXES

At a group level, ETNO members (including non-European subsidiaries) created €136.9bilion of value added (revenue minus the cost of goods and services) in 2018.

Figure 1.12: Breakdown of value added from ETNO members (group level), 2018

EUR136.9 billion

- Salaries — 37%
- Interest — 10%
- Tax on earnings — 6%
- To shareholders — 11%
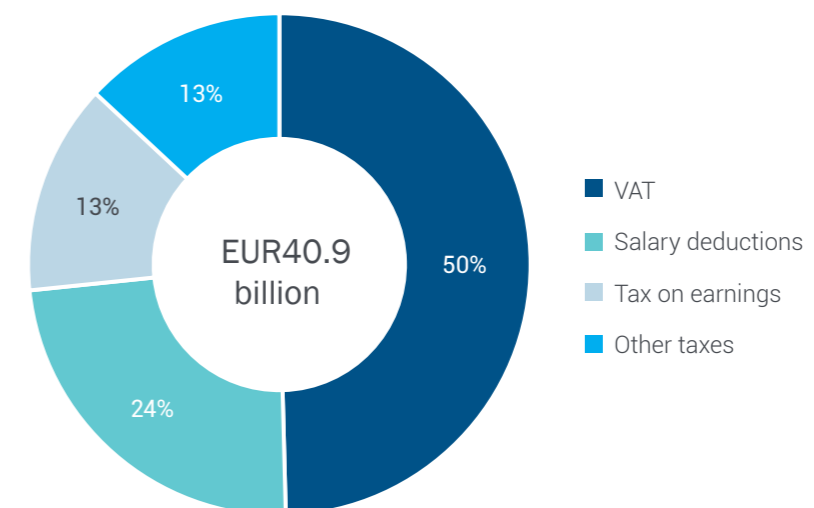- D&A — 35%
- Retained profit — 1%

Source: Analysys Mason, 2019

Current tax rules were designed for 'brick and mortar' businesses. They are largely based on physical presence and were not designed to cope with business models driven primarily by intangible assets, data and knowledge, and which have fewer constraints on where they establish physical presence. As a result, companies with purely digital business models and small physical presence (such as major OTTs) typically pay less than half the tax rate of businesses with traditional business models. For example, according to the French Telecoms Federation, their members are subject to a fiscal burden that is 25 times higher than that of tech companies[5].

---

[5] https://www.fftelecoms.org/etudes-et-publications/etude-economique-2019-telecoms-premiers-acteurs-numerique/

> **"** *Telecoms is Europe's main technology business, with a €136.9bn/year value added and training on the rise.* **"**

Figure 1.13: Total direct and indirect tax, ETNO members (Europe only), 2018

EUR40.9 billion

- VAT — 50%
- Salary deductions — 24%
- Tax on earnings — 13%
- Other taxes — 13%

Source: Analysys Mason, 2019

This figure includes in 'other' some telecoms sector-specific tax such as:

- annual spectrum licence fees

- the implicit tax associated with universal service obligations

- the cost of financing national regulatory authorities (NRAs)

- the cost of broadcast licences (including financing of public TV and local content)

It also includes local taxes such as property rates. It excludes, however, the amortised cost of the one-off amount paid at auction for spectrum licences, which is typically far higher than the annual fees and which we have excluded from CapEx. This varies hugely between markets, but on average the amortised annual cost to European operators is equivalent to about 5-7% of mobile revenue.

QUALITY EMPLOYMENT

ETNO members create high-quality employment, not only for their own staff but also for the suppliers that sell them goods and services and the service providers further downstream in the value chain. At a domestic operator level, ETNO members employed about 525 000 people in Europe at December 2018. As the worlds of IT and telecoms merge, so the skills required of employees change. ETNO members delivered an unweighted average of 33 hours per employee of skills training, up 10% from 30 hours last year, and with some members, like KPN, delivering closer to 80 hours per year.

Spend on training is also rising. Orange, for example, plans to invest more than EUR1.5 billion up to 2025 in a skills-building programme (in network virtualisation, artificial intelligence, data, cloud computing, coding and cybersecurity) aimed at training about 20 000 employees, but also open to the external world. This is an important second-order benefit for Europeans. The EU Digital Skills and Jobs Coalition reports that 37% of EU workers have insufficient digital skills, and points to evidence that the digital skills gap is widening, claiming that by the end of 2019. there could be almost 500 000 unfilled digital technology jobs in Europe[6].

TELECOMS OPERATORS ARE EUROPE'S MAJOR TECHNOLOGY BUSINESSES

The European telecoms landscape, considered as a whole, is still characterised by a large number of mid-sized players with limited footprints; it is in effect largely an agglomeration of national markets rather than a single market. **Figure 1.14** shows the number of mobile operators with at least 500 000 subscribers in Europe compared with Japan and South Korea, where there are currently just three each (although Japan is soon to get a fourth) and the USA where there are 7.

Figure 1.14: Number of MNOs with over 500 000 subscribers, Europe, Japan, South Korea and the USA (2Q 2019)

Europe	Japan	South Korea	USA
47	3	3	7

Source: Analysys Mason, 2019
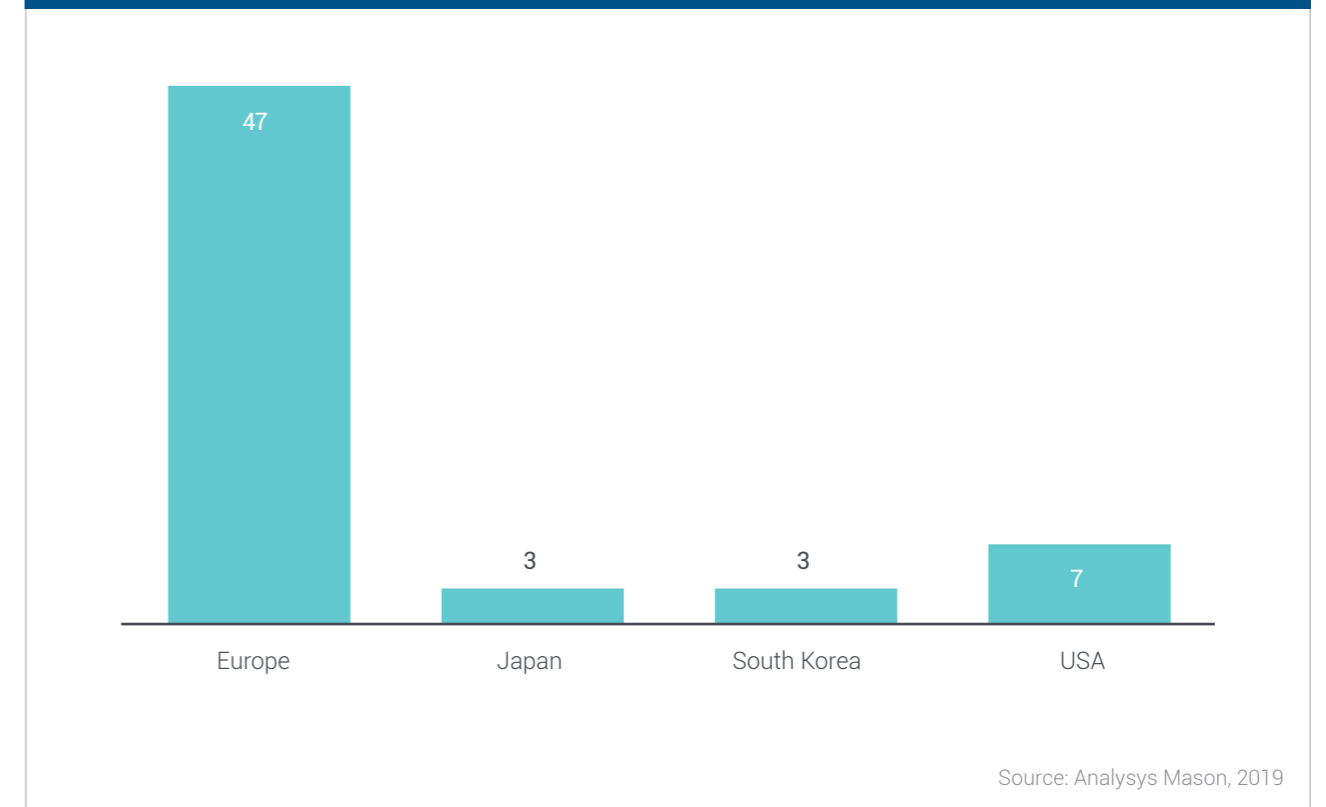
Nevertheless, four of the top 12 operating groups in the world are domiciled in Europe, and three of these are ETNO members.

---

[6] European Commission, The Digital Skills and Jobs Coalition.
See https://ec.europa.eu/digital-single-market/en/digital-skills-jobs-coalition

Figure 1.15: Top 12 operating groups in the world by revenue, 2018

| Rank	Operator	EUR (bn), last financial year
1	AT&T	151.20
2	Verizon	115.85
3	China Mobile	96.54
4	NTT	93.60
5	Comcast	83.66
6	Deutsche Telekom	75.66
7	Softbank Corp	75.65
8	China Telecom	49.41
9	América Móvil	48.71
10	Telefónica	48.69
11	Vodafone	43.67
12	Orange	41.38

Source: Analysys Mason, 2019

Compared with the largest players in the world, the largest European groups have more multinational footprints. This in part due to the smaller scale of individual European markets. Three ETNO members, Deutsche Telekom, Telenor and Telefónica, derived about half of their net operating revenue from operating companies outside Europe in their last full financial year.

Figure 1.16: Proportion of revenue from domestic and non-domestic operating businesses, last full financial year
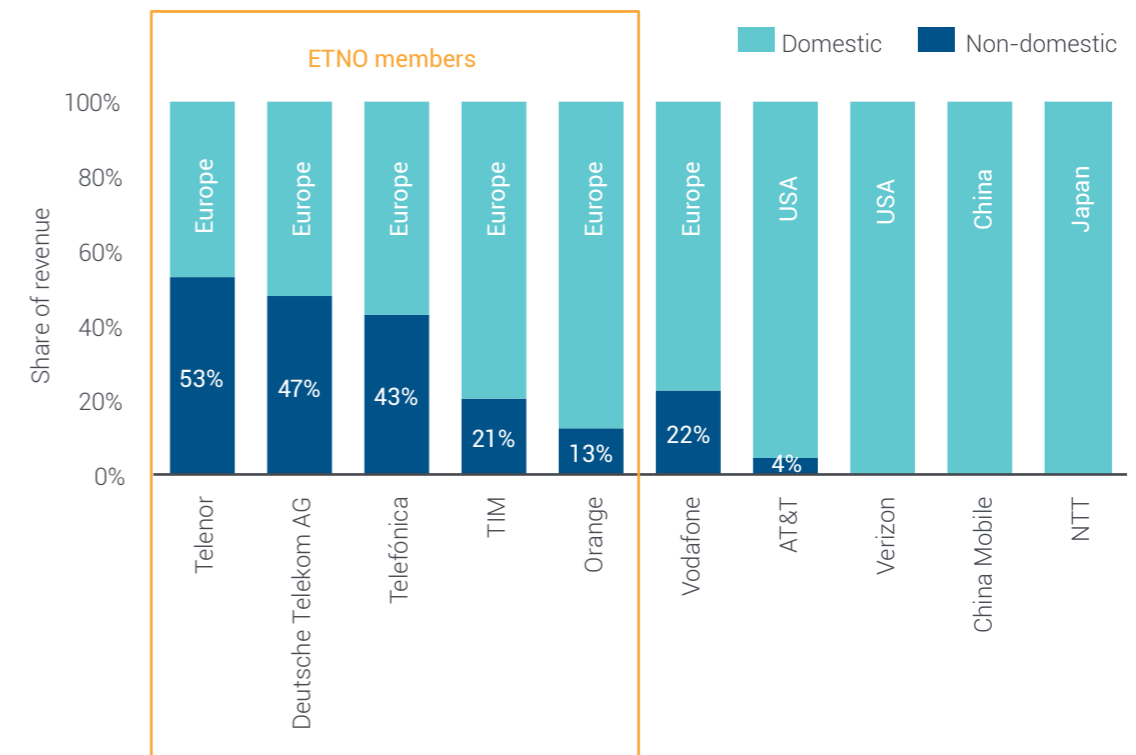
Note: domestic revenue for European operators means 'from European operating subsidiaries'. Global services units are usually domiciled in domestic markets and count as 'domestic'.

Source: Analysys Mason, 2019

Digital communications providers are at the forefront of the European tech sector. Of the 17 Europe-based companies figured in the 2019 Forbes Digital 100 index, 11 are either telecoms operators or telecoms equipment vendors, and 9 are ETNO members or Europe-based observers.

INVESTMENT

ETNO members are major capital investors in networks and infrastructure, having spent EUR26.0 billion in CapEx in 2018 in their own home markets, and EUR34.3 billion overall in Europe. This provides skilled employment not only for ETNO member employees, but for other European citizens in the digital ecosystem. Two of the global top three mobile equipment vendors by revenue are European businesses (Ericsson and Nokia)[7], and fixed network CapEx goes mainly to locally based civil engineering contractors rather than to network equipment vendors.

Figure 1.17: ETNO member CapEx, home markets, rest of Europe and Rest of World, 2014-2018, excluding spectrum

Source: Analysys Mason, 2019
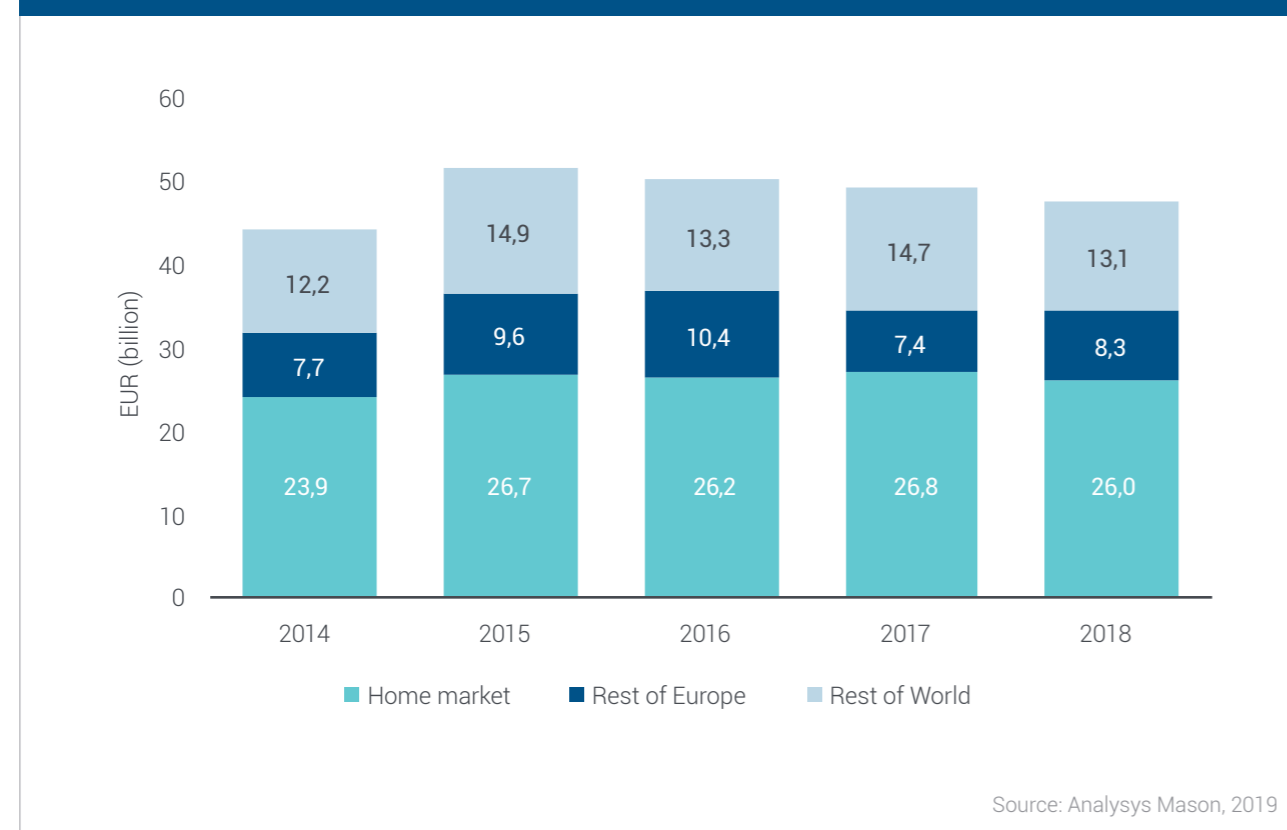
At about 18%, capital intensity among ETNO members in their home markets is significantly higher than that of peers in other comparable markets.

Figure 1.18: Average capital intensity, ETNO and comparable leading operators USA, Japan and South Korea

Source: Analysys Mason, 2019
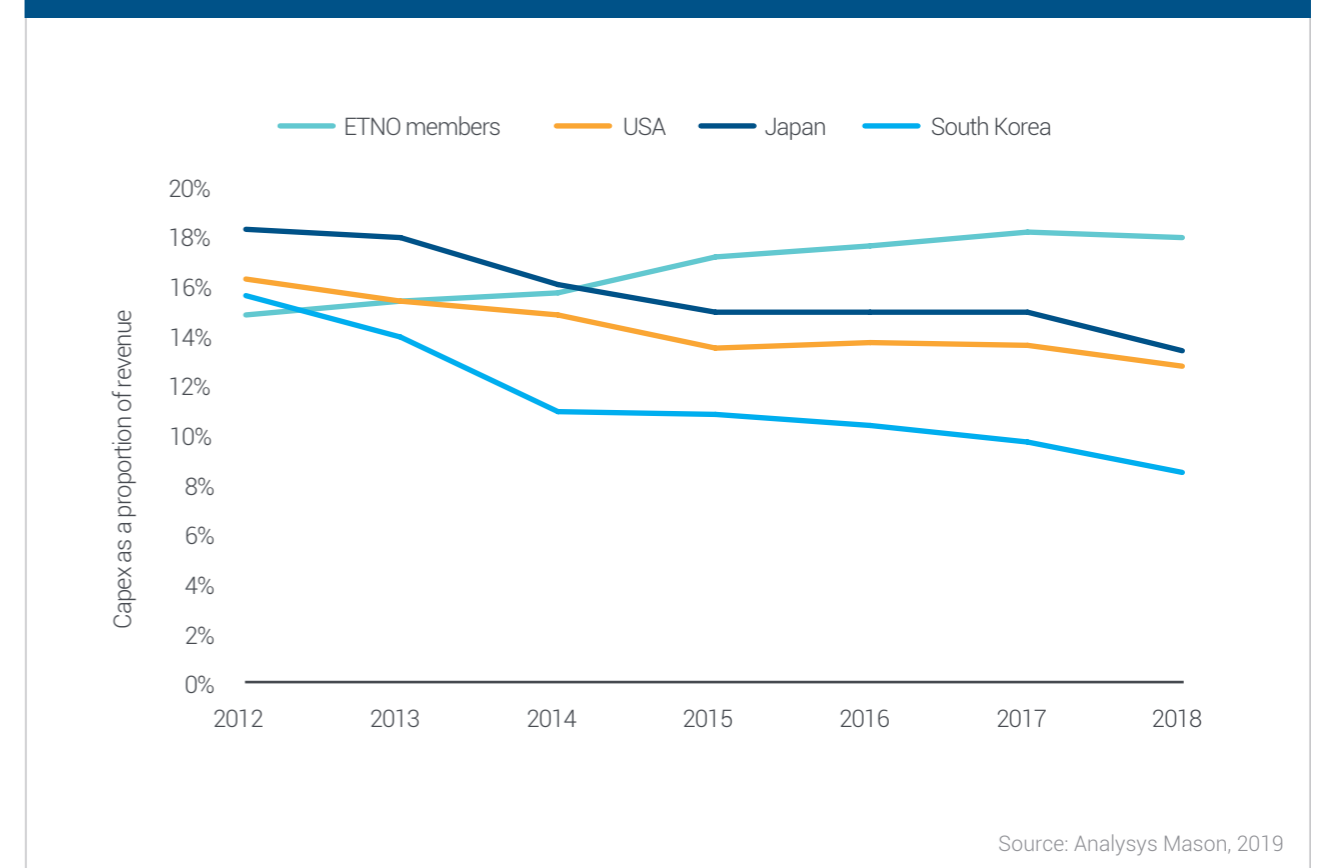
ETNO members are particularly heavy investors in infrastructure. Economies of scale mean that typically the smaller European integrated players tend to have higher capital intensity than the larger ones. However, the main reason for the differences from the Japanese and South Korean examples are that these two have both rolled out dense fibre networks, which typically create a bulge in the CapEx envelope, and the main reason for the differences from the USA is that in North America a higher proportion of fixed broadband is served by cable than in other global regions.

In the past two years investment has shifted towards fixed infrastructure build, although Analysys Mason expects some rebalancing as 5G investment picks up. Nevertheless, 5G will represent less of a CapEx bulge for ETNO members than does fibre.

---

[7] Analysys Mason, Radio access networks and small cells: worldwide market shares 2018

Figure 1.19: Split of CapEx into fixed and mobile for ETNO members, plus total Europe CapEx, 2014–2018 [CapEx excludes Spectrum]

Legend: Mobile | Fixed | Other and common cost | Europe CapEx incl non-ETNO

CapEx (EUR billion)

	2014	2015	2016	2017	2018
Europe CapEx incl non-ETNO	50,3	54,4	51,8	48,0	48,6
Other and common cost	7,5	9,9	8,1	9,5	8,8
Fixed	6,9	8,7	10,6	10,2	10,5
Mobile	17,3	17,7	18,0	14,5	15,0
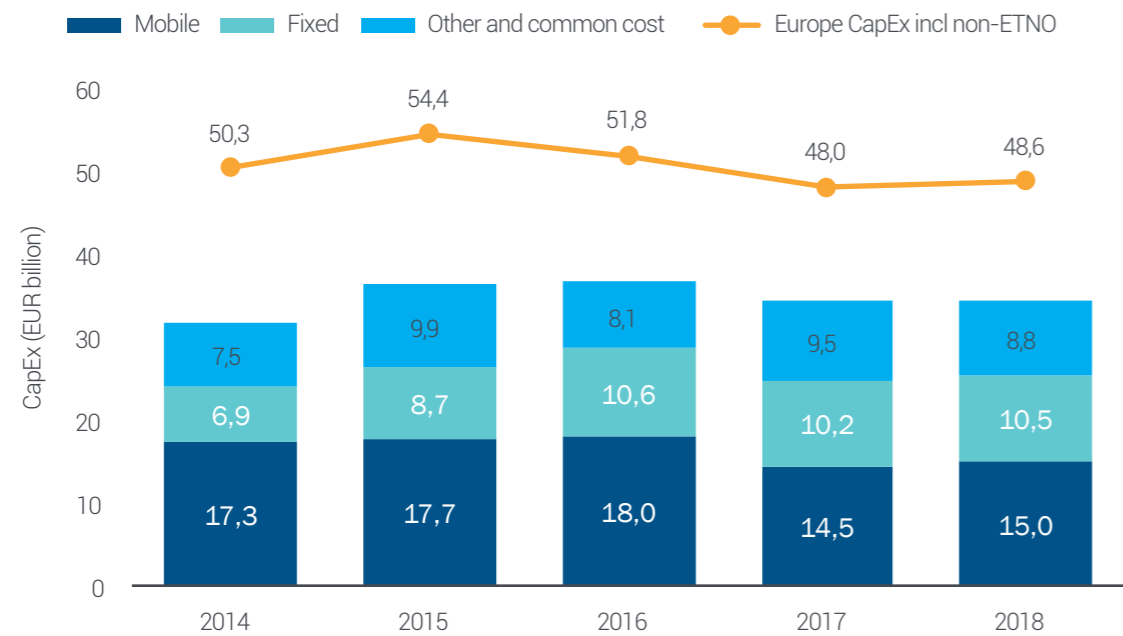
Source: Analysys Mason, 2019

ETNO members contributed 70.5% of the EUR48.6 billion total telecoms network CapEx in Europe in 2018, and about 60% of the EUR17.6 billion fixed access network CapEx. There has been a recent surge in the level of investment in fixed access networks from new FTTP-only players, often backed by general infrastructure investors and often using simple wholesale-only models; together these new players now represent over 20% of fixed access network investment.

Figure 1.20: Split of CapEx between ETNO and other operators, total

EUR48.6 billion

70,5% / 29,5%

Legend: ETNO | Other operator
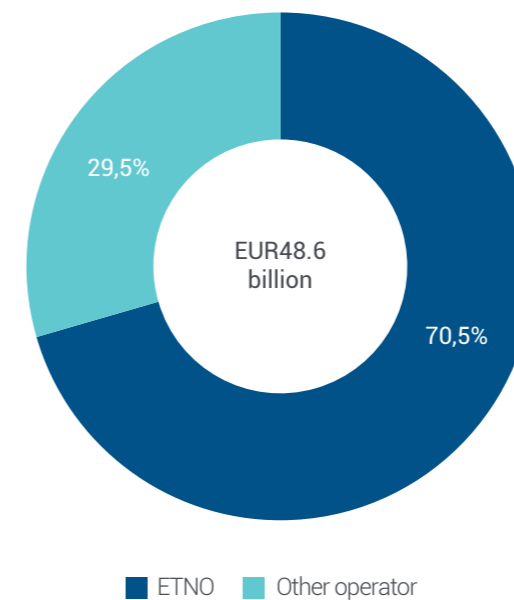
Source: Analysys Mason, 2019

Figure 1.21: Split of CapEx between ETNO and other operator types, fixed only

EUR17.6 billion

60% / 12% / 15% / 13%

Legend: ETNO | Cable | Altnet | Wholesale-only
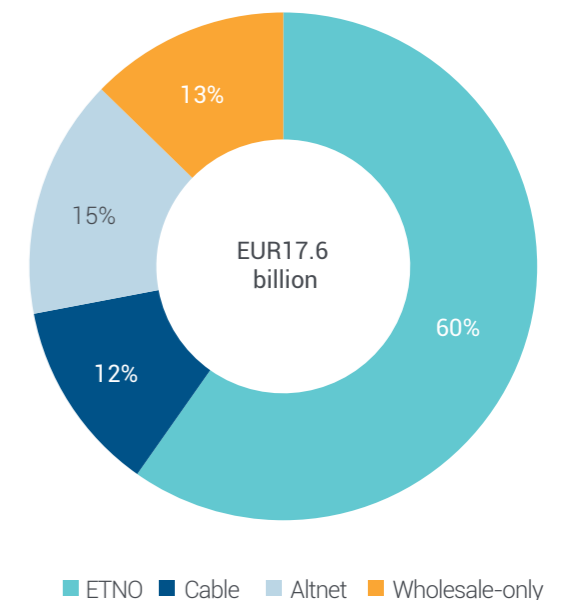
Source: Analysys Mason, 2019

This level of capital intensity among European operators brings both direct and indirect benefits to Europeans, but it disguises a profound problem at the heart of the European telecoms sector. While CapEx as a proportion of revenue is high, revenue is so affected by low prices/low ARPU that investment per capita is low. ETNO members invested EUR89 per capita in 2018, which is significantly lower than the amounts invested by operators in the USA or in Japan, even after allowing for differences in GDP, and still 14% lower than in South Korea. (In fact, Japan and South Korea have very similar GDP per capita when adjusted for PPP to that of Europe, and Japan's investment per capita is over twice that of the ETNO members.)

Figure 1.22: CapEx per capita, Europe, USA, Japan and South Korea, 2018

■ Actual ■ Adjusted for GDP/capita

CapEx per capita (EUR)

Europe	USA	Japan	South Korea
89,2 / 89,2	213,3 / 148,5	191,8 / 193,7	102,8 / 104,1

Source: Analysys Mason, 2019
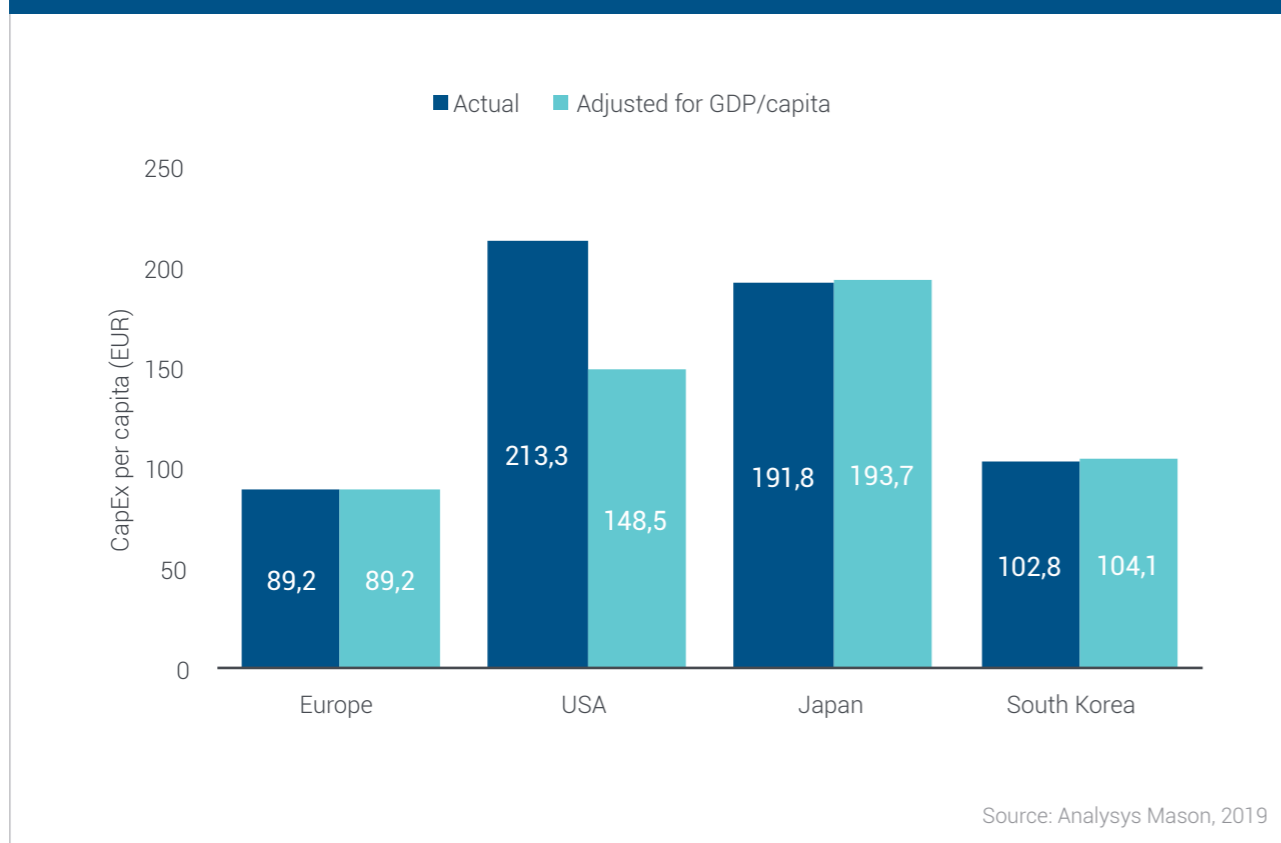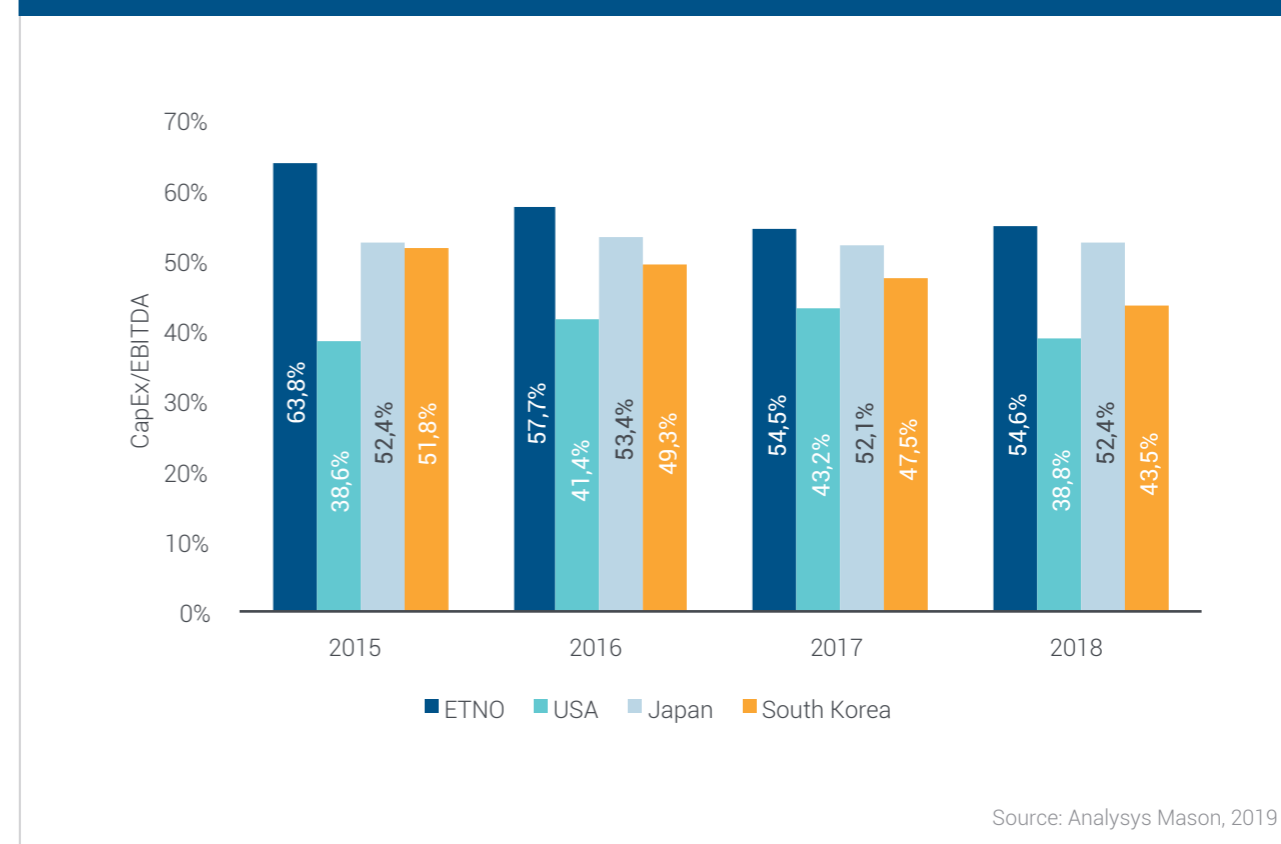
> ❝ *ETNO members provide 70.5% of the total telecoms investment in Europe.* ❞❞

Figure 1.23: CapEx/EBITDA, ETNO members and peers in USA, Japan and South Korea, 2015–2018

CapEx/EBITDA

	2015	2016	2017	2018
ETNO	63,8%	57,7%	54,5%	54,6%
USA	38,6%	41,4%	43,2%	38,8%
Japan	52,4%	53,4%	52,1%	52,4%
South Korea	51,8%	49,3%	47,5%	43,5%

■ ETNO ■ USA ■ Japan ■ South Korea

Source: Analysys Mason, 2019

A further way to look at this is the ratio of CapEx to EBITDA. At a group level, this remains higher among ETNO members than among peers elsewhere. This is to some extent a matter of catch-up on necessary infrastructure. However, for the European digital sector to flourish and for Europeans to derive maximum benefits, whereby operators spend a lot in relation to their means, but little in relation to their end-users, this fundamental imbalance has to change.

ENVIRONMENT

Energy consumption is rising slowly among ETNO members (5% in 2018), as it is for the ICT sector generally, but GHG emissions are falling (-8% in 2018), and so carbon intensity is falling faster. ETNO members, like other operators, are gradually shifting their energy sources to renewable: in 2018, renewable sources accounted for 48% of total energy supply, up from 42% the previous year. Neutralising the effects of carbon emissions, either created by themselves or through the supply and downstream chains, is, though, a long-term process, and these are just first steps. [ETNO members' long-term aims are discussed further in Section 3]

Section 2

# Digital communications providers must contend with rapidly changing demand

❶ Telecoms demand metrics: an ever evolving industry

END-USER DEMAND

The European consumer telecoms service market has declined at a decreasing rate over the last five years, with total consumer service revenue virtually flat in 2019 at EUR165 billion (see **Figure 2.1**). But the top-line figures hide the complex mixture of services that contribute to the revenue as well as the different trends within Europe. The characteristics of the market in Western Europe differ from those in Central and Eastern Europe in the following ways:

- Revenue in Western Europe is stable, as falling voice revenue is balanced by revenue growth in data services, especially in fixed broadband. Broadband revenue growth has been sustained by the widescale deployment of FTTP access networks across the region; such deployments have been made possible by large investments, mainly from ETNO members. FTTP accounts for more than one in six fixed broadband connections in the region. There is also some growth in the number of subscribers for fixed services within the region, which is adding to the overall revenue growth.

- In Central and Eastern Europe, there is a modest amount of growth, especially in the mobile sector which has been growing at a CAGR of 2.5%. Mobile Average Spend Per User (ASPU) has been rising slightly due to enrichment of the customer base as users transfer from featurephones to smartphones, and take up of 4G data plans. Fixed revenue returned to growth in 2018, driven by continued steady increase in fixed broadband penetration across the region.
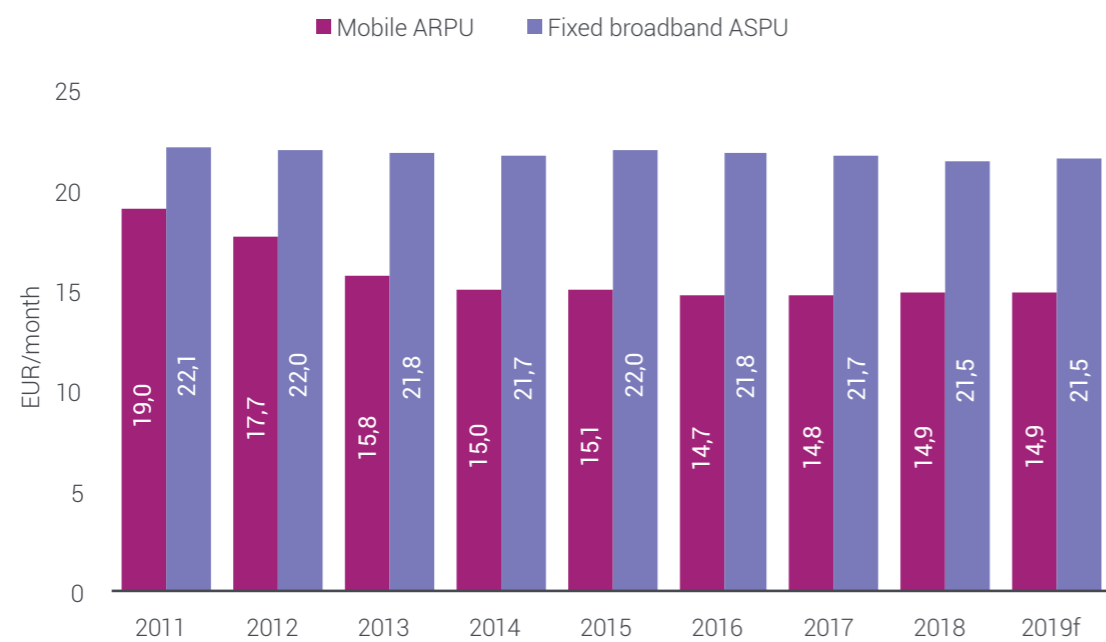

Figure 2.1: Total fixed and mobile consumer telecoms service revenue, Europe, 2011–2019f
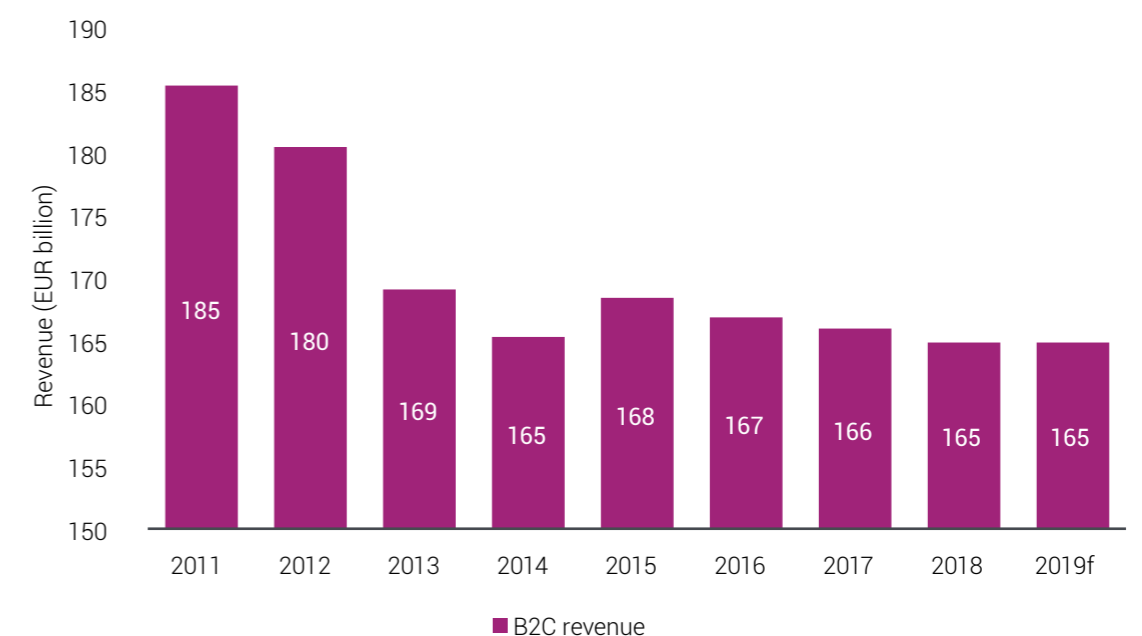
Source: Analysys Mason, 2019

Despite increasing data usage and the launch of new services, users appear to remain unwilling to pay more for their fixed and mobile services. The overall ASPU (Average Spend Per User) for fixed broadband has remained flat at a little below EUR22 per month for the last 8 years, whereas after a decline between 2011 and 2015 mobile ARPU has stabilised at just below EUR15 per month (see **Figure 2.2**). The picture varies across Europe, with a key determinant of mobile ARPU being the degree of competition in the market. Mobile ARPU in Italy fell by 9% in the 24 months ending June 2019, because of the market entry of Iliad. By contrast, in the Netherlands, the merger of T-Mobile and Tele2 has the potential to lead to a better market environment and a healthier sector that can, in turn, deliver stronger levels of investment and improved value propositions for customers.

Consumer services account for a little under two thirds of total telecoms revenue, a proportion that has remained stable for several years. As in the consumer market, the total B2B revenue is stable, at about EUR90 billion per year.
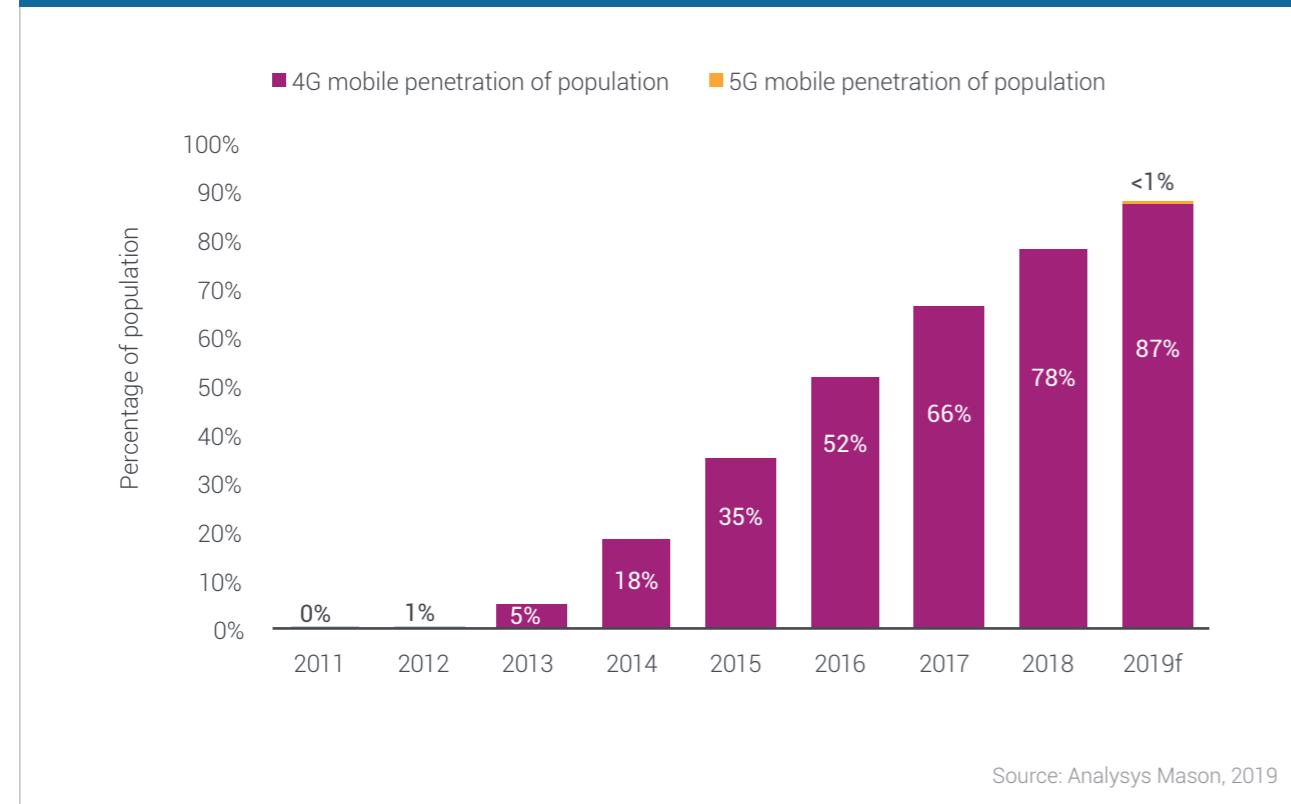

Figure 2.2: Mobile ARPU and fixed broadband ASPU, Europe, 2011–2019f

Source: Analysys Mason, 2019

Figure 2.3: B2B and B2C revenue within Europe, 2011–2019f
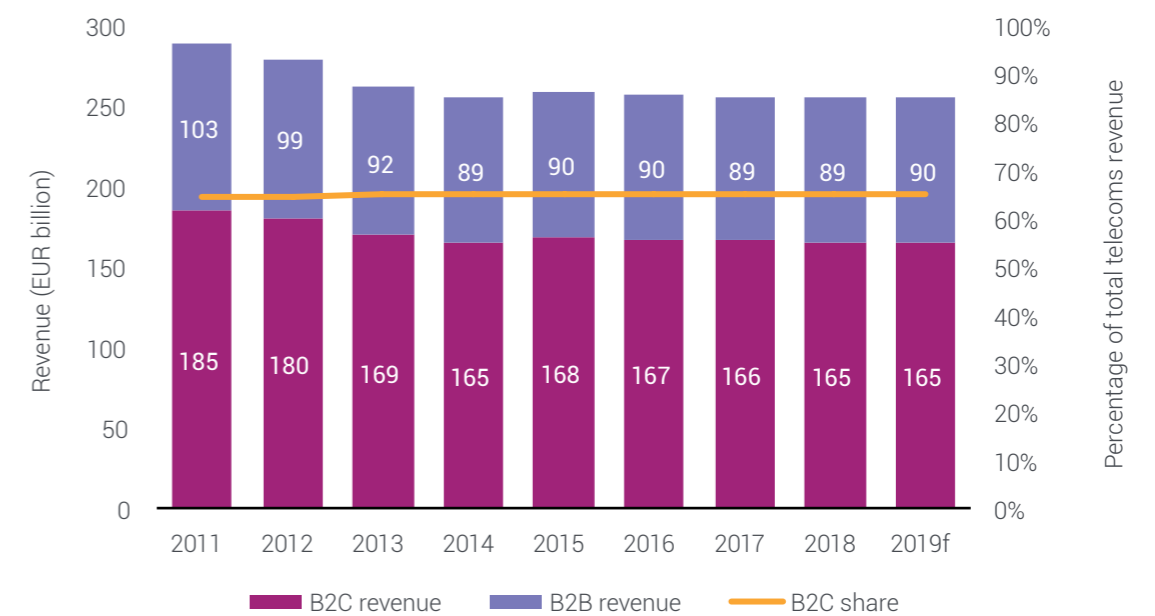
Source: Analysys Mason, 2019

4G accounts for a majority of mobile connections in almost all European countries, and penetration is at over 85% of population (see **Figure 2.4**). 4G has fuelled strong growth in mobile data usage across the region, but this has not translated into increased ARPU (Average Revenue per User).

Figure 2.4: Total number of 4G connections (excluding M2M) as a percentage of the population, Europe, 2011−2019f

■ 4G mobile penetration of population ■ 5G mobile penetration of population

- 2011: 0%
- 2012: 1%
- 2013: 5%
- 2014: 18%
- 2015: 35%
- 2016: 52%
- 2017: 66%
- 2018: 78%
- 2019f: 87% (<1%)

Source: Analysys Mason, 2019

At the time of writing, no European operator had disclosed 5G subscriber figures. It is unlikely penetration will have reached 1% before the end of 2019.

Fixed broadband take-up continues to grow in the region, particularly in Central and Eastern Europe (see **Figure 2.5**). Technological upgrades are the focus, and ETNO members are at the heart of this. FTTP rollout is accelerating across the region, while VDSL take-up continues to grow at the expense of ADSL. Cable shows some signs of having peaked. FWA is becoming a more credible substitute, and some markets exhibit significant ADSL-to-FWA churn.

Figure 2.5: The number of fixed broadband connections by technology, Europe, 2011−2019f

■ ADSL ■ VDSL ■ Cable ■ FTTP/B ■ Other

Year	ADSL	VDSL	Cable	FTTP/B	Other
2011	104	5	25	7	4
2012	104	7	27	9	4
2013	103	10	29	11	4
2014	99	15	31	13	5
2015	93	20	33	17	6
2016	86	27	35	22	7
2017	77	35	36	27	8
2018	67	42	36	34	9
2019f	58	49	37	41	10

Source: Analysys Mason, 2019
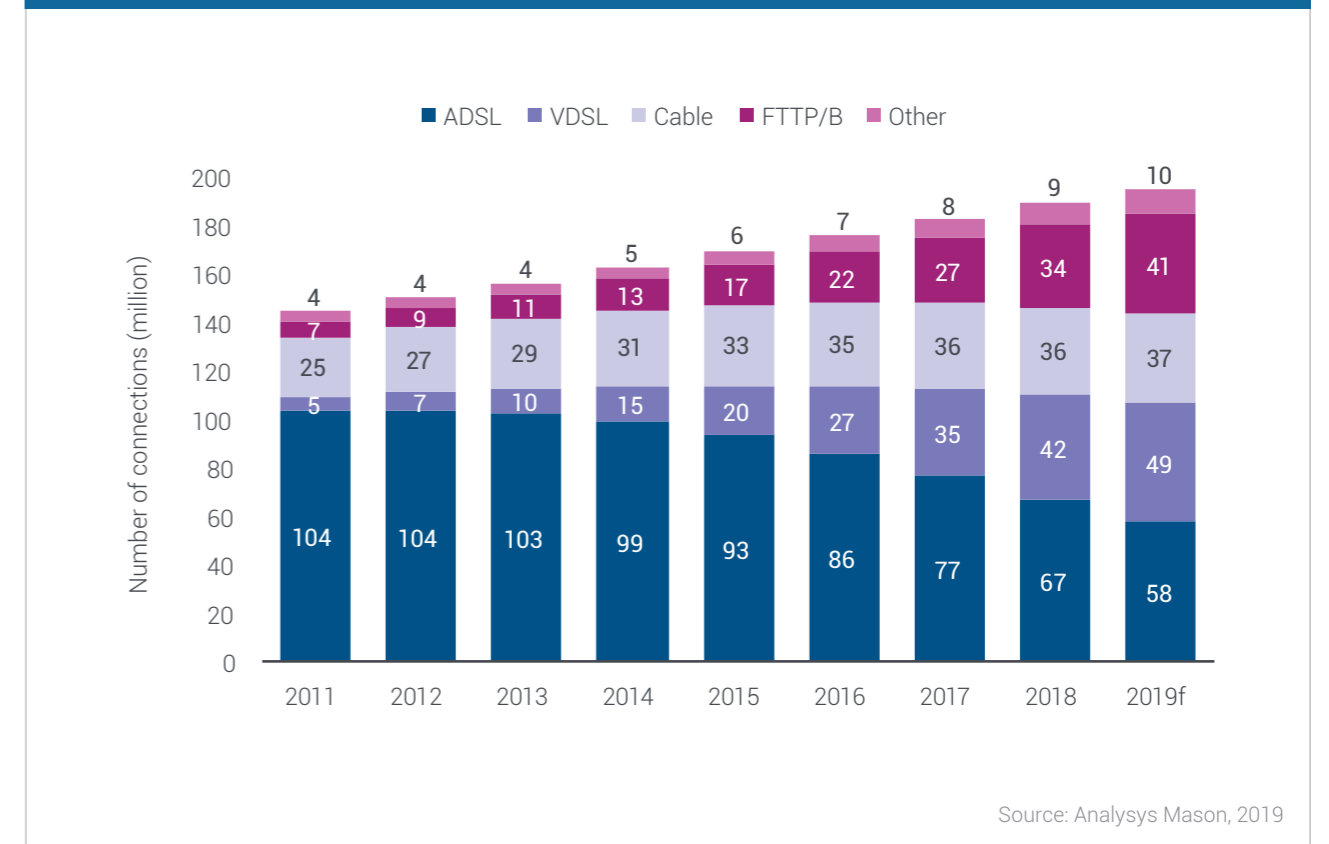
Over the last year, residential indoor coverage has been further prioritised by European broadband operators, especially in multi-occupant households with multiple devices competing for the available bandwidth. Newer versions of Wi-Fi, which enable more deterministic performance, are an important component of the solution to this challenge. These enable consumers to gain the full benefit of 'whole-home' connectivity, and operators to channel more traffic onto the fixed network.

Fixed-mobile convergence (FMC) has proven popular as consumers seek to reduce complexity and save costs in their communications services spending (see **Figure 2.6**). Take-up of FMC varies considerably across Europe, which is mainly a consequence of the differing market structures in each country. Mobile discounts given as part of a FMC offer create value for both customers and operators, as they help to reduce customer churn and maximise the acquisition of new clients. Very few ETNO members have a separate mobile line of business and most are therefore actively promoting FMC propositions. However, some leading markets for FMC have reached saturation, with little increase in take-up over the last year.

Figure 2.6: FMC share of fixed broadband subscriptions and FMC share of all contract SIMs, Q2 2019

Source: Analysys Mason, 2019
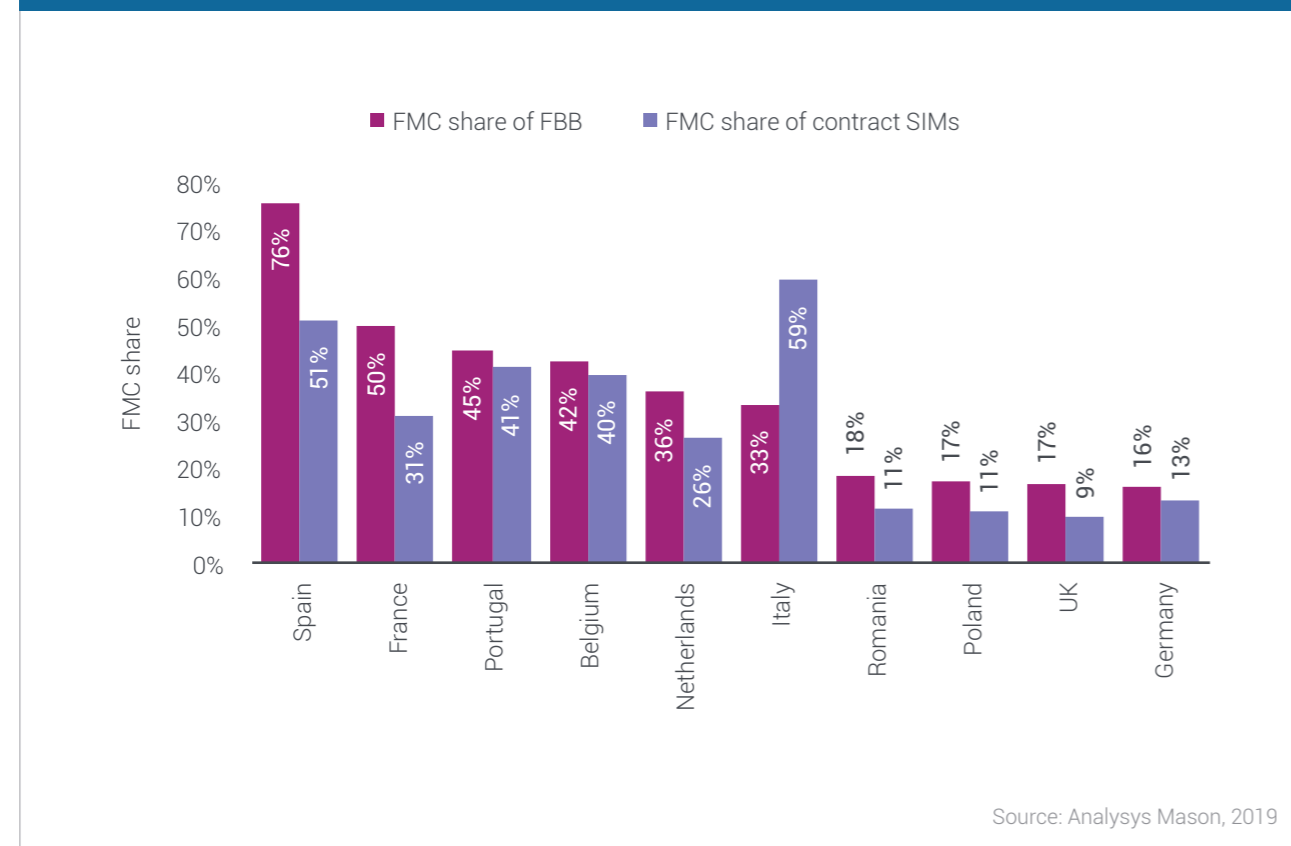
Fixed and mobile data usage in Europe continues to grow strongly. Fixed broadband networks account for the vast bulk of traffic (over 91% in 2019f). Increased demand for video content is the main driver of traffic growth, both from international premium subscription services such as Netflix, domestic broadcasters' catch-up services mostly on fixed networks, and from free platforms such as YouTube mostly on mobile networks.

Figure 2.7: Fixed and mobile data usage per connection, Europe, 2013−2019f

Source: Analysys Mason, 2019
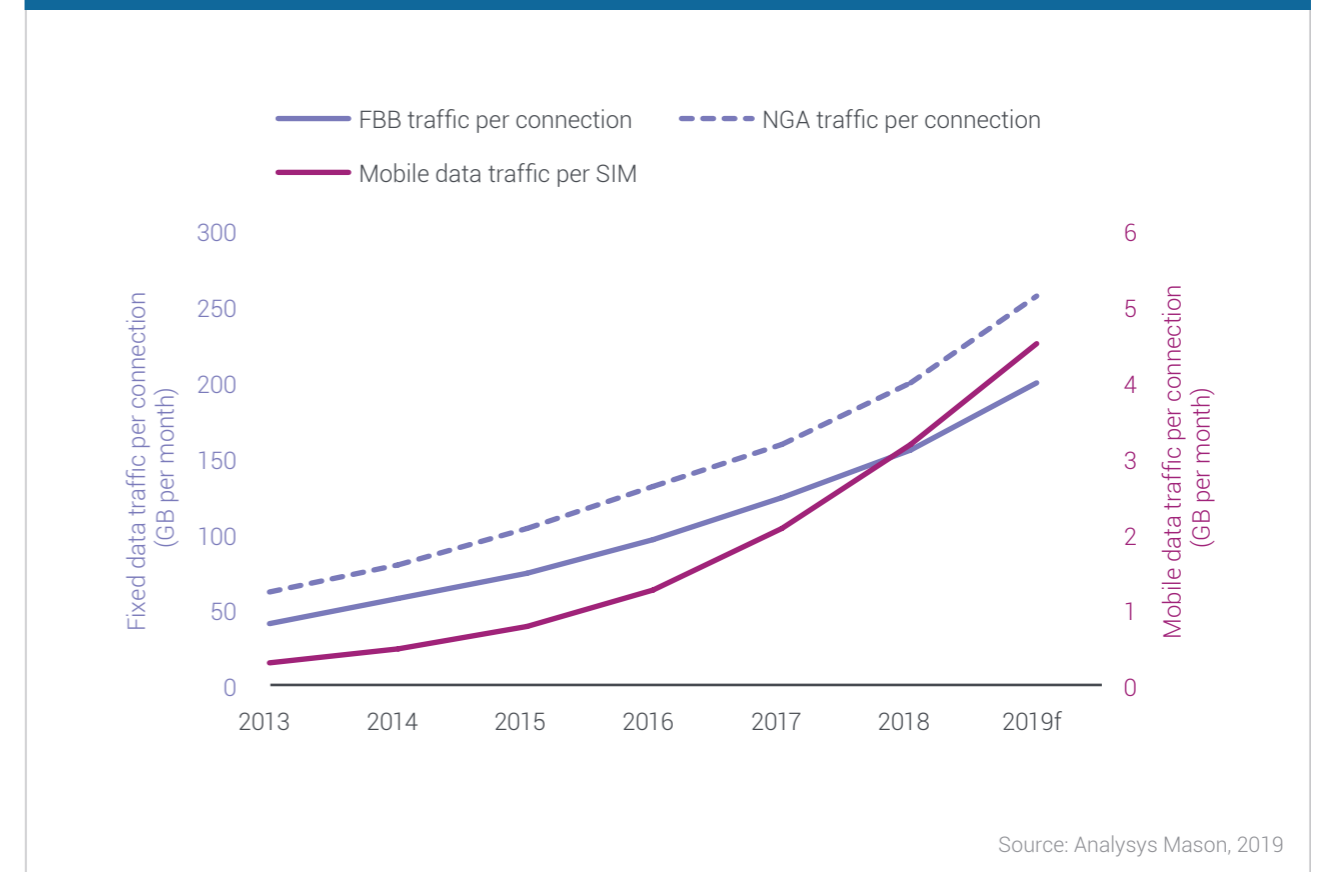
Relatively high mobile data usage does not translate into high overall data usage, as a comparison of individual countries shows. In countries with high usage of cellular networks, such as Austria and Finland, over half of traffic on those networks is not associated with smartphones. Some Northern European countries such as Norway, Iceland and the UK have among the highest average broadband data usage − and therefore the highest overall data usage − in the world.

High overall data usage is generally driven by connected TVs, not by mobile devices. Households with connected TVs generally consume around 300GB per month, whereas those without consume less than half of this number. High data consumption globally is often associated with English language or a high level of bilingualism with English.

Figure 2.8: Fixed and mobile data usage per pop, Europe, USA, Japan and South Korea

Source: Analysys Mason, 2019
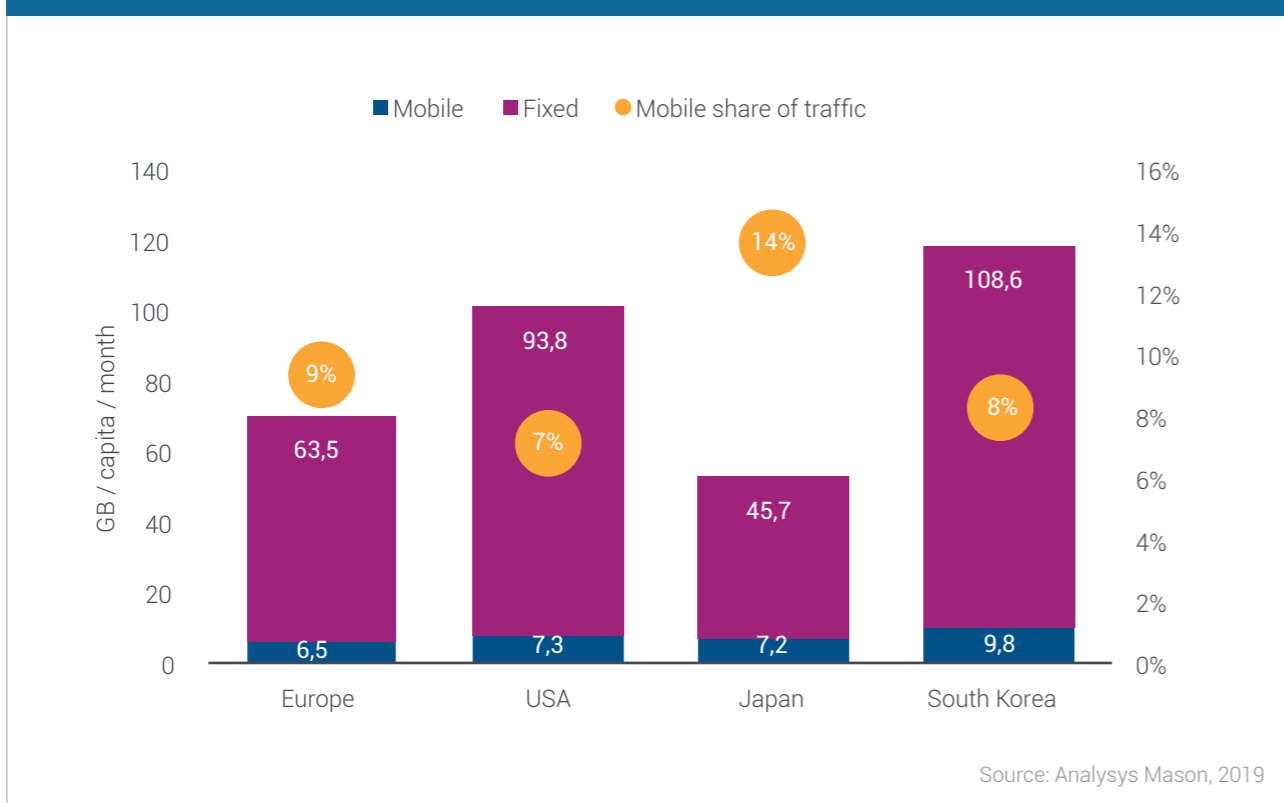
Fixed networks are more efficient than mobile at handling high traffic volumes, both from an economic and an environmental perspective: per gigabyte, the cost is lower, and the power consumption (CPE and node) is lower, on fixed than on mobile. It seems likely that fixed and mobile networks will remain largely complementary to each other and that traffic growth rates on both will converge.

Last, but not least, voice: overall managed voice usage in the region continues to decline, as slowing growth in mobile voice is outweighed by sustained double-digit declines in legacy fixed voice traffic.

Figure 2.9: Voice traffic growth, Europe, 2011−2019f

Source: Analysys Mason, 2019
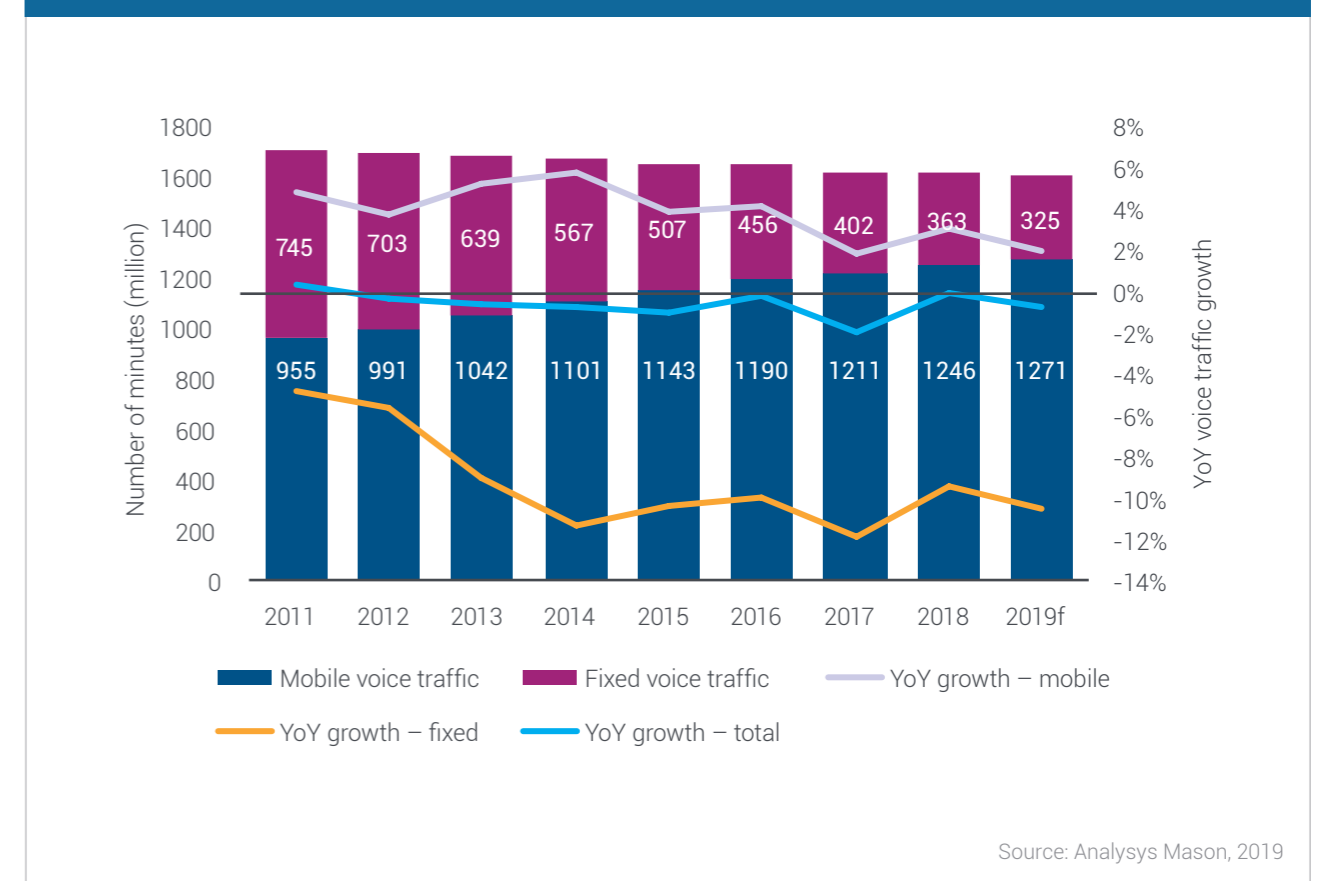
While managed voice on fixed, mobile and broadband networks remains an important component of the communications market, voice is increasingly treated by consumers and businesses as one application among many. The supply of Internet-based voice application usage is increasing, while traditional voice communications services are fragmenting: this means that the decline in managed voice service usage should not necessarily be read as a decline in voice communication. Whatever the case, the number of fixed or mobile voice-only customers is in rapid decline, and the anchor service for all telecoms is now indisputably Internet access.

THE STATE OF DIGITAL COMMUNICATIONS **2020**

DEMAND-SIDE CHALLENGES

Meeting and monetising demand while maintaining profitability still pose considerable challenges for European operators. This can become even more fraught when supply-centred policy agendas call for investment in additional capacity often apparently ahead of demand, though historically operators may have elected to invest in capacity and technology to gain commercial advantage.

→ Commoditisation

Demand for data services remains highly elastic. There is no real evidence that demand for mobile data has resulted in any increased overall mobile revenue, and slow secular declines in mobile revenue seem to indicate that supply-side efficiencies in a competitive market outstrip growth in demand, resulting in slight deflation.

Moreover, small shifts in price or changes to data allowance cause significant churn in consumer services. The continued demand for more data for the same or less money is forcing operators to increase data allowances just to maintain current ARPU levels. Over 90% of European mobile subscribers purchase plans with data limits whereas in the USA about 40% of subscribers are on unlimited data plans. However, subscribers in the USA pay almost twice as much as European providers.

A slowdown in handset refresh rates and a steady shift to SIM-only plans reduces revenues, shortens contract lengths and drives down margins: SIM-only now accounts for 36% of mobile subscribers in Europe. The slowdown in handset refresh rates may also impact the uptake of 5G services as they roll-out within Europe.

Low margins are also forcing some leading operators to break triple- and quad-play bundles back out in order to maximise utilisation and value, which impacts churn rates.

→ Efficient services are not always what customers want

Operators' imperative to improve efficiency with new network technologies and new digital means of interacting with customers does not always square with customer demand. Customers may want a real person in a (local) call centre; customers' prime consideration may be price, and so they may be happy with previous technologies, and they may not see any obvious benefit in switching to the latest or new technologies, fixed or mobile. The reality is that a premium for these sort of services is usually impossible to maintain, and often the new, better and more efficient service in which the operator has invested, is sold at a discount to the older, less efficient one, in order to realise the efficiency benefits. Both at a wholesale (bitstream) and a retail level, the price of entry-level FTTP has dropped below that of ADSL in several European markets.

→ Stimulating demand

Digital communications providers can stimulate demand through means other than pricing. This can be done in ways that have a clear social benefit. For example, additional coverage, skilling and upskilling projects, all play a major role in increasing digital inclusion of both citizens and companies, especially SMEs.

ETNO members have taken steps to create digital training and skills programmes that will also function in some respects to boost demand for services. For example BT's 'Skills for Tomorrow', an online and community programme launched in 2019, aims to provide essential digital and computing skills for primary-school age children, for parents with low digital skills, for young people not in employment or education, for older digitally excluded people, and for small businesses.[8] Similarly, in 2018, A1 Telekom Austria's Internet für Alle initiative trained 180 000 children, young people adults and seniors in digital skills with the aim of breaking down barriers to participation in digital life.[9]

In Italy, TIM has also launched a comprehensive digital skills initiative, branded «Risorgimento Digitale». Through the project, more than 400 teachers are delivering 20.000 hours of lessons and digital training courses in 107 Italian local communities.[10]

These measures will have some benefits, especially since in all but the poorest European countries it is issues other than affordability that hold back participation. However, the reality is that operators have to broaden the base of what they offer to end-users in order to break out of a largely commoditised marketplace for data connectivity. But while connectivity has not been significantly disrupted by Internet players, the digital services market already largely belongs to them. Telecom companies are working to increase alternatives in this field, offering additional choice to consumers.

[8] https://www.bt.com/skillsfortomorrow
[9] https://a1internetfueralle.at/home/
[10] https://operazionerisorgimentodigitale.it/

2 Trends for digital services suppliers: OTTs, B2B and IoT

Large-scale Internet plays (commonly called OTTs) have an advantage of larger resources, economies of scale and benefit from investment patterns that value top-line growth over margin. They continue to innovate in services faster than operators, and through different business models can create products and services that are hard to compete directly against. The extent to which they have actually reduced telecoms revenue is difficult to determine. In cases such as voice, messaging and enterprise networking they compete head-on with existing telecoms services, but these cases have to be seen in the context of the longer-term trend towards rebalancing of tariffs and revenue from service to connectivity. In other cases, such as video, telecoms operators were less well-established, and therefore the opportunity for revenue growth, rather than simply revenue, is reduced.

OTTS CONTINUE TO IMPACT HEAVILY ON DIGITAL CONSUMERS

Telecoms have their part to play in supporting digital services by further developing their own messaging, voice, video or AI-enabled services, whose price, functions and performance can compete with OTT offerings at national levels within the European market. This will require co-ordinated support between different operators to be successful, as scale is a major factor of success in digital markets.

All OTT services continue to grow, whether for voice, messaging and video. New OTT services continue to be added; significant new services in video include the Disney+ and AppleTV, which have entered the market with heavy advertising and high value content. An additional example is Microsoft Teams, which is now used by over 500,000 organisations, is expected to grow at 20% over the next five years, and has become the default application within Microsoft Office365.

Telecoms users continue to support OTT services, with 70% of mobile users (**Figure 2.10**) also using OTT messaging.
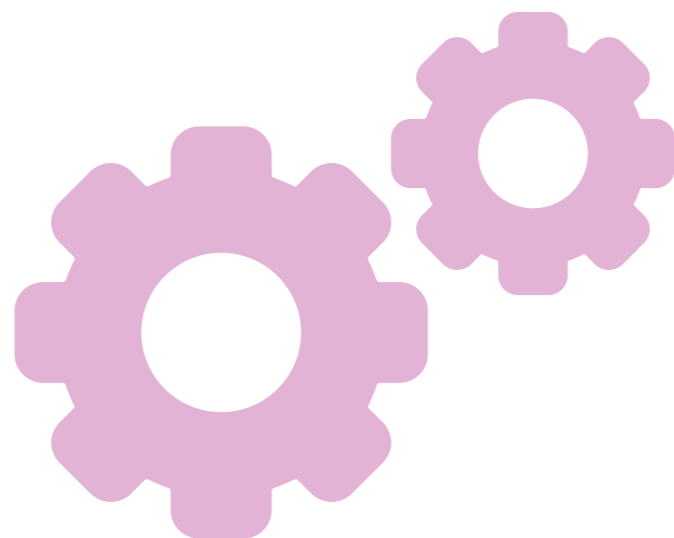
Figure 2.10: Penetration of OTT services, Western Europe, 2015–2023f

Source: Analysys Mason, 2019
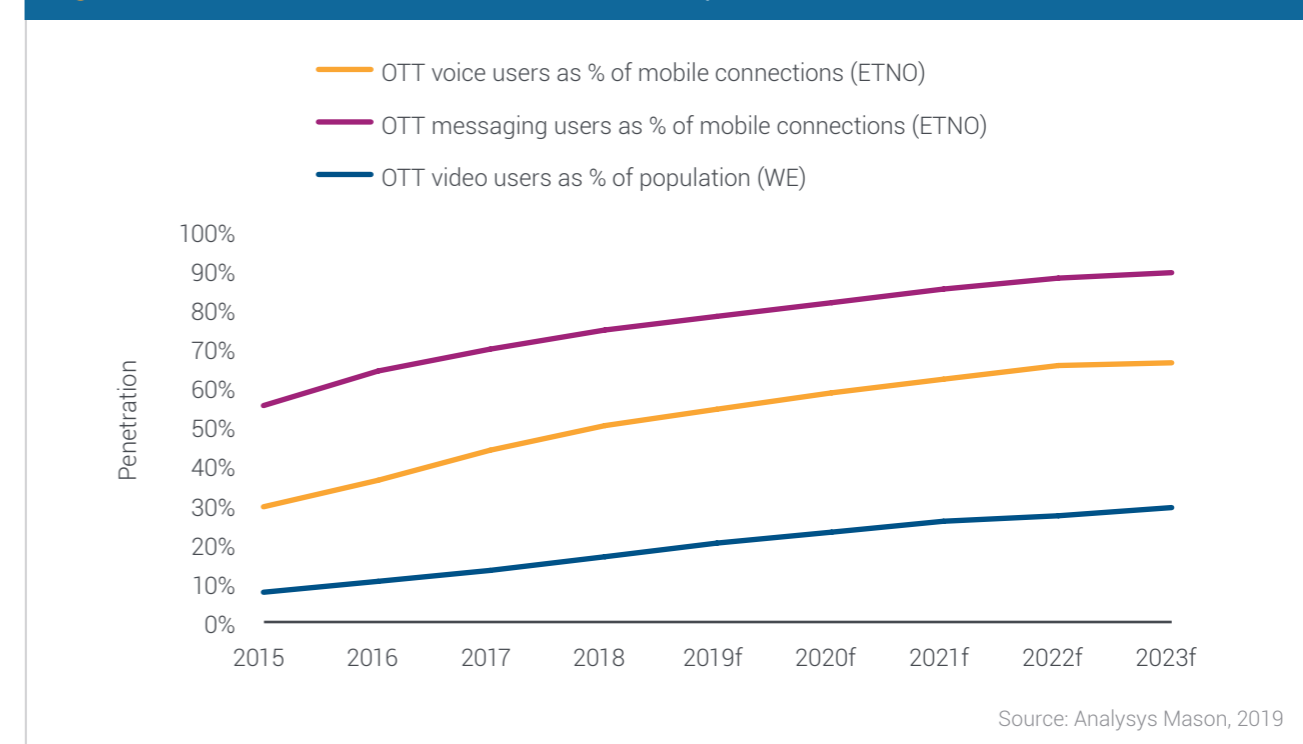
Operators supplying traditional pay-TV within Western Europe continue facing strong competitive pressures from OTT services. Partnering strategies with OTTs and other players help provide some additional revenue streams, despite traditional pay-TV services falling. OTT revenues continue to be concentrated in two prime vendors (Amazon Prime and Netflix), but this may become more fragmented with new US-based entrants (Disney, NBC Universal and Apple) and some home-grown ones such as UK base new entrant BritBox entering the European market. Operator revenues are therefore rising when OTT revenues are included within the forecast numbers, but traditional pay-TV revenues are declining.

Figure 2.11: Traditional pay-TV and OTT retail revenue, Western Europe, 2015–2024f

- Traditional pay-TV
- Operator OTT video
- Third-party OTT video

Source: Analysys Mason, 2019
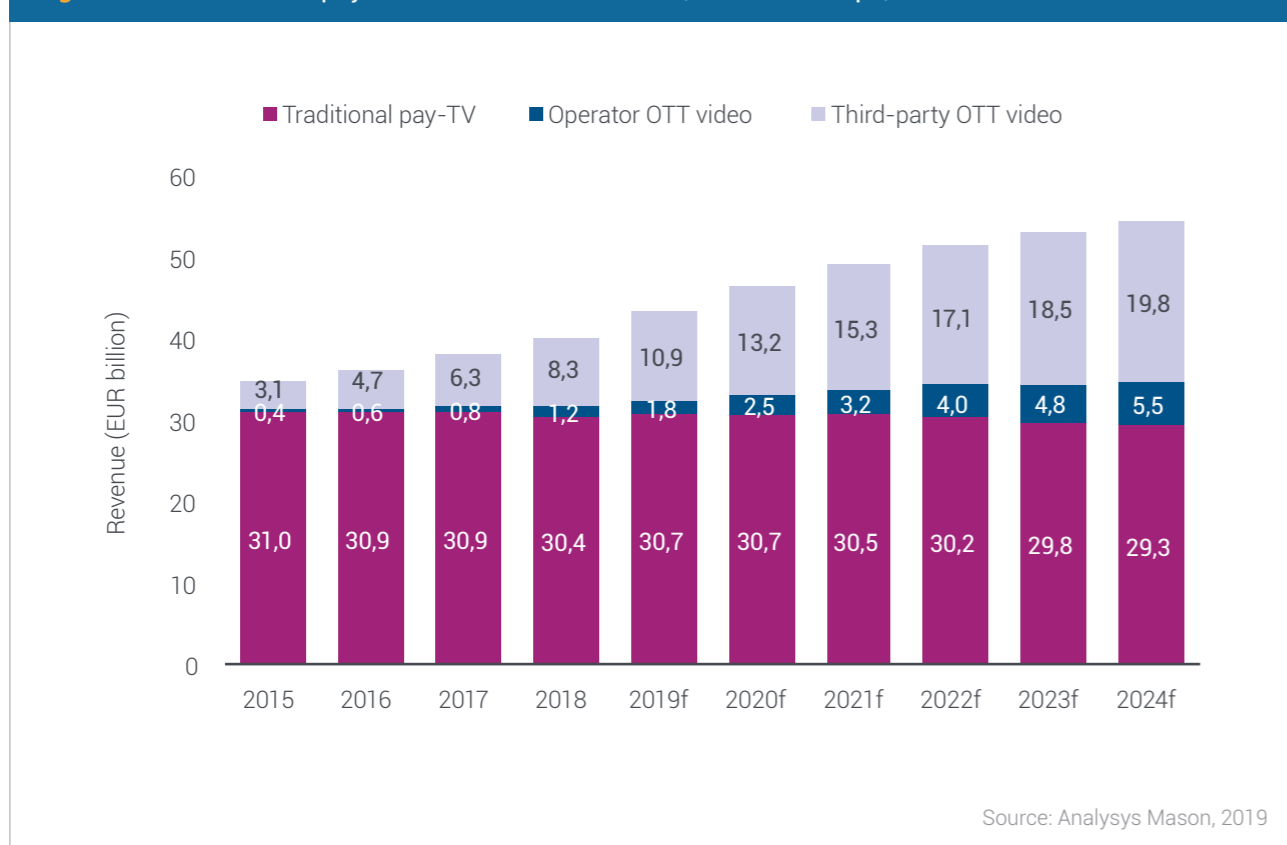
Revenues for traditional pay-TV are falling as OTT revenues both replace them and grow the market. Some of the OTT services will be provided by operators, but the majority will be directly by OTT providers. Western Europeans are stacking multiple TV services, purchasing or using more than one service including multiple OTT services. Super aggregators, such as Amazon Prime, are providing access to other OTT services, such as AppleTV, offering a single billing method and platform to support their delivery. Other relatively smaller market players have to also bundle their content to remain competitive, such as Disney, Hulu and ESPN. This is a trend in North America that will be replicated within Europe. The implications are that the stronger platforms will increasingly dominate the market with nearly 50% of pay TV revenues being driven by OTT services by 2024.

Consumer video services are dominated by only a few OTT players, Netflix being the dominant player with 158 million houses worldwide, followed by Amazon Prime Video with over 75 million. Their global footprint and ability to produce original content ensure that smaller OTT providers will increasingly struggle to make an impact profitably.

BUSINESS SERVICE REVENUE CONTINUES TO BE DISRUPTED, WITH MAJOR OPPORTUNITIES AHEAD

Business services revenues are in flux at present as higher value communications services are being replaced with lower cost solutions in the market, in particular SD-WAN, VoIP services, hosted PBX and unified communications services. New business communications services have created greater market fragmentation, and smaller service providers are winning share from many traditional operators with large market shares.

Figure 2.12: B2B connectivity services revenue, Europe, 2011–2019f

- B2B revenue
- YoY growth

Source: Analysys Mason, 2019

Hosted services for computer and storage offering is under sustained pressure from global companies that include Amazon, Microsoft and Google. However, in the rising tide of cloud-based services locally hosted data services represent an opportunity for operators. Edge-based computing that utilise local operators' assets and provide low-latency for devices and applications that need them is one area where operator local presence can provide a market differentiation. In addition, European users seem to be keen to prioritise trust and there are additional opportunities, for European telecom operators, in providing trusted services.

Figure 2.13: Total European IT B2B service revenues and operator % share, Europe, 2013–2019f

Legend:
- Unified communications
- PaaS (public cloud)
- Security
- Co-location and hosting
- Desktop management
- SaaS (public cloud)
- IaaS (public cloud)
- Private cloud
- Enterprise mobility
- Operator share
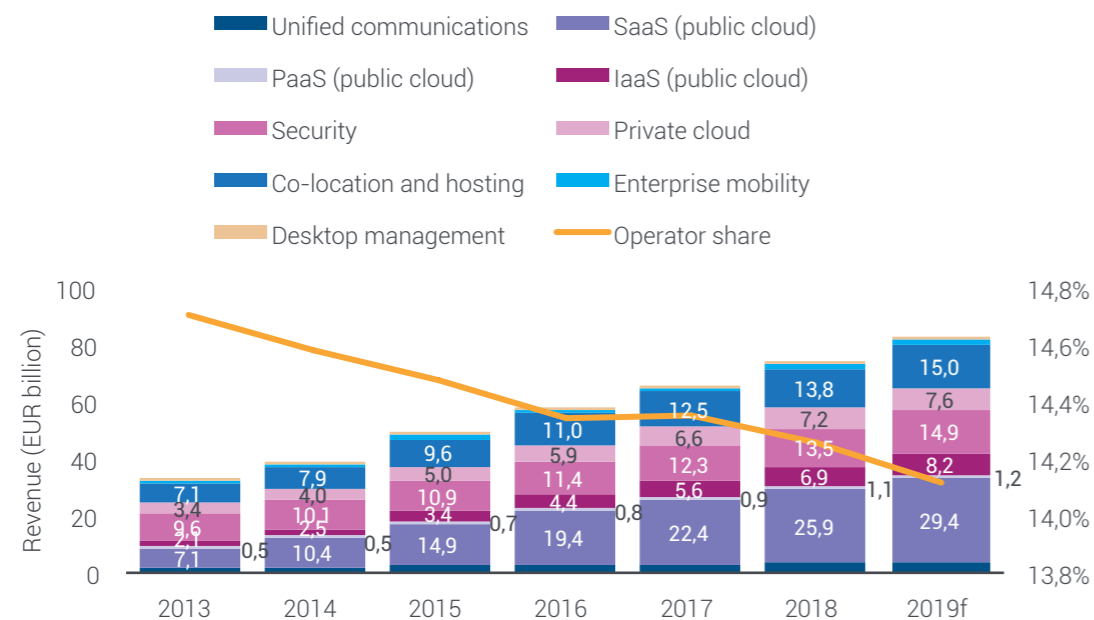
|	2013	2014	2015	2016	2017	2018	2019
Unified communications	1.59	2.06	2.56	2.88	3.14	3.39	3.59
SaaS (public cloud)	7.14	10.39	14.90	19.38	22.43	25.85	29.40
PaaS (public cloud)	0.46	0.52	0.66	0.80	0.94	1.06	1.16
IaaS (public cloud)	2.10	2.54	3.41	4.45	5.64	6.89	8.20
Security	9.63	10.14	10.89	11.37	12.27	13.50	14.95
Private cloud	3.35	4.01	4.99	5.85	6.63	7.19	7.59
Co-location and hosting	7.12	7.92	9.57	11.02	12.45	13.77	14.95
Enterprise mobility	0.65	0.89	1.14	1.36	1.56	1.75	1.93
Desktop management	0.10	0.14	0.18	0.21	0.25	0.28	0.31
TOTAL	32.15	38.62	48.29	57.32	65.30	73.68	82.09
Operator share	14.7%	14.6%	14.5%	14.3%	14.4%	14.3%	14.1%

Source: Analysys Mason, 2019

IOT IS A GROWTH AREA IN TELECOMS

IoT connections are rapidly growing in Europe; as of 2018, there were over 140 million connections, and these are set to continue to grow rapidly as industrial and domestic applications using IoT are developed. Europe's industrial base is making use of the IoT technology with growth for business and services that support domestic applications being the most significant area.

IoT based solutions are a critical component in addressing greenhouse gas emissions. IoT devices enable greater precision to be applied to resources, smarter agriculture enables greater land yields to reduce deforestation, smarter buildings to give precise lighting and heating solutions, more precise transport planning and better use of current power resources with smart electricity grids.

IoT connectivity will represent only 5% of total telecoms revenue in 2025 (**Figure 2.14**), despite its growth, and will accounts for less than 15% of the total IoT value chain; devices, data monitoring and other value-added revenue streams are often not captured by digital operators. For digital operators to deliver the whole value chain, they will need to address vertical markets (**Figure 2.15**).

Figure 2.14: IoT revenue forecast, Europe, 2016–2026f

Legend:
- Total IoT connectivity revenue
- IoT share of total mobile service revenue
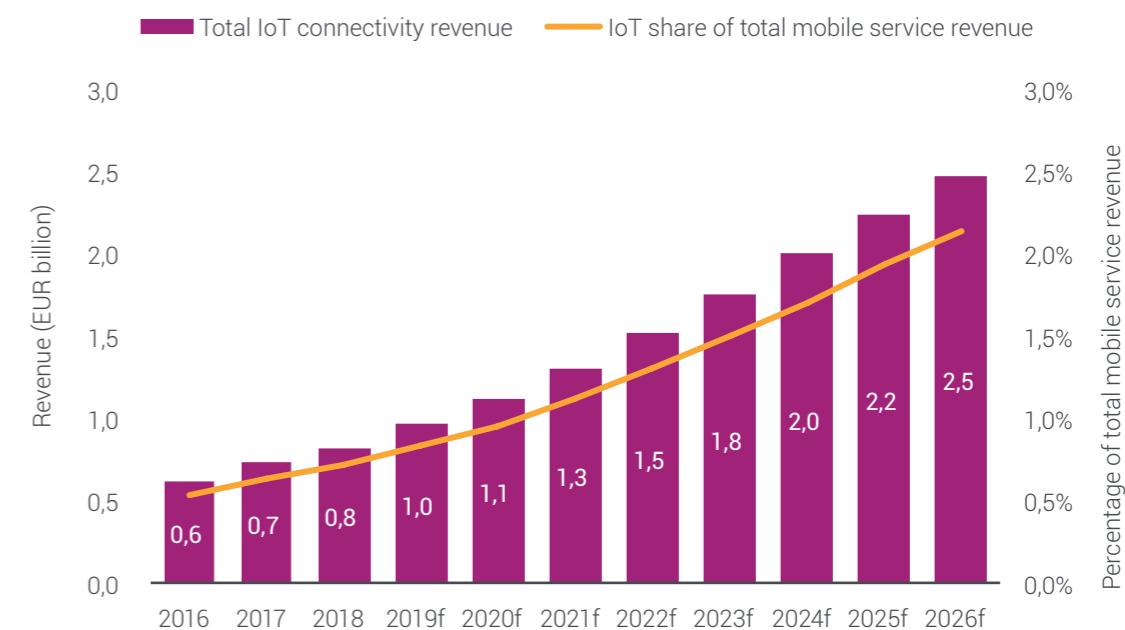
Source: Analysys Mason, 2019

Figure 2.15: Number of active IoT connections by vertical industry sector, Europe

Legend: 2017, 2020f, 2023f, 2026f
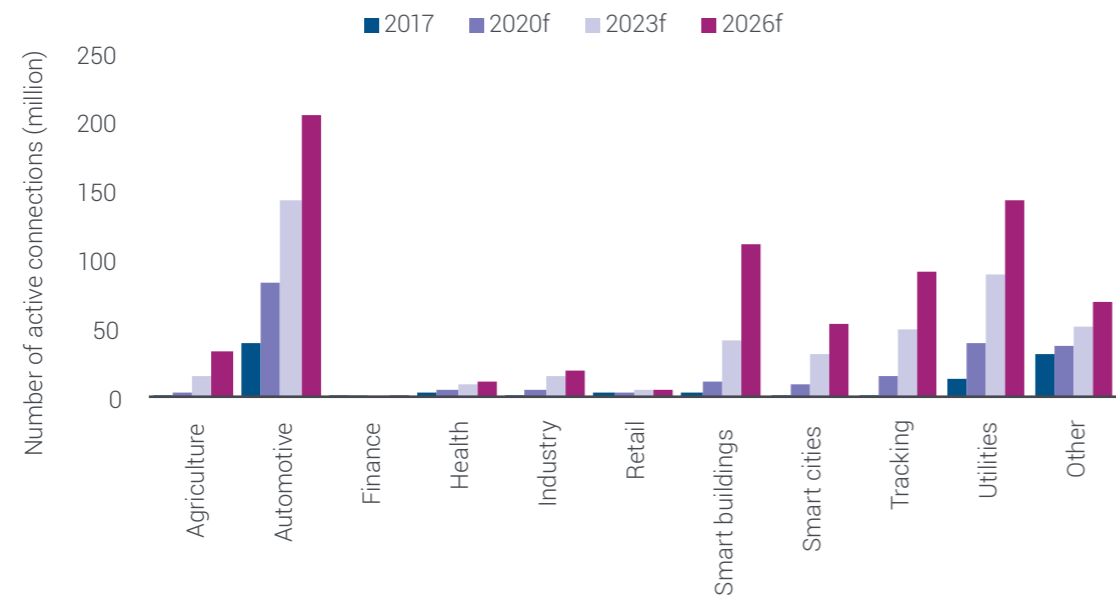
| Sector	Number of active connections (million), 2017	Number of active connections (million), 2020f	Number of active connections (million), 2023f	Number of active connections (million), 2026f
Agriculture	0.11	2.20	15.53	33.31
Automotive	39.33	82.37	141.85	204.10
Finance	0.09	0.11	0.12	0.12
Health	2.17	5.71	8.87	11.98
Industry	0.41	5.07	15.69	19.07
Retail	2.80	3.63	4.14	4.66
Smart buildings	3.38	10.39	40.07	109.99
Smart cities	1.62	9.81	31.01	52.77
Tracking	1.85	15.55	48.17	91.04
Utilities	13.75	38.50	88.22	143.49
Other	30.14	37.54	49.93	69.24
TOTAL	95.66	210.87	443.59	739.76

Source: Analysys Mason, 2019

New IoT technologies providing low-power wide-area (LPWA) wireless services account for a significant number of IoT connections and this share is expected to grow to over 30% by 2025. NB-IoT (Number-Based) will have the largest share of connections in both the LPWA market and the overall market, but there is no dominant LPWA technology yet. The automotive sector is currently dominant in terms of revenue, though this dominance will reduce as other sectors such as fleet management, utilities and smart buildings grow.

Operators need to be able to build pan-European strategies in order to scale to address global demands. In order to do so, the development of an appropriate and pro-innovation regulatory context is of essence. Regulatory requirements within the European market increase the friction of doing business with twice as many regulations as the USA and over a third more than China (Hogan Lovells March 2019[11]). Europe has significantly more impactful regulations covering single authorisation, numbering, net neutrality, over-the air switching of providers and ePrivacy.
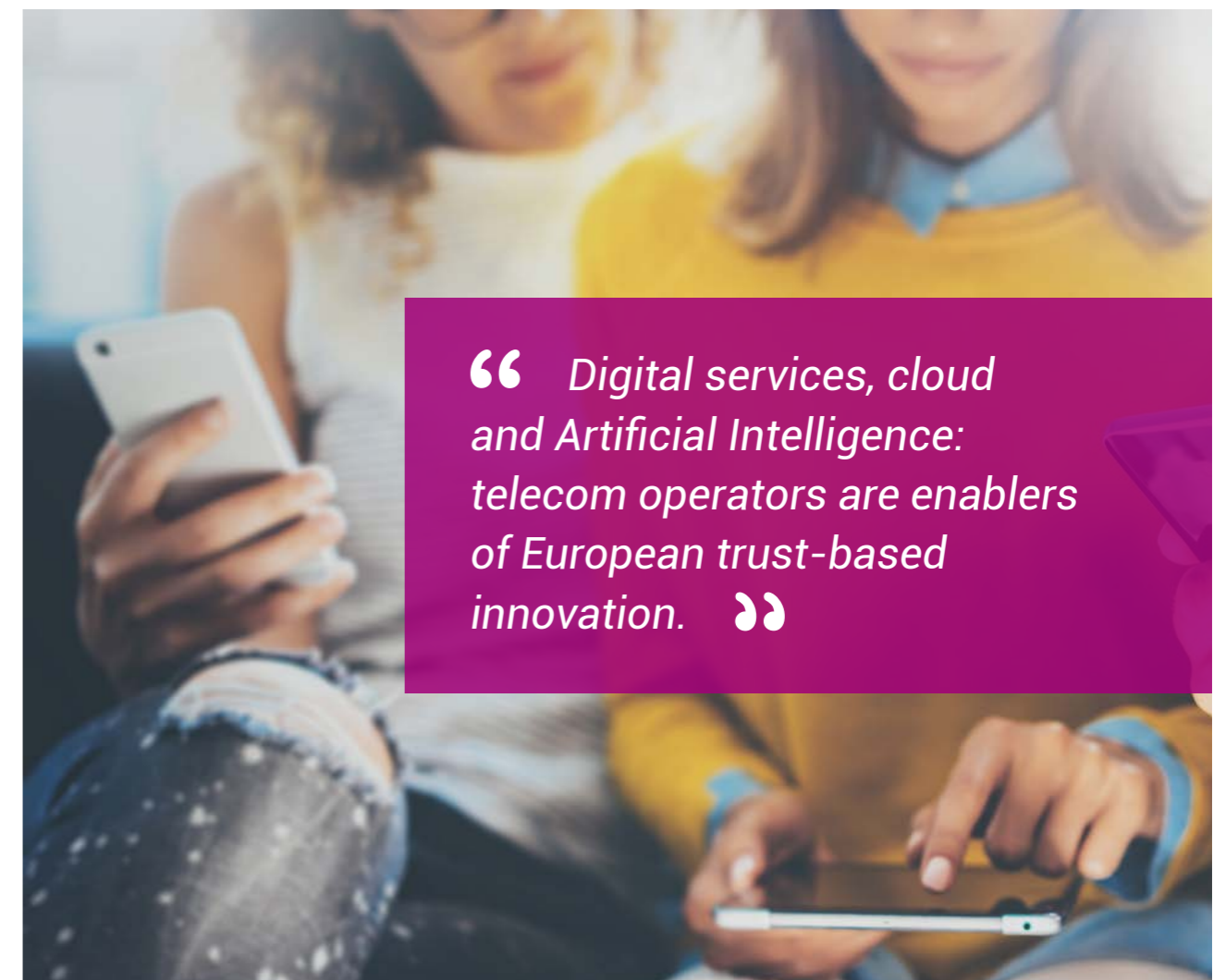
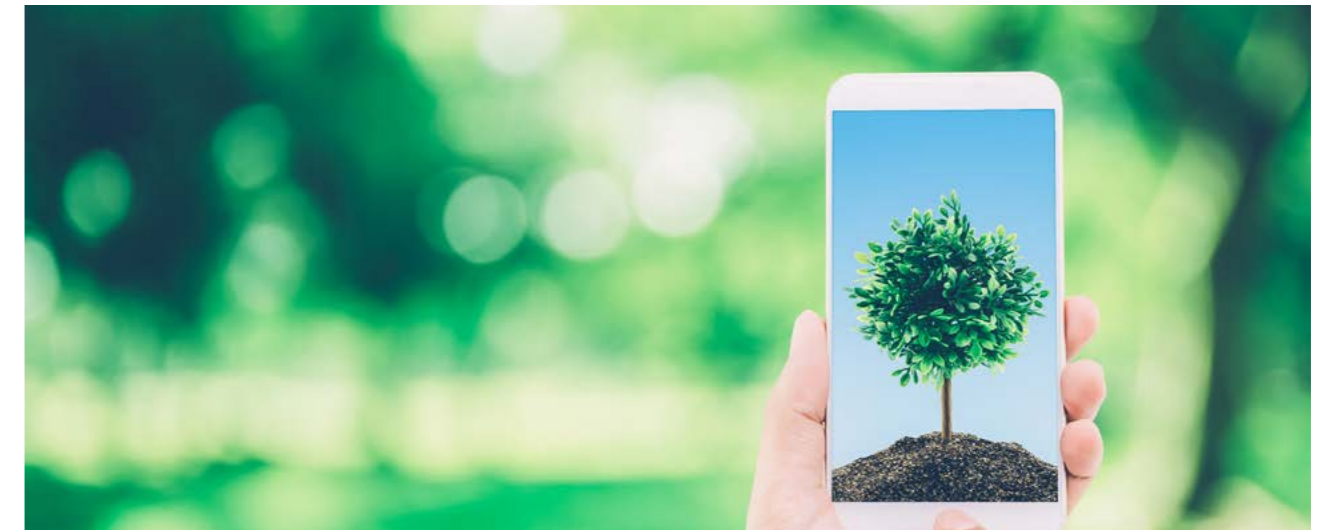> " *Digital services, cloud and Artificial Intelligence: telecom operators are enablers of European trust-based innovation.* "

[11] https://www.hoganlovells.com/~/media/hogan-lovells/pdf/2019/2019_03_20_a_comparison_of_iot_regulatory_uncertainty.

How digital communications providers help to deliver a strong and sustainable future for the digital economy

① The challenges ETNO members are meeting

European operators are presented with three broad sets of challenges:

- To be ever more efficient in a context of hyper-competition and of flat revenue

- To develop in a way that is compatible with European aims and values, putting citizens at the centre and having a positive impact on the environment

- To aspire to European digital leadership in a world dominated by the USA and China

BEING MORE EFFICIENT

→ Investment in 5G means investment in more efficient and secure mobile networks

The cost per byte on 5G networks is a step-change lower than that on 4G. Efficiency of this kind means little, however, unless earlier generation networks are decommissioned in an expeditious manner. Some European operators are planning for 2G and 3G decommissioning, meaning that spectrum used for these legacy networks can be re-farmed for more efficient use in the future. Operators in Switzerland, Norway, Sweden and the Netherlands have all indicated switch-off dates for 2G, 3G or both.

Future versions of 5G (so-called standalone 5G) will enable further efficiency gains, not only for operators, but for enterprise and other third-party customers that use the networks for their own purposes. Different types of traffic with different demands on the network will be sliced off, thereby realising efficiencies that cannot be made on today's one-size-fits-all 4G networks. For enterprise customers, the ability to utilise a slice of an operators' mobile network rather than build a bespoke wide-area network represents a large potential cost saving.

What is more, mainly through encryption and AI-enabled tools, 5G is also expected to offer additional opportunities to secure digital networks and make them more resilient.

European operators are pushing ahead with standalone 5G, although on average about one year later than peers in developed Asia-Pacific and North America.

Figure 3.1: Timelines to migrate to 5G NR Standalone

Legend: ■ 2020 ■ 2021 ■ 2022 ■ 2023 ■ 2024 ■ Later
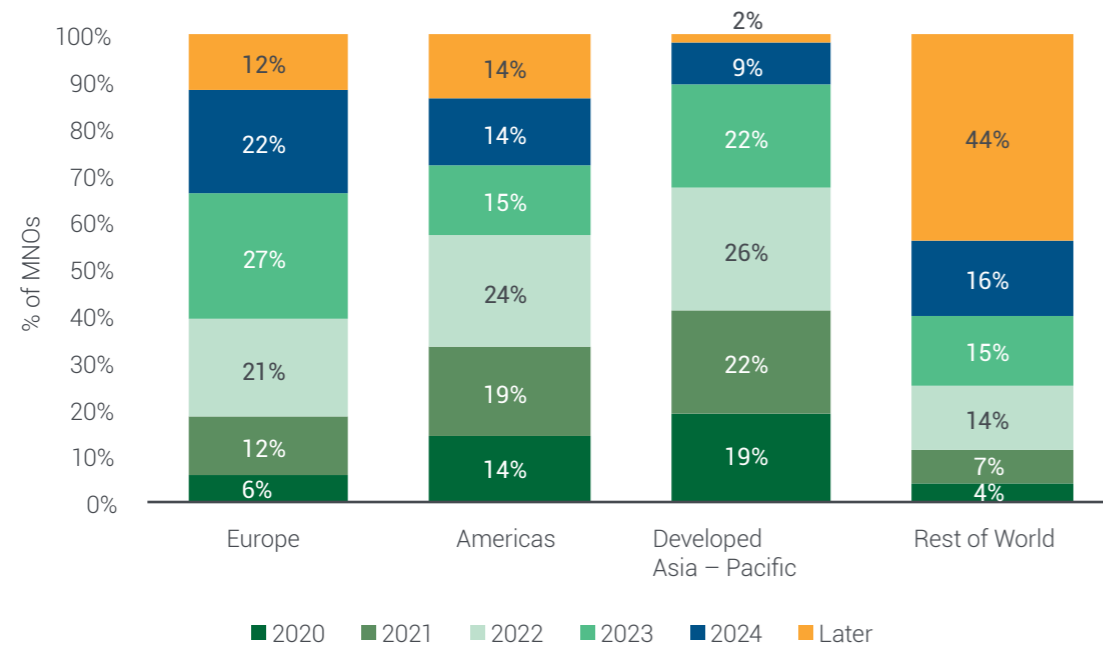
Source: Analysys Mason, 2019[12]

→ Investment in FTTP is an efficient foundation for telecoms for decades to come

FTTP networks reduce the need for engineer dispatches to outside plant or customer premises by around 50-80%, and they consume less energy. Signals transmit over 20km on FTTP without significant loss, so active equipment can be centralised, reducing the number of facilities and sites required to be maintained and powered. In the future, ultra-high capacity fibre lines in the fixed access network will also enable the centralisation (and potentially even Cloudification) of mobile base station units.

Europe and the USA are significantly behind the advanced Asia-Pacific markets in terms of roll-out of FTTP, but on current plans European operators will deploy FTTP at a proportionately much faster rate than those in the USA.

_____

[12] Based on 120 MNO stated plans (public or in operator survey) and Analysys Mason models/estimates. National opcos and large regional MNOs, no private operators

Figure 3.2: FTTP premises passed adds, as a proportion of total premises (estimates), 2020-2025

Legend: ■ USA ■ Europe
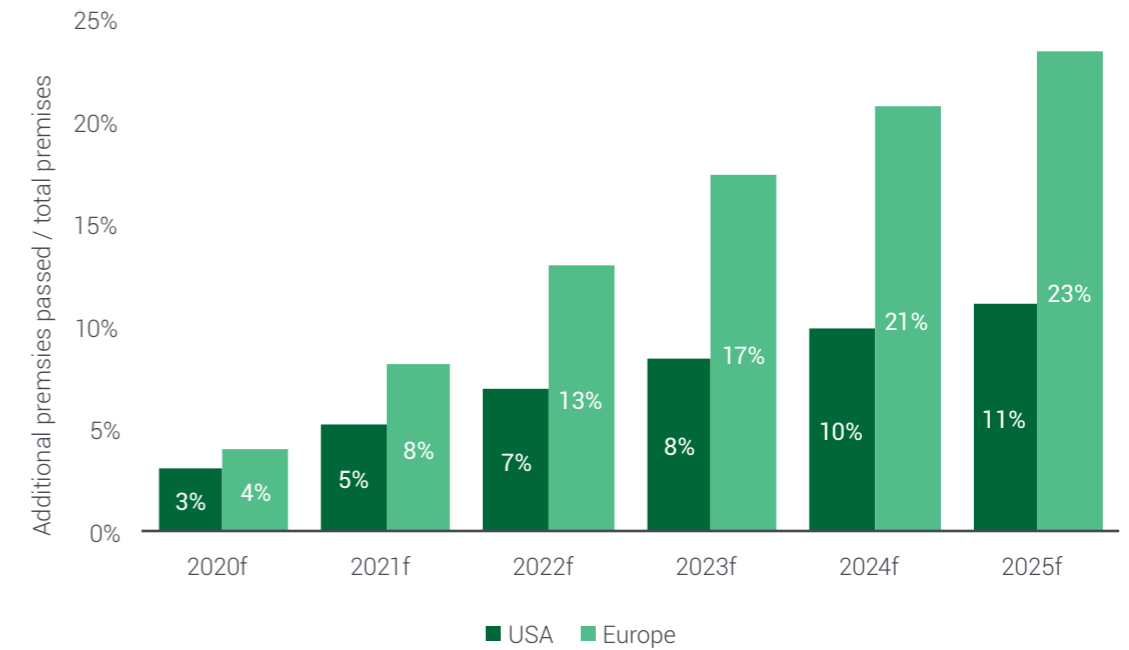
Source: Analysys Mason, 2019

→ The importance of sharing resources

As networks reach nearly full coverage, it is apparent that there is increasingly little to be gained competitively from duplicating costs and resources on mobile network infrastructure (as long as this does not adversely affect coverage and competition). This is important both 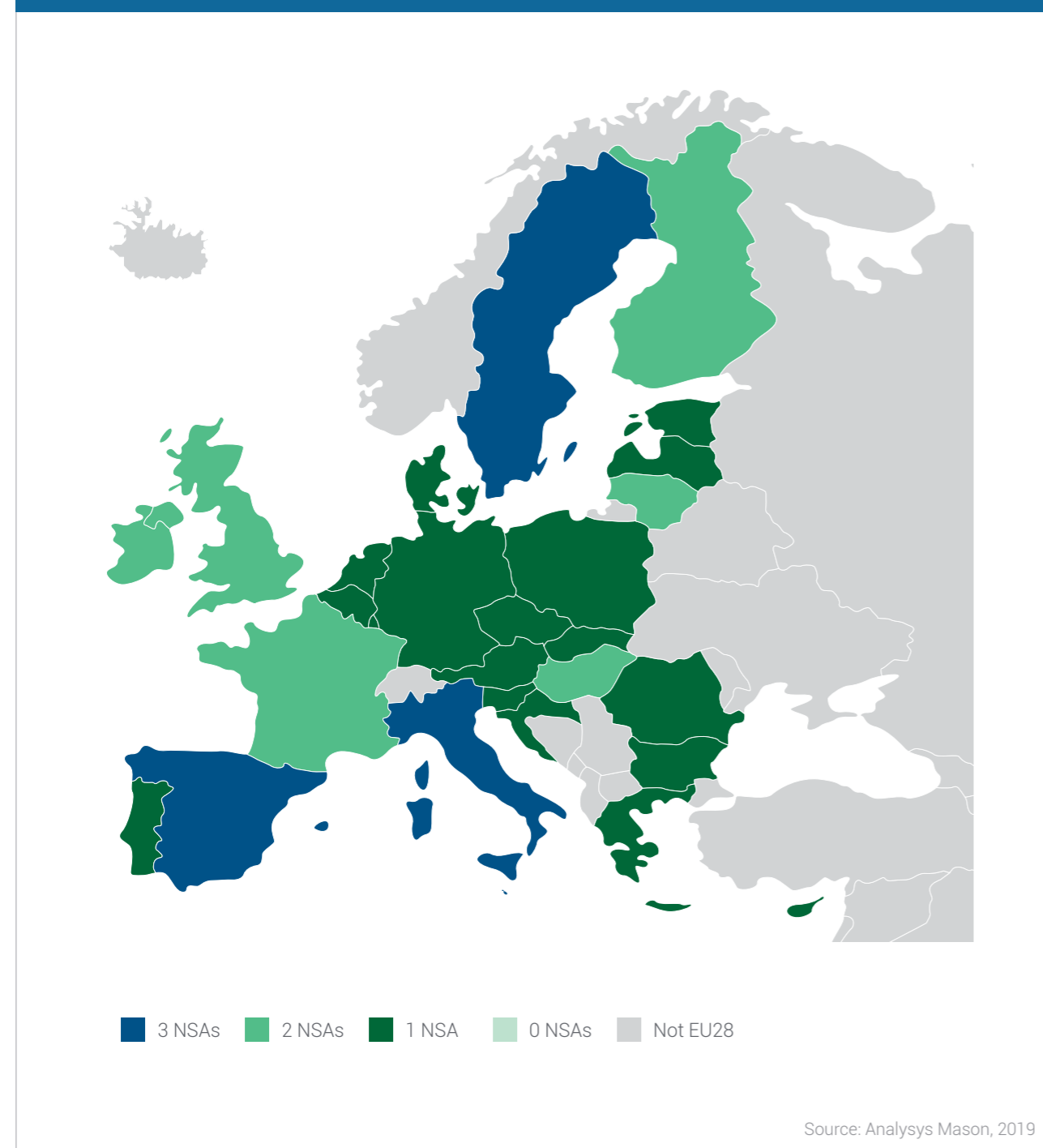at the fixed level, for example with co-investment agreements, but also at the mobile level. ETNO members have started to share mobile infrastructure:

Figure 3.3: Network sharing agreements in EU28

- 3 NSAs
- 2 NSAs
- 1 NSA
- 0 NSAs
- Not EU28

Source: Analysys Mason, 2019

> " *Most EU countries have between 1 and 3 network sharing agreements in place.* "

Moreover, just over half of the network sharing agreements involve more than simply passive infrastructure and extend to sharing of active RAN equipment.

In order to fill in the remaining population gaps, and perhaps more importantly now, the remaining geographical coverage gaps, a shared network approach becomes not just economically expedient, but economically necessary. ETNO members, such as BT/EE, are taking a pivotal role in sharing this cost.

Many operators expect 5G to require additional densified infrastructure, and it will become increasingly important to share infrastructures to reduce duplication of costs while ensuring retail competition and a fair return for those that have invested in physical network infrastructure (fibre backhaul). In this context, legal certainty for such agreements is of essence.

Next-generation fibre-based fixed networks, all supported by a Wi-Fi edge, and 4G/5G networks co-exist and complement one another. While many European operators have converged their retail service offerings, network convergence has been slower. Fixed networks remain critical in delivering ever-improving efficiency. Extending the 5G core network intelligence to encompass all access network resources, including fixed and Wi-Fi access will realise further efficiencies, reduce the need for duplicated resources, and enable a more seamless user experience across the fixed, Wi-Fi and mobile domains. European integrated operators / ETNO members see the huge fixed and Wi-Fi estates they control as critical assets as they seek both to differentiate themselves and to realise long-term efficiencies. European operators, like for example BT, are at the forefront of creating 5G-converged cores.

→ Use of automation and AI

Automation and AI are needed to provide efficiencies to ensure ETNO members remain competitive versus non-telecoms competitors, to improve customer experience, and to complement new technology such as 5G where new levels of complexity require it. Typical use-cases deployed can be broken into examples that address either customer experience or operational optimisation. In both cases AI replaces or augments current manual processes. The use of this level of automation helps reduce the cost for subscribers for the use of new technologies, such as 5G and IoT, or enables the delivery of better customer experience.

Telecom operators' businesses are emphatically not the same as those of hyperscale OTTs, and one should expect higher productivity from businesses that do not have to run and maintain physical access networks. Nevertheless, the need to improve productivity is highlighted by lower absolute levels and lower growth in productivity than telecoms peers in the USA, even though this is somewhat offset on average by higher salaries in the USA.

Figure 3.4: Revenue per employee, 2017-2018, ETNO members, comparable leading operators in the USA, Japan and South Korea, and selected hyperscalers

EUR million/employee/year

	2017	2018
Japan	0,33	0,31
ETNO*	0,43	0,44
USA	0,62	0,65
South Korea	0,77	0,77
Alphabet	1,23	1,23
Facebook	1,43	1,39
Netflix	1,88	1,97

■ 2017 ■ 2018

*unweighted average

Source: Analysys Mason, 2019
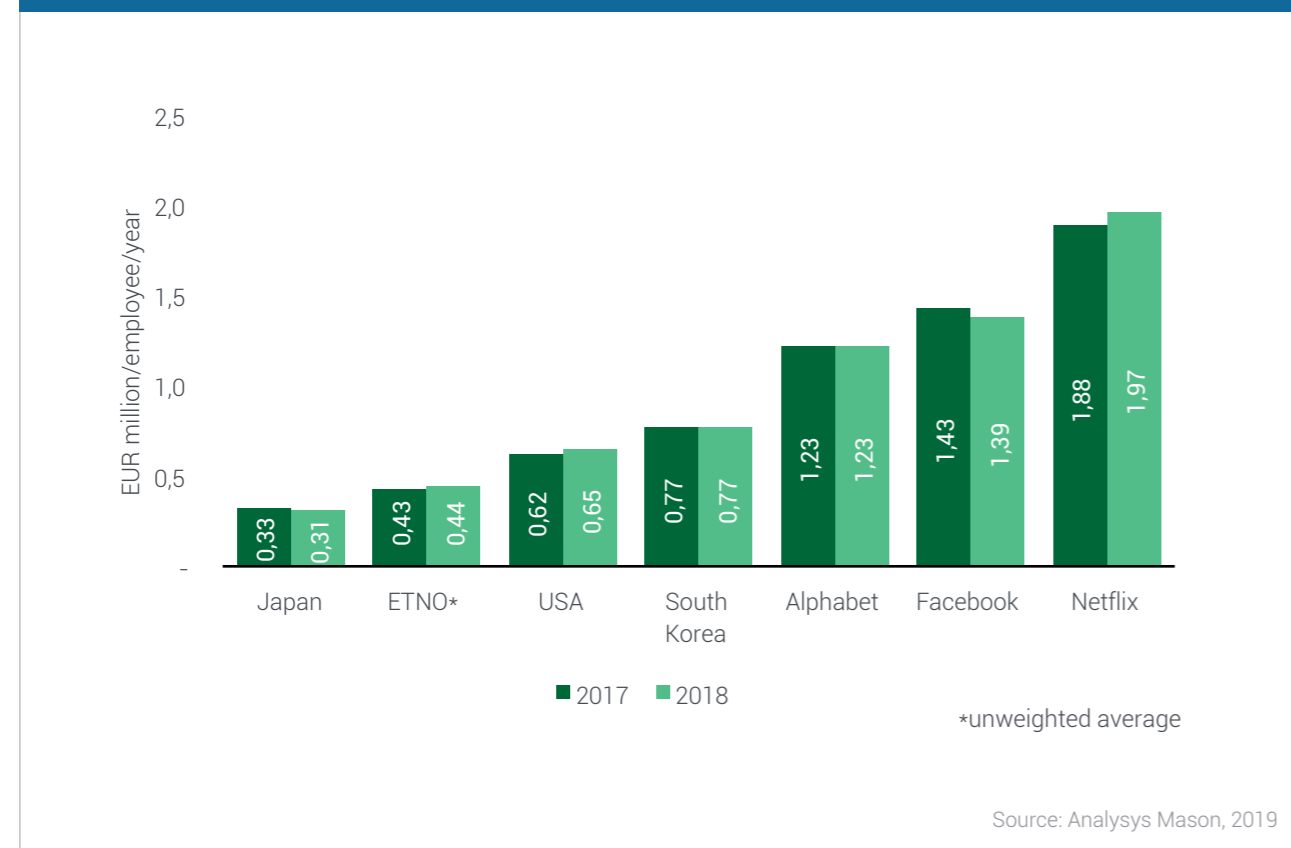
BEING GREENER

Being economically efficient is necessary, but it is not sufficient. Many ETNO members are publicly acknowledging the roles they have to play in furthering societal aims such as environmental target and social inclusion. This commitment was articulated by the Orange CEO Stéphane Richard in December 2019: "Strong economic performance is impossible without environmental leadership," adding that companies ignoring trends including climate change "cease to be relevant"[13].

While energy consumption in advanced economies is probably peaking, the energy required by ICT in these markets continues to grow. Very rapidly increasing levels of demand in the sector make this almost inescapable. Like many industries in the past, ICT is affected by the Jevons paradox, whereby technological progress increases efficiency, but this merely encourages a growing rate of consumption. Among European operators, it is estimated that actual power consumed (GWh) is growing at about 5% per year. What is not inescapable is the environmental impact of the industry.

In addition to this, there is a clear and evident enabling potential of digital access technologies – and 5G in particular – in enabling carbon reduction in other sectors. A recent report by GeSI and Deloitte found that "2030 digital technologies will deliver reductions in carbon emissions equivalent to nearly seven times the size of the growth in the total information and communications technology (ICT) sector emissions footprint over the same period"[14].

> 66 *Networks are becoming greener. Carbon intensity and emissions are decreasing, climate targets are bold.* 99

---

[13] Announcement of new Orange's 5-year plan Engage2025, 4 December 2019
[14] https://gesi.org/research/gesi-digital-with-purpose-full-report

→ **Environmental impact**

The contribution of the ICT sector to climate change has been the subject of an on-going debate since 2007, when Gartner estimated that the ICT industry overall produced 2% of global CO_2 emissions, placing it on a par with the aviation industry.[15] This is due, among others, to intensive cloud computing, which has dramatically increased in the past years, as OTT services developed at a rapid pace. Other estimates place ICT directly representing about 2%-4% of global greenhouse gas (GHG) emissions. Telecom operators, being a subset of ICT, are directly responsible for about 1.5%-2% of emissions. For ETNO members, this amounted to about 7700kTonnes of CO_2e in 2018, a fall of 8.5% over the previous financial year.

Figure 3.5: CO_2e emission, 2017-2018 , and per revenue, Scope 1 and 2 only, ETNO member group level

Source: Analysys Mason, 2019
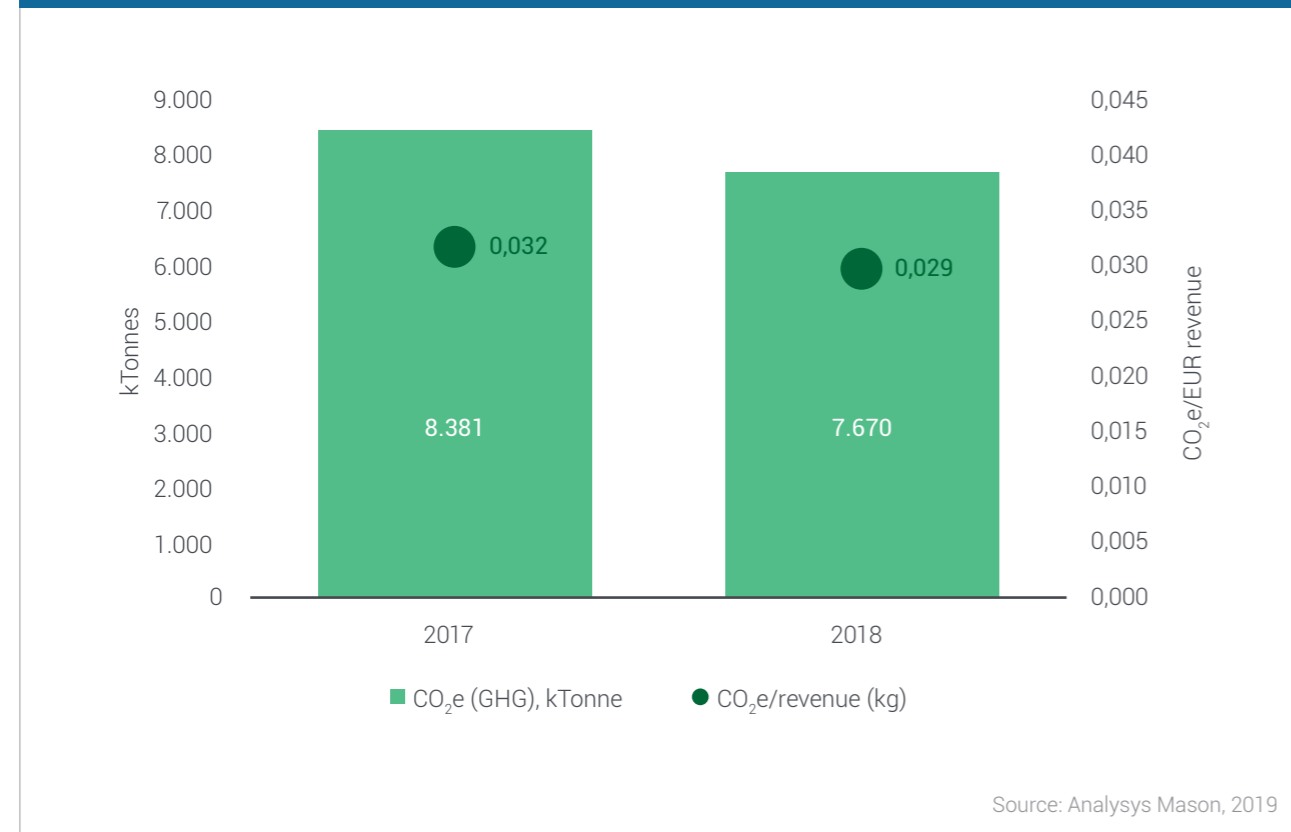
Measuring GHG against industries with rapidly evolving needs and demand is difficult. For example, telecom operators have little tools to manage increase of data traffic, which is driven by usage of services generated in other parts of the digital ecosystem. Concretely, playing GHG off against data consumption seems unreasonable: an operator could do nothing, watch data traffic rise and apparently be more efficient. Plotting GHG emissions against revenue seems fairer, and in this respect the amount of CO_2e emitted per EUR earned by ETNO members fell last year from about 32 grams to about 29 grams.
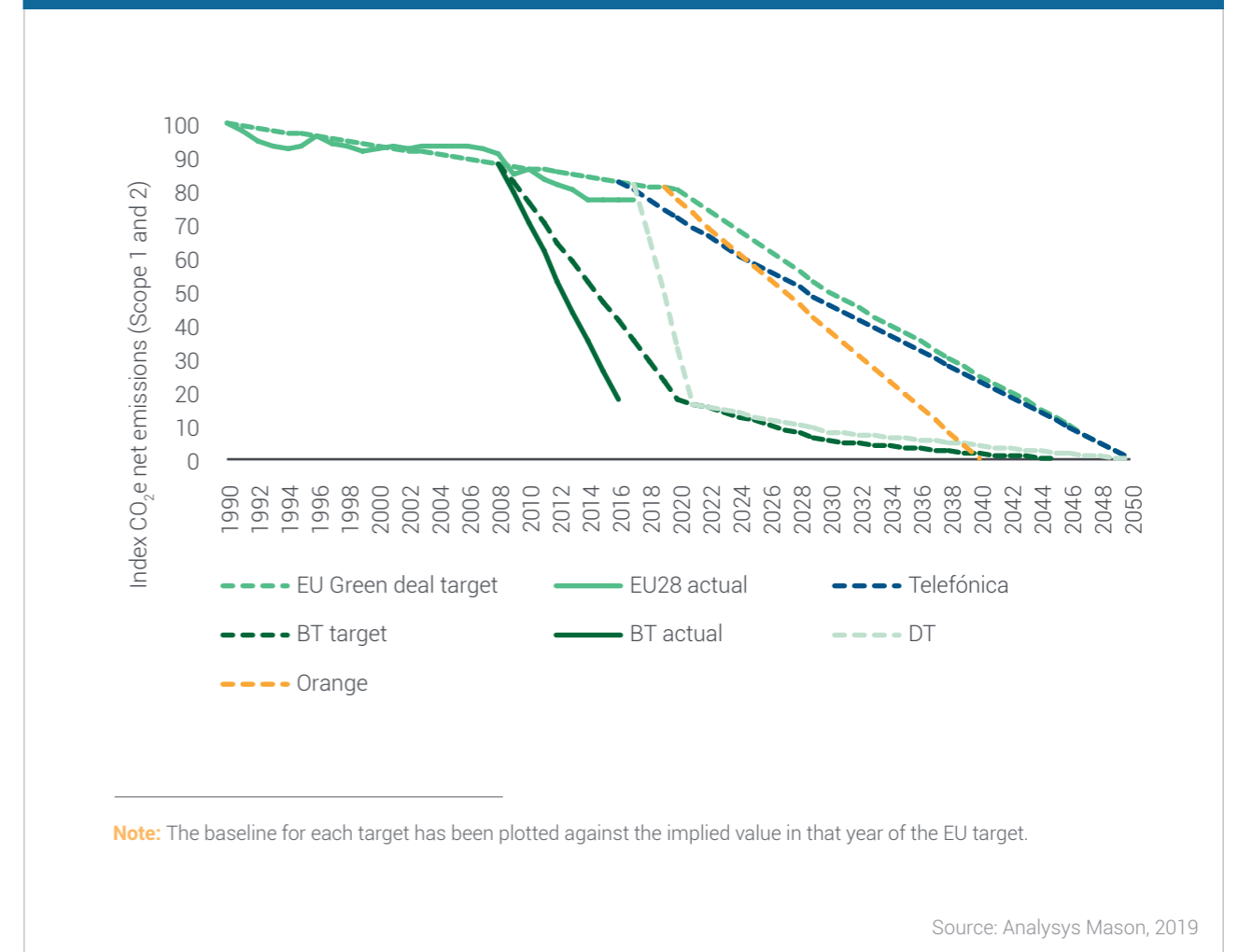
A portion of emissions is under the direct or indirect control of telecoms operators (direct emissions from own property and plant, and indirectly through choice of energy supplier), and another, potentially larger, portion is where they have an influence rather than control (e.g. in the supply chain of goods and services, or in the transport choices for employees). In addition, they can develop services that reduce consumption in other areas (e.g. transportation).

→ **Reducing emissions under their control**

ETNO member companies are fully aware of the challenge presented by climate change, and they are working hard to reduce their footprint as well as to demonstrate that they are an important part of the solution. Their targets should be read in the context of the Green Deal targets set by the EU, which are to raise the share of renewable energy to 100% by 2050, and to reduce CO_2e emissions relative to the 1990 level by 50%-55% by 2030, with the longer-term proposed target of 100% reduction by 2050. Operators' own targets are diverse, but where they can be plotted against EU targets, they look generally more ambitious.

Figure 3.6: Selected Scope 1 and 2 CO_2e emissions targets against EU 2030 targets

Note: The baseline for each target has been plotted against the implied value in that year of the EU target.

Source: Analysys Mason, 2019

---

[15] Gartner, Green IT: The New Industry Shockwave, presentation at Symposium/ ITXPO conference, April 2007
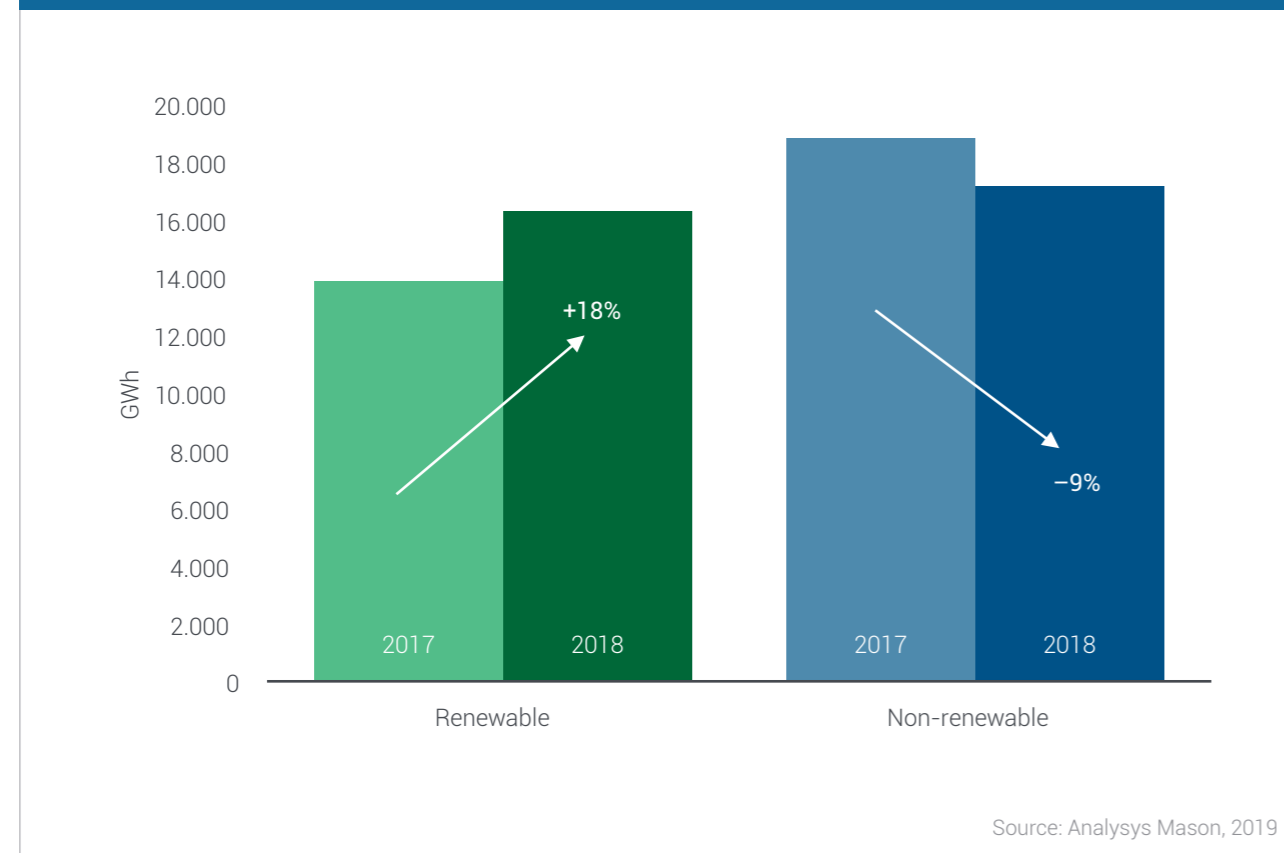
Being economically efficient often satisfyingly overlaps with being greener. Some of the efficiency measures described above, such as network sharing, fixed-mobile convergence, increasing data centres' efficiency and upgrading network technologies, can help reduce carbon footprint. However, other measures come at some economic cost over less green options, for instance:

- Own use of renewables and recycling of products utilised
- Shifting energy supply to renewable
- Carbon offsetting

In 2018, it is estimated that ETNO members' energy supply was already 49% renewable. Mostly gains were made by switching supplier to one that buys only renewables. ETNO members work in multiple markets, and the availability of local renewable energy supply varies[16].

Figure 3.7: GWh/year for renewable and non-renewable energy, Scope 1 and 2, 2017 and 2018, and year-on-year growth ETNO Group level

Source: Analysys Mason, 2019

→ Influencing the supply chain

Influencing the upstream supply chain is another important lever an operator has. One ETNO member, Telia Company, has a commitment to being carbon neutral not only in its operations, but also in its supply chain, by 2030. Another, Telenor, invested 110 000 person-hours in training for supply-chain sustainability.

As operators outsource more, supply-chain sustainability is also an important consideration in any objective measure of the environmental credentials of telecoms, especially as there is a trend for operator-owned datacentres and network functions move to the Cloud. Major global Cloud providers such as AWS and MS Azure have their own targets, as do global OTT players.

When it comes to efficiency, AWS claimed that 50% renewable energy had been reached in 2018, largely as a result of building and operating its own large solar and wind farms. AWS has a long-term goal to reach 100%, but it has not indicated a specific date. Amazon, as a whole, has a commitment to be carbon neutral by 2040. Major OTT players like Facebook and Alphabet enjoy advantages of scale and centralisation over telecom operators. They have far fewer, but much larger, facilities, and their own networks consist largely of high capacity transport links rather than local access facilities, which necessarily have fewer economies of scale. Efficiencies can be achieved on distributed physical networks elements, but they will not disappear with a wave of a software wand; someone has to own and manage them. Alphabet has been carbon neutral through offsetting since 2006 and for the last two years has used 100% renewable energy. Facebook aims to use 100% renewable by 2020. Gross CO_2e emissions per EUR of revenue for several ETNO members approximately matches that of Alphabet, the better performer of these two.

Local facilities may in fact get a new lease of life through edge computing. Centralising the processing of the huge volumes of data involved in, for example AI, may not be feasible with the current spread of Cloud datacentres, and it may be more efficient to use a more distributed pattern.

→ Influencing behaviours

Telecoms and ICT enable personal and corporate behaviours that more than offset any negative impact of digital, e.g. through transportation substitution, traffic management / transport sharing, smart cities, remote working.

❝ *The SMARTer 2030 study, released by the Global enabling Sustainability Initiative (GeSI) in 2015, estimates that the ICT sector's carbon footprint will account for 1.97% of global emissions by 2030, and that ICT has the potential to enable a 20% reduction of global CO_2 emissions by 2030, maintaining emissions at 2015 levels. These figures show that the contribution of ICT usage to reducing emissions is nearly ten times higher than the emissions generated by deploying it.*

ICT has the potential to reduce EU carbon emissions by over 1.5 Gt CO_2e in 2030, 2.7 times larger than the carbon emissions of the entire UK in 2015. This saving is equivalent to almost 19 times the size of the expected footprint of the EU's ICT sector in 2030, or 37% of the EU's total emissions in 2012. ❞

---

[16] It is important to note that Scope 2 emissions can be interpreted/defined in two ways: location-based and market-based. A location-based method reflects the average emissions intensity of grids on which energy consumption occurs. A market-based method reflects emissions from electricity that companies have purposefully chosen (or their lack of choice). Most operators opt to report the market-based method.

ETNO members also have environmental ambitions that extend beyond their own operations and the upstream and downstream supply chain. One example that pushes towards the kind of gains envisaged in the SMARTer 2030 study is the 3:1 target set by BT. Its short-term 2020 ambition is to "have helped customers' cut their carbon emissions by at least three times our own end-to-end carbon impact." While it may not halt global warming, the ICT sector in general, and the telecoms sector on which it critically depends, will play crucial roles not only in the gradual decarbonisation but also the gradual dematerialisation of lives and businesses in advanced economies.

A STRONGER EUROPEAN ROLE IN AI

It is widely agreed that AI is the beginning of a new industrial revolution, with a potential to significantly change society, industries and economies. The digitalisation of devices, tasks and processes provides an increasing stream of data on which AI system can act. This data is transported in increasing volumes from an ever-increasing number of devices over public and private networks. Operators are in strong positions to utilise this data in compliance with EU data rules, or provide support to agencies, organisations and business who wish to utilise it through AI.

Global competition is significant between the USA, China and Europe. The USA has been a front-runner in the commercialisation of AI technology, but China's strong research capability is now turning to more industrial applications and challenging the USA. Europe's balanced approach to commercial and research on AI is being supported by national governments and EU initiatives.

While AI has barely started to make its presence felt by most people, the potential negative impact of AI in the replacement of skilled human tasks is an active concern, including within telecoms operators. Most studies focus on the replacement of current roles by AI based technologies and not on the creation of new roles and jobs. The concentration of industrial knowledge into fewer companies is also a likely outcome as leaders within given markets will have access to data to fuel their AI based processes generating an impossible barrier to entry for newer companies.

European citizens' and businesses' access and control of data is critical to remaining a trusted developer of technology based on AI, not just a consumer of it. In addition, research in AI needs to be maintained and increased to support industrial applications of the technology. The EU, in support of national initiatives as well as private-sector investments, aims to reach a combined total of EUR20 billion per year. The EU's Open Data Portal also supports organisations wishing to access data sources from over 11,000 datasets, enabling smaller organisations to have access to data to train their AI models.

Beyond direct investment to fund AI work, regulatory frameworks that encourage AI but also provide ethical guidance in its use are needed. GDPR that has been in force since 2018 has already been widely accepted at the forefront of privacy legislation.

The EU has commissioned the High-Level Expert Group on Artificial Intelligence (AI HLEG) - an independent expert group set up by the European Commission in 2018 to which some representatives of ETNO members belong - which published the Ethics Guidelines for Trustworthy AI. The group follows a legal framework for achieving «trustworthy» AI based on three components: (i) legality (it should comply with applicable law and regulations); (ii) ethics (it should ensure that ethical values are respected); and (iii) robustness. After a test phase, the guidelines will be updated in the course of 2020.

Europeans are protected by what is recognized to be some of the advanced legislation globally, protecting data rights and data-driven automations for the citizens and has helped shaping a uniquely European approach to AI and related big data technologies and uses. The vison of Europe as a "trustworthy" region from which products and services are created and delivered will provide an advantage for developers and sellers of AI applications. Consumers of AI products and services that trust European built solutions are more likely to purchase or use European products because they value the ethical position Europe has adopted.

The AI ethics guidelines for Europe outline four areas for consideration covered by the following principles: beneficence – to do good, non-maleficence – do no harm, autonomy – to preserve human agency, justice – to be fair, explicability – to operate transparently.

European policymakers need to ensure that they do not place European companies at a disadvantage in the world while maintaining influence over the global use of AI and related data. In this field, the elimination of regulatory asymmetries with other players remains an important point.

ETNO members are significant generators of customer data and internal users of AI technology. The uses of AI include network and infrastructure operations, customer relations and the development of new products. Many ETNO members have already developed AI guidelines for their companies, with a strong focus on ethical and transparency aspects. AI is a critical factor in delivering lower cost services to telecom subscribers and supporting the increasingly complexity of 5G as it's rolled out throughout Europe. Efficiency gains support the better utilisation of resources, for environmental goals that include smarter use of power through dynamically reducing electricity during non-peak usage.

CREATING EUROPEAN EXCELLENCE IN THE GLOBAL DIGITAL ECONOMY

Despite Europeans' enthusiasm for digital services, Europe can be perceived mainly as a consumer, but not sufficiently as an innovator or producer, in the digital economy. Even though Europe is lagging behind other regions globally in some respects, there are areas where Europe is a leader.

→ Unicorns

European operators have to make choices about how and where they invest in tech and media areas. Although some make it onto the Forbes Tech 100 list, it is not generally by dint of the size of their tech businesses. Focusing on up to three areas appears to be the norm. The preferred 'tech' areas for operators appear currently to be cybersecurity, IoT and AI, but also some that have been adopted by fewer such as FinTech/banking.

The choice for operators is whether to develop adjacent tech businesses to support their core telecoms business, or whether to allow these to develop on their own terms. The general trend going forward appear now to be for the latter, and separate lines of business with their own P&L are being created. This makes sense as the logic of the digital world is that it is not dependent on geographically defined physical networks, and the need to be accountable to a connectivity business may hinder growth. However, the creation of virtual tech lines of business can also be perceived as an indication that operators are open to co-investment models with other tech or telecoms businesses, that it is difficult to achieve scale, and that they would with appropriate valuation consider sales. In addition to creating spin-off tech business, ETNO members support start-ups. One major initiative is GO Ignite, an alliance of the innovation arms of Deutsche Telekom, Orange, Telefónica and Singtel whose aim is to nurture and connect start-up eco-systems worldwide.

A key assumption of the 5G era is that cellular connectivity will be for a far wider variety of use cases than in the past, going well beyond mobile broadband and deep into industries. As this becomes more business-critical, there is rising interest in private networks, which can be deployed in the specific locations that map to enterprise usage, and to support their specific connectivity and data requirements.

European industries and governments look well-positioned to leverage these new private networks – whether virtualised or physical - to support applications that require specialised capabilities, such as very high security, massive sensor density, or critical availability. Cooperation between (and within) sectors will be key to develop new digital services, based on 5G technology.

European operators are generally more advanced than those elsewhere in setting up private network practices, often focusing first on localised LTE systems for leading industries such as manufacturing or transport, in which they can offer not just connectivity but added value services such as security, device management or edge computing. Examples include Telefónica and Deutsche Telekom, both of which have roadmaps to take them from private LTE towards future 5G slicing.

② What gets in the way of the long-term vision

Telecom operators are businesses and are answerable to shareholders. ETNO members are no different, even if in some cases the state retains some holding. It is salutary to remember that a very high proportion of shareholders in telecoms are institutional, often pension funds. Stock markets have not looked kindly on the European telecoms sector in the past five years, which has underperformed both a cross-sector European index and a telecoms-specific global index.

Figure 3.8: Stoxx Europe 600 index, Stoxx Europe 600 index for telecommunications, and Stoxx Global 1800 index for telecommunications, 4Q 2014–4Q 2019

Source: Analysys Mason, 2019
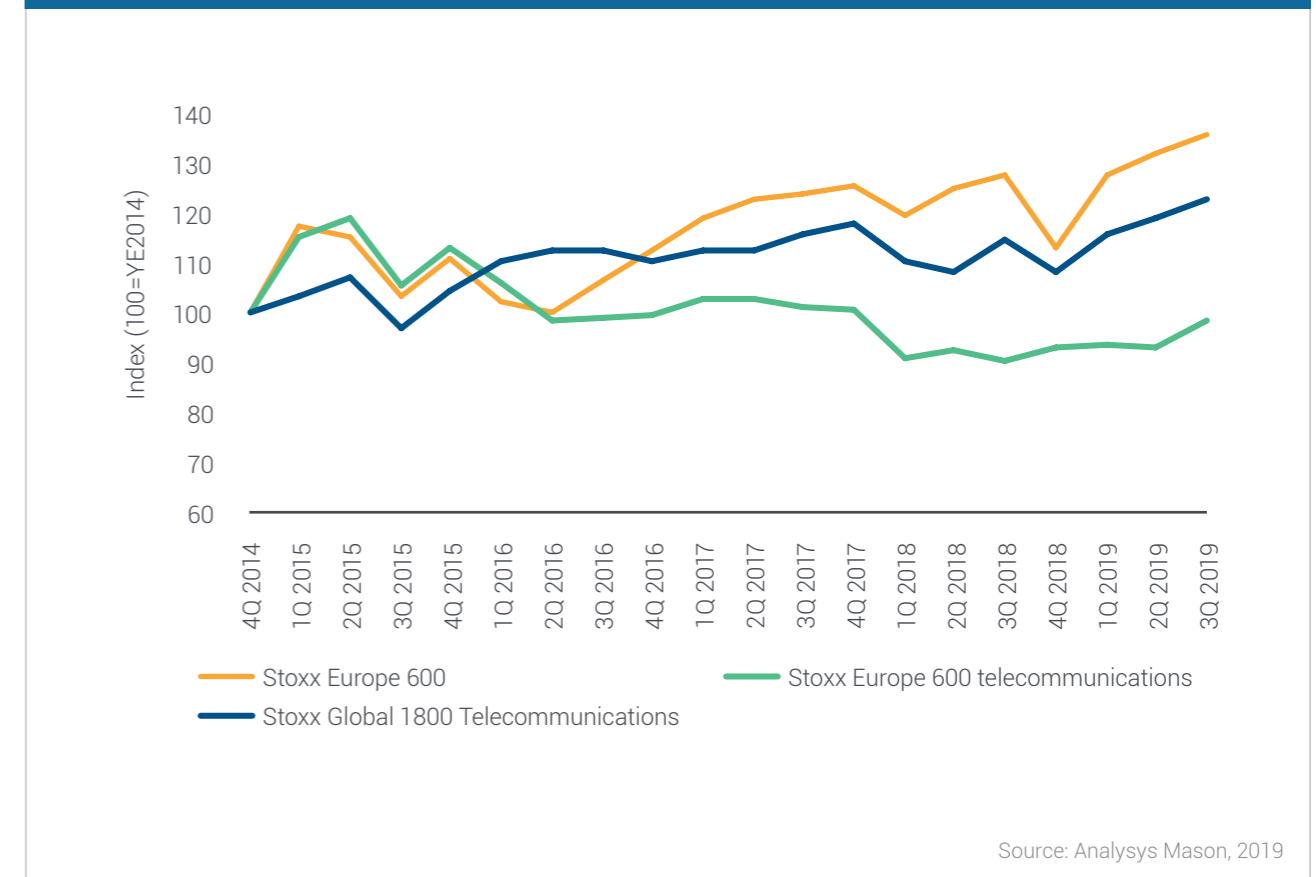
Investment in future efficiency is not the same as simple cost-cutting. Transformation is hard and it takes time to deliver results. This is something the markets do not always understand. European operators still have to invest a great deal in order to be best-of-breed efficient.

Enterprise value/EBITDA multiples are extremely low in the sector, particularly in Europe. This can of course be attributed in part to high EBITDA margins, but the multiple is just about the lowest of any vertical and significantly lower than utilities.[17]

---

[17] See Damodaran Online, Jan 2019

Figure 3.9: EV/EBITDA, ETNO members and others, end of last FY

Source: Analysys Mason, 2019
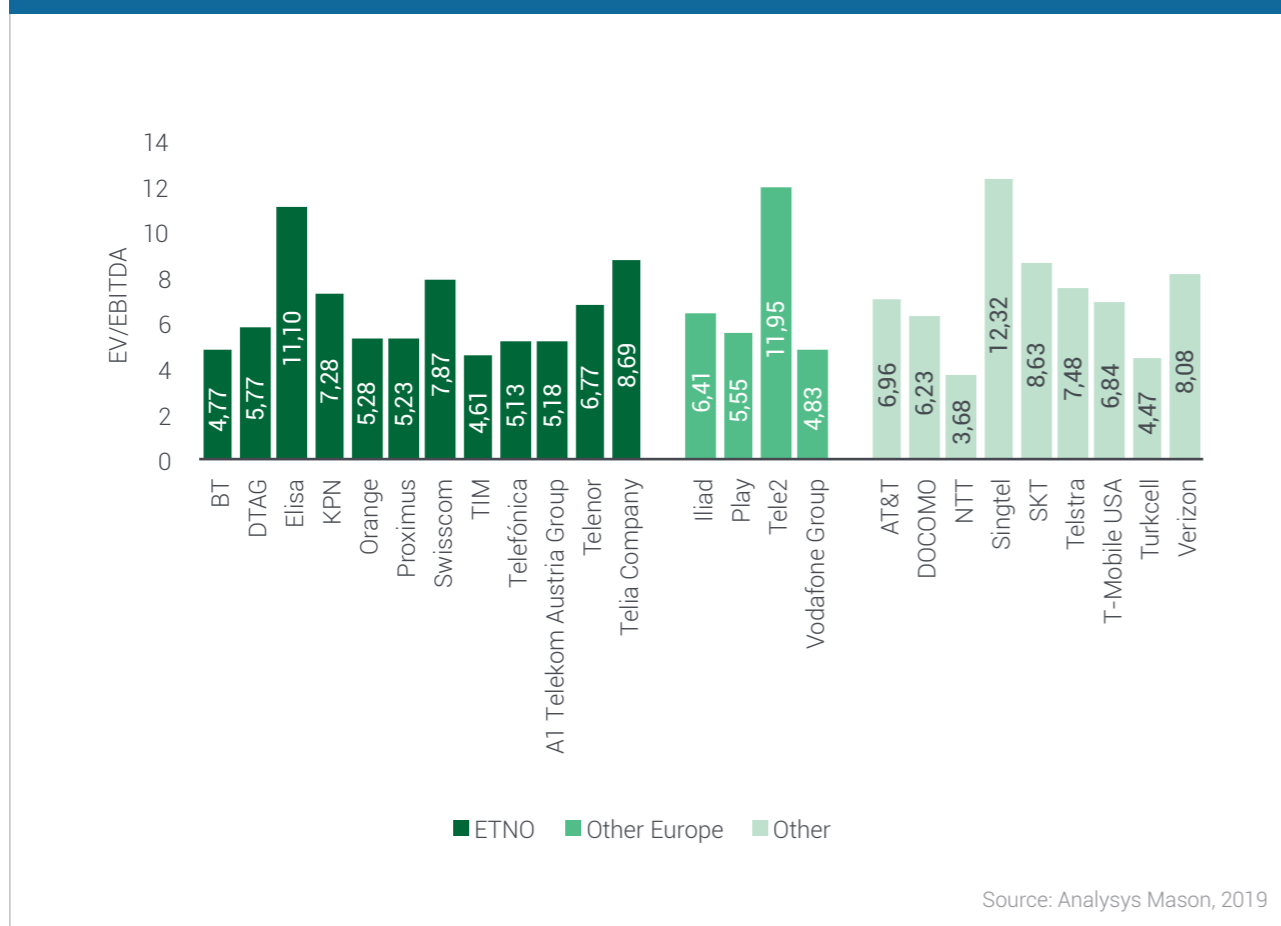
Positive goals therefore have to be squared with responsibility to shareholders. Sometimes these go hand-in-hand, sometimes they add additional cost. However, avoidable external factors can also get in the way of doing the right thing for the long term. These are outlined in the following sections.

THE UNEVEN COST AND RELEASE OF 5G SPECTRUM

There is a level of industry consensus that 5G represents an opportunity to expand business opportunities and economies.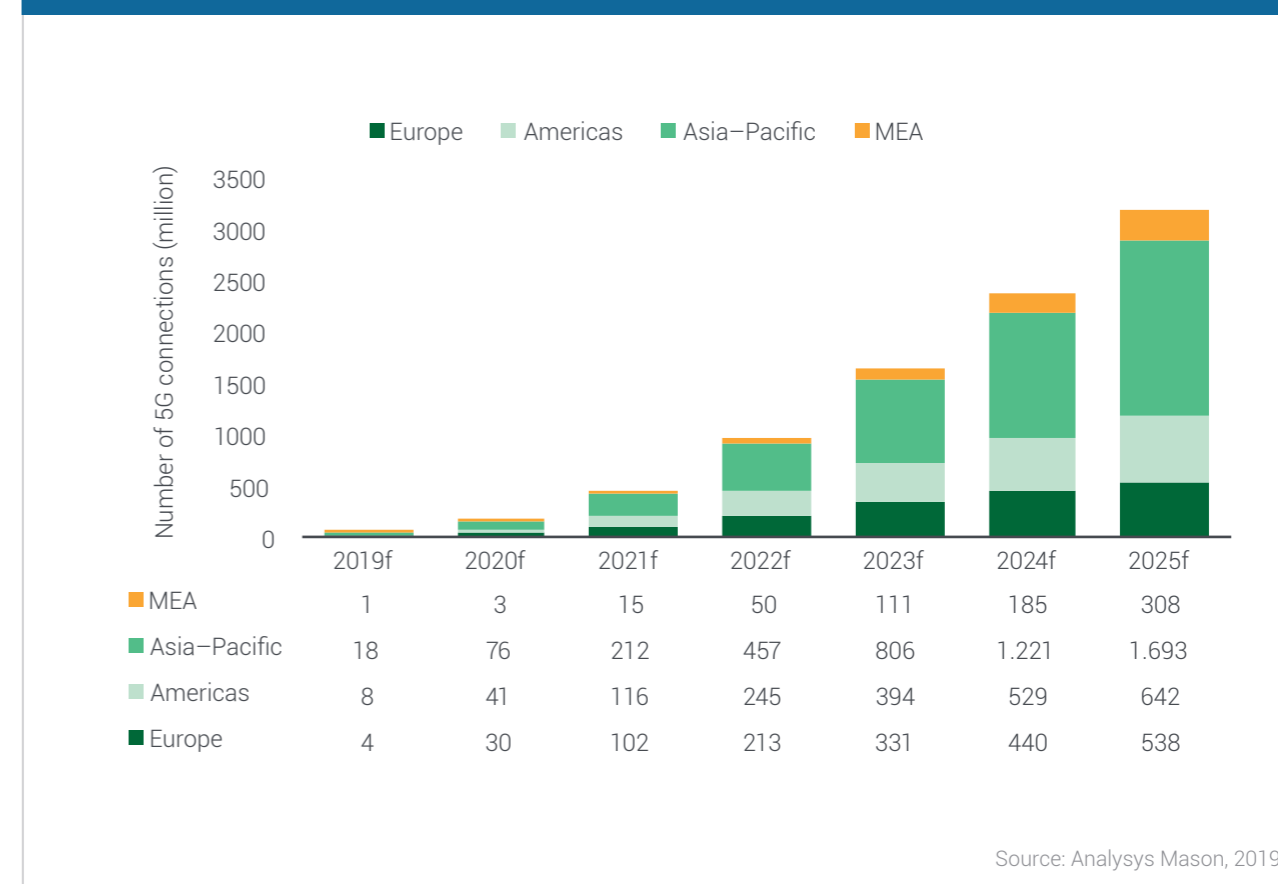 Long-term economic development requires Europe to be a leading adopter of 5G and related / adjacent technologies in order to support industry sectors. One way of looking at 5G is the number of connections, but the true additional value of 5G will be:

- in its ability to offer hugely differentiated services from massive IoT to ultra-low-latency to mission critical services over a common infrastructure

- in the capability of an expanded / converged 5G core to marshal network resources not only from the 5G RAN but also from Wi-Fi and fixed networks

Figure 3.10: Forecast for the number of 5G connections 2018−2025

	2019f	2020f	2021f	2022f	2023f	2024f	2025f
MEA	1	3	15	50	111	185	308
Asia−Pacific	18	76	212	457	806	1.221	1.693
Americas	8	41	116	245	394	529	642
Europe	4	30	102	213	331	440	538

Source: Analysys Mason, 2019

A handful of European countries now have 5G networks up and running. However, the roll-out in some non-European countries has been much more intense. In South Korea, China (pre-commercial launch) and arguably in Japan and the USA, the general trend has been to build, monetise with consumer, and identify new opportunities. For many operators in Europe, which are already spending heavily to upgrade infrastructure and which are already beset by hyper-competition, the order has been different − put a stake in the ground (follow as far as necessary), identify opportunities, then build out on that basis. This means that European operators − and European businesses and consumers − may continue to be behind the curve.

European jurisdictions have not, with only a few exceptions, taken such a proactive view on the national importance of the economic and societal value of 5G and FTTP as jurisdictions like China, South Korea and Japan (even though some of the societal goals intended in China in particular are unlikely to be shared in Europe). In these markets, 5G and fibre networks are treated as critical national infrastructure. Instead, European governments have sometimes appeared to prioritise monetising spectrum, hence creating supply-side bottlenecks that can work against longer-term economic and societal goals.

Slow and patchy release, plus artificially high cost of spectrum, hold back the market. The following figures show the varying speeds at which spectrum has been released across the continent.

Figure 3.11: State of development of 5G spectrum auctions in European countries, latest
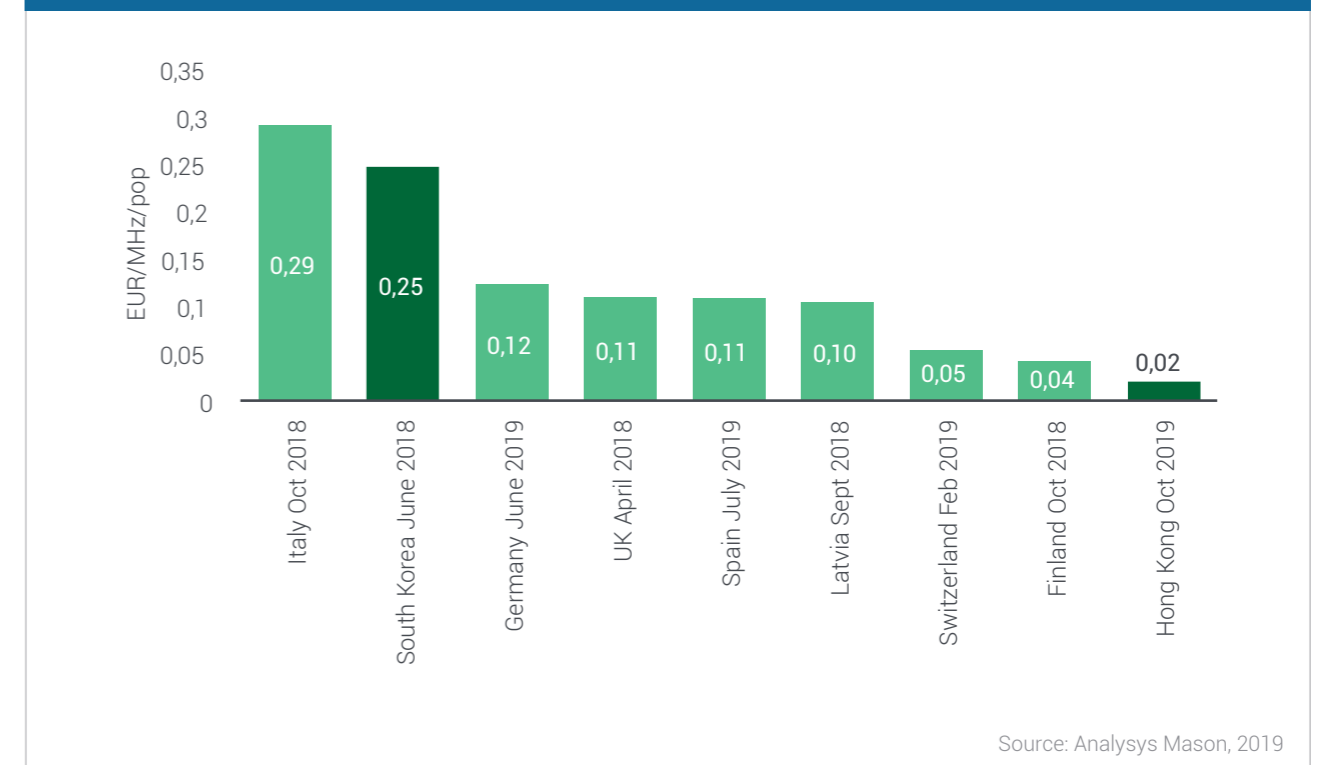
Country	700MHz	3.4GHz	3.5GHz	3.6GHz	3.7GHz	mmWave
Austria	consultation opened	auction concluded	auction concluded	auction concluded	auction concluded	
Belgium	auction announced	consultation opened	consultation opened	auction announced	consultation opened	
Bulgaria		consultation opened	consultation opened	consultation opened	consultation opened	
Croatia	auction announced	auction announced	auction announced	auction announced	auction announced	
Czech Republic	auction proposed	auction concluded	auction concluded	auction concluded	auction concluded	
Denmark	consultation concluded					
Estonia	consultation concluded	consultation concluded	consultation concluded	auction announced	consultation concluded	
Finland	auction concluded	auction concluded	auction concluded	auction concluded	auction concluded	
France	auction concluded	auction announced	auction announced	auction announced	auction announced	
Germany	auction concluded	auction concluded	auction concluded	auction concluded	auction announced	
Greece		auction announced	auction announced	auction announced	auction announced	
Hungary	auction proposed			auction announced		
Iceland	auction concluded					
Ireland	consultation opened	auction concluded	auction concluded	auction concluded	auction concluded	auction concluded
Italy	auction concluded	consultation opened	consultation opened	auction concluded	auction concluded	auction concluded
Latvia		auction concluded		auction concluded	auction concluded	
Lithuania		consultation opened	consultation opened	consultation opened	consultation opened	
Malta	auction proposed					
Netherlands	consultation opened					
Norway	auction concluded					
Poland	consultation opened	consultation opened	consultation opened	auction announced	auction announced	
Portugal	consultation concluded			consultation concluded		consultation concluded
Romania	consultation opened	consultation opened	consultation opened	consultation opened		
Slovenia		auction announced				auction proposed
Spain	auction proposed	auction proposed	auction proposed	auction concluded	auction concluded	
Sweden	auction concluded	auction announced	auction announced	auction announced	auction announced	auction announced
Switzerland	auction proposed	auction concluded	auction concluded	auction concluded		
United Kingdom	consultation opened	auction concluded	auction concluded	consultation opened	consultation opened	

Source: Analysys Mason, 2019

While 5G, like 4G, will not prove the cash bonanza that was 3G, the sums already spent are high, and the spend per MHz/pop is improbably uneven relative to likely demand.

Figure 3.12: C-band (3400-3800MHz) spectrum prices, normalised, by November 2019

	EUR/MHz/pop
Italy Oct 2018	0,29
South Korea June 2018	0,25
Germany June 2019	0,12
UK April 2018	0,11
Spain July 2019	0,11
Latvia Sept 2018	0,10
Switzerland Feb 2019	0,05
Finland Oct 2018	0,04
Hong Kong Oct 2019	0,02

Source: Analysys Mason, 2019

As of November 2019, EUR17.4 billion had been spent at 5G auctions.

Figure 3.13: Prices paid at auction for 3G, 4G and 5G licences, 2000—to date

Chart: EUR billion (y-axis)

- 3G: 109,7
- 4G: 38,4
- 5G: 17,4 (with 22.0 (forecast) shown in dashed box)

Source: Analysys Mason, 2019
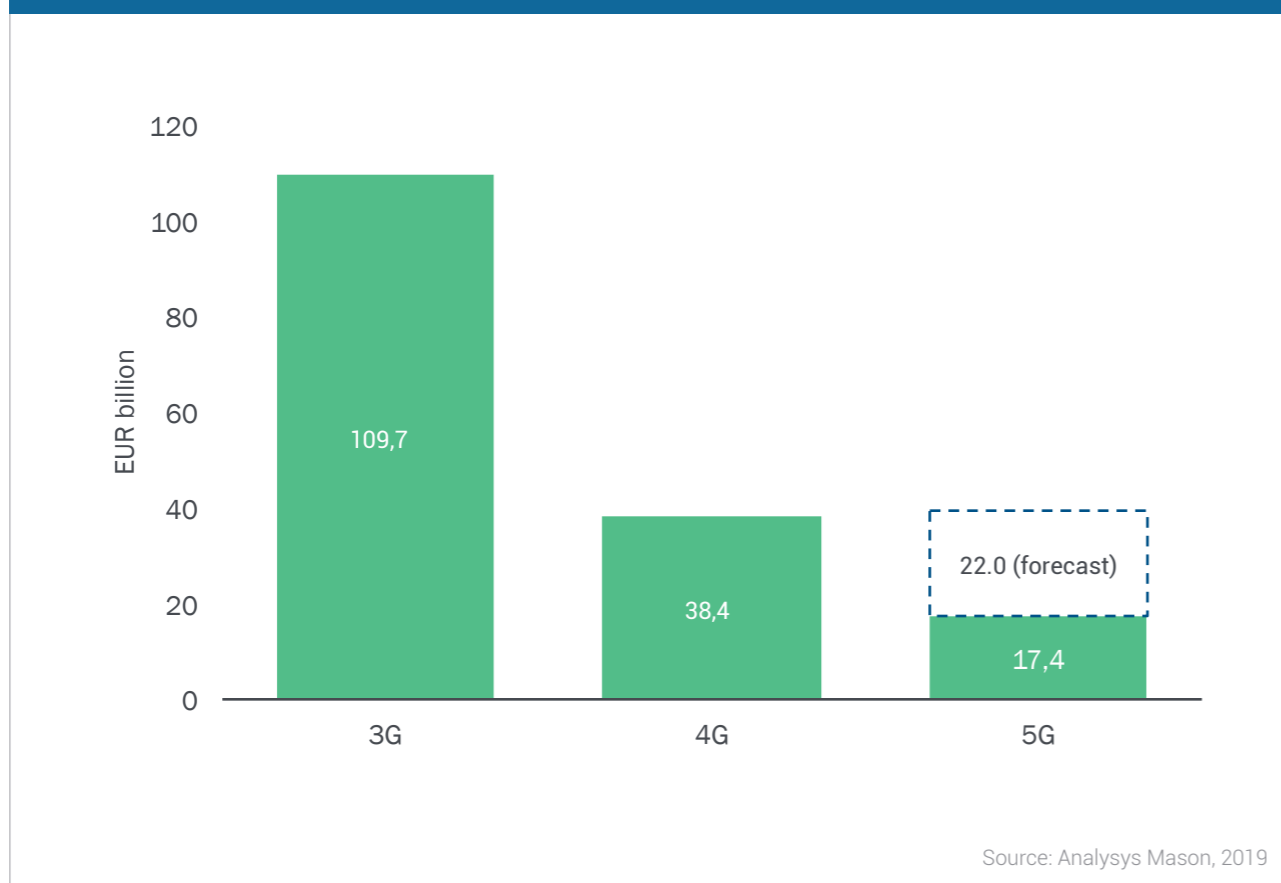
There is an opportunity cost associated with the amount spent at 5G auctions. Unlike, say, spend on rolling out physical networks, spectrum auctions are immovable one-offs; operators cannot decide to defer spending until some later point, although actual payment of the amount bid can sometimes be staggered in a non-linear way. Spend at the current round of 5G auctions has a direct impact on ability to invest in, for example, FTTP; regions where the business-case is more marginal or risky may not benefit from the most future-proof or efficient networks.

For example, EUR4.35 billion was spent on what was just half of the C-band in Italy in 2018. If one assumes that the average cost per premises passed for FTTP in the last 10% of most rural properties in Italy (or anywhere else for that matter) is EUR2000, then 2.2 million premises (or all of them in Italy) could be supplied.

Figure 3.14: Opportunity cost examples for spectrum licences

EUR4,35 billion =

- 2.2 million rural homes passed FTTP
- Over 20 000 new base stations
- About 125 million person hours of ICT training

Source: Analysys Mason, 2019
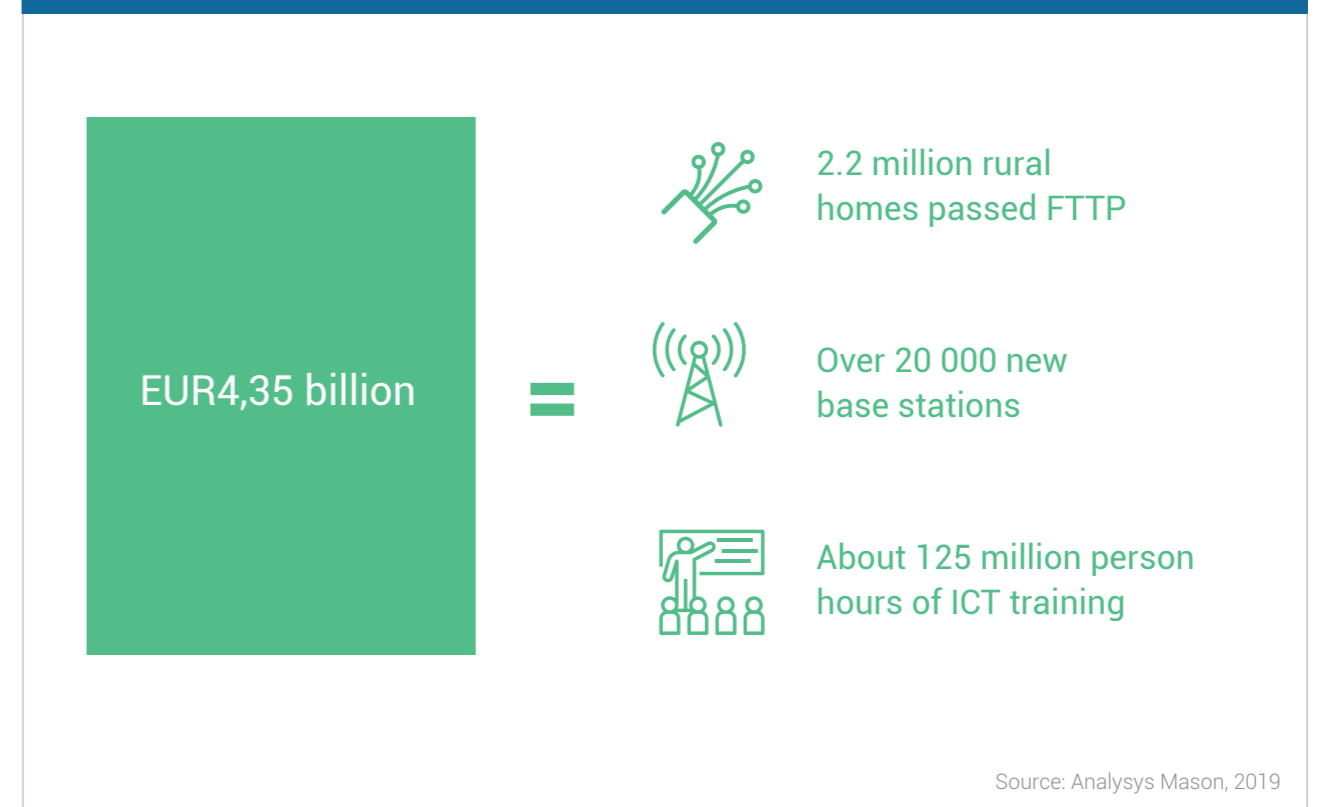
Not every jurisdiction conducts auctions for mobile spectrum. Japan for example conducted a 'beauty contest' for 5G spectrum licences in 2019. Some jurisdictions do recognise the opportunity cost and have adapted their regimes. For example, renewal of some licences in France has been granted in exchange for commitment to better rural mobile coverage. However, there is no consistency of approach across the continent. While it must be recognised that money raised by auctions goes on important public expenditure, some auctions appear to be designed to extract the maximum bids and appear not give sufficient consideration to the public benefits of new networks.

Carving out spectrum for local licences aimed at industrial verticals risks reducing the overall benefits of 5G at national levels. 5G technology creates the ability for verticals to create virtual, and, if required, local, slices of national networks, whereby they benefit from operational control of the network, but the efficiency and reusability of a national physical network is maintained.

While European fixed networks are in an era of fiberisation of the local loop, European mobile networks have on the whole not yet densified beyond the macrocell grid to any great extent. Future versions of 5G, especially those that rely on higher frequencies, plus new smart city and transport use cases will require densification. Density of mobile infrastructure (cell sectors per head of population) remains far lower in Europe than Japan, South Korea and China, although it is broadly comparable to the USA in this respect. To densify mobile networks efficiently, existing infrastructure at street level will have to be used, but this often relies on slow local decision making. Moreover, municipalities in Europe often treat access to public infrastructure as a short-term cash generators rather than consider the longer-term commercial and social benefits of the networks. In this context, network sharing agreements are proving essential to support the sustainability of mobile network investment.

FTTP OUTCOMES ARE POSITIVE,
## BUT REQUIRE AN IMPROVED INVESTMENT CLIMATE

FTTP has very attractive long-term outcomes both for operator total cost of ownership and for social / environmental goals. Although 2018 and 2019 saw a large uptick in investor interest and confidence in FTTP in Europe, even in areas that might a couple of years ago be thought of as uneconomic, it nevertheless requires significant public commitment if anything like the EGS 2025 coverage targets are to be met.

Figure 3.15: Premises passed by FTTx, FTTP and DOCSIS3.0+, Europe, 2012-2025f

Source: Analysys Mason, 2019
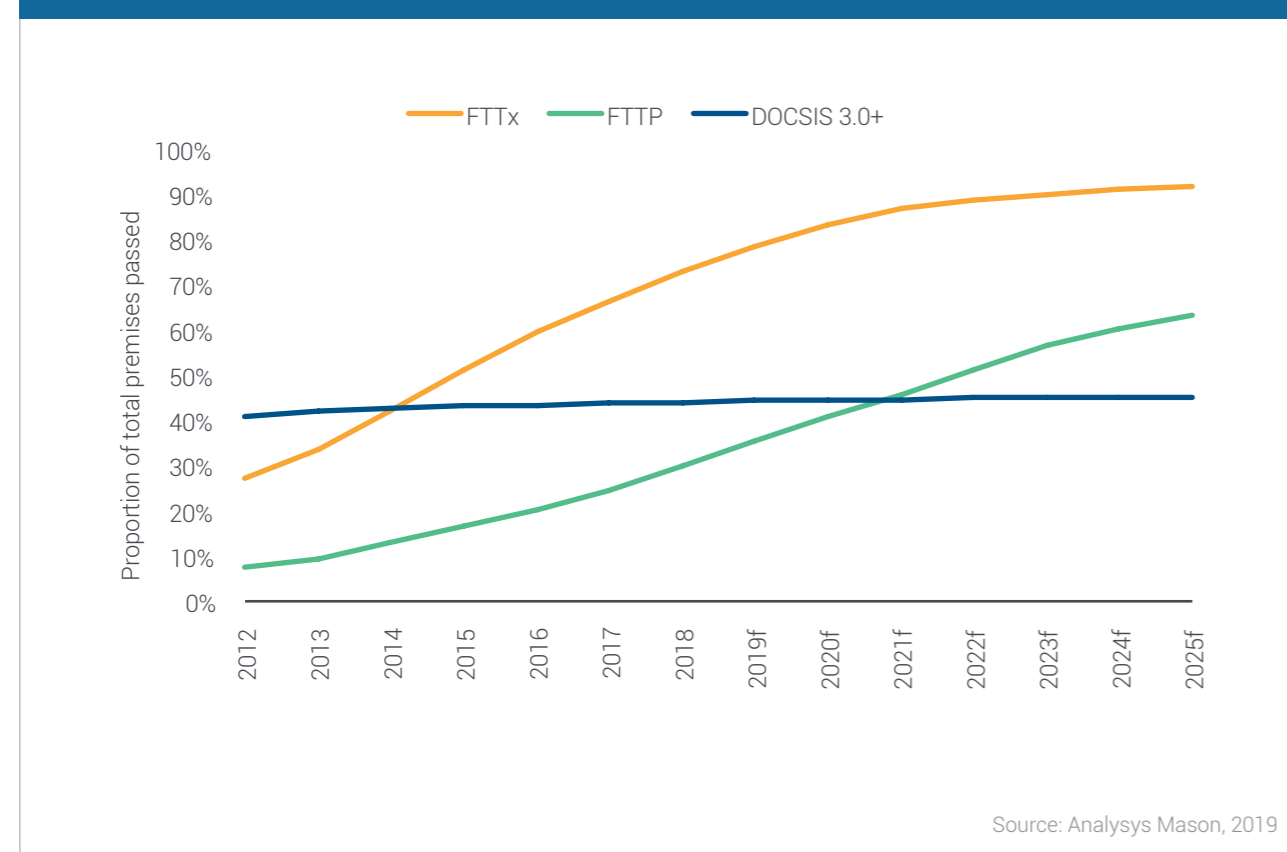
Analysys Mason forecasts that 63% of the roughly 270m premises will be covered by FTTP access and 66% will have either DOCSIS3.1 or FTTP access by 2025, and that over 95% of the total FTTP CapEx by then (EUR120 billion) will have been privately funded. If we assume that incentives to increase private investment do not change, and that all the rest of unpassed premises would require subsidy over and above an average private contribution of EUR600 per premises, we conclude that: it would cost about EUR151.0 billion additional CapEx to reach 99% of premises, bearing in mind that some of the fibre would already be in place (as part of existing FTTC and HFC networks).
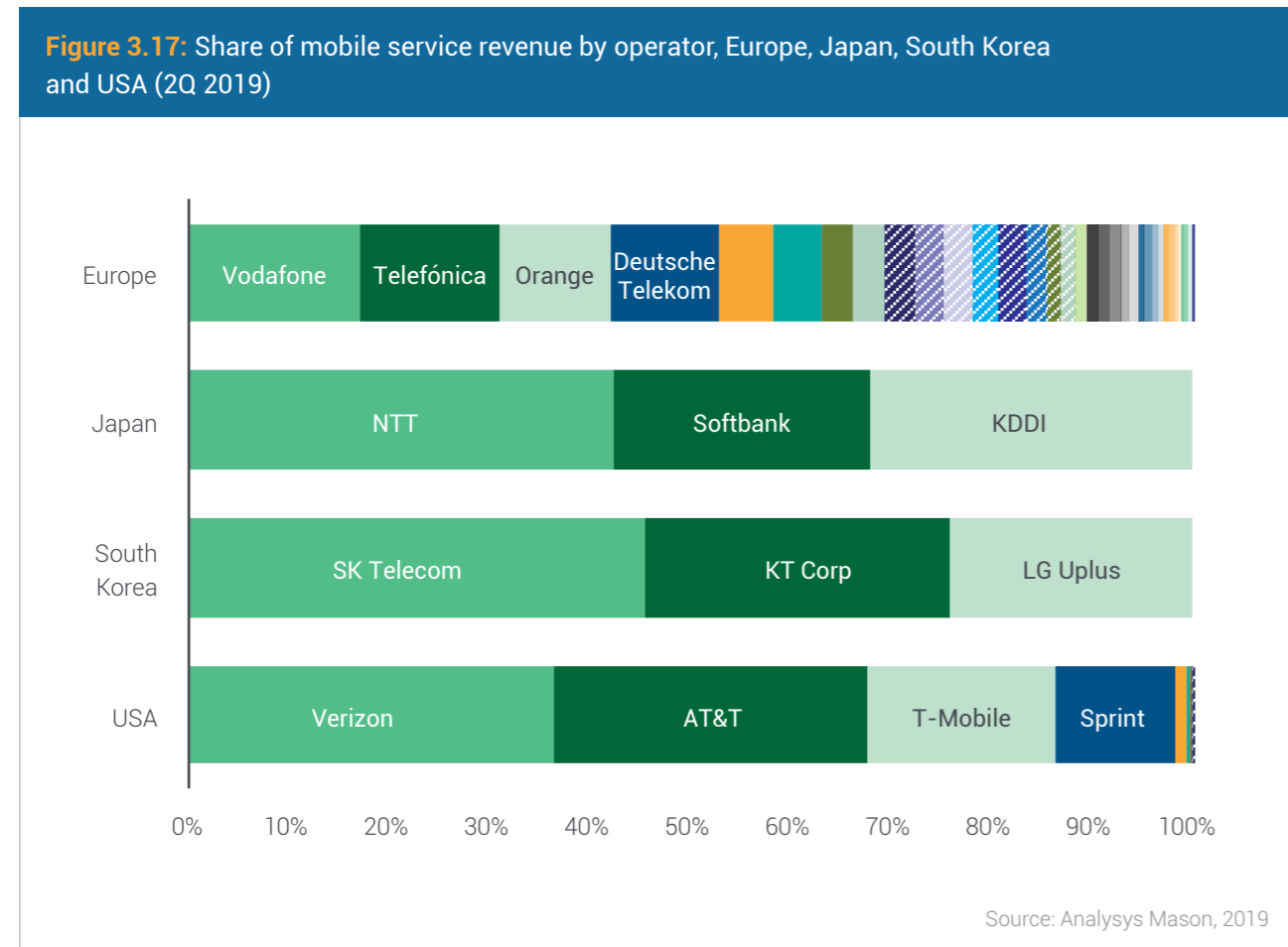

Figure 3.16: Additional cost to reach 99% of premises with FTTP

Source: Analysys Mason, 2019
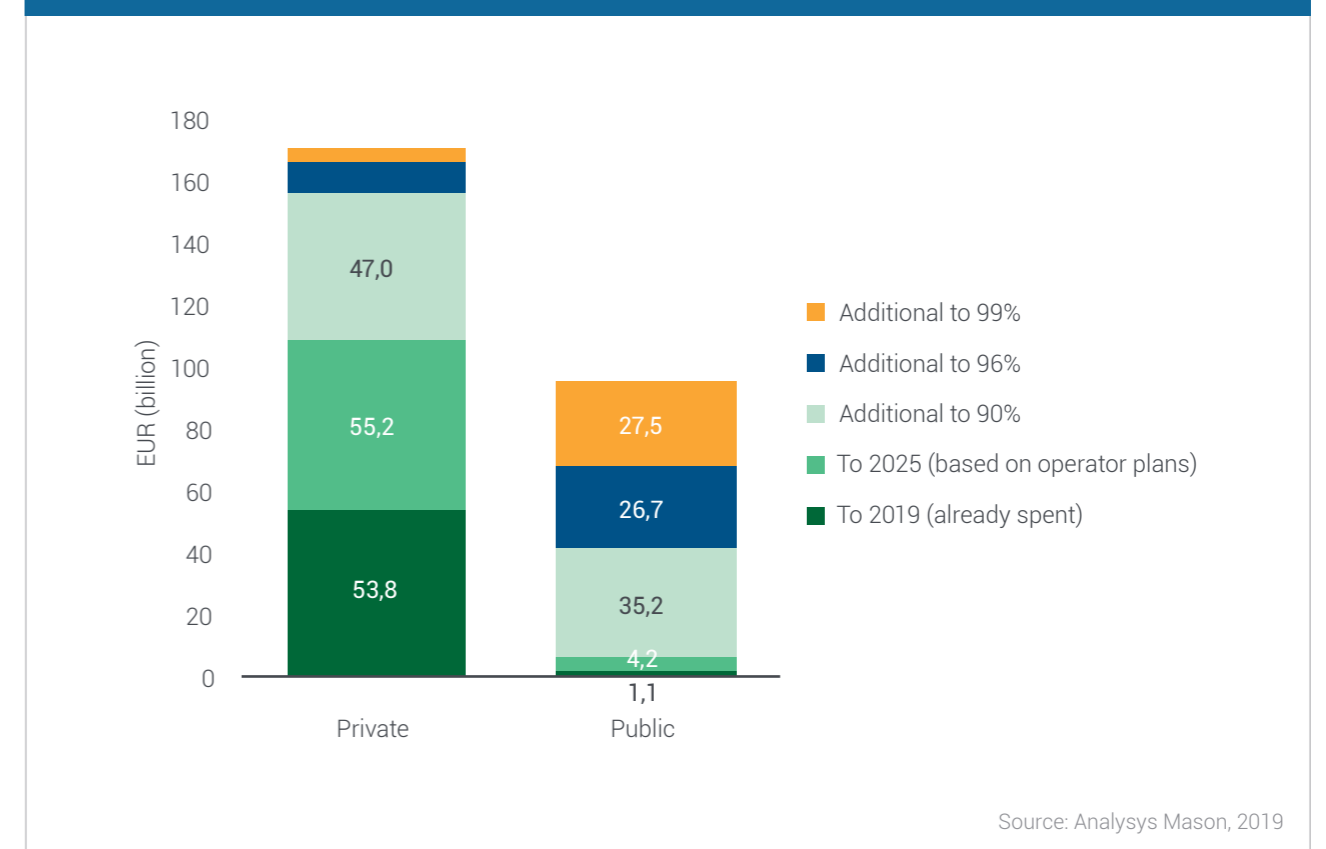
These figures exclude final customer connection costs that could increase overall costs by another 25%-30%, but this sum could in part be clawed back from the customer. The private spend would have to be met either through raised CapEx intensity of existing operators, or spread over a longer period of investment, or met through new infrastructure-focused entities. Furthermore, supply-side constraints (skills, labour etc.) may further slow roll-out. For this reason, a combination of pro-investment regulatory approach for fibre and robust demand-side policies appear to be necessary in order to meet Europe's own political targets.

8.3   THE ABSENCE OF A HARMONISED SINGLE MARKET HAS LEFT THE EUROPEAN LANDSCAPE VERY FRAGMENTED

The European telecoms market has not consistently consolidated or coalesced, and despite framework regulation it cannot accurately be described as a single market, at least not in the same sense as large countries like the USA, Japan or China. Real harmonisation of spectrum allocation criteria is still lacking. The mobile retail market is highly fragmented; the four largest operators control only about half of the total market.

Figure 3.17: Share of mobile service revenue by operator, Europe, Japan, South Korea and USA (2Q 2019)

Source: Analysys Mason, 2019

In fixed telecoms the difference is a little less stark because of other players' share in the USA, Japan and South Korea, but nonetheless operating groups are spread more thinly in Europe.

Figure 3.18: : Share of fixed broadband retail revenue by operator, Europe, Japan, South Korea and the USA (2Q 2019)

Source: Analysys Mason, 2019
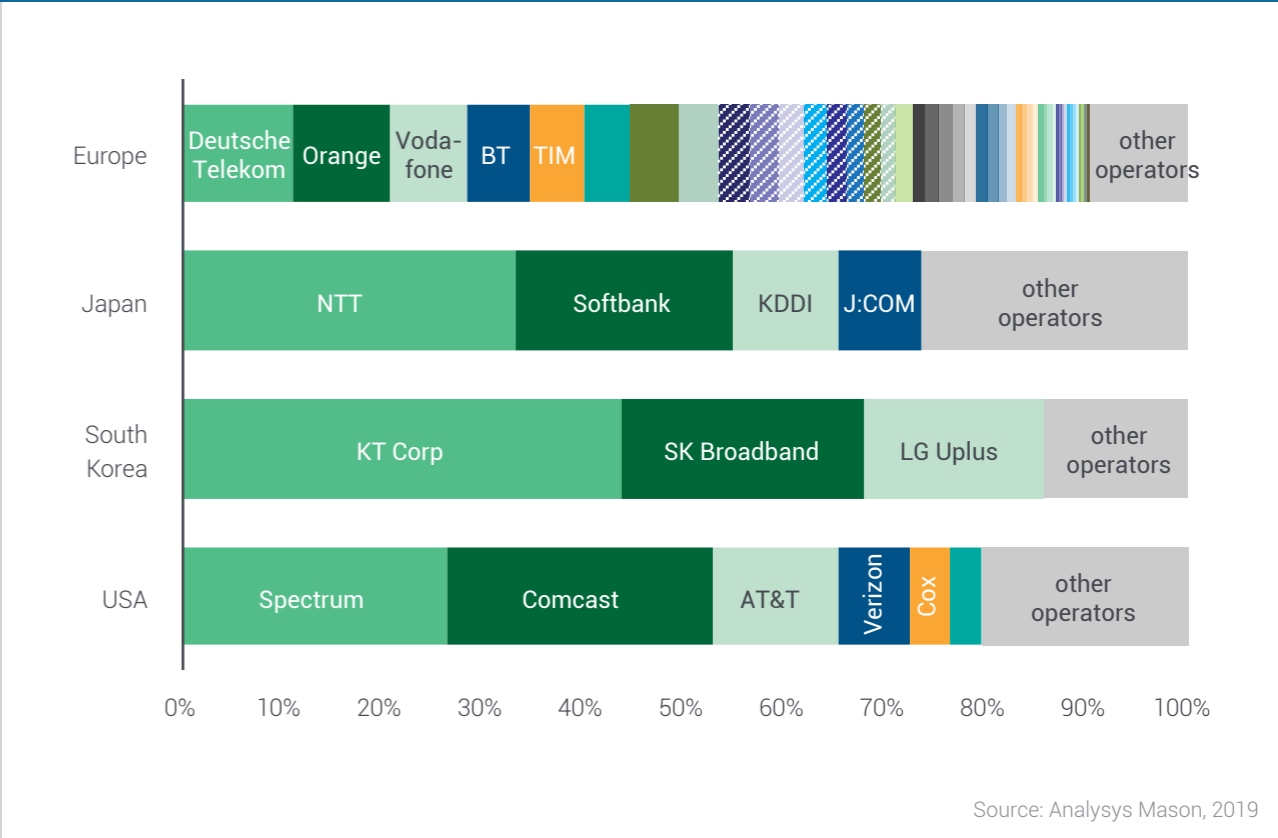
This absence of concentration is of course not the same as consumer choice. Most individual national European markets have three or four MNOs: the USA is seeing one merger and might get one major new player; Japan gets a brand-new national entrant with 5G. The fixed market Europe is less clearly defined than mobile, but shows the same overall absence of concentration. In fact, it is difficult to discern any great appetite for intra-European consolidation under current conditions now that the vogue for fixed+mobile mergers appears to have run its course.

EUROPEAN OPERATORS ARE SUBJECT TO A LEVEL OF REGULATION AND SCRUTINY THAT BIG TECH IS NOT

There is an asymmetry of regulation between digital and telco in terms of security, confidentiality and transparency. Operators are subject to extra layers of privacy regulation, for example on metadata. This is not only inconsistent with respect to the GDPR, but it also creates an asymmetry in terms of competitiveness. Tax authorities expect operators to pay tax on a fair basis, but have to request that OTT players do so.

The OECD unified approach to taxation of multinational enterprises with digital businesses and non-routine margins is broadly to be welcomed as it attempts to redress clear imbalances by redefining taxable presence as 'digital' presence rather than the older strictly 'physical' presence. However, other consumer-facing MNEs adopting increasingly digital business models may also see their tax bill rise. Operators/ETNO members have routine margins, have made significant physical and tangible investments in the infrastructure of a country, have heavily-regulated revenues generated, monetised and subject to tax within that same market jurisdiction, and it is important that they should not be the target of any new international tax rules, or that any risk of double taxation is avoided.

FOCUSING ON A COMMON GOAL: DELIVERING EUROPEAN DIGITAL LEADERSHIP

This report shows that increased investment in 5G and fibre networks is a major enabler of economic growth as well as a potential accelerator of sustainability.

For this reason, regulation should not hinder the roll-out of something that provides an excellent and desired outcome for Europeans. Symmetrical (de-)regulation of access will probably deliver a good level of investment and a flourishing commercial wholesale sector in fixed. The current model will not deliver these benefits for end users, due to the creation of multiple parallel regulated entry points for access-seekers with very different levels of commitment to invest. Moreover, maintaining regulation-based services relying on copper networks should not stand in the way of replacing these with full fibre.

This check on investment will end up affecting end users directly, even though they currently benefit from affordable prices. It also means that European operators have reduced ability to invest in innovative, riskier and higher-growth sectors of the digital economy, even though they are in a strong position within the ecosystem to do so. This not only affects operators, but it also ultimately inhibits the growth and the breadth of the European digital economy.

Telecoms operators are businesses and they operate in a business-driven environment. That can sometimes lead to a hyper-commercialisation where every element in the production chain / value chain from physical infrastructure, passive network infrastructure and spectrum upwards has a price, and where social and/ or environmental targets are expected to be met but with little financial help or incentive. In less purely transactional environments, where infrastructure and spectrum are treated as being of critical national importance, the development of networks and broader ICT infrastructure has tended to be faster, and this would only be of benefit to the European digitalising economy. Moreover, it should also bring swifter benefits in terms of cleaner and more efficient networks, and the knock-on environmental benefits to Europeans of efficient and effective ICT infrastructure.
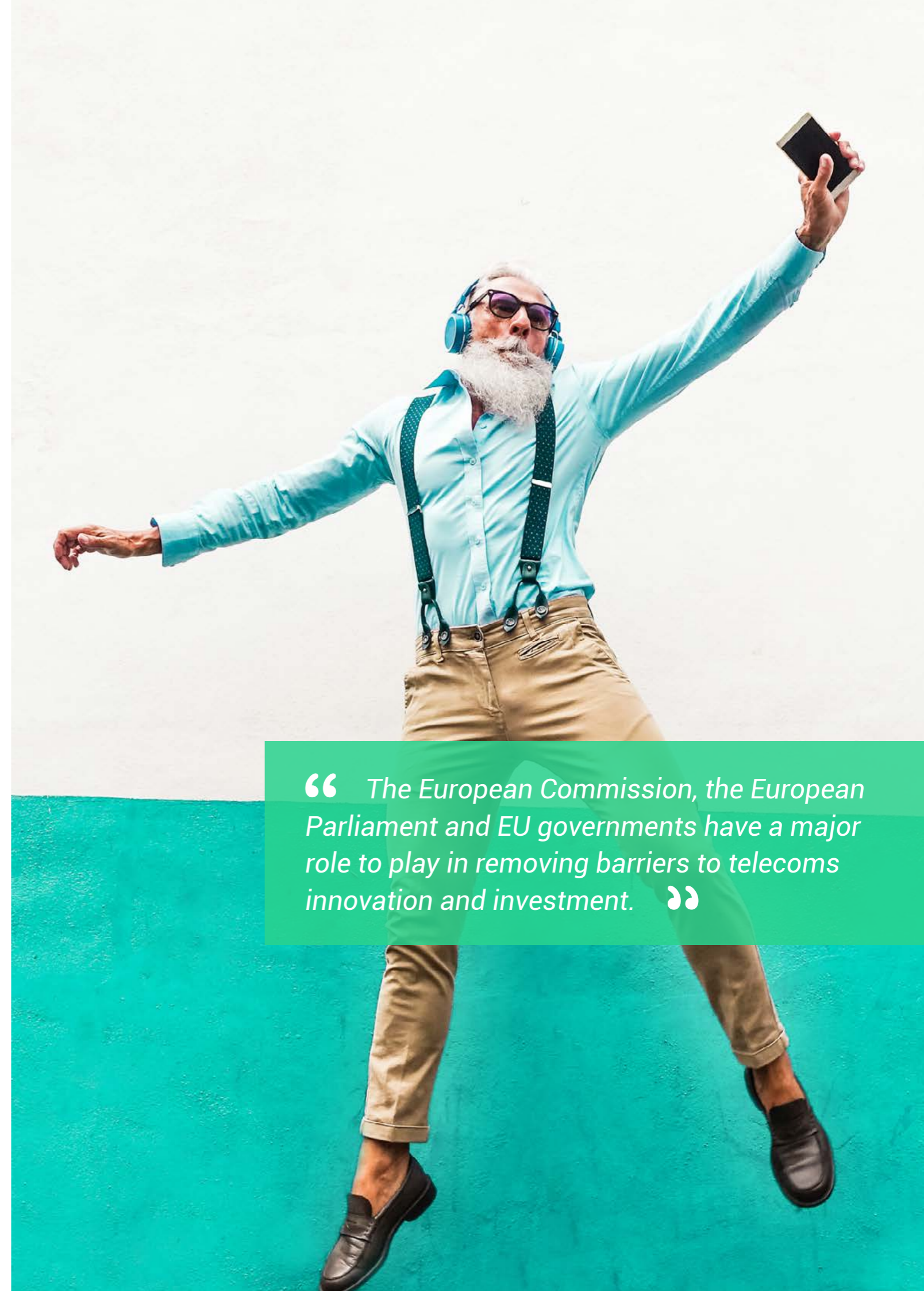
> " *The European Commission, the European Parliament and EU governments have a major role to play in removing barriers to telecoms innovation and investment.* "

ETNO Members

Albania	Austria	Belgium	Bosnia and Herzegovina
ALBtelecom	A1 Telekom Austria Group	proximus	bh

Bulgaria	Croatia	Cyprus	Denmark
VIVACOM	Hrvatski Telekom	cyta	TDC

Finland	France	France	Germany	Greece
elisa	tdf	orange	T	OTE

Hungary	Iceland	Italy	Lithuania	Luxembourg
T	Síminn	TIM	Telia Company	Post LUXEMBOURG

Macedonia	Malta	Netherlands	Netherlands	Norway
T	GO	kpn	UNITED GROUP	telenor

Poland	Portugal	Romania	Serbia	Slovakia
orange	altice	T	Telekom Srbija	T

Slovenia	Spain	Sweden	Switzerland	UK
TelekomSlovenije	Telefónica	Telia Company	swisscom	BT

ETNO Observers

China	Finland	Italy	Sweden	USA
HUAWEI	NOKIA	Prysmian Group	ERICSSON	at&t

USA	USA	USA
CISCO	QUALCOMM	verizon

etno

European Telecommunications
Network Operators' Association

info@etno.eu
Tel: +32 (0)2 219 3242
www.etno.eu

#StateofDigi

@ETNOAssociation

Subscribe to our weekly **digital newsletter**