GSMA

The Mobile Economy Europe 2023

GSMA

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

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GSMA Intelligence is the definitive source of global mobile operator data, analysis and forecasts, and publisher of authoritative industry reports and research. Our data covers every operator group, network and MVNO in every country worldwide – from Afghanistan to Zimbabwe. It is the most accurate and complete set of industry metrics available, comprising tens of millions of individual data points, updated daily.

GSMA Intelligence is relied on by leading operators, vendors, regulators, financial institutions and third-party industry players, to support strategic decision-making and long-term investment planning. The data is used as an industry reference point and is frequently cited by the media and by the industry itself.

Our team of analysts and experts produce regular thought-leading research reports across a range of industry topics.

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Executive summary

Digital technologies are playing a crucial role in Europe as economies advance their efforts to embrace green and digital transformation. 5G connectivity is serving as a catalyst for GDP growth and a powerful tool to help combat climate change. In the coming years, the mobile ecosystem will focus on improving 5G coverage in rural areas and increasing investment to support the growing adoption of use cases enabled by 5G standalone (SA) and 5G-Advanced technologies.

The contribution from mobile technologies and services to social and economic progress in Europe continues to grow. 5G connectivity and services are set to generate economic benefits of €153 billion in 2030. It is therefore imperative that stakeholders take steps to ensure continued investment and the long-term sustainability of the mobile industry. This means a reset of the policy framework governing the digital communications ecosystem, and effective spectrum policy to support the Digital Decade goals.

5G connectivity and services are set to generate economic benefits of €153 billion in 2030

Key trends shaping the mobile ecosystem

Unlocking 5G's revenue potential

In Europe, attention is shifting to 5G monetisation, as operators seek returns on their significant capital outlays. Speed-based tariffs and bundles that package content and services with mobile subscriptions offer ways to grow average revenue per user (ARPU) in a fiercely competitive market. Operators can also look to early examples of success with 5G fixed wireless access (FWA) in Austria and Italy.

The transition to 5G SA should add further impetus to 5G monetisation efforts by introducing new capabilities, including improved support for network slicing. While 5G SA deployments in Europe have been trailing other regions, recent launches by Orange Spain, Movistar and Vodafone UK point to growing momentum. Similarly, private 5G deployments are gaining traction in Europe, offering opportunities to create new revenue streams and serve additional enterprise customers.

Transforming networks

There is a need to rethink the design of telecoms networks to meet evolving connectivity requirements and enable the rapid expansion of data-driven technologies (AI and web 3.0). As well as investments in infrastructure rollout, this network transformation entails the softwarisation and virtualisation of network functions, as well as cloud-native and disaggregated network architectures.

To manage increasing complexity, operators need to invest heavily in network automation, including the use of AI and machine learning, as well as software skills. These allow customised connectivity solutions to be provided, as well as added services and functionality (such as edge cloud), which can be offered to customers using standardised interfaces (network as a service).

Reigniting satellite connectivity

Satellite broadband is being reinvented through the low Earth orbit (LEO) constellation model. This underpins a growing list of partnerships between mobile operators and satellite companies. In many cases, operators are partnering with satellite companies for wholesale satellite backhaul access. Direct-to-device (D2D) agreements are also growing in number, providing satellite connectivity directly to smartphones and IoT devices without the need for a dish or other receiving equipment. Much of this stems from the integration of non-terrestrial networks (NTNs) into the 3GPP's 5G new radio (NR) standard, meaning satellite connectivity can be accessed seamlessly on devices updated to Release 17 or later.

Exploring the role of generative AI

It has been less than a year since ChatGPT launched, introducing much of the world to generative AI. Since then, competitors have emerged and businesses have begun to explore how to use the technology. For mobile operators, the range of generative AI applications is broad, covering areas including code development support, network management, customer care and customised proposition development.

Despite the potential to reap significant benefits from the application of advanced AI, ethical concerns around the technology still need to be addressed. Mobile operators must also upskill staff and recruit external expertise to take full advantage of the AI opportunity.

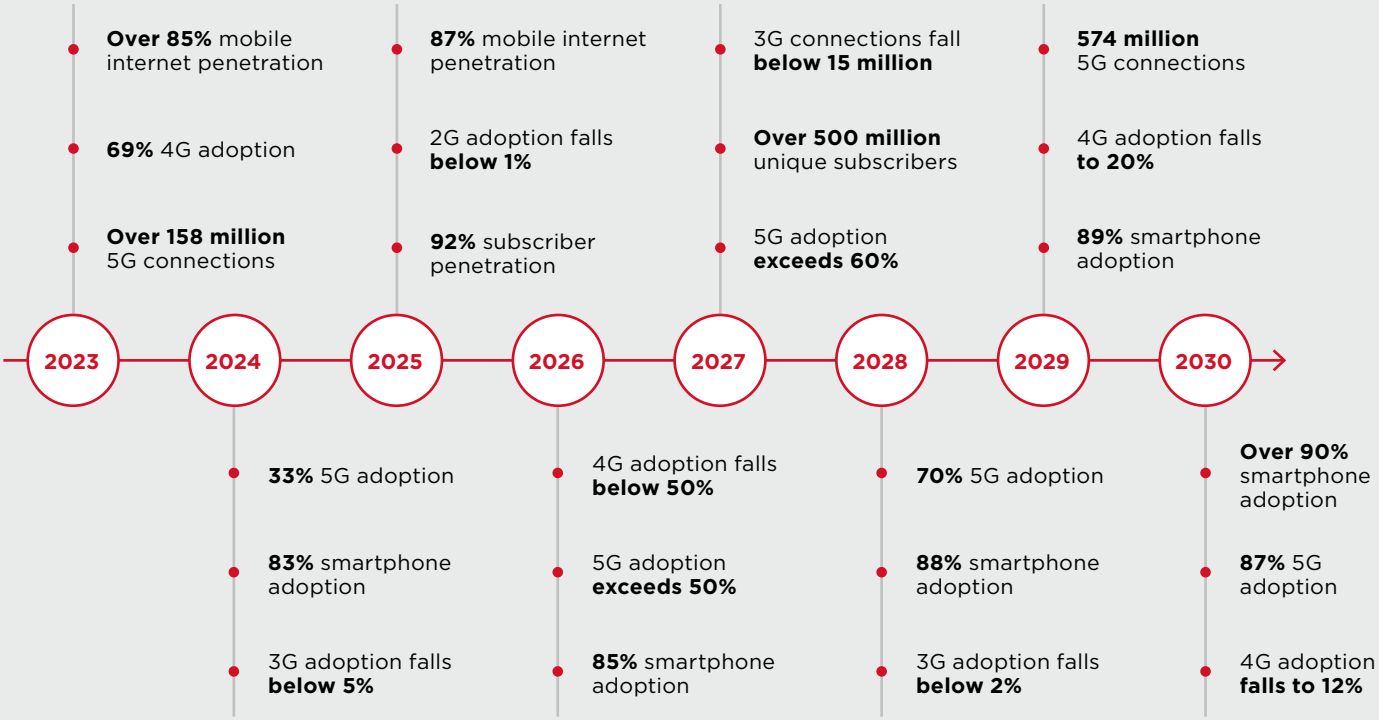
Shifting to circularity

Circularity is a priority for policymakers and industry players. This involves considering the right use of materials, developing long-lasting devices and using recyclable materials. However, behavioural change among consumers is needed to extend the average three-year device usage period. Governments and ecosystem players are working together to raise awareness and incentivise consumers. In Europe, operators are at the forefront with plans to promote the recycling of mobile phones, other devices and network equipment.

Growing fintech opportunities

4G/5G users in Europe are increasingly relying on their smartphones for financial services. The shift has driven enhancements in the fintech sector, including new solutions for customers and the modernisation of traditional banking systems. Operators in the region are making partnership moves to capitalise on the shift of financial services to digital channels.

Key mobile industry milestones to 2030



Policies for growth and innovation

For Europe, achieving global leadership in the digital economy and environmental sustainability requires ambitious infrastructure targets, including full 5G coverage. However, significant disparities persist in 5G deployment, particularly in rural areas, with an estimated investment gap of at least €174 billion to meet the Digital Decade connectivity targets. To secure Europe's digital future, the region should focus on the following key policy areas: a digital infrastructure framework and the simplification of regulation; building scale through in-market consolidation; and pro-investment spectrum policy.

Effective spectrum policy can help spur strong and sustainable economic growth and ensure 5G for all European citizens and businesses by the end of the decade. The review of EU spectrum policy presents an opportunity for reform, allowing for further harmonisation in terms of spectrum licensing approach and alignment of spectrum policy with the Digital Decade objectives. To make spectrum policy a lever for investment and growth, regulators should consider measures such as ensuring long-term licence terms and alignment with investor timeframes, preventing inefficient spectrum awards, and increasing transparency in annual fees.

The Mobile Economy Europe

Unique mobile subscribers

2022 496m
2030 507m

90% 2022
92% 2030
Penetration rate
Percentage of population

CAGR 2022-2030 0.3%

Mobile internet users

2022 464m
2030 479m

85% 2022
87% 2030
Penetration rate
Percentage of population

CAGR 2022-2030 0.4%

SIM connections
(excluding licensed cellular IoT)

2022 714m
2030 734m

Penetration rate
Percentage of population
130% 2022
134% 2030

CAGR 2022-2030 0.3%

4G
Percentage of connections (excluding licensed cellular IoT)

2022 75%
2030 12%

5G
Percentage of connections (excluding licensed cellular IoT)

2022 11%
2030 87%

Smartphones

Percentage of connections (excluding licensed cellular IoT)

2022 **81%**

2030 **91%**

Licensed cellular IoT connections

2022 **206m**

2030 **501m**

Operator revenues and investment

2022 **€156bn** Total revenues

2030 **€162bn**

Operator capex

€198bn

2023 → 2030

Mobile's contribution to GDP

2022 **€910bn** **4.3%** of GDP

2030 **€1 trillion**

Public funding

2022 **€110bn**

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

Employment

1.3 million jobs

Directly supported by the mobile ecosystem in 2022

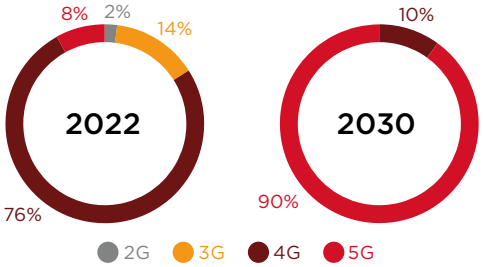
0.9 million jobs

supported indirectly

Subscriber and technology trends for key markets

France

Technology mix*



Subscriber penetration

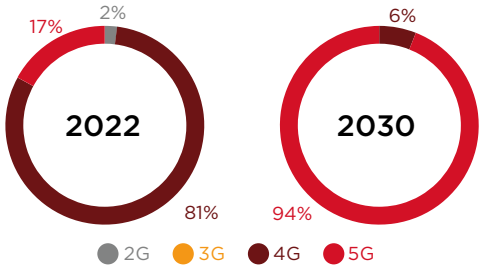
2022	93%
2030	96%

Smartphone adoption

2022	85%
2030	94%

Germany

Technology mix*



Subscriber penetration

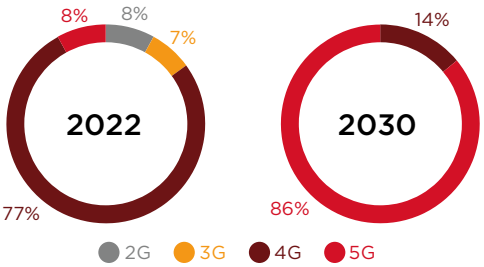
2022	91%
2030	94%

Smartphone adoption

2022	82%
2030	93%

Italy

Technology mix*



Subscriber penetration

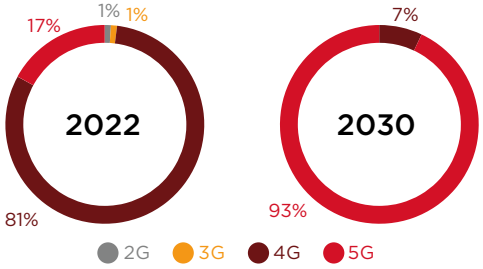
2022	94%
2030	96%

Smartphone adoption

2022	78%
2030	88%

UK

Technology mix*



Subscriber penetration

2022	92%
2030	93%

Smartphone adoption

2022	85%
2030	91%

* Percentage of total connections (excluding licensed cellular IoT)

01

The mobile industry in numbers

Europe will have more than 500 million unique mobile subscribers by 2030

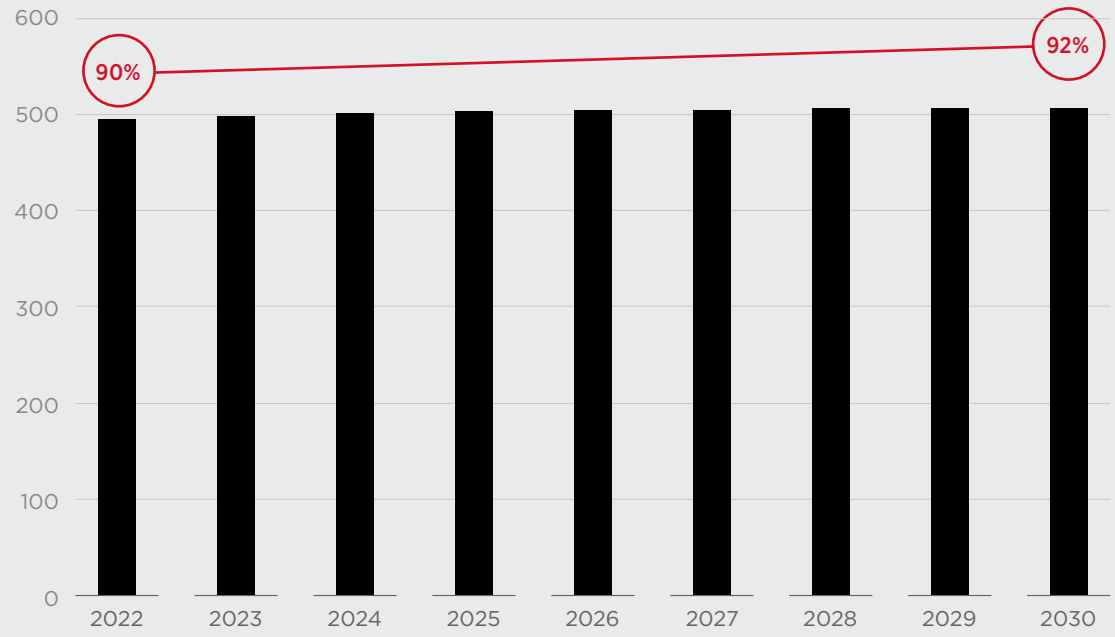
With growth of 11 million subscribers between 2022 and 2030, Europe will reach 507 million by 2030.

Unique mobile subscriber penetration in Europe will reach 92% of the population by 2030 – higher than North America and much higher than the global average (at 73%). Within Europe, penetration rates are above 90% in most countries, with France reaching 96%, Germany 94% and the UK 93% by 2030.

Figure 1

Europe: mobile subscribers and penetration

Million, percentage of population



Source: GSMA Intelligence

Mobile internet penetration in Europe reached 85% in 2022

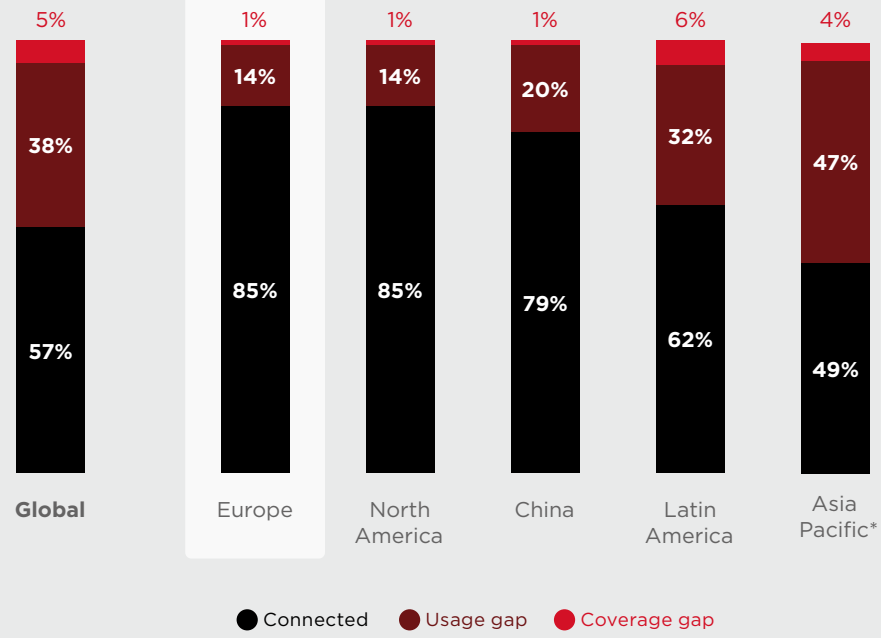
With more than 460 million people connected to the mobile internet in Europe, the mobile internet usage gap narrowed to 14% in 2022.

Most countries in Europe had mobile internet penetration rates above 60% as of 2022. Some countries, including Denmark, Italy, Spain and Portugal, have rates of more than 90%.

Figure 2

Mobile internet penetration by region, 2022

Percentage of population



* Excludes China
Source: GSMA Intelligence

5G will be the dominant mobile technology in Europe by 2026

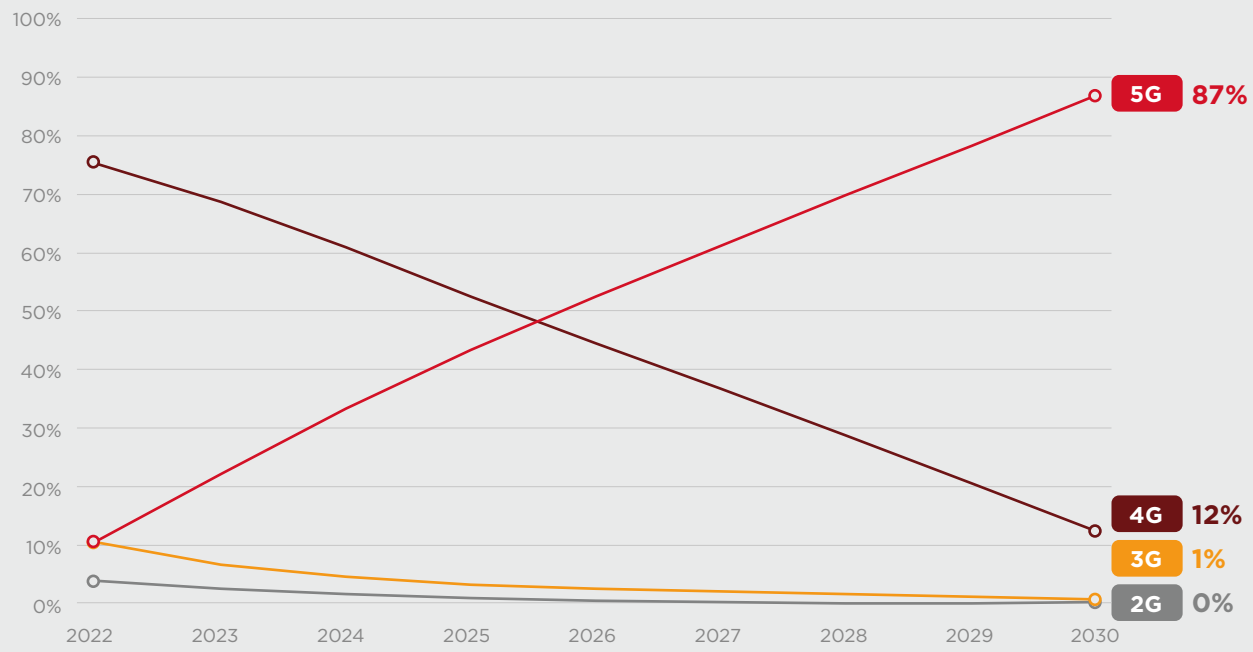
With new network deployments, 5G adoption (as a percentage of total connections) continues to grow in Europe, as 4G adoption begins to decline. 5G is set to dominate by 2026, so legacy networks (2G and 3G) are being phased out. In the UK, all the mobile network operators have pledged to turn off 2G and 3G by 2033. 3G is likely to be switched off before 2G in Europe. Operators from Denmark, Greece and Sweden plan to switch off 3G by the end of 2023.[1]

The shutting down of 2G/3G networks removes the availability of circuit-switched emergency calling (circuit switched is typically used for emergency calling in markets where voice over LTE, or VoLTE, has been deployed). Following concerns regarding the availability and interoperability of VoLTE emergency calls in both Europe and the US, the GSMA and its members have come together to update and align technical specifications.[2]

Figure 3

Europe: mobile adoption by technology

Percentage of total connections



Source: GSMA Intelligence

1. "2G and 3G Shutdowns Continue", Telegeography, February 2023
2. "How we're addressing VoLTE emergency call issues", GSMA, May 2023

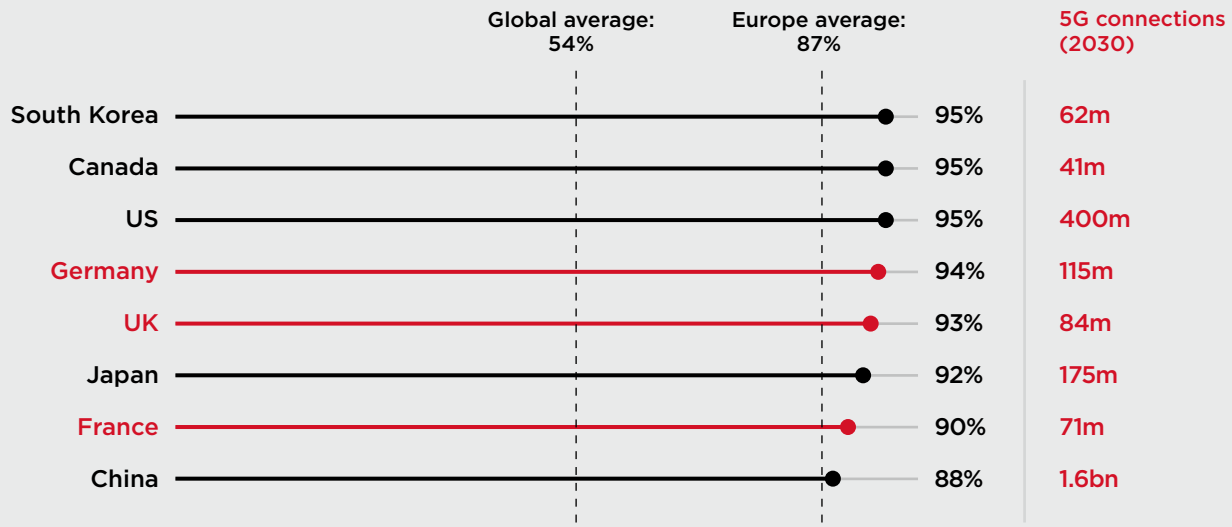
Germany and the UK are driving uptake of 5G in Europe

5G is expanding rapidly in Europe, with the number of connections estimated to have roughly doubled between the end of 2022 and 2023. Over the period to 2030, 5G connections will increase to reach 638 million (an adoption rate of 87%). Most countries in the region will see 5G adoption rates for 2030 that are above the global average, with the leading markets of Germany and the UK forecast to exceed 90%.

Figure 4

5G adoption in 2030

Percentage of total connections



Source: GSMA Intelligence

By 2030, smartphone connections will total more than 665 million in Europe

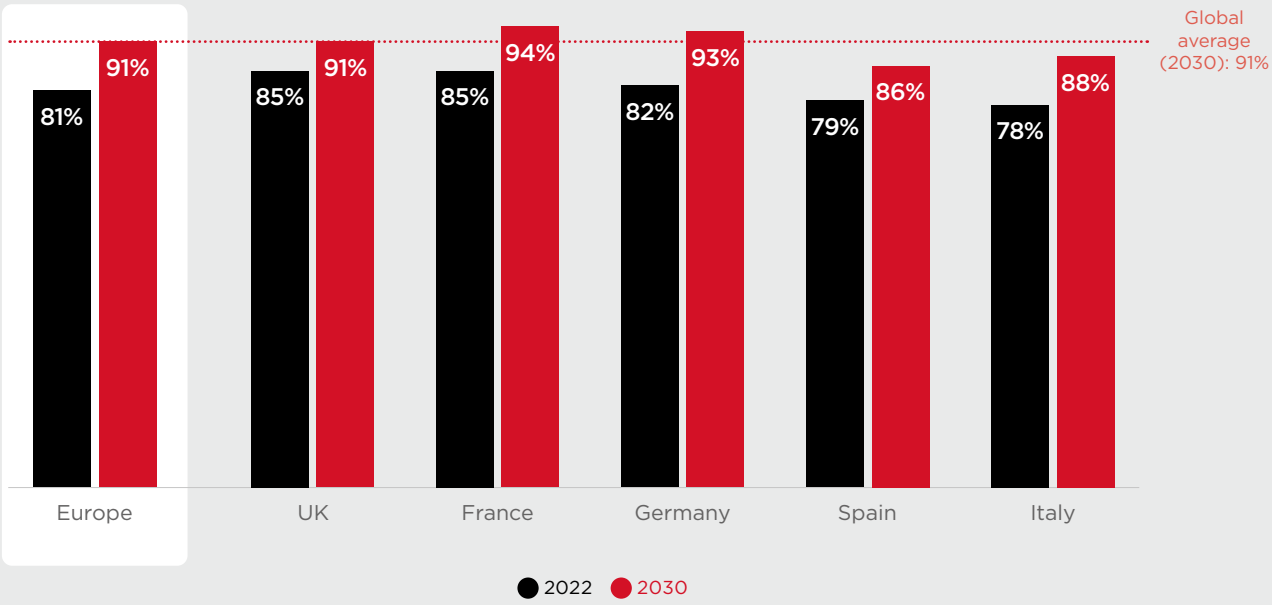
By 2030, smartphone adoption will reach 91% in Europe, matching the global average. Growth in smartphone connections will be seen across all countries in the region. Germany is forecast to lead in terms of number of smartphone connections by 2030, adding 15 million between 2022 and 2030.

The availability of affordable smartphones has played a key role in driving adoption. To help extend the lives of smartphones, the European Council in 2023 adopted regulation requiring all smartphones to have replaceable batteries by 2027. The regulation encourages right-to-repair for users, and aims to reduce e-waste.

Figure 5

Smartphone adoption

Percentage of total connections (excluding licensed cellular IoT)



Top three smartphone markets in Europe
(smartphone connections, 2030)

Germany **113 million**

UK **82 million**

France **74 million**

Mobile data traffic in Europe will almost triple over the next five years

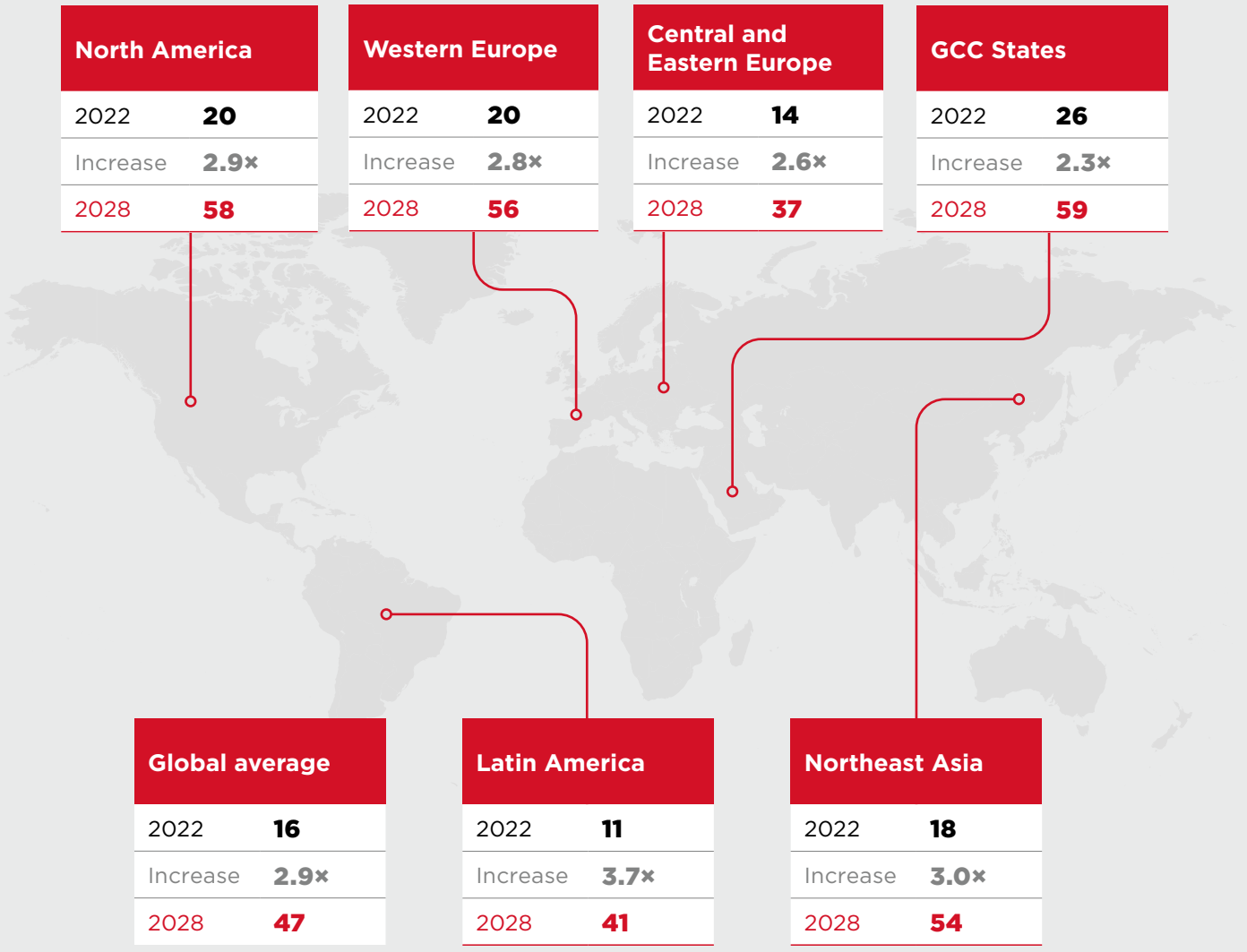
Mobile data traffic across the region will rise considerably with migration to 4G (particularly in Central and Eastern Europe) and improved 5G network coverage and capacity. A GSMA Intelligence consumer survey showed that 5G subscribers are particularly interested in adding services and content to their mobile contracts, with potential implications for data use.

Uptake of apps for gaming, extended reality and video are the primary drivers for the increase in data usage. Operators are evolving their mobile networks to meet this growing demand and ensure a consistent experience across locations.

Figure 6

Mobile data traffic per smartphone

GB per month



Source: GSMA Intelligence, based on Ericsson Mobility Report June 2023

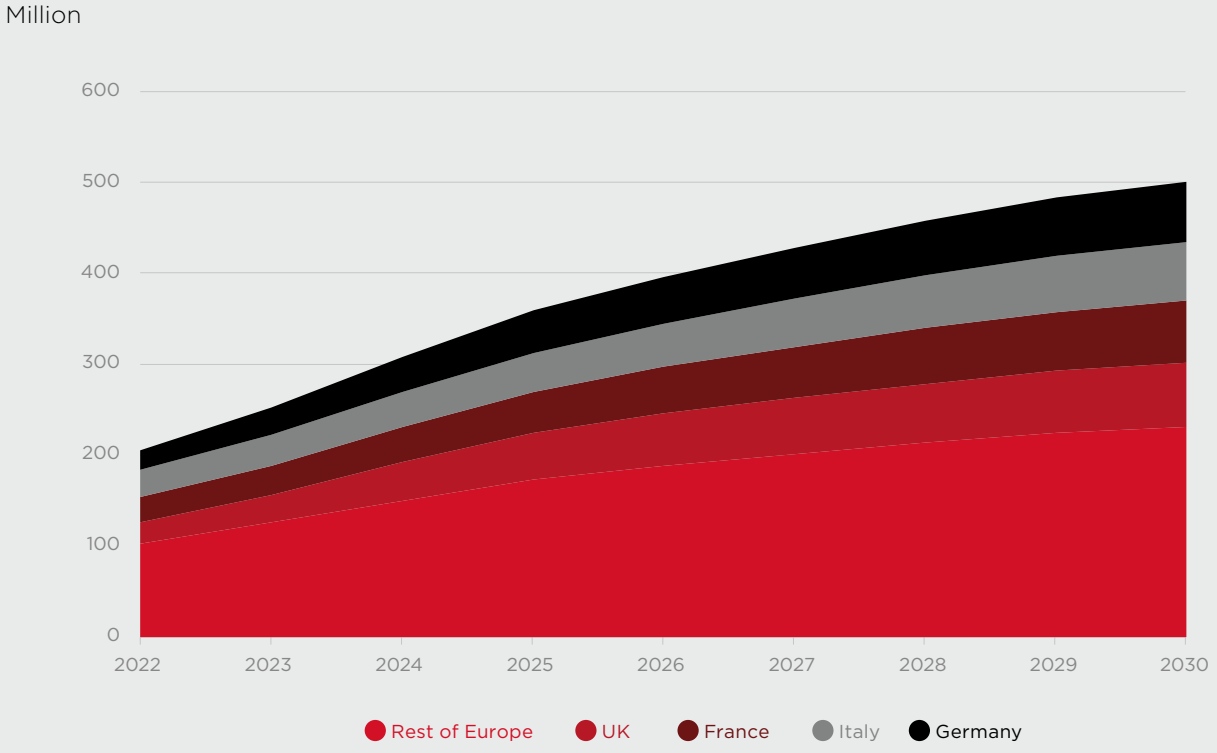
Licensed cellular IoT connections in Europe will double by 2030

Europe will have more than 500 million licensed cellular IoT connections[3] by 2030, driven by growth in the automotive and utilities sectors. More than 70% of operators in Europe deem IoT to be a very or extremely important success factor for their enterprise portfolios, second only to 5G connectivity services.[4]

While the IoT market and ecosystem is growing, consolidation is taking place in certain areas, especially those adjacent to IoT connectivity (e.g. equipment and management). Operators are rethinking their IoT strategies accordingly. GSMA Intelligence research shows that many operators are maintaining an interest in being directly involved with IoT, while others are considering different plans, such as spinning off IoT units into separate entities or even divesting.[5]

Figure 7

Europe: licensed cellular IoT connections



Source: GSMA Intelligence

3. Licensed cellular IoT connections use licensed spectrum from mobile operators, including 2G/3G/4G/5G NB-IoT and LTE-M. Unlicensed IoT connections use SigFox or LoRa.
4. GSMA Intelligence Operators in Focus: Enterprise Opportunity Survey 2022
5. Operators in IoT: progress in the last decade and pathway to sustained success, GSMA Intelligence, 2023

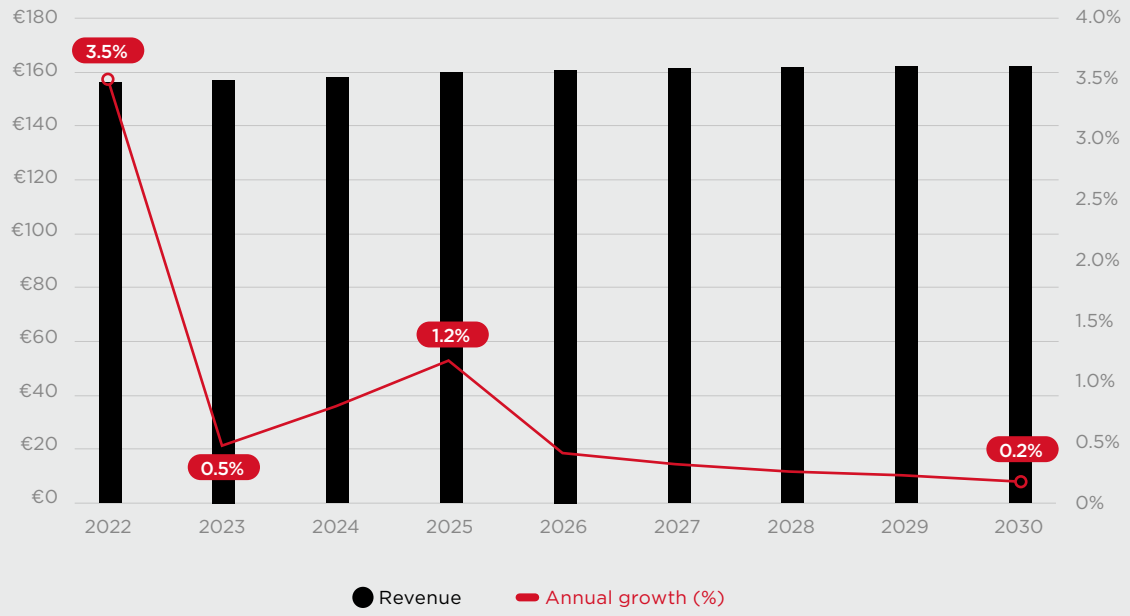
Europe will see flat revenue growth over the coming years

Operator revenue is forecast to grow marginally in Europe, as operators continue to diversify their services and look to generate new revenue streams. Consumer services are the largest contributor to operator revenues, while the enterprise segment is the main growth driver as operators increasingly target the digital transformation of vertical industries. Amid growing 5G connections and investments in network deployment, services beyond connectivity (such as cloud and security) and further service diversification have become strategic imperatives for operators.

Figure 8

Europe: mobile operator revenue and year-on-year growth

Mobile revenue (billion)



Source: GSMA Intelligence

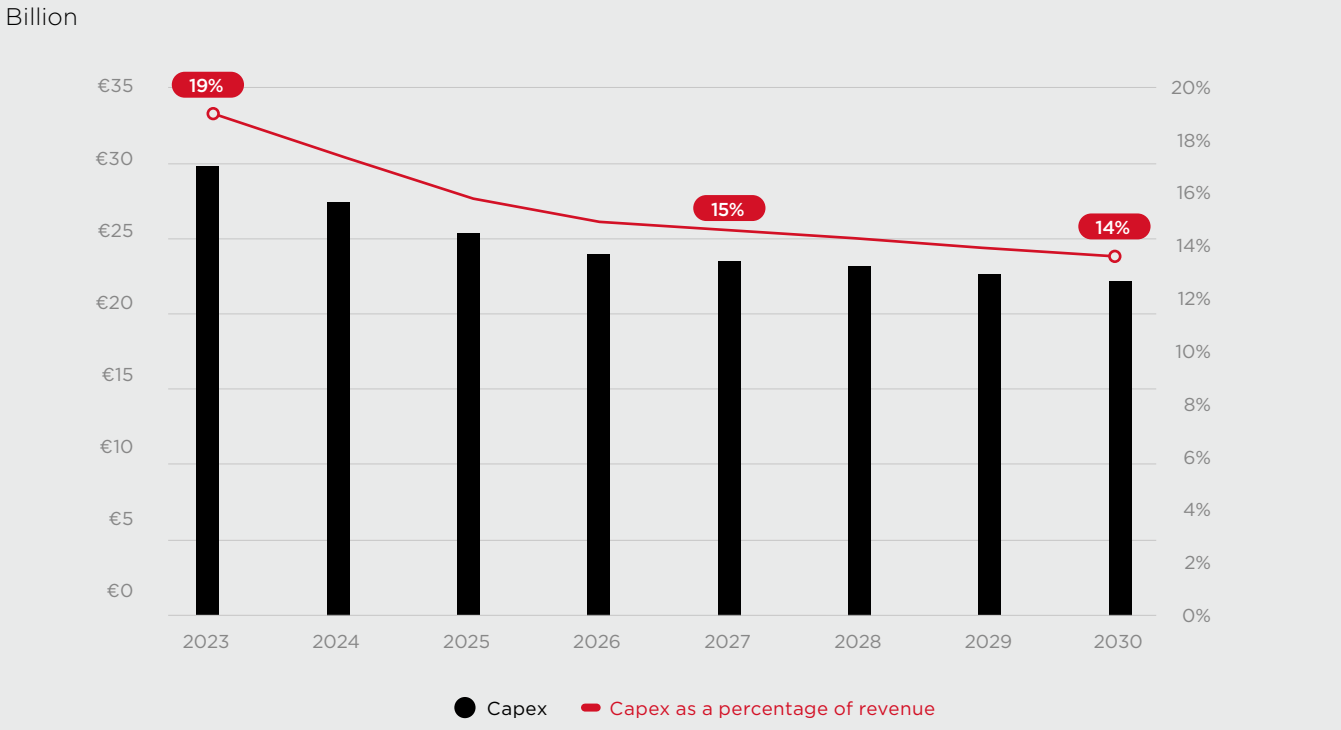
Operators will spend more than €195 billion on networks during 2023–2030

As in North America and China, operator capex levels in Europe are forecast to begin to trend downwards. Operators are focusing on generating a return on investment after extensive rollout of 5G networks.

Over the coming years, operators' attention will shift to extending 5G coverage in rural areas in particular, and investing to support use cases enabled by 5G SA and 5G-Advanced.

Figure 9

Europe: mobile operator capex



Source: GSMA Intelligence

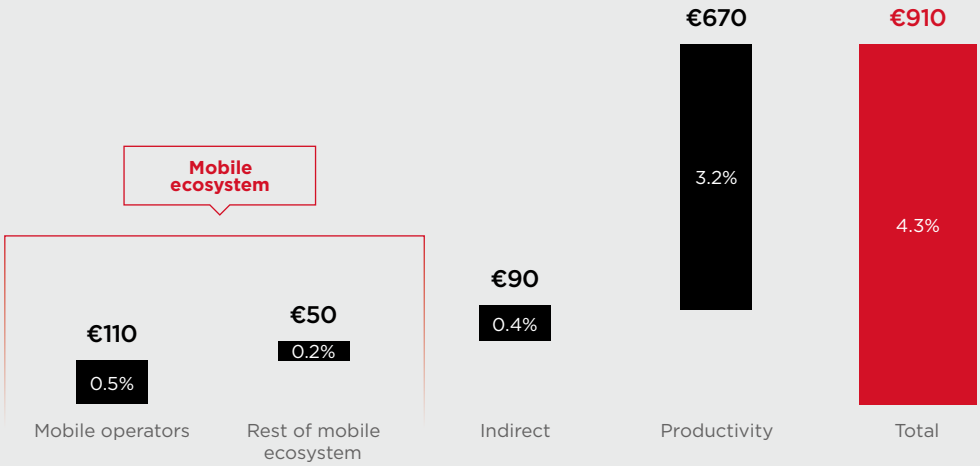
Mobile added €910 billion of economic value to the European economy in 2022

In 2022, mobile technologies and services generated 4.3% of GDP across Europe – a contribution that amounted to €910 billion of economic value added. The greatest contribution came from productivity effects (€670 billion), followed by mobile operators (€110 billion).

Figure 10

Europe: total economic contribution of mobile, 2022

Billion, percentage of GDP



Note: Totals may not add up due to rounding
Source: GSMA Intelligence

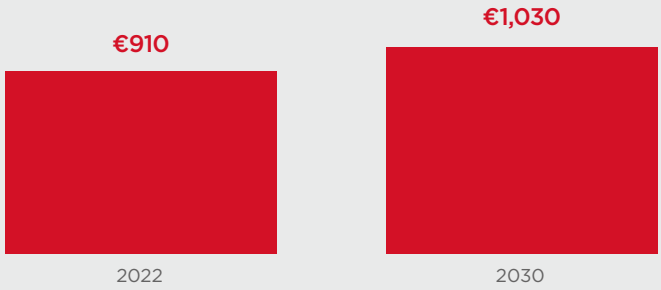
By 2030, mobile's economic contribution in Europe will reach €1 trillion

Mobile's contribution will reach approximately €1 trillion in Europe by 2030, driven mostly by the continued expansion of the mobile ecosystem and verticals increasingly benefitting from the improvements in productivity and efficiency brought about by the take-up of mobile services.

Figure 11

Europe: economic impact of mobile

Billion



Source: GSMA Intelligence

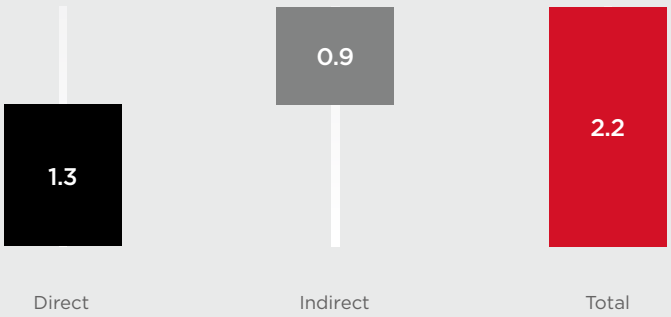
The mobile ecosystem in Europe supported more than 2 million jobs in 2022

Mobile operators and the wider mobile ecosystem provided direct employment to around 1.3 million people in Europe in 2022. In addition, the economic activity in the ecosystem generated almost 1 million jobs in other sectors.

Figure 12

Europe: employment impact of the mobile ecosystem, 2022

Jobs (million)



Note: Totals may not add up due to rounding
Source: GSMA Intelligence

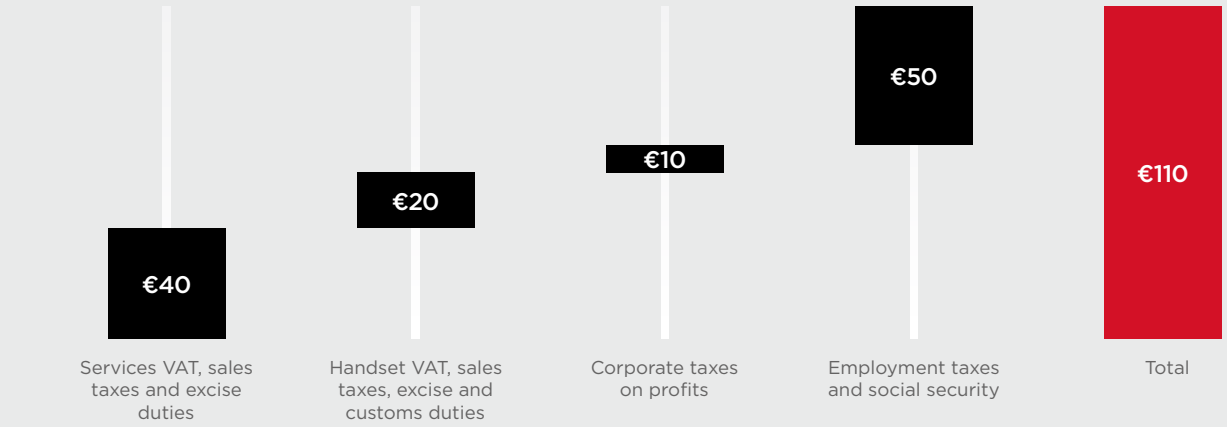
In 2022, the fiscal contribution of the mobile ecosystem in Europe reached €110 billion

In 2022, the mobile sector made a substantial contribution to the funding of the public sector, with around €110 billion raised through taxes on the sector. A large contribution was driven by employment taxes and social security (€50 billion), followed by services VAT, sales taxes and excise duties (€40 billion).

Figure 13

Europe: fiscal contribution of the mobile industry, 2022

Billion



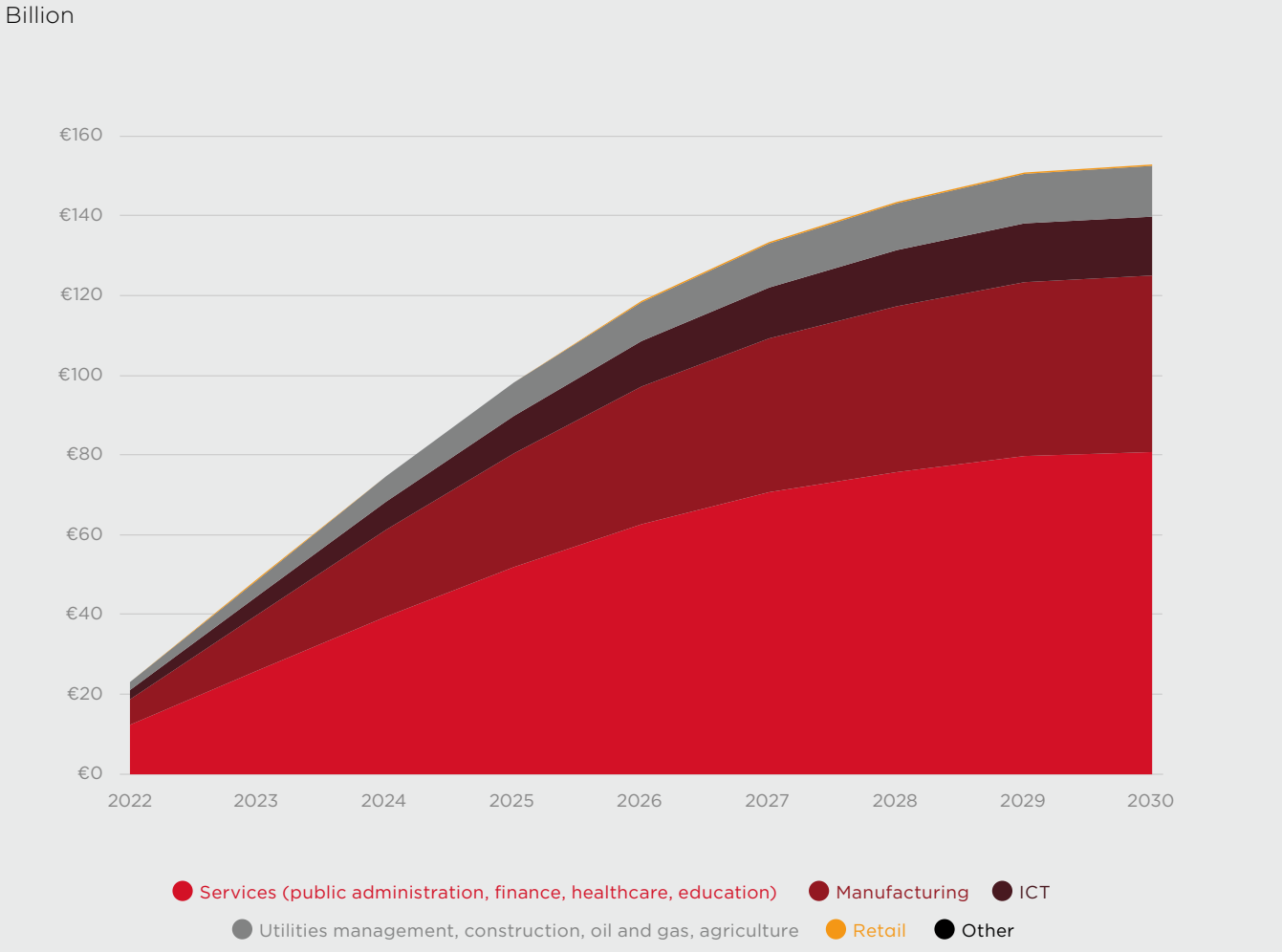
Note: Totals may not add up due to rounding
Source: GSMA Intelligence

5G will add more than €150 billion to the European economy in 2030

5G is expected to benefit the European economy by €153 billion in 2030, accounting for approximately 15% of the overall economic impact of mobile. Much of the benefits will materialise over the next five years. Towards the end of the decade, growth in 5G economic benefits will stabilise as the technology reaches widespread adoption.

Figure 14

Europe: annual 5G contribution, by industry



Source: GSMA Intelligence

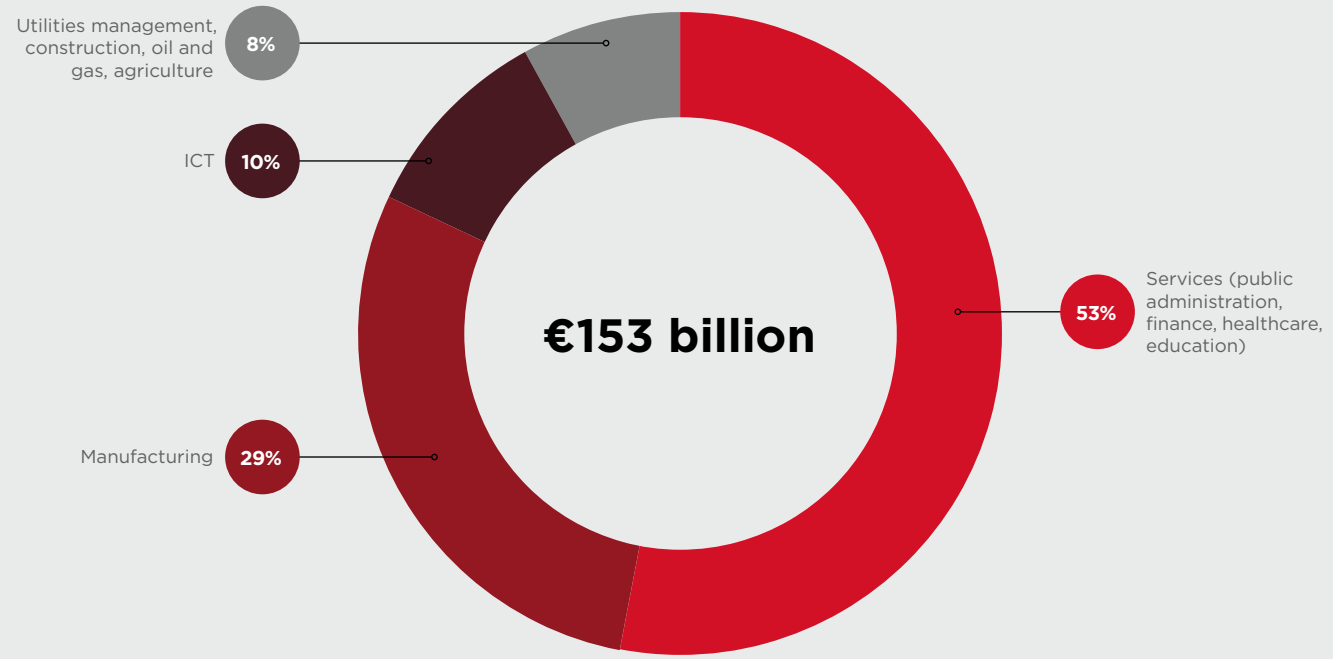
The benefits of 5G in Europe in 2030 will focus on the services and manufacturing industries

5G is expected to benefit most sectors across the European economy, depending on their ability to incorporate 5G use cases into their business. Over the period to 2030, 53% of the benefits is expected to originate from the services sector, while 29% is expected to come from the manufacturing sector, driven by applications including smart factories, smart cities and smart grids.

Figure 15

Europe: 5G contribution, by industry, 2030

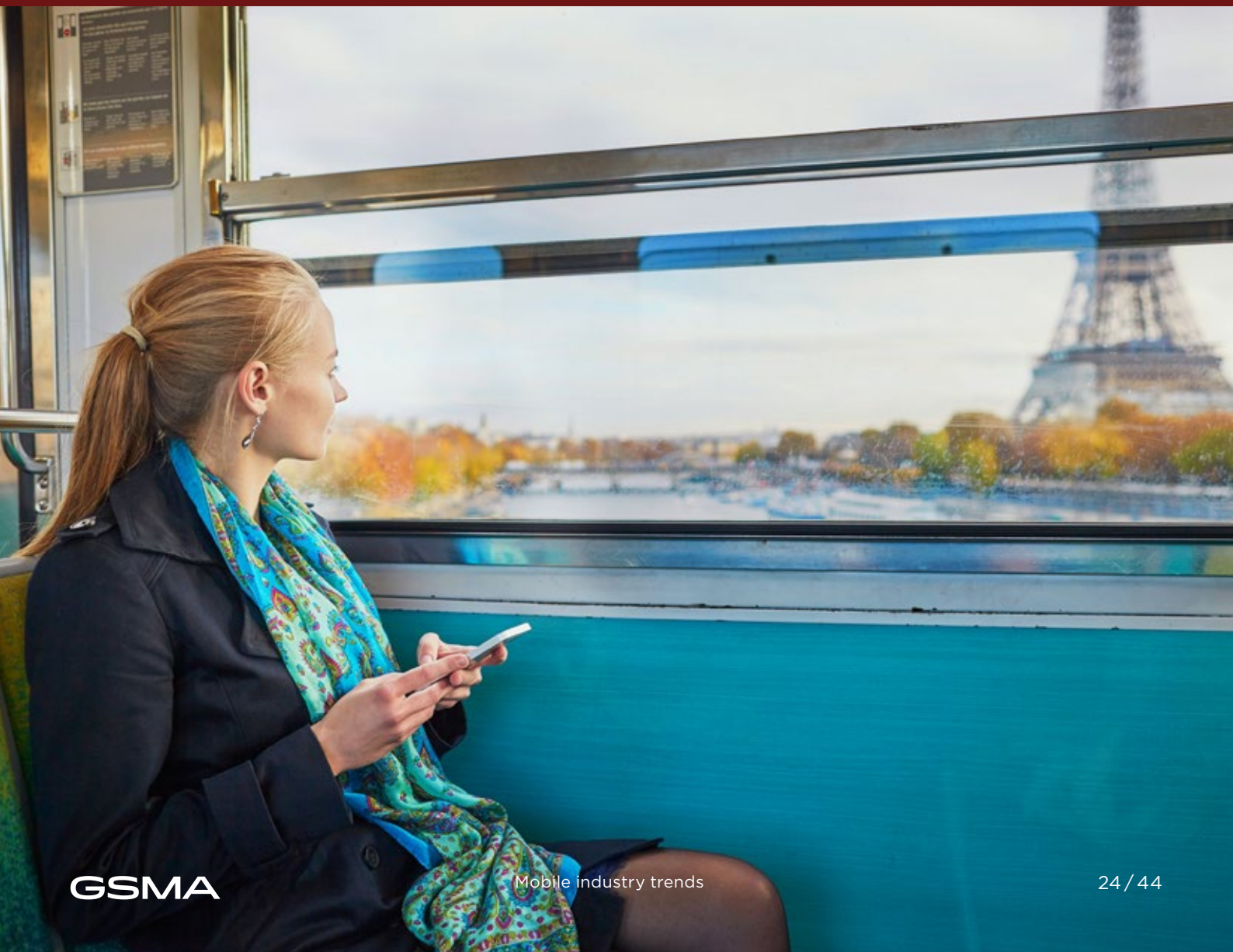
Percentage of total benefit



Source: GSMA Intelligence

02

Mobile industry trends



2.1
Unlocking the revenue potential of 5G

Across Europe and elsewhere, focus is shifting to 5G monetisation as operators seek returns on their significant capital outlays. Bundling non-connectivity offerings with mobile subscriptions is one route. GSMA Intelligence research shows 5G users are more interested than 4G users in adding content, services and devices to their mobile contracts.[6] Video and music streaming are the bundling options with the greatest demand. Gaming, digital security and smart home services offer other routes to revenue diversification.

Tariff structures that enable operators to move away from volume-based pricing can also help drive 5G monetisation. In Finland, Elisa offers 5G plans that are differentiated by mobile speed. The operator reported that 47% of its smartphone-based subscriptions were on speeds higher than 200 Mbps in Q2 2023. The pricing strategy has helped Elisa achieve an average billing uplift of €3 per month when customers upgrade to 5G.

5G FWA represents a further incremental revenue opportunity for operators. Several European countries have a large installed base of legacy cable and xDSL connections that will need to be upgraded to keep up with growing consumer demand for data-rich applications. Operators can take note of early 5G FWA successes in Austria and Italy. GSMA Intelligence forecasts that four of the top 10 most penetrated 5G FWA markets will be in Europe by 2030.[7]

5G SA momentum builds

5G SA deployments in Europe have been trailing other regions. At the end of 2022, only around 5% of live 5G networks in Europe were 5G SA, compared to 25% in Asia Pacific. This reflects the challenging operating environment facing operators in Europe, characterised by market fragmentation and low ARPU levels.

However, 5G SA activity has recently started to gather pace in the region. Many operators are promoting the network upgrade to their customers using new branding (e.g. 5G+ or 5G Ultra). This serves as a valuable proxy for network quality and can help operators differentiate their 5G offerings versus competitors yet to launch 5G SA.

5G SA brings new capabilities that will be crucial to monetising 5G investments, including improved support for network slicing. Successful trials of slicing include the broadcasting of major events (e.g. the coronation of King Charles III in the UK) and cloud gaming.

6. Consumer 5G: user behaviour offers new opportunities, but monetisation at scale is still a work in progress, GSMA Intelligence, 2023
7. 5G FWA on the rise: state of the market, new developments and outlook through to 2030, GSMA Intelligence, 2023

Private 5G gains traction

As of Q2 2023, Europe was the leading region in terms of number of private wireless networks, accounting for around 40% of global deployments.[8] Much of the activity in Europe is focused on private LTE deployments, reflecting the wider availability of the necessary equipment compared to private 5G. Nonetheless, private 5G activity is accelerating, with recent announcements including the following:

- **August 2023:** Deutsche Telekom announced it will build private 5G networks at port terminals in Hamburg, Bremerhaven and Wilhelmshaven in Germany on behalf of container terminal operator Eurogate Terminals.
- **July 2023:** Orange Business unveiled a hybrid private network using 5G SA at its premises in Arcueil, on the outskirts of Paris. The solution relies on network slicing to offer companies the benefits of a private network, while simultaneously connecting to public infrastructure.
- **May 2023:** Telia partnered with Ericsson to debut a private industrial 5G network in the Baltics, with the duo outlining use cases including digital twins and robotics to ramp up operational efficiency at the vendor's Estonian facility.

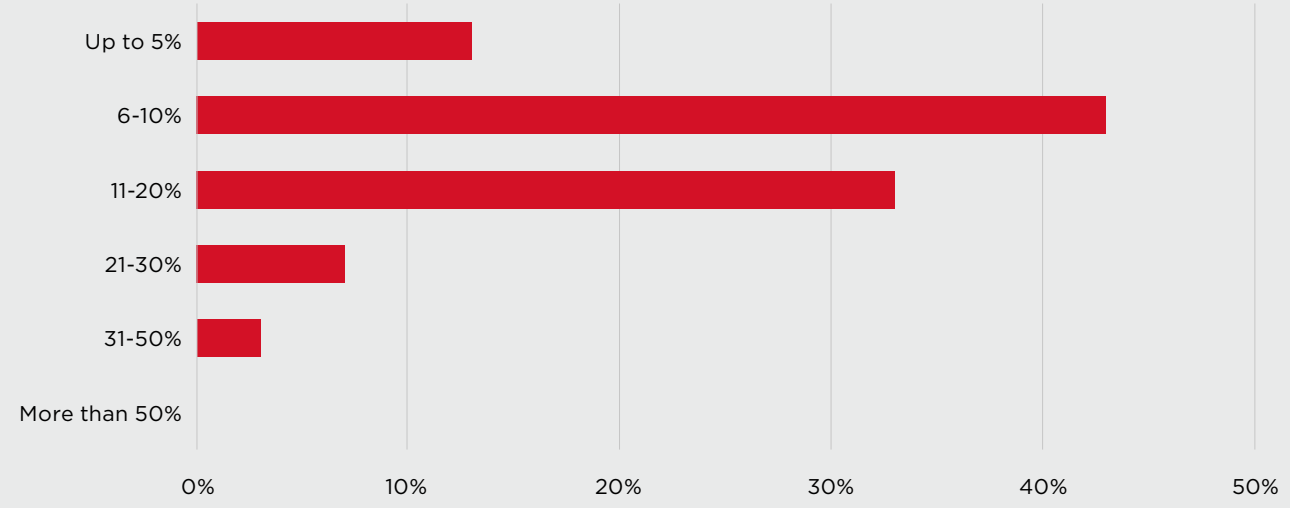
Private 5G network provision is a new business for operators in the 5G era, with opportunities to create new revenue streams and serve additional enterprise customers. Almost half of operators expect private wireless networks to account for more than 10% of their total enterprise revenues by 2025, according to a GSMA Intelligence survey. The contribution of private wireless networks to operator enterprise revenues should then rise in the second half of the decade as private 5G network equipment and devices become more readily available.

Figure 16

Operator revenue contribution of private wireless networks

Thinking about revenues for your company generated by private wireless networks, how do you expect such revenues to contribute to total enterprise revenues by 2025?

Percentage of European respondents



Source: GSMA Intelligence Operators in Focus: Enterprise Opportunity 2022

8. Private Mobile Networks, GSA, 2023. Based on a sample of 1,212 catalogued customers deploying private wireless networks with revenue greater than €100,000.

2.2
Transforming networks

There is a need to rethink the design of telecoms networks to meet evolving connectivity requirements and enable the rapid expansion of data-driven technologies (AI, web 3.0). As well as investments in infrastructure rollout, this network transformation entails the softwarisation and virtualisation of network functions, as well as cloud-native and disaggregated network architectures.

To manage increasing complexity, operators need to invest heavily in network automation, including the use of AI and machine learning, as well as software skills. These allow customised connectivity solutions to be provided, as well as added services and functionality (such as edge cloud), which can be offered to customers using standardised interfaces (network as a service).

Network as a service: a new business model

Operators are now focused on creating an open, network-as-a-service (NaaS) environment to integrate their service portfolios (connectivity, 5G, IoT and cloud) and enable seamless connectivity for immersive technologies. This approach will deliver connectivity through application programming interfaces (APIs) for developers in various sectors, who are improving their business processes and building new digital services. This will help power the next wave of innovation.

Whereas the existing operator business model is about selling connectivity for digital infrastructure, the new operator business model is about orchestrating highly responsive digital infrastructure for developers. Digital services will require more sophisticated networks, and new capabilities are needed for the developers interacting with the networks.

2.3
Reigniting satellite connectivity

Efforts to extend connectivity in underserved areas have successfully reduced the size of the coverage gap in Europe in recent years. However, operators still face an unfavourable set of economics for expanding into areas of low population density. Backhaul costs are a major reason; these tend to rise 5–10× for the final 10% of households in a country. This highlights the need for operators to consider alternative backhaul solutions to fibre and microwave technologies in rural areas. In Europe, 65% of populated rural areas are not currently covered by 5G, according to the State of the Digital Decade report.

Satellite backhaul has been around for a while. However, recent developments offer the possibility of using the technology in more scenarios. The rising number of high-capacity and low-latency LEO constellations is a key reason, as is the arrival of high-throughput satellite (HTS) and a more powerful satellite ground segment. This is leading to new partnerships between mobile operators and satellite companies, such as the recent agreements between T-Mobile US and Starlink, Vodafone and Project Kuiper, and Orange and OneWeb.

Deutsche Telekom and Orange back European satellite bid

Major players in Europe's telecoms and space sectors have formed a consortium to tender for a contract to supply the EU's forthcoming satellite constellation project, IRIS2. The group is being led by Airbus Defence and Space, Eutelsat, Hispasat, SES and Thales Alenia Space. It is built as an open consortium, which also comprises a core team of cross-sector players including Deutsche Telekom and Orange. The IRIS project carries an EU budget of €2.4 billion and aims to deliver satellite communication services by 2027 across Europe for use cases such as the protection of critical infrastructure, surveillance and crisis management.

The direct-to-device opportunity

Direct to device (D2D) is not new, but an important change came about from the 5G NR standard from 3GPP; this incorporates integration for NTNs. Where commercial partnerships are in place, standard smartphones and IoT devices can connect seamlessly with traditional cellular base stations and satellite systems (effectively satellite base stations). D2D is likely to offer 3G-like speeds (3–5 Mbps), though these could be slightly higher in scenarios where the economics and technology provide the right mix.

D2D satellite offers mobile operators access to new customer segments and the ability to provide connectivity for existing customers when roaming out of range of a terrestrial signal. In most cases, the business model would be a wholesale partnership. For example, Vodafone and Orange are working with AST SpaceMobile to deliver a D2D smartphone service in Africa. T-Mobile US is working on a similar offering with Starlink.

Satellite makes in-roads in the enterprise segment

Much of the attention from expanding satellite coverage has understandably been focused on coverage in-fill. The enterprise side has garnered relatively less attention. This is starting to change, in recognition of clear demand from SMEs and even larger enterprises for stable connectivity to service IoT installations in hard-to-reach areas or for transiting purposes (such as with logistics).

GSMA Intelligence survey data indicates that 15–20% of enterprises already use, or would be interested in using, satellite connectivity.[9] This skews higher for industries with remote operations (oil & gas, and mining) and for logistics/haulage. The 15–20% may at first seem high, but it may be reflective of businesses that have terrestrial coverage from a mobile operator on an intermittent basis, making satellite a desired back-up. Deutsche Telekom and Telefónica have both recently announced partnership agreements with satellite companies covering enterprise connectivity, highlighting the growing perceived importance of the technology among operators.

Figure 17

Examples of recent partnerships between mobile operators and satellite companies

Deutsche Telekom	In February 2023, Deutsche Telekom announced a partnership with Intelsat and Skylo to add satellite connectivity to its existing terrestrial IoT networks, creating what it calls a "global network of networks". The companies highlighted several use cases, such as recording water levels and weather data in unsafe locations and offering broadband connectivity in the ocean.
Orange	Orange and OneWeb announced a partnership in March 2023. As part of the agreement, OneWeb will provide LEO satellite backhaul for selected Orange sites in rural areas. Additionally, Orange will add OneWeb's LEO broadband service to its enterprise portfolio.
Telefónica	In August 2023, Telefónica announced it had become an authorised worldwide partner of SpaceX's Starlink. With this agreement, Telefónica will be able to complement its existing offering by integrating Starlink's Enterprise solutions (fixed or mobile) into its global portfolio. These solutions include a broadband service capable of download speeds of up to 350 Mbps in remote locations and an IoT terminal adapted to work in vehicles.
Vodafone	Vodafone and Project Kuiper, Amazon's LEO satellite communications initiative, announced a strategic collaboration in September 2023. Vodafone will use Project Kuiper's service to provide 4G/5G backhaul in areas where it is challenging and prohibitively expensive to use fibre or microwave backhaul solutions. The companies plan to participate in beta testing of the Project Kuiper service in 2024.

Source: GSMA Intelligence

9. Satellites and telcos: coming to a place above you, GSMA Intelligence, 2023

2.4
Exploring the role of generative AI

It has been less than a year since ChatGPT launched, introducing much of the world to the concept of generative AI. Since then, competitors have emerged and businesses around the world, including mobile operators, have begun to explore how to use the technology.

Generative AI differs from other types of AI primarily in its ability to create new content. For mobile operators, generative AI offers various potential use cases. User-facing applications include improved customer care via enhanced chatbots, and customised proposition development. Operator-facing applications include marketing collateral development, knowledge base management, network management and code development support.

Such applications build on existing uses of AI in the telecoms sector. These have focused on recognising patterns or making decisions based on existing data. Network use cases such as fault detection and resolution, network optimisation and network planning have been key areas.

Figure 18

Example AI use cases from the telecoms sector

Use case	Example
Code development support	In August 2023, Vodafone provided information about its use of generative AI to help its software engineers generate code. Vodafone claims using generative AI led to a productivity gain of between 30% and 45% during trials conducted with about 250 developers.[10]
Fighting spam calls and messages	In September 2023, EE detailed its efforts in deploying AI to prevent call and SMS scams across its networks, using the technology to block potential threats by identifying spoof numbers and patterns in text messages. The operator stated the new prevention methods will also be deployed on the Plusnet and BT networks. The three brands combined have blocked 281 million spam texts and 105 million international scam calls with the security measures currently in place.[11]
Improving energy efficiency	In April 2023, Tele2 completed a three-year research project examining the use of AI to better predict mobile network traffic capacity requirements.[12] The results demonstrate the potential for AI to help operators with power saving, ensuring network performance with fewer human interactions, increasing efficiency and reducing the number of human errors.

Source: GSMA Intelligence

10. "Google and Microsoft loom large in Vodafone's gen AI plans", Light Reading, August 2023
11. "EE steps up AI use to battle scams", Mobile World Live, September 2023
12. "New research project demonstrates AI reduces energy consumption in Tele2's 5G network", Tele2, April 2023

Use case	Example
Supporting call-centre staff	Several mobile operators have explored the use of generative AI to enhance call-centre operations by automating routine tasks such as call routing, FAQs and data entry. For example, Virgin Media O2 has used large language models (LLMs) to build chatbots and virtual agents that can support call-centre agents. It is also exploring the use of LLMs to analyse customer interactions for sentiment and intent, offering real-time insights.[13]
Supporting network expansion	When planning and preparing to lay fibre-optic lines, Deutsche Telekom uses cars equipped with cameras and eye-safe laser scanners.[14] In accordance with data protection, the relevant streets are recorded in 2D and 3D and analysed by AI. This recognises different surfaces such as asphalt or cobblestones, and checks whether trees or streetlamps cross the new fibre-optic routes. A planning tool then automatically determines the most efficient way to lay the new fibre-optic lines, and an experienced planner evaluates and optimises the result. Since 80% of the costs for fibre-optic expansion are incurred by underground construction work, AI can be used to achieve cost savings.

Source: GSMA Intelligence

AI skills and regulation move up the agenda

Staff training and upskilling are among the top three investments operators expect will be needed to support the use of generative AI.[15] For example, through a mix of external recruitment and internal retraining, Vodafone aims to add 7,000 software engineers to its workforce by 2025. This figure is almost double the total number of software engineers Vodafone had in 2021 when the plan was announced, highlighting the scale of the transformation needed to unlock new opportunities in areas such as generative AI.

Despite the potential to reap significant benefits from the application of advanced AI in business and society, valid ethical concerns around the technology still need to be addressed. Leading officials in the European telecoms industry have warned about the existential threats associated with development of an out-of-control generative-AI model.[16] Meanwhile, the European Data Protection Board (EDPB) announced the formation of a ChatGPT taskforce to foster cooperation and exchange information on possible moves by individual data protection authorities in the region.[17] The EU is also in the process of finalising the AI act, which will regulate the use of AI in the EU.

13. "How Generative AI is Revolutionising the Telecom Industry — Customer Care and Chatbots / Virtual Agents", Medium, September 2023
14. See https://www.telekom.de/netz/glasfaser-ausbauplanung-ki
15. Generative AI in operator networks: is there life at the edge?, GSMA Intelligence, 2023
16. "Telefonica chief latest to sound generative AI warning", Mobile World Live, April 2023
17. "EU privacy body forms ChatGPT task force", Mobile World Live, April 2023

2.5
Shifting to circularity

Demand for telecoms equipment and services is on the rise due to the increasing adoption of 5G technologies. In Europe, there are more than 900 million active mobile connections, including feature phones and smartphones. With growing concerns around e-waste, circularity has become a priority for policymakers and the telecoms industry. As one of the largest consumer markets for new 5G devices, Europe is at the forefront of promoting sustainable 5G solutions, including green consumer options and enterprise use cases.

The mobile ecosystem in the region is embracing circularity for both mobile devices and network equipment. This means considering factors such as materials used in mobile phone production, developing long-lasting devices and equipment, and using recyclable and recycled materials to reduce e-waste.

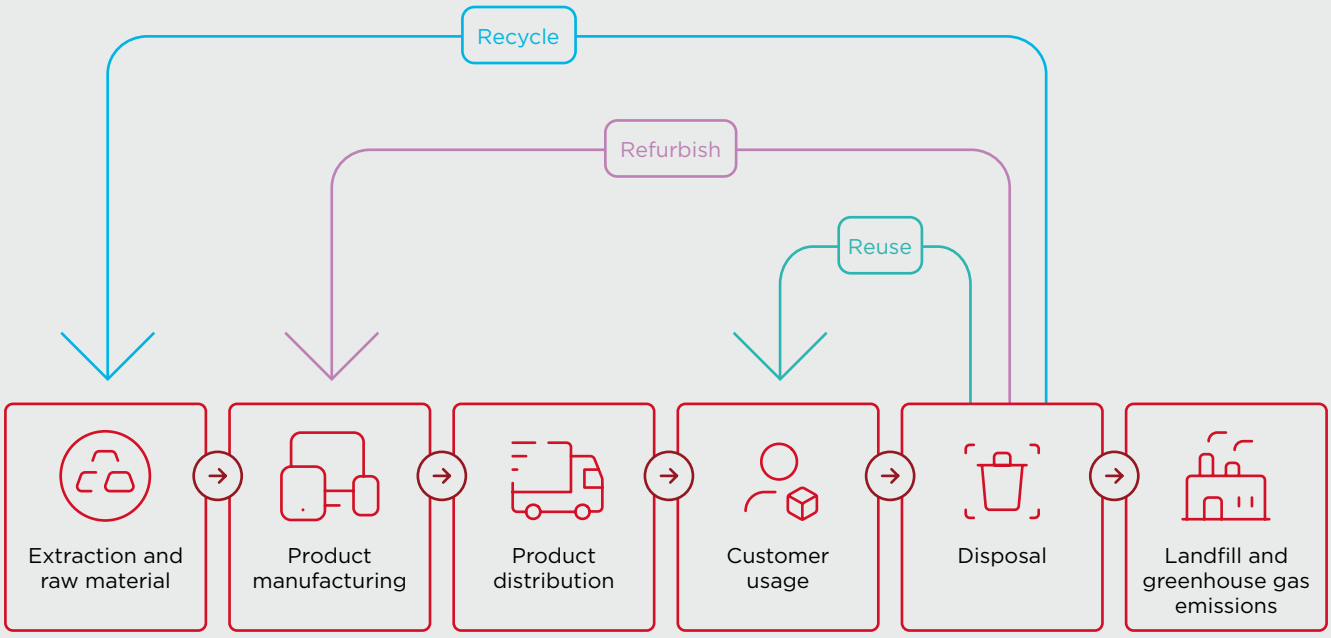
The technical lifespan of a mobile device has improved, ranging from four to seven years on average.[18] However, the average usage period of a mobile device remains around three years,[19] indicating the need for initiatives that steer consumer behaviour toward reducing e-waste. Encouraging and incentivising consumers will play a critical role in achieving success, though it may be complicated by influencing factors such as affordability, information availability, social norms and personal preferences.

Governments and ecosystem players can collaborate to raise awareness and incentivise consumers to prolong the lives of devices. For example, there is an opportunity to establish new channels to collect, refurbish and resell devices and network equipment. Moreover, educational campaigns on sustainability can be implemented to inform consumers.

European manufacturers such as Nokia and Ericsson have committed to reducing the environmental impact of their products, operations, manufacturing and supply chains. The vendors are primarily focusing on asset recovery, refurbishment and the recycling of legacy equipment in the original country of deployment, or reusing across markets globally. The guiding principles of reuse, recycle and refurbish are central to extending the life of a product and, in turn, reducing or eliminating waste in the production and usage cycle.

Figure 19

The concept of the circular economy



Source: GSMA

18. E-waste and raw materials: from environmental issues to business models, IVL Swedish Environmental Research Institute, 2019
19. Statista

Circularity: example operator initiatives

Tele2 commits to 100% circularity for network equipment by 2025	Tele2 is the first telecoms company in Sweden to publicly commit to 100% of its network equipment being responsibly resold, reused, remanufactured or recycled, and non-recyclable materials being disposed of securely. As part of its vision to be a leader in sustainability, Tele2 is already climate-neutral in its operations and aims to reduce greenhouse gas emissions across its value chain by 60% per subscription by 2029. Tele2 has been an active participant in an industry-wide project led by the GSMA to identify opportunities for increased circularity.
Vodafone's circular economy initiatives	Vodafone aims to reach net zero for its UK operations by 2027 and to be fully net zero across the Group by 2040. Its main sources of e-waste are its network equipment and the devices provided to businesses and consumers. The group has been reusing, reselling or recycling 96% of its waste network equipment. In 2022, the initiative helped save around 1,500 tonnes of CO2 by reusing equipment across its UK sites. Vodafone also operates an International Asset Marketplace for sharing equipment between its businesses. This is used to reuse and resell excess stock or decommissioned equipment such as masts and antennas. The platform helped the group save more than £12.5 million of spend and over 1,100 tonnes of CO2 in the year ending March 2023.
BT aims for net zero using the circular economy	BT aims to reach net-zero emissions from its operations by the end of March 2031, and its supply chain and customer emissions by the end of March 2041. BT sources 99.9% of global electricity consumption from renewable sources. Additionally, the operator's aim is to transition to electric or zero-carbon emission vehicles by 2030. Its subsidiary, EE, is exploring ways to reuse and recycle legacy 3G network equipment. The group has also created its Exchange Clearance Operation (ECO) programme, which involves recycling and reselling equipment from old telephony exchanges.
OTE collects 730,000 pieces of equipment for recycling	OTE collected more than 730,000 pieces of equipment in 2022 for refurbishment or recycling, according to the group's Unified Sustainable Development Report for 2022. The company achieved the responsible management of 100% of its ICT waste, strengthening its positive environmental footprint. OTE also recycled more than 21 tonnes of mobile devices, saving approximately 4.2 tonnes of plastic and 2.8 tonnes of precious metals.

2.6
Growing fintech opportunities

Europe's fintech sector remains at the centre of the financial services industry, capturing around 25% of the $75.2 billion in global investment, second only to the US (37%) in 2022.[20] Within the region, the UK accounted for the highest fintech investment value, with 67% of total regional investment in 2022. Germany and France followed at 16% and 15% respectively.[21] These countries are driving the sector forward with progressive regulation, technology innovation and a willingness to embrace digital transformation.

Figure 20

Fintech investment deal values for European countries in 2022

Billion

Source: Statista

The strong fintech sector in the region has offered customers greater choice and convenience. It has also encouraged the modernisation of banking systems and grown the number of internet banking users, with rising adoption of mobile banking and online account opening. The neobanking[22] market has grown substantially and expanded into new markets such as SME lending and investment services. User penetration of neobanking in Europe is expected to rise from 9.8% in 2023 to 14.7% by 2027, adding almost 124 million users.[23] Examples of neobank developments include the following:

- **Wise expands into new markets:** Wise, a UK-based neobank, was founded with a goal to make international money transfers more affordable and accessible. Services include low-cost, transparent currency exchange and borderless banking capabilities for individuals and businesses. Wise has expanded its portfolio to include multi-currency accounts, debit cards and business accounts. Its partnerships with financial institutions and HR & payroll companies have expanded its reach.
- **JP Morgan's neobank in Germany:** Following its success in the UK, in May 2023, JP Morgan announced the expansion of Chase, its digital-only bank, in Germany and other European countries. In the UK, Chase was the fastest-growing fintech app of 2022, reaching more than 1.6 million customers less than two years from launch.[24] The bank is now looking to build a strong presence across Europe.

Open banking is also boosting the sector's growth and is expected to foster the creation of new products and services. In 2022, open banking in the UK reached $50 billion in total purchase value.[25] The regulator's decision to roll out open banking as a payment method further boosted its growth in the UK. The government collaborated with Ecospend, the integrated open banking platform that enables consumers to conduct instant 'pay by bank account' transactions. This option is integrated into payments, including PAYE, corporation tax and capital gains tax, making it widely accessible.[26]

20. State of Fintech, CB Insights, 2022
21. Statista Research Department, 2023
22. A neobank is a challenger bank that operates digitally only. Neobanks do not have any physical branches and can provide their services via mobile or desktop devices. Examples of neobanks include Revolut, Chime, Nubank, N26 and Monzo.
23. Statista
24. "JP Morgan's Chase UK fastest growing fintech app in 2022", AltFi, January 2023
25. Reimagining the Future of Finance, BCG and QED Investors, 2023
26. "A2A payments made to HMRC using Ecospend's 'Pay by Bank' top £2.3bn", Open Banking Expo, February 2023

Increasing use of mobile devices for financial services

Use of mobile for financial services is increasing with the growth in 4G/5G users across the region. Consumers in countries such as the UK, Italy and France are the most frequent users of smartphones for financial services. In France, the share of 4G/5G subscribers using their devices daily for contactless payments grew by six percentage points between 2020 and 2022.[27] The numbers signal growing momentum behind digital financial services.

Operators have introduced new solutions to keep up with the expanding banking sector. They can continue to leverage their large, established customer bases to offer financial services and collaborate with players such as banks to capitalise on the shift to digital financial channels. Such moves are targeting new services for customers and digital capabilities for businesses.

Examples of operators collaborating on digital financial services

Orange Bank expands with new features

Orange Bank has partnered with Mambu to launch offerings such as government-regulated savings accounts, with a faster time to market. In 2023, the bank announced its migration to Mambu's cloud banking platform in France, to drive its European expansion. Orange Bank's core banking solutions are built on Mambu and hosted with Amazon Web Services (AWS), which enables it to easily scale operations. The bank currently uses Mambu to manage its current account, loan and credit-card products, with the government-regulated savings account in development.

The move is an extension of the companies' existing partnership, following the launch of Orange Bank on Mambu in Spain in 2019. Orange Bank in Spain had 1.9 million customers as of October 2022 and is one of the highest-rated banking apps in the country.

Telefónica's online loan services

Since April 2023, Telefónica Consumer Finance (a joint venture between Telefónica and the CaixaBank Group) has enabled Movistar Money customers to apply for online loans. According to Telefónica Spain, the Movistar Money service is part of its strategy to provide new digital services to customers. Such strategic moves are helping the operator advance its diversification and revenue growth by taking advantage of its broad customer base.

27. Banking on an opportunity, as consumers embrace mobile for financial services, GSMA Intelligence, 2023

03

Mobile industry impact

3.1
Operator progress with sustainability

Nearly 85% of operators worldwide have made net-zero commitments, according to a GSMA Intelligence survey.[28] Furthermore, as of 2022, two thirds of European operators had joined an initiative, the European Green Digital Coalition, and committed to reaching net zero by 2040.

Operators are taking steps to improve the energy efficiency of their networks. As a result, use of renewable energy by operators has increased significantly in the region. In 2022, emissions per connection (Scope 1 and 2) dropped by 20% versus 2021.[29]

Operators are expanding their sustainability efforts throughout the value chain and encouraging suppliers to follow the net-zero standards. Recent initiatives include the following:

- **Deutsche Telekom's climate targets:** Deutsche Telekom has set a number of targets in line with scientific research and the Paris Agreement, including climate neutrality in operation (Scope 1 & 2) by 2025, and a reduction of all technically avoidable emissions by 2025. In addition, unavoidable residual emissions will be neutralised through high-quality offsetting measures. The purchase of 100% of electricity from renewable energy worldwide has been in place since 2021. Deutsche Telekom is also targeting climate neutrality along the entire value chain (Scope 3) by 2040 at the latest.[30]
- **BT's expanding commitment to net zero:** BT Group tracks compliance through supplier assessments and encourages them to disclose to the CDP (Carbon Disclosure Project) to enhance transparency and accountability. In February 2023, BT launched a new supplier engagement campaign to encourage the setting of net-zero science-based targets.
- **Telefónica's sustainable approach to digital solutions:** Telefónica has developed an internal voluntary framework called Responsibility by Design to incorporate ethical and sustainability principles from the beginning of developing a new product or service through to its delivery to customers. It also helps Telefónica ensure that the product or service complies with the operator's Responsible Business Principles.

Operators are also developing collaborative efforts to deploy new technologies that help address the energy management issues faced by users. For example, working with housing cooperations in Sweden, Telia offered a heating optimisation solution to manage district heating during the winter of 2022/2023. Five buildings were connected through NB-IoT sensors in each apartment to measure temperature and humidity. A connected control unit for the building management systems was also installed. In this way, buildings were equipped with an automated solution to optimise the energy consumption of their district heating based on real-time, indoor temperature data.

> Nearly 85% of operators worldwide have made net-zero commitments, according to a GSMA Intelligence survey

28. The next generation of operator sustainability: greener edge and open RAN, GSMA Intelligence, 2023
29. Mobile Net Zero, GSMA, 2023
30. See https://www.telekom.com/en/corporate-responsibility/environment/details/climate-protection-at-dt-608474.

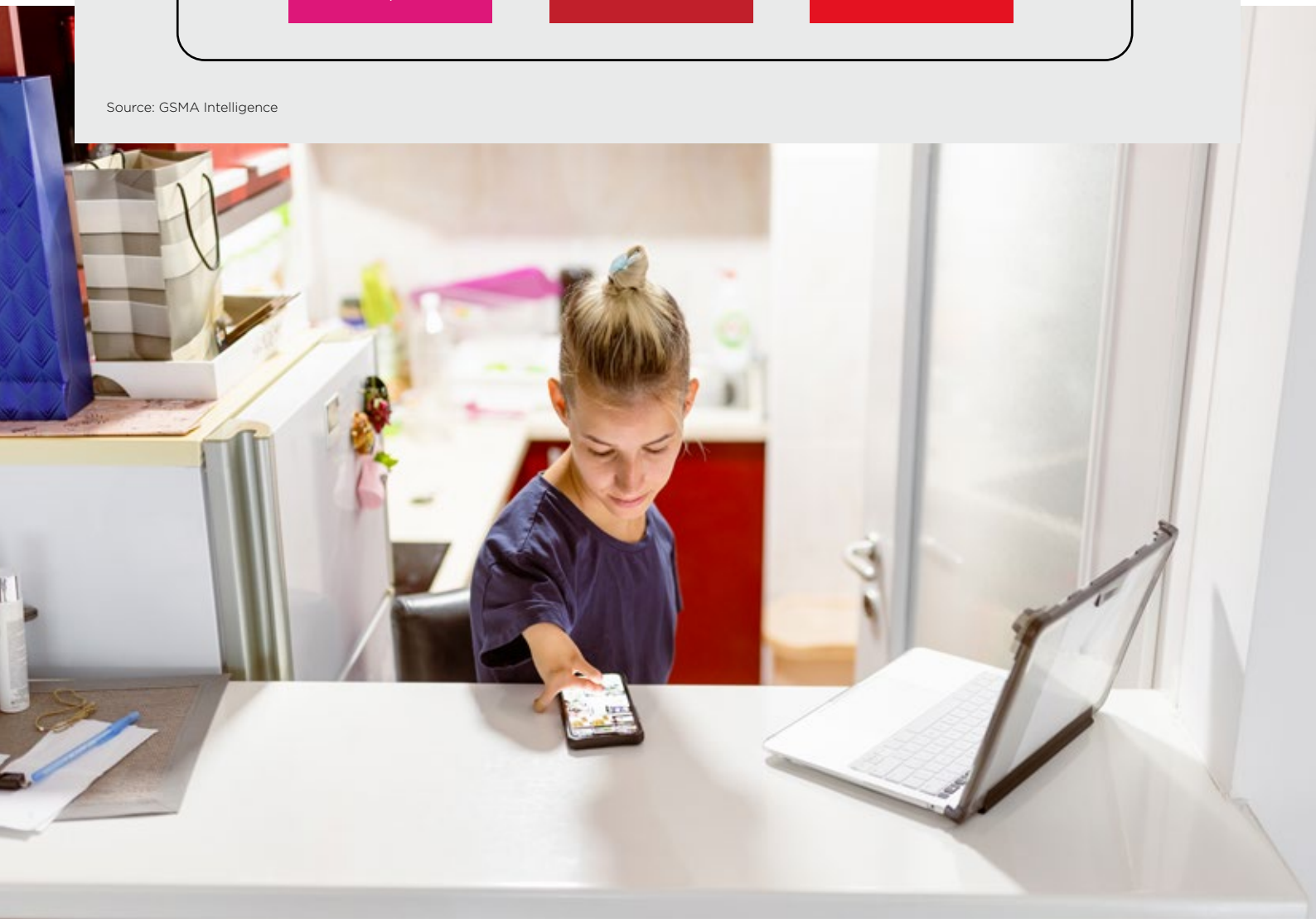
3.2
Mobile's impact on the SDGs

In 2022, European operators made progress with their impact on the UN Sustainable Development Goals (SDGs). SDG 10: Reduced Inequalities, SDG 4: Quality Education and SDG 1: No Poverty were the most improved SDGs, reflecting improving mobile broadband coverage and the increased use of devices for services.

Figure 21

Mobile's impact on the SDGs in Europe

Source: GSMA Intelligence



Strengthening digital inclusion and improving access to education

The barriers to mobile internet adoption are particularly acute among certain segments of the population, including the poorest, those in rural areas, women, persons with disabilities and the elderly. Driving mobile internet adoption among these segments remains a focus for operators globally.

Operators and their partners in Europe have been working to improve accessibility by developing inclusive products and services that meet the diverse needs of persons with disabilities. At the same time, operators have been partnering to provide quality education by building digitised content and improving reach. Examples of operator initiatives include the following:

- **Go digitises Malta's first autism-sensitive resource:** Operator Go in Malta has helped digitise the book *Mase in Space*, including the addition of interactive features, to make it accessible to as many families as possible. The interactive digital book is Malta's first autism-sensitive resource. It is designed with particular attention paid to the fonts used, colours selected, positioning of characters and rhythm and rhyme used in the storytelling. It supports children in the development of their social and communication skills. The online version of the book broadens its reach and increases its longevity. It also provides an alternative means of engagement between children and their carers/ parents, teachers or therapists and helps enhance children's digital skills.
- **BT supports digital skills development:** As part of its Skills for Tomorrow programme, BT in the UK is supporting older and vulnerable people to get online and make the most of the digital tools on which modern life is increasingly dependent. BT aims to help 25 million people make the most of life in the digital world by 2026.

Operators in Europe are also partnering with charities and encouraging the public to donate devices they no longer use to support people living in digital poverty. In the UK, for example, 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.

Operators are taking steps to address the challenge and help ensure digital inclusion for all. For example, Vodafone, under its everyone.connected campaign, donates free connectivity to UK charities and gives connectivity to someone in need each 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. It then provides six months' worth of free connectivity, including data, calls and texts. With these initiatives, by July 2022, the operator had provided free connectivity to 500,000 people via charities working in communities nationwide and its partners.

> Operators and their partners in Europe have been working to improve accessibility by developing inclusive products and services that meet the diverse needs of persons with disabilities

04

Mobile industry enablers

4.1
Grasping control of Europe's digital future

By 2030, digital technologies will form the fabric of Europe's economy and society, enabled by ultra-fast, low-latency networks. Global events over the last three years have reminded us that advanced telecoms networks are essential if Europe is to be successful in its pursuit of global leadership in the digital economy, remain secure and resilient in the face of unpredictable global threats, and achieve migration to net zero.

The EU has set ambitious digital infrastructure targets for the Digital Decade, including full 5G coverage by 2030. Mobile broadband has been proven to be a catalyst for GDP growth,[31,32] a basis for social inclusion and wellbeing, and a powerful tool in the fight against climate change.[33] As Europe seeks to deliver on the digital and green transition, mobile has an important role to play in connecting everyone and everything.

While most countries in Europe have deployed commercial 5G services, and nearly two thirds of operators in the region have launched 5G networks, large differences remain between Europe and other leading regions, as well as between urban and rural areas within the continent. According to the European Commission's recently published State of the Digital Decade report, 65% of populated rural areas are not currently covered by 5G.[34]

It is estimated that the additional investment required to meet the Digital Decade connectivity targets is at least €174 billion.[35] In addition, it is expected that increased data traffic, intensive use of connectivity for Industry 4.0 scenarios and growing security requirements are likely to push investment needs higher. The telecoms sector is currently not strong enough to meet that requirement, as it faces relatively flat revenues, returns that are below the cost of capital and weakened investor sentiment.

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. Without the necessary investment, the European Digital Decade will fail. Future investments are under serious pressure; political action is needed to secure them.

For the future of connectivity, Europe requires a broad reset of the policy framework governing the digital communications ecosystem, reforming today's outdated (and still largely national) regulatory approaches that have so far failed on the vision of a true telecoms single market. In this context, the following areas are key:

- Introducing a digital infrastructure framework that enables the huge effort required in rollout and network transformation to achieve the 2030 targets. The new framework should incentivise investments by tackling low returns for service providers and finding a new financing model in the digital value chain that allows for sustainable, secure and efficient use of Europe's networks.
- Addressing barriers to the European telecoms single market by simplifying and removing regulation.
- Urgently building scale through in-market consolidation, as well as cooperation on innovative technologies, as a fundamental stepping stone for creating European telecoms operators that are globally competitive.
- Introducing a more pro-investment approach to EU spectrum policy.

31. The Mobile Economy 2023, GSMA, 2023
32. The Socio-Economic Benefits of Mid-Band 5G Services, GSMA, 2022
33. Mobile Industry Impact Report: Sustainable Development Goals, GSMA, 2022
34. State of the Digital Decade, European Commission, 2023
35. Investment and funding needs for the Digital Decade connectivity targets, WIK Consult, 2023

A digital infrastructure framework

The EU Digital Declaration[36] calls for "adequate frameworks so that all market actors benefiting from the digital transformation assume their social responsibilities and make a fair and proportionate contribution to the costs of public goods, services and infrastructures, for the benefit of all Europeans". The status quo for digital connectivity does not align with this principle.

The introduction of such a framework would bring about significant improvements for European users, economies and society as a whole by ensuring more resources for a faster, more inclusive rollout of next-generation network infrastructure. Operators will be able to upgrade infrastructure and provide better coverage and higher quality connectivity, allowing consumers to enjoy faster, more content-rich and widespread connectivity.

In addition, an economic incentive would be provided for large traffic generators to manage their traffic more effectively. This in turn would result in a reduction in the carbon footprint of data usage and improved network quality.

A simplified European regulatory framework is needed, including the removal of regulation where appropriate, and fully harmonised implementation. Introducing further EU-wide best practices in areas such as telecoms regulation, consumer protection, taxation and other areas would make investment in telecoms markets more attractive.

Market structure and scale

The root cause of the underperformance of the telecoms sector and underinvestment in innovative network infrastructure in Europe is market fragmentation at the national and EU levels, leaving operators below the minimum viable scale to meet network investment targets, specifically for 5G deployment.

With economies of scale in the sector being mostly local (e.g. efficient non-duplicated investment, optimised used of assets and spectrum efficiencies), the fragmentation of telecoms markets at the national level remains a key issue for the sector.

While the telecoms sector has delivered improved connectivity, retail prices for telecoms services have generally been falling over the past 10 years – as costs have increased. The combination of increasing costs for the rollout of 5G and gigabit networks and relatively flat revenues has left the sector with a massive investment challenge. The telecoms sector urgently needs more scale for sustainable investment in network infrastructure and innovative technologies.

In-country consolidation allows for the scale needed for more efficient investment, which frees up resources for innovative technologies. It is an important contributor to the investment gap that EU operators face, as it would provide them with the ability to invest in infrastructure to achieve connectivity targets. Reducing financial constraints will also make operators less dependent on finding financial investors whose incentives may not be aligned with European policy goals.

With this in mind, a re-evaluation is needed of EU merger policy, acknowledging the role of minimum viable scale in markets with high fixed costs, and based on evaluations that take longer time horizons and appropriately weigh quality and efficiency benefits. Prices are important but cannot be the sole measure of regulatory success for the telecoms sector.

36. European Declaration on Digital Rights and Principles for the Digital Decade, European Commission, 2022

Spectrum policy for the Digital Decade

A more pro-investment approach to EU spectrum policy can be an important driver of Europe's connectivity goals. Effective spectrum policy can support strong and sustainable economic growth and ensure 5G for all European citizens and businesses by the end of the decade. There is also a need to clarify the spectrum provisions already present in the European Electronic Communications Code (EECC).

To make spectrum policy a lever for investment and growth, regulators are encouraged to consider the following regulatory actions:

- **Licence terms** – Ensure long-term business certainty and alignment with investor timeframes through licence duration, and establish a deadline for all Member States to assess renewals (in line with Art. 50 EECC).
- **Awards procedures** – Prevent distortive or inefficient awards for new spectrum through a strengthened review process for awards, with a stronger role for the Commission to foster compliance with the EECC.
- **Annual fees** – Increase transparency through the collection of information from national regulatory authorities on spectrum fees. The creation of a public database would help make comparisons of the impact of spectrum prices more feasible.
- **Spectrum availability** – Establish a clear roadmap for increased spectrum capacity and the expectation of additional supply of low- and mid-band spectrum to support ongoing network expansion.
  - **470–694 MHz** – Set a deadline (e.g. 2026) for the Commission to put forward proposals to reduce barriers to the introduction of mobile post-2030 in interested Member States.
  - **6 GHz** – Provide guidance to Member States on conducting a rigorous cost-benefit analysis of the different options for the band, ensuring that value to end users and opportunity costs are properly accounted for.
  - **3.8–4.2 GHz** – Recommend a policy that is neutral at the assignment stage and flexible from a forward-looking perspective; that is, one that maps incumbent users and defines the least restrictive technical conditions, as well as allowing for second-wave licences without power restrictions once demand for local use is determined.
- **Minimum scale** – Recognise that 5G deployments require scale. Regulators should take this into account in the context of spectrum policy and when considering regulatory interventions such as preferential treatment for new entrants in spectrum awards or setting aside spectrum for use in private networks. Reservations and set-asides adversely affect the EU telecoms industry by creating scarcity, which leads to higher spectrum prices. This in turn reduces the investment capability of operators for public networks. There are also other approaches to service these needs. A recent report by the GSMA[37] shows that caution should be taken when making long-term decisions on spectrum assignments and that market-driven approaches that foster cooperative solutions can bring the best outcomes for spectrum users and consumers.

The review of EU spectrum policy is an opportunity to deliver wider adoption of best practices. Rules based on these principles will help achieve a more harmonised approach to licensing, encourage more ambitious investment outcomes across the Union and deliver the far-reaching goals of the Digital Decade to the ultimate benefit of EU citizens and businesses.

> Effective spectrum policy can support strong and sustainable economic growth and ensure 5G for all European citizens and businesses by the end of the decade

37. The Impact of Spectrum Set-Asides on 5G, GSMA, 2023

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