



The Mobile Economy **Europe** **2022**



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Contents

	Executive summary	2
1	The mobile market in numbers	9
1.1	Mobile adoption increasing but slowly	10
1.2	5G accelerates but 4G remains dominant	11
1.3	Smartphone adoption and data traffic on the rise	12
1.4	Macroeconomic pressures weigh on revenue growth	14
2	Key trends shaping the digital landscape	15
2.1	5G: momentum continues to build	16
2.2	The telco of the future: European operators lead the way in use of renewable energy	20
2.3	Revenue diversification takes priority	22
3	Mobile contributing to economic growth and social progress	25
3.1	Mobile's contribution to economic growth	26
3.2	Mobile enhancing digital inclusion	29
3.3	The mobile industry's impact on the SDGs	31
4	Policies to realise the digital agenda	33
4.1	Enabling policies to stimulate innovation and investment	35
4.2	Driving affordable 5G for all through spectrum availability	37

Executive summary



Connectivity set to power post-pandemic economic recovery

Mobile networks are vital to economic recovery and realising green and digital transformation across Europe.

The economic toll of the Covid-19 pandemic has been exacerbated by the crisis in Ukraine and the related impact on energy prices, and supply-chain disruption. Governments are keen to build resilient, sustainable and inclusive economies that can withstand current and future shocks. Digital technologies, with mobile at the core, have been a lifeline during the pandemic and are playing a crucial role as a 'new normal' unfolds in the way people and businesses interact with the society and environment around them.

Mobile networks are vital to economic recovery and realising green and digital transformation across Europe. Two years into the EU's Digital Decade, the connectivity target of 'Gigabit for everyone, 5G everywhere' has never felt more urgent. The Digital Europe Programme, the Connecting Europe Facility and the recovery funds provided to EU Member States offer an opportunity for operators to partner with governments to improve connectivity across society and drive post-pandemic economic recovery across the region.



5G accelerates but 4G remains dominant

The majority of countries in Europe have now deployed commercial 5G services, and nearly two thirds of operators in the region have launched 5G networks. 5G adoption is gaining momentum in Europe, supported by an expanding 5G device ecosystem and strong marketing campaigns by operators. However, European markets still lag global peers such as Japan, South Korea and the US in adoption of the technology. By 2025, the UK and Germany will have the highest 5G adoption rates in Europe at 61% and 59% respectively, compared to 73% in South Korea and 68% in Japan and the US.

4G adoption in Europe will peak in 2022 and then decline. However, it is set to remain the dominant technology across the region, accounting for just over half of total connections by 2025. The pace of 5G coverage expansion across Europe will be a key factor in the transition from 4G to 5G. Although 5G network coverage in Europe will rise to 70% in 2025 (from 47% in 2021), nearly a third of the population will remain without 5G coverage. This compares to 2% or less in South Korea and the US.



Mobile adoption is still growing but slowly

In 2021, 474 million people in Europe (86% of the population) subscribed to mobile services. The total addressable market for the region's operators is approaching saturation point, with larger mobile markets accounting for the majority of new subscribers. Germany and the UK will account for more than a third of the 6 million new subscribers expected over the period to 2025. Countries in Eastern Europe, with lower penetration rates, will record the fastest subscriber growth rates over the period to 2025.

Smartphone adoption is also rising. By the end of 2021, four in five mobile connections in Europe were based on smartphones. However, variation in adoption levels among European markets means there is more room for growth in some markets than others. For example, smartphone adoption is still less than 75% in a number of markets, including Croatia, Hungary and Poland. Rising smartphone adoption and a growing array of bandwidth-hungry applications are among the key drivers of mobile data traffic in Europe, which is forecast to more than triple over the period to 2027.



Mobile continues to contribute to the economy and social wellbeing

In 2021, mobile technologies and services generated 4.5% of GDP in Europe – a contribution that amounted to approximately €760 billion of economic value added. The mobile ecosystem also supported approximately 2.6 million jobs (directly and indirectly) and made a substantial contribution to the funding of the public sector, with €109 billion raised through taxation. Over the period to 2030, 5G technologies will drive further contributions to the region's economy, impacting key industries such as manufacturing and public administration.

Beyond economic impacts, operators are making significant contributions to the welfare of society more broadly, including keeping vulnerable people connected. The humanitarian crisis in Ukraine highlights the important role of connectivity in enabling people and communities to obtain life-saving information, stay connected with loved ones, and access vital services. Since the start of the conflict, mobile operators across Europe and beyond have introduced a range of relief packages to support victims, demonstrating the role the industry plays in keeping the most vulnerable connected during difficult times.



Policymakers can help realise the digital agenda

As economies and societies around the world digitalise, the acceleration of 5G in Europe is necessary to ensure that traditional industrial and manufacturing strengths are not dragged down by weaknesses in the ICT sector. With the limitations of existing networks becoming more apparent amid an increasingly distributed workforce, there is also a need to ensure fair and even access for all.

To achieve this, it is vital to create the right conditions for private infrastructure investment, network modernisation and digital innovation. A financially sustainable mobile sector is key to the delivery of innovative services and the deployment of new networks. Policymakers should collaborate with the private sector to stimulate investment in next-generation networks that will form the backbone for Europe's economic recovery by enabling employment, entrepreneurship and innovation while helping achieve essential climate-related goals.

A financially sustainable mobile sector is key to the delivery of innovative services and the deployment of new networks.

Practical steps that authorities in Europe can take include the following:

- **Rethink competition policy and enforcement** in terms of harmonised conditions for investment and doing business.
- **Fairly allocate the costs of network traffic to the largest drivers**, to deliver an economic incentive to use network capacity more efficiently.
- **Foster supply-chain diversity and competition**, to improve network security and resilience through disaggregation and greater interoperability.
- **Adjust the regulatory framework to enable the data economy to thrive in Europe**, by ensuring a level playing field in digital markets, services and taxation.
- **Implement fair spectrum licensing conditions** and avoid excessive charges and limited durations of licences, which can undermine investment.
- **Implement cost-reduction measures and simplification for network deployment** to achieve Europe's Digital Decade connectivity targets.

The Mobile Economy Europe



Unique mobile subscribers

2021
2025

474m
480m

86%
2021

87%
2025

Penetration rate
Percentage of population



CAGR
2021-2025

0.3%



Mobile internet users

2021
2025

433m
453m

79%
2021

82%
2025

Penetration rate
Percentage of population



CAGR
2021-2025

1.1%



SIM connections

(excluding licensed cellular IoT)

2021
2025

692m
704m

Penetration rate
Percentage of population

126%
2021

128%
2025

CAGR
2021-2025
0.4%



4G

Percentage of connections
(excluding licensed cellular IoT)

2021
75%
2025
52%



5G

(excluding licensed cellular IoT)

Connections

311m
2025

Adoption

44%
2025



Smartphones

Percentage of connections
(excluding licensed cellular IoT)

2021

80%

2025

84%



Licensed cellular IoT connections

2021

172m

2025

406m



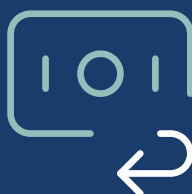
Operator revenues and investment

2021

€162bn

2025

€169bn



Total revenues

Operator capex

€122bn

2022 — 2025

90% on 5G



Mobile industry contribution to GDP

2021

€760bn 4.5% of GDP

2025

€840bn



Public funding



2021

€109bn

Mobile ecosystem contribution to public funding (before regulatory and spectrum fees)



Employment

1.4 million jobs



Directly supported by the mobile ecosystem in 2021



Plus an additional

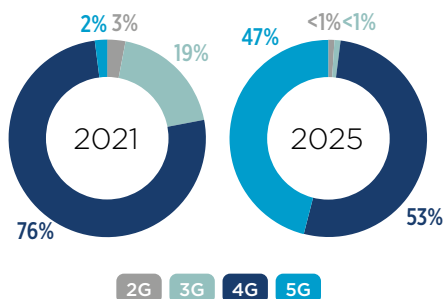
1.3 million jobs supported indirectly

Subscriber and technology trends in key markets

France



TECHNOLOGY MIX*



SUBSCRIBER PENETRATION



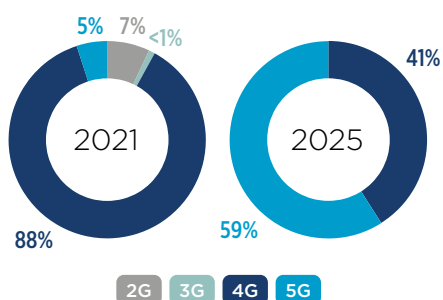
SMARTPHONE ADOPTION



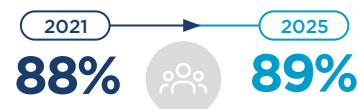
Germany



TECHNOLOGY MIX*



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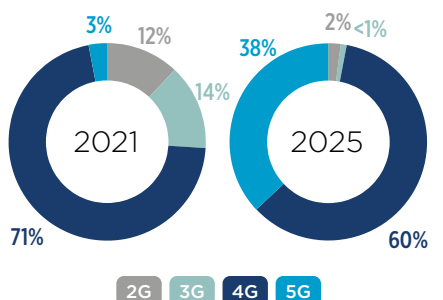
SMARTPHONE ADOPTION



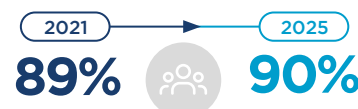
Italy



TECHNOLOGY MIX*



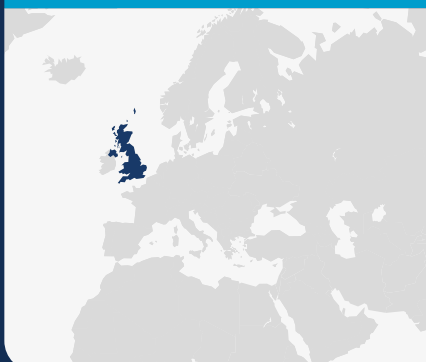
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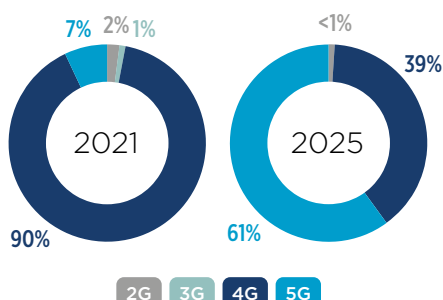
SMARTPHONE ADOPTION



UK



TECHNOLOGY MIX*



SUBSCRIBER PENETRATION



SMARTPHONE ADOPTION



* Percentage of total mobile connections (excluding licensed cellular IoT)
Note: Totals may not add up due to rounding

01

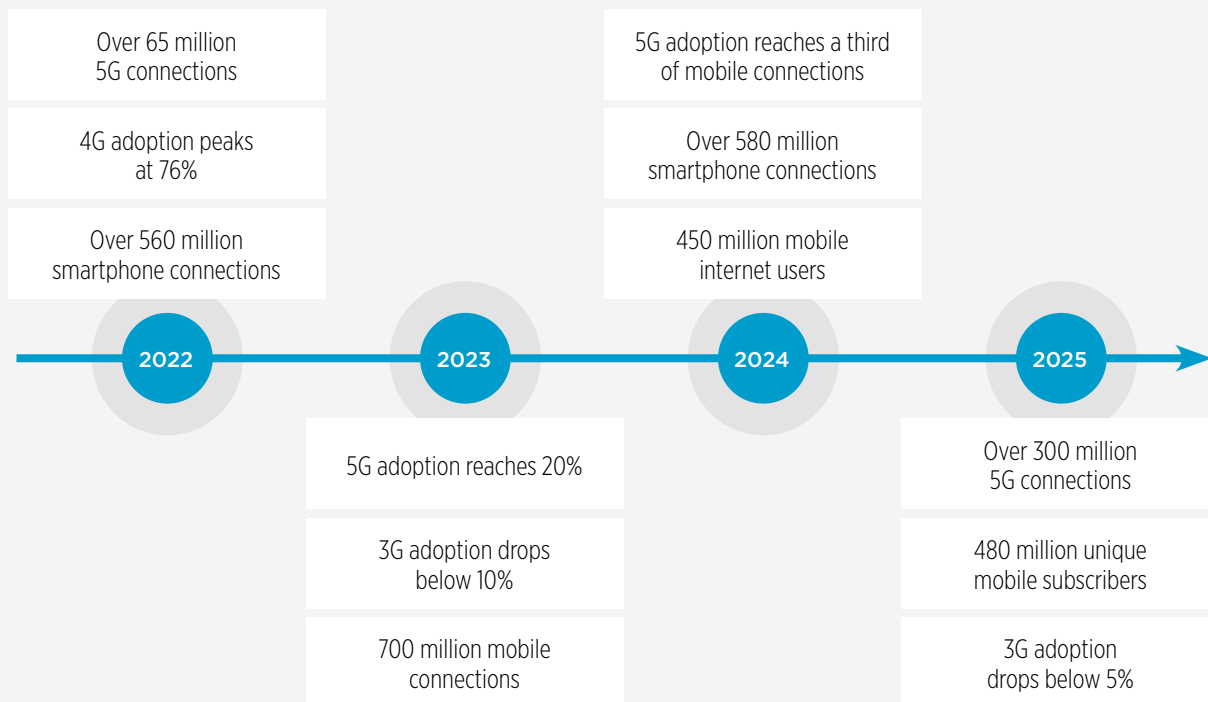
The mobile market in numbers



1.1 Mobile adoption increasing but slowly

Figure 1

Key milestones for the mobile industry in Europe

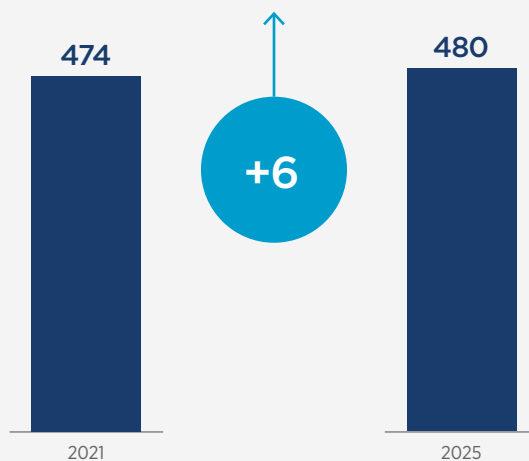


Source: GSMA Intelligence

Figure 2

Mobile subscribers to grow by 6 million in Europe by 2025

Subscribers (million)



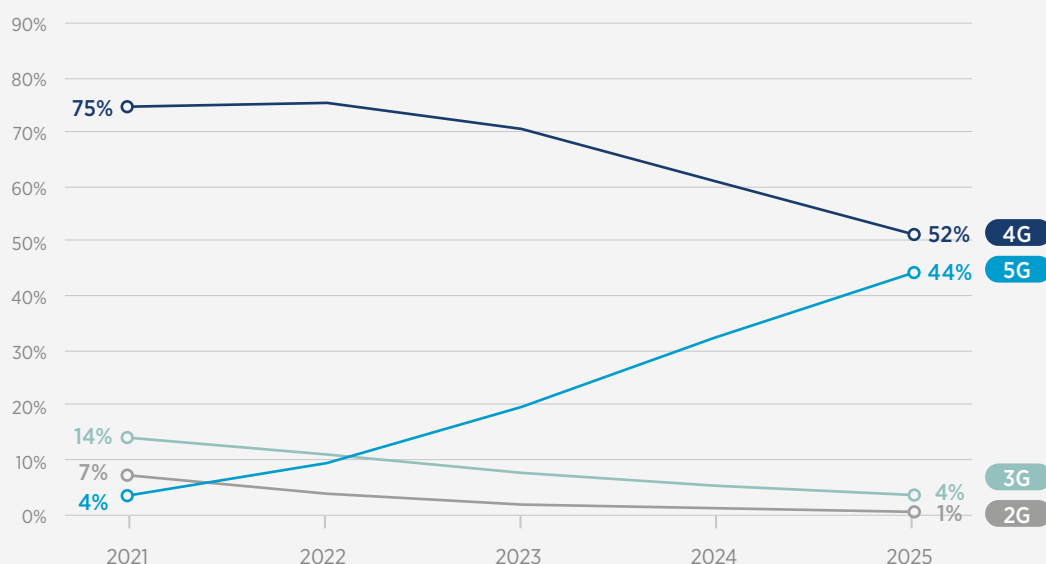
Source: GSMA Intelligence

1.2 5G accelerates but 4G remains dominant

Figure 3

5G will overtake 3G in Europe by 2023 and reduce the gap with 4G

Percentage of total connections (excluding licensed cellular IoT)



Source: GSMA Intelligence

European markets progress with plans to shut down legacy networks

Operators across Europe are increasingly outlining plans to shut down legacy (2G and 3G) networks, as the transition to 5G gathers pace. This is with a view to optimise network operations given the cost and complexity of simultaneously running multiple generations, the need to repurpose spectrum assets for more efficient 4G and 5G networks, and the opportunity to improve energy efficiency in the network (as legacy networks are less energy efficient). In addition, the standardisation and maintenance of legacy equipment is slowing, with some equipment due to lose support within a few years. This could result in higher security risks and a greater incidence of outages on 2G/3G networks.

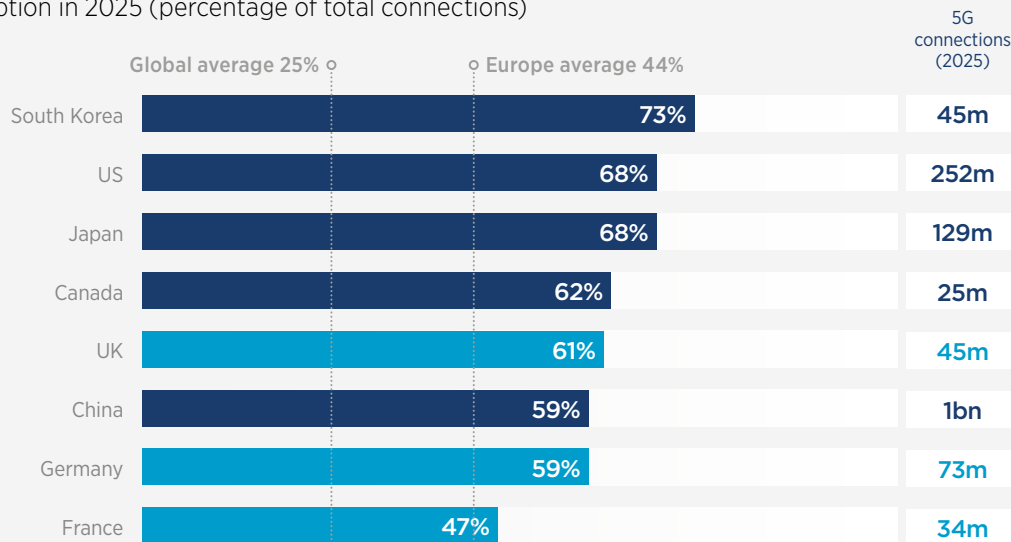
A number of operators have recently shut down legacy networks. For example, O2 retired its 3G network in Germany at the end of 2021, freeing up frequencies at 2100 MHz to be used entirely for 4G networks. Meanwhile, Dutch operator KPN discontinued its 3G operations at the end of March 2022.

The next few years will see this trend gather momentum. In 2023, Vodafone UK intends to retire its 3G network, while Swiss network operator Sunrise plans to do the same for its 2G operations. The case for legacy network shutdown is clear. However, there are important considerations, particularly around the ongoing use of such networks to support IoT services and devices. This calls for collaboration among stakeholders to facilitate a transition from legacy networks that is both efficient and causes the least amount of disruption.

Figure 4

By 2025, 5G will account for nearly half of mobile connections in Europe, but major European markets will lag global peers

5G adoption in 2025 (percentage of total connections)



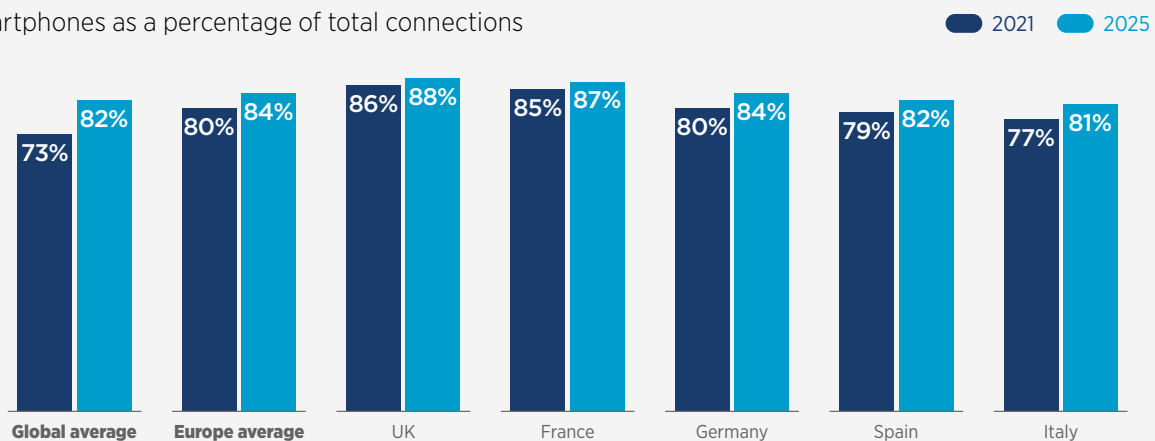
Source: GSMA Intelligence

1.3 Smartphone adoption and data traffic on the rise

Figure 5

By 2025, smartphones will account for nearly 85% of connections in Europe

Smartphones as a percentage of total connections



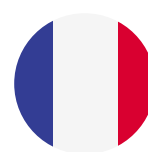
Largest smartphone markets in Europe by number of connections, 2025



Germany
105 million



UK
65 million

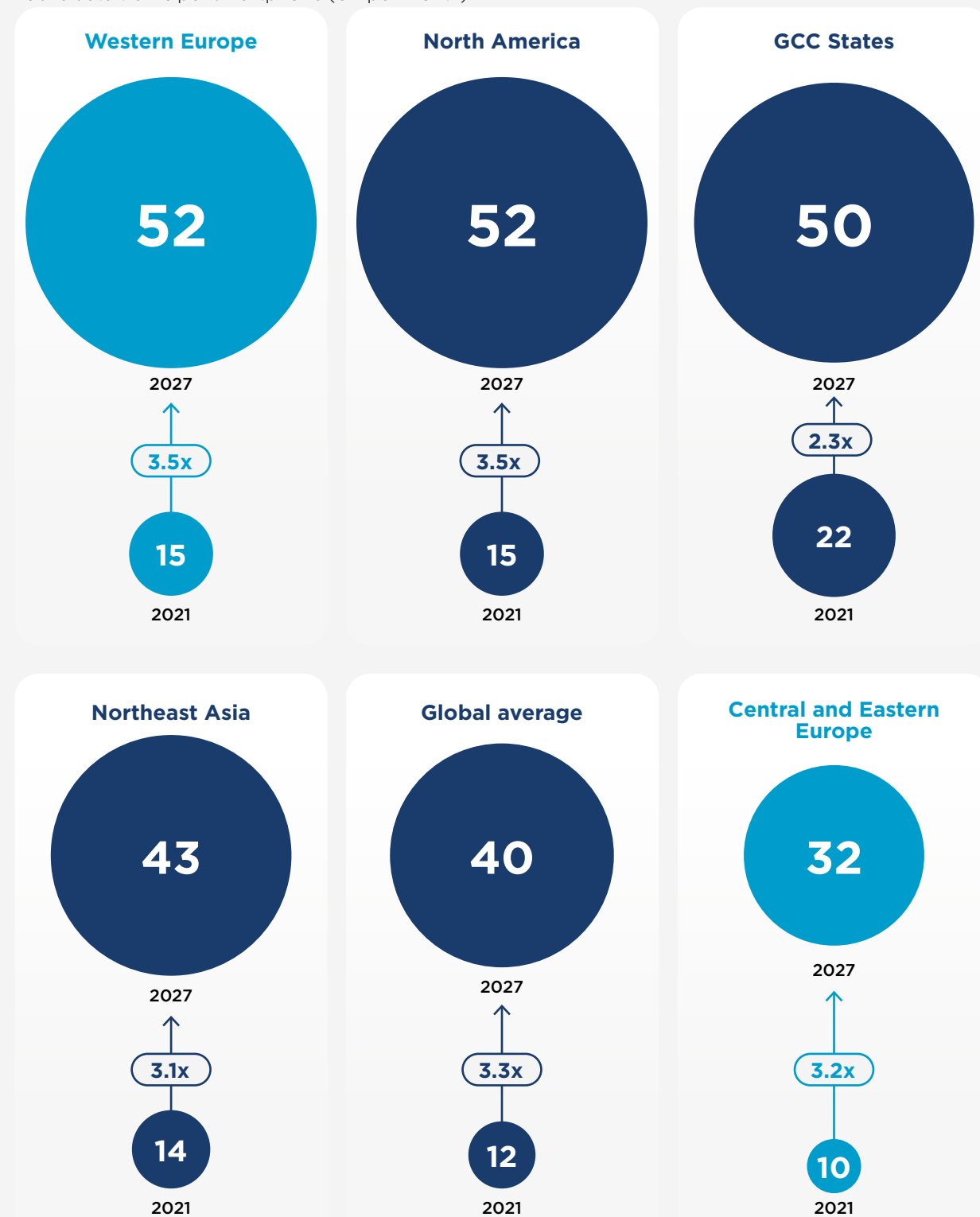


France
62 million

Figure 6

Western Europe is home to some of the world's biggest consumers of mobile data, while Central and Eastern Europe lags behind the global average

Mobile data traffic per smartphone (GB per month)

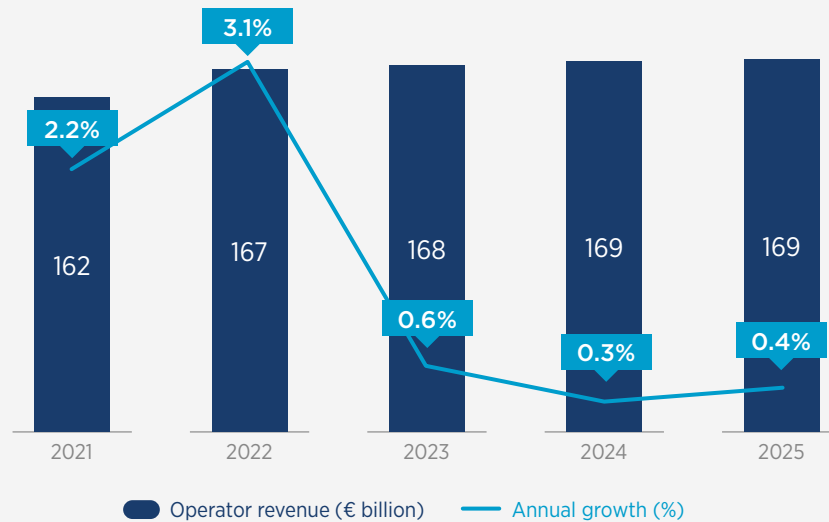


Source: Ericsson

1.4 Macroeconomic pressures weigh on revenue growth

Figure 7

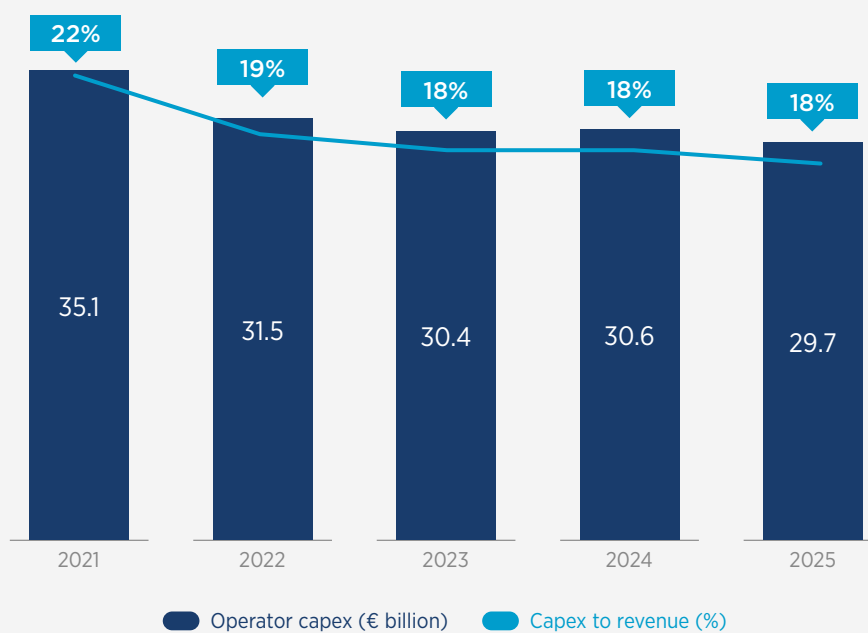
Operator revenue growth will moderate in the coming years as inflationary pressures weigh on consumer spend in Europe



Source: GSMA Intelligence

Figure 8

European operator capex-to-revenue will stabilise in the coming years



Source: GSMA Intelligence

02

Key trends shaping the digital landscape



2.1 5G: momentum continues to build

As of June 2022, 208 mobile operators in 79 markets worldwide had launched commercial 5G services. This includes 108 operators in 34 European markets. Take-up of consumer 5G continues to grow steadily across the region, reaching 6% of the mobile customer base at the end of June 2022, led by

adoption in Norway (16%), Switzerland (14%), Finland (13%), UK (11%) and Germany (10%). Momentum has been boosted by a number of factors, including economic recovery from the pandemic, rising sales of 5G handsets, operators' marketing efforts and the expansion of network coverage.

Consumers and 5G: pulling the levers for growth

Despite positive momentum, Europe still lags China, the US and South Korea in terms of consumer intent to upgrade to 5G. Various factors play a role, such as satisfaction with existing networks and the degree of operator marketing push. European consumers tend to migrate to new technologies at a slower pace

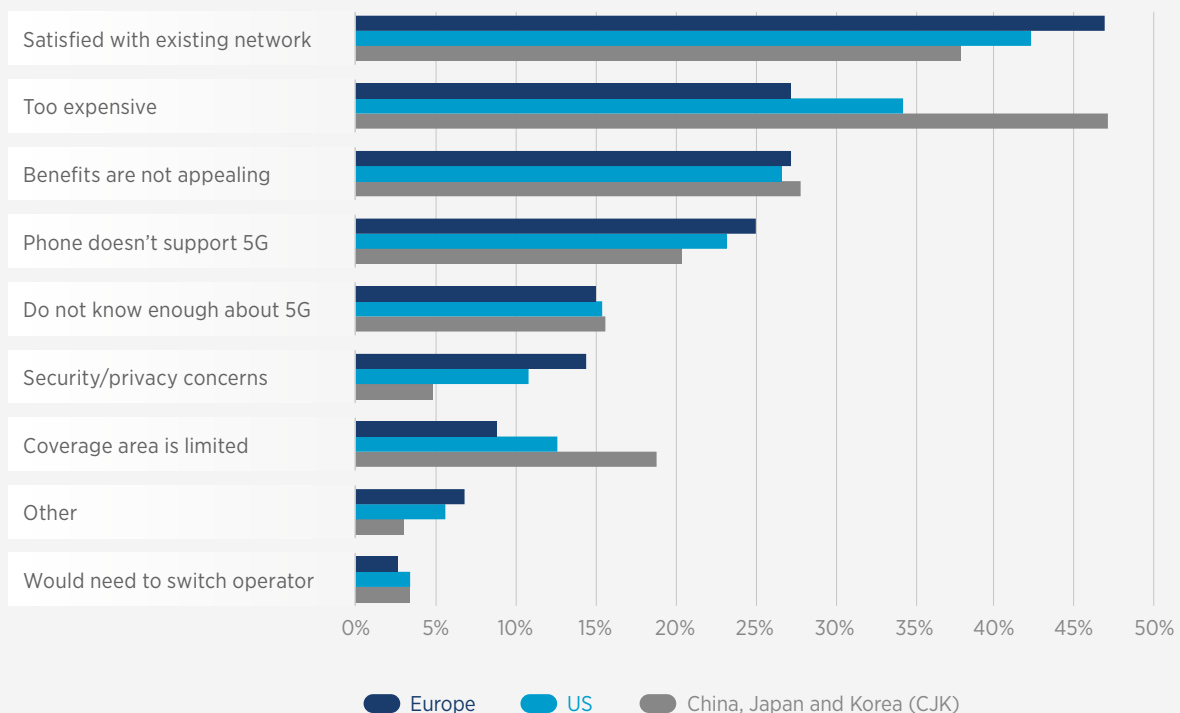
than those in other developed regions/countries – a trend already seen with 4G.¹ Rising 5G coverage and the plethora of 5G smartphones now available should help convert some latent demand into new 5G subscriptions.

Figure 9

Satisfaction with existing networks is highest in Europe

Which of the following explains why you have decided not to upgrade to 5G when it is available?

Percentage of respondents



Source: GSMA Intelligence Consumers in Focus Survey 2021

1. Analysing the behaviour of early 5G users: 10 things to know when planning consumer 5G strategies, GSMA Intelligence, 2021

On a relative basis, satisfaction with existing networks (largely 4G) is the top reason for consumers in Europe not intending to upgrade to 5G. To differentiate their 5G networks from previous generations, operators are investing in 5G standalone and other network innovations to improve 5G performance and meet growing data requirements. For example, UK operator EE claimed to be the first European player to successfully aggregate a 5G signal using carrier aggregation across seven different spectrum carriers, with speeds exceeding 2.2 Gbps in laboratory tests.²

Other barriers to 5G adoption include the cost of 5G (mostly a function of 5G device prices rather than 5G subscription costs). The cost barrier should become less prevalent as more affordable 5G devices enter the market. The average retail price for a 5G phone has already fallen significantly in recent quarters. The proportion of respondents claiming 5G's benefits are not appealing should also come down over the next few years, as operators promote new services that take advantage of 5G's enhanced capabilities (e.g. metaverse applications).

5G and the metaverse

5G networks can provide the high-capacity, low-latency transmission needed for immersive experiences, and allow the user to experience extended realities (offered by the metaverse) in the real world. Operators in Europe are stepping up efforts to grow the region's metaverse ecosystem.

Deutsche Telekom recently partnered with SK Telecom to bring the South Korean operator's Ifland metaverse platform to Europe. The deal will see the pair carry out a live trial of the metaverse platform before the end of 2022, with the goal of co-creating virtual content for the European market. This highlights the opportunity for operators to capture value beyond connectivity, particularly in the development of platforms, content and services in the metaverse.

Leveraging new and existing relationships to create partnerships within the industry and beyond will also be crucial to capitalise on the potential of the metaverse. For example, Telefónica – through Wayra (its open innovation hub) – has launched Open2metaverse, an initiative to connect startups developing metaverse applications with Telefónica. The operator is also collaborating with Meta to drive innovation in connectivity and technology for the metaverse.

2. "EE collaborates with Qualcomm to achieve a European first in 5G Speeds", Mobile UK, April 2022

5G standalone: growing momentum in Europe

Deployments of 5G standalone (5G SA) ramped up globally in 2021 and the first quarter of 2022. As of April 2022, 25 operators in 18 countries had launched commercial 5G SA services. Asia Pacific leads the way in terms of 5G SA commercialisation, while commercial 5G SA services in Europe are available in Finland, Germany and Italy. Further deployments are expected in the next few years, including the following:

- At MWC22, **Orange** revealed its 5G SA suppliers in Europe, opting for Ericsson's core network in Belgium, Spain, Luxembourg and Poland, and Nokia's equivalent offering in France and Slovakia. Testing and trials will be conducted in 2022, with commercial launches from 2023.

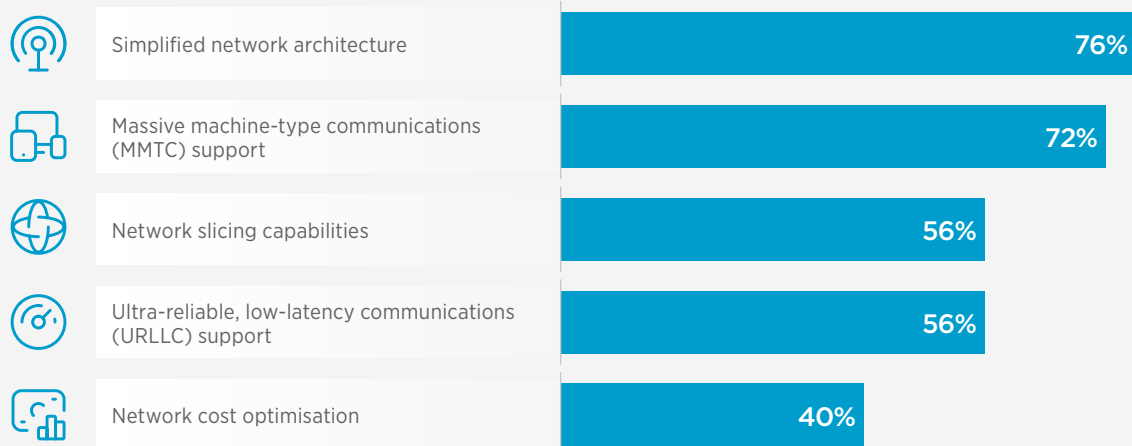
- In March 2022, **Vodafone Germany** announced plans to achieve nationwide coverage of its 5G SA network, which uses 700 MHz and 3.5 GHz spectrum, by 2025. It will be using the '5G+' brand as the service rolls out across the country.

The added functionality enabled by 5G SA is key to delivering on the 5G promise of fully supporting advanced 5G use cases. This helps explain why operators cite 5G SA as the most important 5G network feature for enterprise success.³

Figure 10

Deploying 5G SA offers new business opportunities as well as cost benefits

5G SA: top benefits cited by operators in Europe (top three choices selected)



Source: GSMA Intelligence Operators in Focus: Network Transformation Survey 2021

3. Enterprise Opportunity 2021: understanding operator thinking, expectations and agendas, GSMA Intelligence, 2021

Network slicing continues to make progress

With the rollout of 5G SA networks, interest is growing in the customised network capabilities that network slicing offers. While slicing provides use cases in the consumer segment (e.g. gaming), it is the enterprise market (e.g. IoT applications across vertical sectors) that is attracting more attention.⁴

Progress on network slicing continues in Europe. Over the last few months, Vodafone UK and Ericsson have demonstrated VR-oriented slicing for a retailer, offering guaranteed bandwidth and latency (260 Mbps at 12.4 ms); Deutsche Telekom and Ericsson have demonstrated cross-border continuity of enterprise network slicing (in Germany and Poland); and Proximus and Nokia recently tested 5G network slicing for demanding network conditions at the Proximus 5G innovation lab in Brussels.

That the industry is still conducting network slicing trials indicates there is work to be done to execute on commercialisation, but such trials are critical to ensure that dedicated on-demand slicing solutions can deliver on their promise.

Operators aim to unlock the 5G enterprise opportunity

Consumer services are the largest contributor to operator revenue, but the enterprise segment is the main growth driver as operators increasingly target the digitisation of vertical industries. The pandemic has increased enterprises' need for digital transformation, which has boosted demand for digital solutions and value-added services from operators, particularly cloud and security.

Operators' current 5G value propositions for enterprises focus on speed and network slicing, but the marketing message will shift towards edge computing and massive IoT in the coming years, as operators increasingly see a number of verticals receptive to 5G benefits. To fully exploit these opportunities, operators in Europe have unveiled new enterprise strategies and initiatives, including the following:

- In May 2022, **BT** announced a new charter for its 1.2 million business and public sector customers in the UK, looking to accelerate enterprise digital transformation while fuelling economic growth in the UK. The charter includes a new set of commitments, including investing almost £100 million over the next three years to accelerate

the development of business-to-business (B2B) and business-to-government (B2G) solutions that integrate emerging technologies (e.g. 5G, IoT, edge/cloud and AI).

- Ahead of the rollout of its 5G SA network in Spain, **Telefónica** revealed plans to target three specific enterprise 5G use cases: automated guided robot vehicles for use in locations such as warehouses; remote maintenance systems using technology such as smart glasses; and drones for site surveillance.
- **Three UK** is looking to use 5G to bolster its position in the enterprise market. In May 2022, the operator announced the launch of its new enterprise segment proposition – Three Business Adapt. This will initially target medium-sized enterprises, but there are plans to target large enterprises and the public sector. Three's ambitions for the enterprise segment include increasing connection numbers from the 260,000 expected for 2022 to more than 1 million in 2026, and capturing a 12% market share over the same period, from a starting point of 3%.

4. [Network slicing: assessing the gap between enterprise expectations and operator deployments](#), GSMA Intelligence, 2022



2.2 The telco of the future: European operators lead the way in use of renewable energy

Sustainable transformation is accelerating across the region

European operators are at the forefront of cutting-edge, energy-efficient technologies and the use of renewables. BT, KPN, Proximus, Swisscom, Telia and Vodafone are among those who have already reached 100% renewable electricity use across their footprints, to power their network infrastructure, data centres and other sites. Others such as Orange, Telefónica and TIM are expected to reach that goal over the coming years.

Across Europe, operators mostly purchase renewable electricity through the traditional grid or from a renewable source. However, with solar energy solutions becoming more price-competitive, some are exploring the opportunities these offer to boost access to renewables. For example, Telefónica has formed a 50:50 joint venture in solar photovoltaic panels with Spanish energy firm Repsol. The companies will jointly market and sell solar panels to households, offering advice on installation and services as well as value-added services related to

home energy management. Similarly, Vodafone has partnered with Repsol to create a solar community; photovoltaic panels from the parking facility at the operator's headquarters in Madrid are used to serve 66 homes in the neighbourhood.

European operators are also at the forefront of a growing trend among operators to develop power purchase agreements (PPAs) with local energy suppliers. With PPAs, an operator (or company from any industry) invests capital with a renewable energy provider to fund capacity at a specific generation facility, such as a solar or wind farm. In May 2022, Vodafone signed a 10-year deal to build three new solar farms in the UK in partnership with energy service provider Centrica and Greek construction company Mytilineos. Once fully operational, the solar farms could supply 100 gigawatt hours of renewable electricity annually – enough to power almost 30,000 households for a year and save around 25,000 tonnes of CO₂e emissions.

Pricing pressure furthers green transformation in Europe

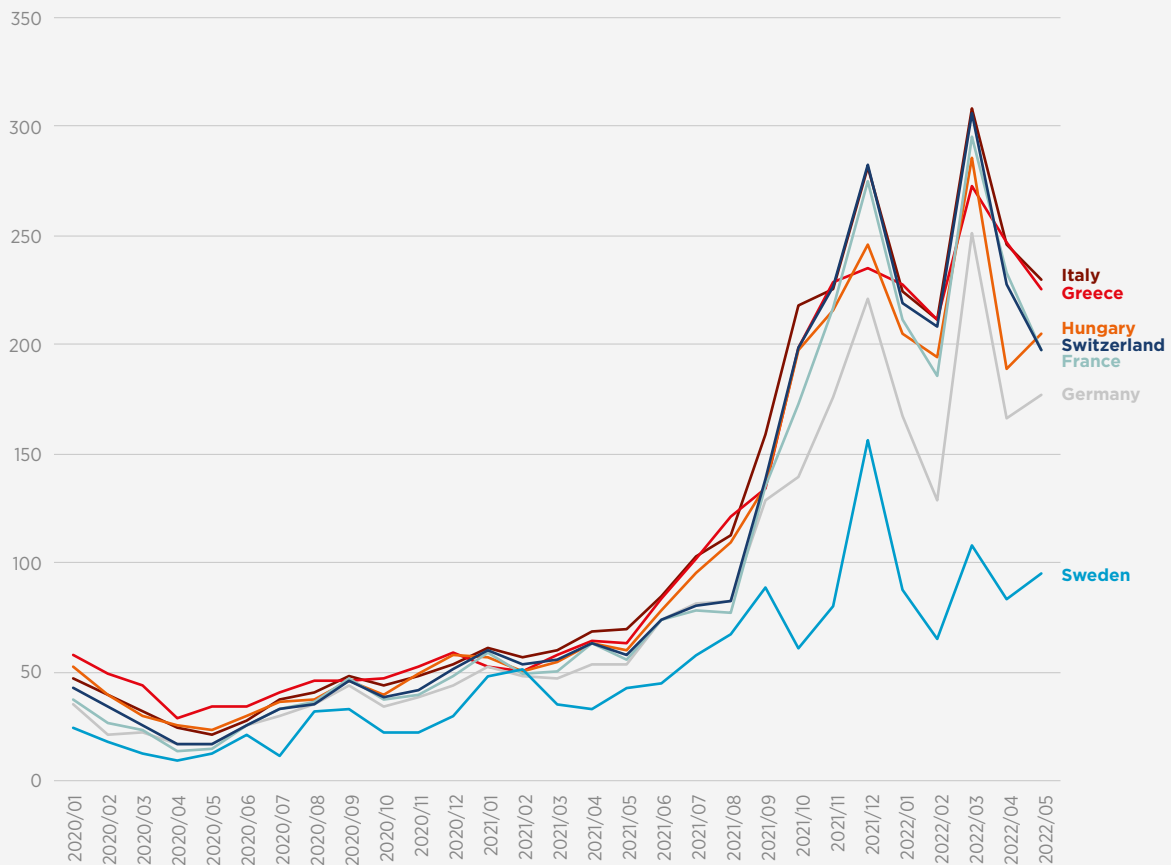
As the transition to 5G gathers pace in Europe, operators face the prospect of rising energy prices, as a result of the conflict in Ukraine, with implications for efforts to power new equipment. Energy efficiency and the use of renewables have therefore

risen up the agenda in attempts to run sustainable network operations. For European operators, energy is a top three area of opex, alongside labour and site rentals.

Figure 11

Wholesale electricity prices have skyrocketed in Europe since the beginning of 2022

Average monthly electricity wholesale prices per megawatt-hour (€)



Source: Statista

Political and business leaders in Europe have made attempts to find alternative options to mitigate the crisis, such as coal and liquefied natural gas from other regions. However, these are short-term and unsustainable measures. For operators, the long-term focus will be on developing renewable

alternatives, diversifying the energy mix and strengthening self-sustainability. This is essential for operators to meet their commitments to green transformation while building and powering the networks of the future.

The European Green Digital Coalition

At the beginning of 2022, the European Commission selected the GSMA, Global Enabling Sustainability Initiative (GeSI), European Digital SME Alliance, DigitalEurope and ETNO to support the European Green Digital Coalition (EGDC). The associations will work with the EGDC to meet the objectives of the founding members' declaration. The declaration has now been signed by 76 companies active in Europe, comprising 31 current EGDC members and an additional 45 SMEs applying for membership. The main aim of the EGDC is to maximise the sustainability benefits of digitalisation within the ICT sector, while supporting the sustainability goals of other key sectors such as energy, transport, agriculture and construction.

The EGDC recognises the need for science-based methods to estimate the reduction and avoidance of greenhouse gas (GHG) emissions by specific ICT solutions across sectors. This is expected to accelerate the sustainability and circular transitions of these sectors while contributing to an innovative, inclusive and resilient society.

2.3 Revenue diversification takes priority

Over the past decade, operators have faced pressure in terms of their traditional value pools, while network investments have continued to rise to meet increasing performance and capacity requirements. 5G rollout and commercialisation bring a new set of opportunities and challenges around capex and

monetisation. This comes against the backdrop of a growing shift of economic value away from operators towards internet players, which have leveraged new technologies and delivery models to capture a rising share of engagement and value.

The evolving internet value chain

Although the internet value chain is growing strongly, the benefits and returns are flowing principally to players in the online services segment.⁵ Growth of online services since 2015 has been driven on the consumer side by the emergence of many gig-economy services and consumers shifting more of their entertainment spend to online services, including online gaming and video streaming, while search and social media services have continued to grow strongly too. On the enterprise side, there has been a strong, ongoing migration of on-premise IT applications to cloud-based services.

However, the telecoms operators providing the connectivity infrastructure underpinning these services have generated relatively low, even single-digit, returns on capital. Although operators continue to invest in complex networks that enable the entire ecosystem, the low returns raise questions about the robustness of continued investment in coverage, speed and capacity, as well as additional computing functionality at the edge. While operator requirements to expand network capacity and extend coverage have never been greater, their business model is being squeezed.

5. [The Internet Value Chain 2022](#), GSMA and Kearney, 2022

Policymakers therefore need to ensure that market distortions, regulatory requirements and other factors do not limit the ability of participants across the internet ecosystem to make sufficient returns, and that the right incentives are in place to realise the potential of technology and service innovation.⁶

Against this backdrop, revenue diversification has become strategically and financially more important than ever before for mobile operators. The goal of diversification is twofold:

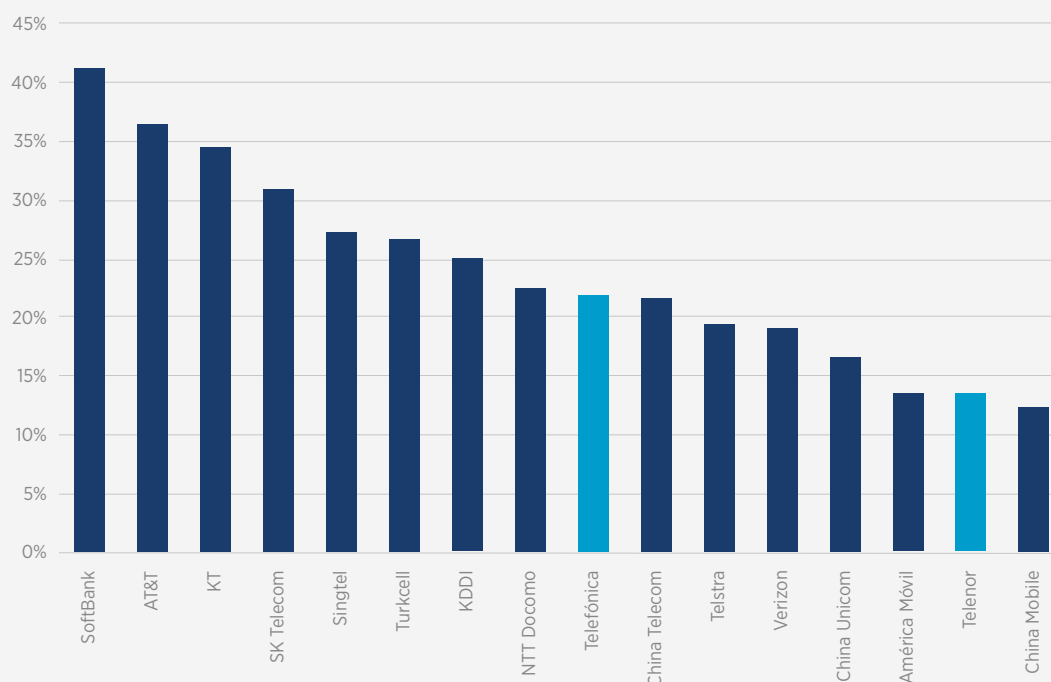
- to offset stagnating (or declining) core telecoms revenues
- to capture incremental value from new growth areas (such as digital services and platforms).

The average contribution to total revenues of services beyond core (a growing and diverse range of B2B and B2C services) reached 24% in 2020, up from 18% in 2017.⁷ However, revenue beyond core as a percentage of total revenues varies significantly among operators, from 12% to 41%. Among the operators in Europe that disclose revenue for services beyond core, Telefónica and Telenor reported contributions to total revenues of services beyond core of 22% and 14% respectively. This is considerably less than counterparts in Japan, South Korea and the US, who are leaders in offering a range of digital lifestyle services to consumers. With the right regulatory conditions, there is a significant opportunity for operators in Europe to accelerate their revenue diversification efforts and narrow the gap in revenue beyond core telecoms versus their counterparts in these markets.

Figure 12

Revenue diversification progress varies significantly among operators

Revenue beyond core as a percentage of total revenues in 2020



Source: company figures (at group level), GSMA Intelligence

6. See Chapter 4 for more information

7. Based on operators analysed in [Operator revenue diversification: growth beyond core continues as Covid-19 spurs digitisation](#), GSMA Intelligence, 2021

Figure 13

Opportunities to expand revenue beyond core telecoms

Cloud



The pandemic spurred growing demand for cloud services provided by operators, as enterprises pushed forward with their digital transformation plans. To meet demand, operators have been investing in new capabilities. For example, Proximus and Microsoft are working together to meet the privacy and sovereignty challenges of companies in public and regulated sectors by developing a 'sovereign cloud' solution, combining Microsoft's Azure hyperscale capabilities and hybrid capabilities from Proximus.

As operators advance the use of cloud technologies in their networks (a priority for 80% of operators in Europe according to the GSMA Intelligence Network Transformation Survey 2021), cloud offerings for enterprise customers will continue to grow.

Financial services



Financial services represent a key component of revenue diversification strategies for many operators. For example, Orange Bank had 1.7 million customers in Europe at the end of 2021. The operator is targeting new customer segments (SOHO and SME) following an initial focus on consumers. To support this aim, it acquired Anytime, a neobank in Belgium focused on financial services for independent professionals and small businesses. Orange is also expanding its portfolio of offerings to include insurance and digital currencies.

Gaming



The shift of gaming from consoles to mobile devices, combined with the rise of cloud-based gaming, offers new opportunities for monetisation. To capture this opportunity, some European operators have launched their own, local cloud gaming propositions, including Deutsche Telekom, TIM and Vodafone Italy. GSMA Intelligence estimates that in 2025 gaming subscriptions could generate 3% of new revenues for operators in Italy and the UK.⁸

Security



According to the GSMA Intelligence Enterprise Opportunity Survey 2021, security saw the strongest growth in demand from enterprises due to the pandemic; it was highlighted as the primary growth area by 47% of the European operators surveyed.

Most major European operators provide security services to their enterprise customers. To grow their presence, some have acquired security companies in recent years. For example, Telefónica's acquisition of ElevenPaths was instrumental in expanding the operator's security portfolio to include both traditional network security products and emerging security services such as those for IoT, cloud and edge.

Source: GSMA Intelligence

8. Analysing the behaviour of early 5G: 10 things to know when planning consumer 5G strategies. GSMA Intelligence, 2021

03

Mobile contributing to economic growth and social progress



3.1 Mobile's contribution to economic growth

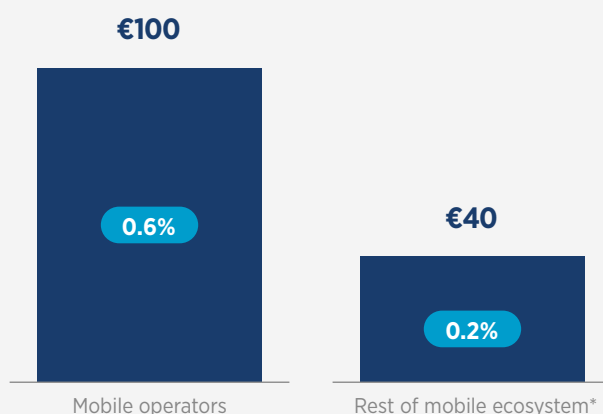
In 2021, mobile technologies and services generated 4.5% of GDP in Europe – a contribution that amounted to around €760 billion of economic value added. The mobile industry also supported approximately 2.6 million jobs (directly and indirectly) and made a substantial contribution to the funding of the public sector, with almost €109 billion raised through taxation on the sector.

By 2025, mobile's contribution will grow by €80 billion, as countries in the region increasingly benefit from the improvements in productivity and efficiency brought about by the increased take-up of mobile services.

Figure 14

The mobile ecosystem in Europe directly generated around €140 billion of economic value in 2021, with mobile operators accounting for the majority

Billion, percentage of GDP (2021)



Source: GSMA Intelligence

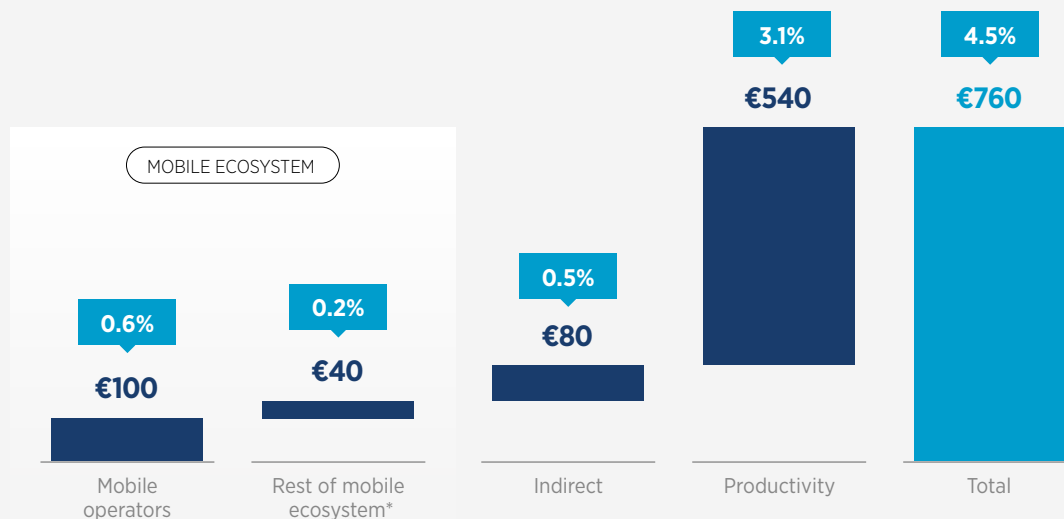
* Rest of mobile ecosystem includes infrastructure providers, device manufacturers, distributors and retailers, and content, apps and service providers.

Note: Totals may not add up due to rounding

Figure 15

Additional indirect and productivity benefits bring the total contribution of the mobile industry to €760 billion (4.5% of GDP)

Billion, percentage of GDP (2021)



Source: GSMA Intelligence

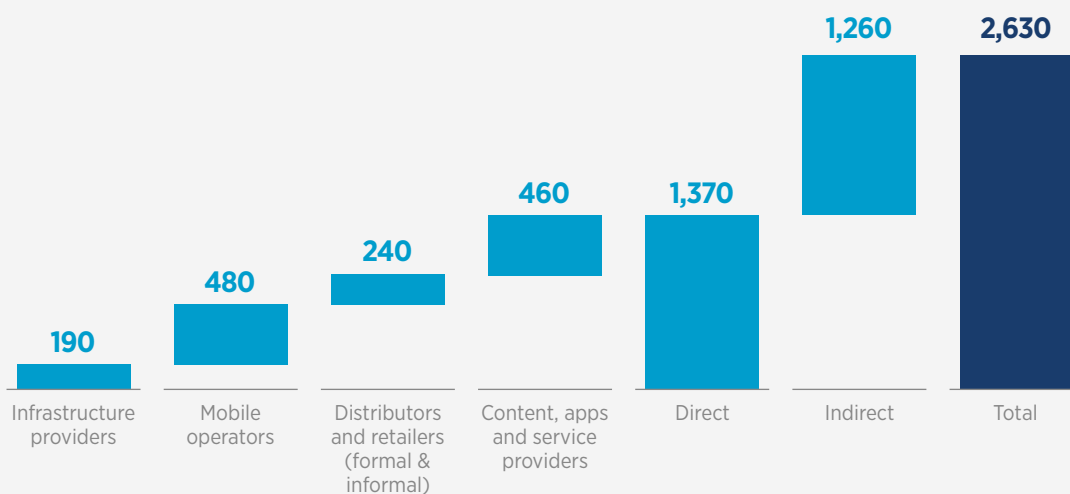
*Rest of mobile ecosystem includes infrastructure providers, device manufacturers, distributors and retailers, and content, apps and service providers.

Note: Totals may not add up due to rounding.

Figure 16

The European mobile ecosystem directly employs around 1.4 million people, plus another 1.3 million indirectly through adjacent industries

Jobs (thousands)



Source: GSMA Intelligence

Note: Totals may not add up due to rounding.

Figure 17

In 2021, the mobile ecosystem contributed around €110 billion to the funding of the European public sector through consumer and operator taxes

Billion



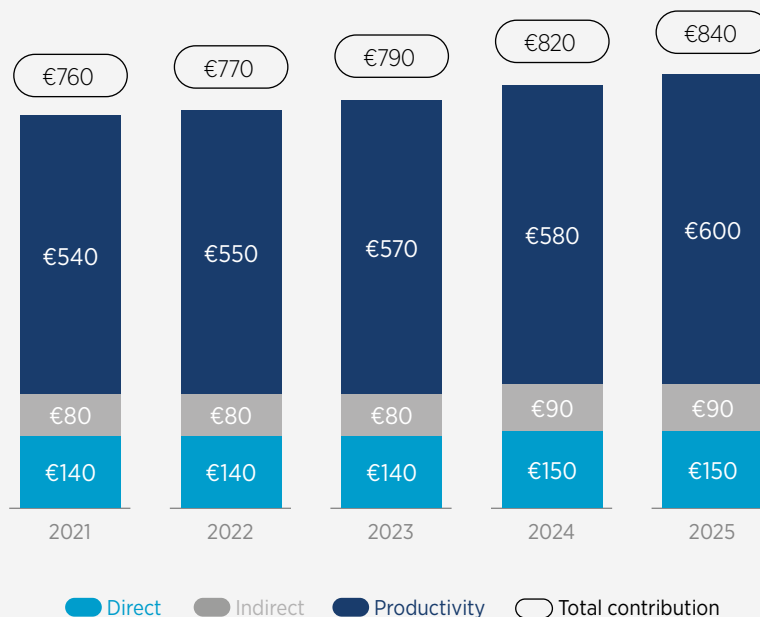
Source: GSMA Intelligence

Note: Totals may not add up due to rounding.

Figure 18

The economic contribution of mobile in Europe will increase by €80 billion by 2025

Billion



Source: GSMA Intelligence

Note: Totals may not add up due to rounding.

3.2 Mobile enhancing digital inclusion

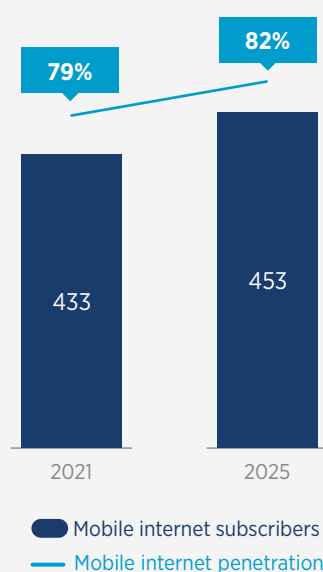
Although other forms of connectivity are well developed in Europe, consumers and businesses in the region continue to rely on mobile technology for internet connectivity. Mobile networks are increasingly ubiquitous and can reach more locations than other technologies. The technology is also supported by a wide range of devices, increasing the options for users to access the internet. By the end of 2021, there were 433 million mobile internet subscribers across Europe, representing a penetration rate of 79%.

Although mobile internet subscriber penetration is high in Europe, the barriers to adoption are particularly acute among certain segments of the population, including the poorest, persons with disabilities and the elderly. Driving mobile internet adoption among these user segments therefore remains a focus for operators, as highlighted by recent industry efforts.

Figure 19

Europe will see a further 20 million new mobile internet subscribers by 2025

Million



Source: GSMA Intelligence

Vodafone works to end digital poverty in the UK

Challenge: Digital poverty is still a big problem in the UK. Around 1.5 million households do not have access to digital connectivity, and roughly half of those affected are children. The problem could get worse due to the cost-of-living crisis, with high inflation outstripping wage and benefit increases.

Solution: As part of Vodafone's everyone.connected campaign, the operator donates free connectivity to UK charities and gives connectivity to someone in need every time a customer signs up for its Vodafone Together service plan, through a partnership with the Trussell Trust. Vodafone has also set up the Great British Tech Appeal, asking the public and businesses to donate devices they no longer use. Vodafone then provides six months' worth of free connectivity, including data, calls and texts. The devices and connectivity are distributed through charity partners Barnardo's and the Refugee Council.

Impact: Vodafone has pledged to connect 1 million people living in digital poverty by the end of 2022. As of July 2022, it had provided free connectivity to 500,000 people via charities working in communities nationwide and its partners, including the Trussell Trust and Good Things Foundation.⁹

9. "Vodafone and The Trussell Trust report rising need for free connectivity due to the cost-of-living crisis", Vodafone, April 2022

Telefónica commits to driving digital inclusion

Challenge: Bridging the digital divide means developing inclusive products and services that meet the diverse needs of persons with disabilities, who typically have lower levels of mobile ownership than those without disabilities.¹⁰

Solution: To support persons with disabilities, Telefónica's products and services integrate the 'Design for All' philosophy, which incorporates accessibility in the development of solutions from the creation phase. Telefónica product managers are trained in accessibility criteria to ensure a good user experience for persons with disabilities. The operator has also improved the accessibility conditions of its call centres, allowing communication between customers with disabilities and call centre advisors through an interpreter.¹¹

Impact: Initiatives such as these give persons with disabilities greater confidence when using mobile devices, which can unlock the life-enhancing potential of smartphones as an assistive technology and a gateway to digital inclusion.

Telia reduces digital exclusion among the elderly

Challenge: Although Sweden has one of the highest levels of internet penetration in the world, mobile operators still need to tackle digital exclusion, particularly among the elderly. A third of people aged 76 and over in Sweden do not use the internet at all, with a further 18% saying they rarely use it.¹² This is becoming increasingly problematic as more everyday activities and services move online.

Solution: A lack of skills and confidence is a key factor behind digital exclusion among the elderly. In response, Telia launched More Digital, an IT training programme designed to show the elderly how they can benefit from using digital tools in their everyday lives. This includes looking for information on the internet, creating an email account, initiating a video call or learning about social media. Teachers at the workshop are young people from the local area, supported by Telia employees and adult supervisors Telia has trained.

Impact: Approximately 10,000 people in more than 30 municipalities in Sweden and Norway have so far attended More Digital sessions. During the pandemic, Telia Sweden also launched printed guide materials to help develop skills. The material was shared with 200,000 Telia customers aged 75 and over.¹³

10. *The Mobile Disability Gap Report 2021*, GSMA, 2021

11. "Telefónica is committed to accessible and inclusive digital transformation", Telefónica, November 2021

12. *The Swedes and the Internet 2021*, The Swedish Internet Foundation, 2021

13. *Annual + Sustainability Report 2021*, Telia Company, 2021



3.3 The mobile industry's impact on the SDGs

As the first industry to have fully committed to the UN Sustainable Development Goals (SDGs), the mobile industry continues to have substantial positive effects on lives and livelihoods. In 2021, the mobile industry increased its impact on all SDGs, with the average year-on-year increase accelerating compared to 2020. The average SDG impact score across the 17 SDGs reached 53, up from 49 in 2020 and 32 in 2015, meaning the mobile industry is achieving 53% of what it could potentially contribute to the SDGs.¹⁴

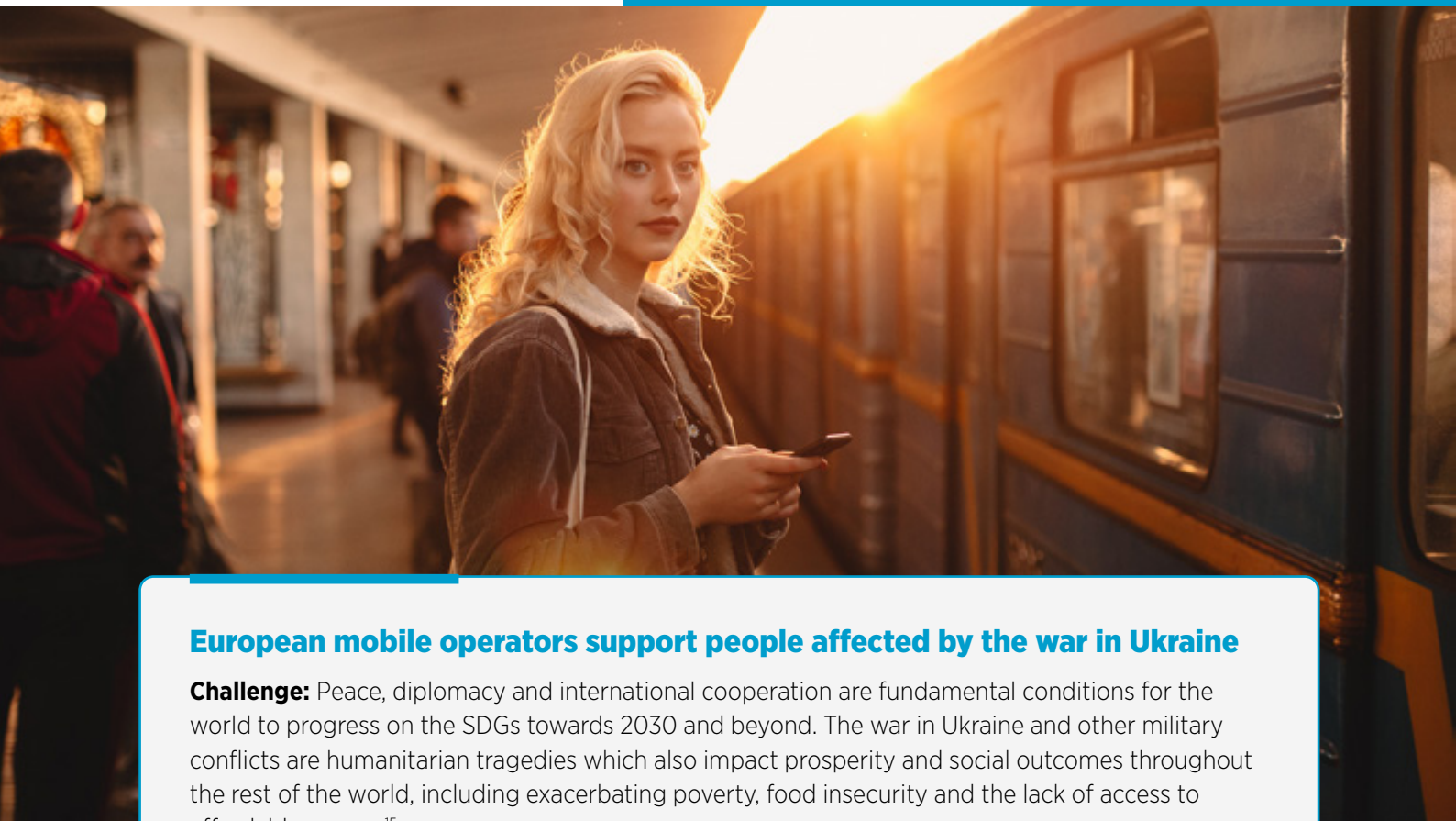
In Europe, the mobile industry recorded a significant improvement in 2021 in its contribution to the following SDGs:

- **SDG 3: Good Health and Well-being** – The Covid-19 pandemic has highlighted the pressing need to strengthen health systems, with digital solutions likely to play a crucial role in addressing systemic challenges. For example, Vodafone

announced a new strategic alliance with Deloitte to accelerate the adoption of connected healthcare solutions through the launch of the Vodafone Centre for Health with Deloitte.

- **SDG 13: Climate Action** – The mobile industry is making continued progress on disclosing climate impact data and setting targets for emissions reductions. The rapid substitution of renewable energy in place of fossil fuels along with network and supply chain innovations are key enablers of this.
- **SDG 16: Peace, Justice and Strong Institutions** – Mobile technology contributes to SDG 16 by facilitating access to information and the right to free expression, while digital identity leverages mobile as a trusted and robust solution for the underserved. The importance of mobile to SDG 16 has been highlighted by the conflict in Ukraine.

14. 2022 Mobile Industry Impact Report: Sustainable Development Goals, GSMA, 2022



European mobile operators support people affected by the war in Ukraine

Challenge: Peace, diplomacy and international cooperation are fundamental conditions for the world to progress on the SDGs towards 2030 and beyond. The war in Ukraine and other military conflicts are humanitarian tragedies which also impact prosperity and social outcomes throughout the rest of the world, including exacerbating poverty, food insecurity and the lack of access to affordable energy.¹⁵

Solution: European operators have rolled out voluntary measures to help Ukrainian refugees and expats in Europe. These include actions on free/reduced rates and SMS in 31 countries, free/reduced outbound roaming in 29 countries and SIM cards for refugees in 21 countries. Operators have also deployed Wi-Fi hotspots at places of arrival of refugees and boosted mobile signal in border areas, among a range of other measures.¹⁶

With the support of the European Commission, EU and Ukrainian operators signed a joint statement to establish a framework to help provide affordable or surcharge-free roaming and international calls between the EU and Ukraine, helping Ukrainian refugees stay in touch with friends and family back home.¹⁷ Operators across Europe have also implemented various initiatives to support victims of the conflict.¹⁸

Impact: Communities affected by conflict continue to prioritise digital technology – not only to communicate and seek/share information, but increasingly also to access humanitarian assistance. The GSMA Mobile for Humanitarian Innovation programme works to accelerate the delivery and impact of digital humanitarian assistance. The programme has reached over 9 million people with improved access to and use of life-enhancing mobile services in humanitarian contexts.¹⁹

15. Sustainable Development Report 2022, United Nations Social Development Network, 2022

16. [GSMA Response to the Ukraine Crisis](#), GSMA, March 2022

17. [GSMA Response to the Ukraine Crisis](#), GSMA, March 2022

18. [Ukraine Support Actions by the European Mobile Operators – Interactive Map](#), GSMA

19. [Mobile for Humanitarian Innovation Annual Report](#), GSMA, 2022

04

Policies to realise the digital agenda



Mobile technology has a crucial role to play as governments look to reinvigorate their economies and build a better, more inclusive society while tackling the climate crisis. Mobile networks are vital to economic recovery and future crisis resilience and will help trigger a green and digital transformation across Europe.

Today, however, communications technology in Europe is at a crucial juncture. Two years into the EU's Digital Decade, the connectivity target of 'Gigabit for everyone, 5G everywhere' has never felt more urgent. By the end of 2025, Europe will be home to 311 million 5G connections, with the Nordics and Western Europe recording the highest adoption rates. Underpinning 5G rollout will be substantial operator investment, totalling €122 billion for the period 2022 to 2025. Almost 90% of this will be specific to 5G.

As economies and societies around the world digitalise, the acceleration of 5G in Europe is necessary to ensure the region's traditional industrial strengths are not dragged down by weaknesses in the ICT sector. The limitations of existing networks are becoming more apparent. If an increasingly distributed workforce and the remote provision of services is to become the norm, there is also a need to ensure fair and even access for all.

The acceleration of 5G in Europe is necessary to ensure the region's traditional industrial strengths are not dragged down by weaknesses in the ICT sector.



4.1 Enabling policies to stimulate innovation and investment

The telecoms industry fully supports the political ambition and vision laid down in the Digital Decade strategy. However, if nothing changes, the Digital Decade connectivity targets will not be met. Policymakers and regulators should ensure that regulatory action at the EU and national levels is consistent with the vision of the Digital Decade, and create pro-investment policies to drive economic growth and social welfare.

While 5G has the potential to deliver a significant amount of value to the region, the mobile sector remains heavily regulated and influenced by fragmented policy frameworks. Getting 5G right should be a top priority for the EU. Yet, the current regulatory environment is creating an investment gap and stifling innovation.

It is vital to create the right conditions for private infrastructure investment, network modernisation and digital innovation.

Tough market conditions in Europe mean investment capital for telecoms operators is harder to secure than in peer markets. As a result, over the past decade, Europe has invested less per capita in its telecoms networks than the US.²⁰ Furthermore, persistent government or regulatory interventions and resistance to consolidation artificially distort competition, leading to poorer service and outcomes for consumers and businesses.

As the EU implements the new *Digital Services Act* and *Digital Markets Act*, designed to curb the influence of Big Tech and encourage competition, stakeholders should ensure that the mistakes of the 4G era are not repeated. While superior mobile broadband in the US and parts of Asia served as a catalyst for the innovation that fuelled the 4G app economy, uneven rollout and a lack of focus meant that the European digital economy is yet to reach its full potential.

To ensure Europe grasps control of its digital future, it is vital to create the right conditions for private infrastructure investment, network modernisation and digital innovation. A financially sustainable mobile sector is key to the delivery of innovative services and the deployment of new networks.

20. "New Report: Europe behind on key digital metrics, telcos essential to achieve leadership", ETNO, January 2021

Policymakers should collaborate with the private sector to stimulate the investment in next-generation networks that will form the backbone for Europe's economic recovery by enabling employment, entrepreneurship and innovation while supporting the achievement of essential climate-related goals.

The GSMA calls on the EU to commit to the following priorities:

- **Rethink competition policy and enforcement**, in terms of harmonised conditions for investment and doing business. With increasing in-country scale and co-operation, operators can improve their ability to invest in widely accessible high-speed mobile networks.
- **Implement fair spectrum licensing conditions.** Excessive charges and limited durations of licences can undermine investment. Licences can be extended without harming competition or spectrum efficiency. The voluntary sharing of spectrum should be encouraged, while the reservation of national spectrum for private networks should be avoided.
- **Fairly allocate the costs of network traffic to the largest drivers.** This would deliver an economic incentive to use network capacity more efficiently, supporting cost-effective investment, driving improved network enhancements and leading to more efficient energy consumption. A regulatory initiative requiring large traffic originators to contribute directly to the costs they generate would be consistent with the EC's digital and green ambitions.
- **Foster supply-chain diversity** and competition to improve network security and resilience through disaggregation and greater interoperability. Take an internationally coordinated approach to standardise open RAN with a progressive schedule that supports the formation of a European open RAN ecosystem.
- **Foster a distributed cloud and edge infrastructure for Europe.** Encourage the paradigm shift that 5G architecture, with its transition to the edge, will create. Support an open, federated data infrastructure and associated computational services, based on secure and efficient international communication networks and connectivity. Promote platforms that allow straightforward switching between cloud services.
- **Implement cost-reduction measures and simplification for network deployment** to achieve Europe's Digital Decade connectivity targets. An ambitious review of the Broadband Cost Reduction Directive should strengthen the implementation of the Connectivity Toolbox through additional provisions and ensure a harmonised, light licensing regime for antenna sites to reduce deployment costs and the response time for permits. Member States should align to global EMF standards.
- **Adjust the regulatory framework to enable the data economy to thrive in Europe.** Ensure a level playing field in digital markets, services and taxation. Build a regulatory environment that stimulates data-driven technologies and services. Restore consumers' trust online and counter disinformation. Consider telecoms operators as trusted partners in ensuring that European values are embedded in technology deployed across the EU.
- **Use digitalisation to enable climate action.** Connectivity is emerging as a key enabler for Europe to meet carbon reduction and environmental commitments through the use of smart, connected technologies. By enabling the green transition and actioning on the EU Green Deal, digitisation and smart connected technologies will be key enablers for Europe to meet carbon reduction and environmental commitments. European operators are committed to supporting national climate change policies and the EU Green Deal, including using greener digital technologies that are more energy efficient.

4.2 Driving affordable 5G for all through spectrum availability

5G rollout depends heavily on operators' 5G spectrum holdings across low, mid- and high bands in order to deliver both speed and geographical coverage. 5G has the potential to deliver a significant amount of value to the European region. However, as data use expands, additional spectrum capacity will be required to satisfy demand for mobile broadband

and achieve Europe's ambitious goal of reducing the gap with other regions in terms of digitalisation. Additional mobile spectrum can boost the provision of cost-efficient investment in mobile networks, which will enhance the quality of mobile broadband in Europe and help deliver the goals of the Digital Decade.

Low bands

Low-band spectrum is an enabler of digital equality and driver of widespread and affordable connectivity. Increased sub-1 GHz spectrum is essential to build coverage in sparsely populated areas and provide indoor coverage in built-up and hard-to-reach urban areas. In addition, it can decrease the number of macro sites required, leading to lower energy consumption.

The lower UHF band is key to the growth of ubiquitous mobile services. Prior to 2030, Europe

should keep the option open of operational use of the 470–694 MHz band, without undermining legal certainty for existing users. European policymakers should also collect evidence on the current and potential uses of the band in Europe, to identify coexistence possibilities, the best methods for video distribution beyond 2030, and possible paths for countries with low DTT usage to introduce earlier measures for use of the band for mobile.²¹

Mid-bands

Mid-band 5G spectrum can play a central role in sustainable social and industrial development. According to a recent study by the GSMA,²² mobile networks will need, on average, 2 GHz of mid-band spectrum per country by 2030. In Europe, that goal leaves a shortfall of around 0.95 GHz compared to today's assignments in most markets.

Firstly, European policymakers should ensure that further harmonisation at the EU level (e.g. in

the context of the 3.8–4.2 GHz band) focuses on applying the least restrictive technical conditions that ensure coexistence with incumbent spectrum users.

Secondly, additional mid-band capacity in Europe is likely to come from the 700 MHz available in the upper 6 GHz band. Ensuring this spectrum is made available for licensed 5G is thus crucial to meeting connectivity development goals.

High bands

Access to mmWave frequencies will allow the full potential of 5G to be realised, with fast download speeds, huge capacity and the lowest latencies. mmWave spectrum is essential for peak performance. According to a recent report by the GSMA,²³ 5 GHz of mmWave spectrum is required per market for eMBB, FWA and enterprise applications.

Successful and effective mmWave spectrum assignments are key to ensuring 5G achieves its true potential in terms of performance and socioeconomic impact. Any spectrum capacity constraints should be addressed early, by licensing adequate mmWave spectrum for IMT services.

21. *Vision 2030: Low-Band Spectrum for 5G*, GSMA, 2022

22. *Vision 2030: Insights for Mid-band Spectrum Needs*, GSMA, 2021

23. *Vision 2030: mmWave Spectrum Needs*, GSMA, 2022

Maximising the opportunity of the 6 GHz band

Considerations on the optimal approach for managing spectrum are currently at the forefront of the debate around the 5925–7125 MHz frequency range (6 GHz). The key consideration is whether to utilise the parts of the range for licensed mobile (e.g. 5G NR) or for unlicensed use (e.g. Wi-Fi). Included on the agenda of the next World Radiocommunication Conference (WRC-23) is the IMT identification of 6425–7025 MHz in ITU Region 1 (Europe, the Middle East and Africa)²⁴ and 7025–7125 MHz in all three ITU regions.

Achieving the 2 GHz of mid-band 5G spectrum required by 2030²⁵ is challenging without 6 GHz capacity. The 6 GHz range sits at a balancing point to deliver citywide 5G connectivity; harmonisation of the band will provide more bandwidth and improve network performance. The broad, contiguous channels offered by the 6 GHz range will reduce the need for network densification and make next-generation connectivity more affordable for all.

A recent report by GSMA Intelligence²⁶ shows that, on a global basis, the greatest socioeconomic benefit from the 6 GHz band will be driven by using it fully for licensed 5G while fibre-to-the-premises (FTTP) speeds remain under 10 Gbps. Up to 10 Gbps, Wi-Fi 6 and 7 requirements can be met with 2.4 GHz and 5 GHz capacity.

The 6 GHz band represents the largest remaining single block of mid-band spectrum that can be allocated to licensed mobile or unlicensed services in the foreseeable future. Governments in Europe and around the world therefore need to make a carefully considered decision as to the most efficient use of 6 GHz spectrum. When considering which approach to take, policymakers should conduct a regulatory impact assessment to identify the best policy option to maximise the socioeconomic value of spectrum.

24. See ITU RR article 5.3 for an exact definition

25. *Vision 2030: Insights for Mid-band Spectrum Needs*, GSMA, 2021

26. *The socioeconomic benefits of the 6 GHz band: considering licensed and unlicensed options*, GSMA, 2022

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