5G Observatory

EUROPEAN COMMISSION

Directorate-General for Communications Networks, Content and Technology

This is the 21st edition of an independent, annual summary of developments in the deployment of 5G in the EU, assessing progress towards EU policy goals. Quarterly publications of the European 5G Observatory have been issued since September 2018, under a contract with the European Union and the opinions expressed are those of the contractor and do not represent the official position of the European Commission. Since 2025, the 5G Observatory is run by a consortium of two companies (the contractors) IDATE and Schuman Associates. Since January 2025 the Reports became annual.

Content

List of Acronyms

Table 1: List of acronyms

Acronym	Definition
5G PPP	5G Infrastructure Public Private Partnership
AI	Artificial intelligence
AR	Augmented reality
AWS	Amazon Web Service
CAM	Connected and Automated Mobility
CBRS	Citizens Broadband Radio Service
CEF	Connecting Europe Facility
CEPT	European Conference of Postal and Telecommunications Administrations
DDPP	Digital Decade Policy Programme
DESI	Digital Economy and Society Index
DSS	Dynamic spectrum sharing
EECC	European Electronic Communications Code
EMF	Electromagnetic fields
EU	European Union
FCC	Federal Communications Commission
GDP	Gross domestic product
GHz	Gigahertz
IPEI-CIS	Important Project of Common European Interest – Cloud Infrastructure and Services
ITU	International Telecommunication Union
KPI	Key performance indicator
MEC	Multiple Access Edge Computing
MHz	Megahertz
MNO	Mobile network operator
MS	Member States
NR	New Radio
NSA	Non-standalone
NTIA	National Telecommunications and Information Administration
NTN	Non-terrestrial networks

QoS	Quality of service
RAN	Radio access network
RSC	Radio Spectrum Committee
RSPG	Radio Spectrum Policy Group
SA	Standalone
SNS JU	Smart Networks and Services Joint Undertaking
V2X	Vehicle-to-Everything
VR	Virtual reality
XR	Extended reality

Index of Tables

Index of Figures

1. Introduction

Launched by the European Commission in 2018, the 5G Observatory plays a central role in supporting the Union's digital transformation by monitoring the deployment of 5G networks and analysing related market, policy, and technological developments across the EU and beyond. Initially created as a public platform to provide transparent and factual information on 5G progress, it has since evolved into a strategic tool to inform evidence-based policy-making under the Digital Decade Policy Programme (DDPP). The 5G Observatory delivers regular, structured, and policy-relevant updates, serving as a key knowledge hub for policymakers, industry stakeholders, and the public. By providing high-quality and timely data and analysis, it enhances the Commission's ability to assess progress, guide decision-making, and advance the Union's digital objectives for 2030. In doing so, it reinforces Europe's strategic autonomy in digital technologies, promotes transparency, and contributes to the development of a competitive, secure, and inclusive digital single market.

A core function of the 5G Observatory is to provide comprehensive quantitative and qualitative data on the rollout and performance of 5G networks across the European Union. This includes key performance indicators (KPIs) such as population coverage per spectrum band, the number and distribution of base stations, and quality of service metrics including throughput, latency, and reliability. The data collected supports the Commission's annual reporting cycle under the Digital Decade framework, notably the "State of the Digital Decade" report, and contributes to tracking progress towards the EU's 2030 digital connectivity targets.

Since the launch of its current phase (Phase IV), which is in partial continuity with previous Phases, the 5G Observatory has been more tightly integrated with the implementation of the DDPP. In this context, it contributes to the refinement of performance metrics and data collection methodologies in close collaboration with Member States, supporting the definition and harmonisation of key performance indicators (KPIs) used to monitor progress towards EU digital connectivity targets. Particular emphasis is placed on improving the collection of spectrum-related data, which is essential not only for assessing network deployment and usage but also as a foundation for future socio-economic analyses carried out by the Commission or third parties. Through these activities, the 5G Observatory helps ensure methodological consistency, data accuracy, and comparability across the Union, thereby facilitating more effective benchmarking, policy assessment, and evidence-based decision-making.

A core component of the 5G Observatory's mandate is the monitoring of spectrum authorisation and utilisation. It tracks the allocation and use of the EU's pioneer 5G bands (700 MHz, 3.6 GHz, and 26 GHz), the repurposing of harmonised bands, and the specific use cases linked to their deployment. This work supports a more strategic and informed approach to spectrum management. The 5G Observatory's geographic scope now covers not only EU Member States but also EEA countries, EU candidate and potential candidate countries, and neighbouring regions, thereby enabling a more comprehensive understanding of regulatory bottlenecks, cross-border coordination challenges, and authorisation timelines.

In support of investment monitoring, the 5G Observatory collects data on public and private investments in digital infrastructure, distinguishing between radio access networks and core networks. The objective is to assess investment intensity across the EU and compare it with global peers. These insights help the Commission to evaluate the effectiveness of national and EU-level funding strategies and identify potential gaps in infrastructure financing. Particular attention is given to the interdependence between fixed and mobile infrastructure, which is increasingly relevant as 5G and future technologies like 6G rely on highly integrated network architectures. Indeed, 6G is envisioned as a fully integrated, intelligent, and secure communication infrastructure that delivers near-instant and unlimited connectivity to support immersive, autonomous, and sustainable digital services across physical, digital, and biological domains. 6G is being developed as encompassing seven key characteristics: sustainability[1], trustworthiness[2], AI-native design[3], integrating sensing and communications[4], extreme performance[5], global coverage[6] and multi-dimensional services[7]. First commercial deployments are expected in 2028-2030. The Smart Networks and Services Joint Undertaking ("SNS JU") is a European Public-Private Partnership under Horizon Europe

[1] 6G will be designed with strict energy efficiency, carbon neutrality goals, and circular economy principles.
[2] Enhanced security, privacy, and resilience-by-design across all layers of the architecture.
[3] Embedded machine learning and AI at the edge, core, and radio layers to enable zero-touch automation.
[4] Networks will natively support environment sensing (e.g., location, motion, health signals).
[5] Peak data rates of 1 Tbps, latency below 100 µs, and high reliability for critical services.
[6] Seamless integration of terrestrial and non-terrestrial networks (e.g., satellites, drones).
[7] Support for immersive XR, digital twins, tactile internet, and real-time holography.

that aims to facilitate and develop industrial leadership in Europe in 5G and 6G networks and services. One of its projects, Hexa-X-II, is the 6G Flagship project that leads the way to the end-to-end (E2E) system design and the enabling platform delivering novel services for the next generation (6G) of wireless networks.

As of its 2025 edition (Phase IV), beyond its internal EU focus, the 5G Observatory has expanded its scope to include comprehensive global benchmarking. It collects comparable data from key non-EU countries and regions, including EU candidate countries (Albania, Bosnia and Herzegovina, Georgia, Moldova, Montenegro, North Macedonia, Serbia, Türkiye, and Ukraine), as well as major international economies such as Australia, Brazil, China, India, Japan, South Korea, the United Kingdom, and the United States. For the EU, the inclusion of candidate countries supports strategic objectives by fostering regulatory alignment, digital interoperability, and infrastructure preparedness in its neighbourhood. This contributes to reducing digital fragmentation at the Union's borders, facilitates a smoother enlargement process, and enables more targeted deployment of EU support instruments. At the same time, global benchmarking with leading digital economies provides valuable insights into Europe's strategic positioning, investment patterns, and infrastructure readiness. These comparative analyses are essential for informing EU policy initiatives aimed at enhancing global competitiveness in mobile and wireless technologies and promoting the Union's digital leadership beyond its current membership.

2. Latest developments

There have been developments in EU policy following the European Commission's publication of the White Paper titled *"How to master Europe's digital infrastructure needs?"*. The Commission conducted a public consultation on the White Paper's ideas, which concluded on 30 June 2024. This process gathered input from various stakeholders, including industry representatives, NGOs, and academic institutions, influencing the shaping of future legislative measures. On 6 December 2024, the EU Council approved conclusions on the White Paper, providing political guidance for future digital infrastructure initiatives. The Council emphasized the need for innovation, investment, and secure networks to bolster Europe's competitiveness. Early 2025, the Commission announced plans to propose the Digital Networks Act (DNA) by the end of the year. The DNA aims to establish a unified regulatory framework to address investment needs, ensure a level playing field, and enhance the security and resilience of digital infrastructures

Since the June 2024 5G Observatory report, interest in EU public funding for 5G and 6G remains strong. The European Commission and the Smart Networks and Services Joint Undertaking (SNS JU) have allocated over €300 million additional funding to support advanced research, infrastructure deployment, and innovation in next-generation networks, through several funding calls of SNS, Horizon Europe (cluster 4) and the Connecting Europe Facility (CEF).

As far as main commercial developments are concerned, it is observed that the rollout and expansion of basic 5G networks across the EU has grown, with 5G coverage increasing in all Member States. There has also been a continued effort by EU mobile operators to launch 5G standalone (5G SA) services across the EU, although the deployment of SA services remains limited, and their information is not always available about the extent of operator rollouts. Private 5G networks, on the other side, have been growing exponentially, despite being still at a relative infancy stage compared to other international countries, such as China and the United States.

In terms of international comparison, the EU, with 94.3% 5G (NSA and SA) households' coverage (at end 2024), is in the top tier globally, just slightly behind global leaders. South Korea led with 100% coverage, followed closely by Japan (99.2%), Norway (99.0%), and Iceland (99.0%). USA (97.0%), India, China, UK, and Liechtenstein (all 95%) also exceed or match the EU's coverage rate. Australia (91.0%) and North Macedonia (93.0%) are comparable to the EU average, with advanced network infrastructure even outside traditional tech powerhouses. Major international developments confirm the continued global investment in 5G networks. The ITU reports that 51% of the global population is now covered by 5G (including both SA and NSA 5G coverage). The GSMA predicts that, by 2030, 5G will make up 57% of all mobile connections and become the dominant mobile technology. There is also growing interest in the development of non-terrestrial 5G networks (NTN).

The current state of play in authorisation of 5G bands indicates limited progress compared to the last reporting period, most notably due to the fact that the 700 MHz and 3.6 GHz bands have now been assigned across all Member States except for the 700 MHz band in Malta, while the 26 GHz band has been authorised only in 12 Member States. As such, the authorisation of the 5G pioneer bands, which should have been completed in all EU Member States by end 2020 has not been completely fulfilled yet.

The most recent assignments took place in Poland, with an auction in the 700 MHz band and the Netherlands, with an auction in the 3.6 GHz band. There is also a continued interest in local spectrum assignment mechanisms across EU Member States, with recent developments in France.

2.1 Public developments

2.1.1 EU policy developments

Since June 2024, the European Union has made progress in shaping its digital infrastructure policy, following the publication of the European Commission's White Paper titled *"How to master Europe's digital infrastructure needs? ».* The European Commission's public consultation on the White Paper concluded on 30 June 2024, gathering feedback from a diverse range of stakeholders, including telecom operators, NGOs, academic institutions, and public authorities. Contributors emphasized the need for increased investment in digital infrastructure, the importance of secure and resilient networks, and the necessity of regulatory reforms to foster innovation and competitiveness. On 6 December 2024, the Council approved the conclusions of the Commission's White paper. The text of the conclusions touched on several key points, such as the acknowledgment of market consolidation trends (stressing the importance of effective competition and consumer welfare), the recognition of the convergence between cloud and telecommunications services (highlighting the need for impact assessments), the consideration of regulatory matters (including the potential for ex-ante control in certain access markets and the migration from copper to fibre networks), and the emphasis on fostering innovation, ensuring security and resilience, promoting fair competition, and driving investments in digital infrastructures.

Formally introduced on 21 February 2024 as part of a comprehensive digital connectivity package, the European Commission's vision for future digital infrastructure is encapsulated in the concept of "3C Networks" (Connected, Collaborative, and Computing). This initiative, outlined in the White Paper *"How to master Europe's digital infrastructure needs?"*, sets the strategic direction for building next-generation networks that are high-capacity, low-latency, and universally accessible (Connected); that foster cross-sector and cross-border cooperation through open, interoperable ecosystems involving telecom operators, cloud providers, industries, and public authorities (Collaborative); and that seamlessly integrate advanced computing capabilities, such as edge, cloud, and AI-driven network functions, into network infrastructure to support emerging digital applications like autonomous mobility, smart manufacturing, and immersive communications (Computing). The 3C Networks vision promotes the development of end-to-end integrated platforms that combine telecommunications and computing, enabling the orchestration of innovative technologies across all sectors. It underpins the EU's ambition to lead in digital innovation, secure its technological sovereignty, and build a competitive, inclusive, and resilient Digital Single Market, in line with the objectives of the Digital Decade and the Union's broader geopolitical and technological priorities.

In March 2025, the European Commission announced plans to propose the Digital Networks Act (DNA) by the end of 2025. The DNA aims to establish a unified regulatory framework to address investment needs, ensure a level playing field, and enhance the security and resilience of digital infrastructures. The objectives include creating an integrated single market for connectivity to enhance industry competitiveness, facilitating a more coordinated EU spectrum policy to stimulate private investments in 5G and, moving ahead, 6G, and improving market incentives to build future digital networks and reducing compliance costs.

2.1.2 Public 5G funding initiatives in the EU

In October 2024, the Smart Networks and Services Joint Undertaking (SNS JU) announced €127 million in funding for 16 new projects under its third call to advance 6G research and innovation. This brings the EU's total investment in the initiative to over €500 million. The selected projects, involving 301 beneficiaries from 25 countries, aim to deliver breakthrough innovations, develop experimental platforms, and conduct large-scale trials for next-generation communication networks. The call received overwhelming interest, with proposals from 1,874 applicants across 33 countries requesting over €863 million, more than seven times the available budget. This strong response highlights Europe's ambition in shaping the future of 6G technologies.

In December 2024, the European Commission announced €132 million in funding for 31 new 5G infrastructure projects (24 in 5G for Smart Communities and 7 in 5G Corridors) under the third call of the Connecting Europe Facility (CEF) Digital programme. This brings the total funding to €225 million for 66 projects since the first call in 2022. The projects aim to accelerate 5G standalone deployment in local communities, and along transport corridors with the view to enable connected and automated mobility solutions, supporting the EU Digital Decade goal of full 5G coverage in populated areas by 2030. A fourth call, with a combined budget of €105 million for 5G smart communities and 5G corridors (labelled 5G Large-Scale Pilots) was closed in February 2025, and the new projects will start by Q4. The initiative aligns with the Commission's broader 3C Network vision that aims to enable the development of innovative ecosystems for verticals thanks to the building of integrated connectivity-edge-cloud platforms, as described above.

In December 2024, the Smart Networks and Services Joint Undertaking (SNS JU) also announced the publication of its Annual Work Programme (AWP) 2025, which includes the Research and Innovation Work Programme for 2025 (SNS R&I WP 2025), allocating €128 million in EU funding to advance Europe's leadership in Beyond 5G and 6G technologies and the future of connectivity.

On 11 April 2025, the SNS JU's Governing Board adopted an amendment to its R&I WP 2025, with calls for proposals opening on different dates: the call encompassing Streams B and C, focused on advancing 6G research and innovation, will open on 22 May 2025 with a budget of €104 million. Subsequently, Stream D, dedicated to "Trials and Pilots with Verticals," will open on 18 June 2025, offering €24 million in funding to address the challenges of adopting 5G Advanced and 6G technologies in high-impact sectors like manufacturing, media, transport, emergency services, and healthcare. The deadline for submitting proposals for all streams is set for 18 September 2025.

2.2 Commercial developments

2.2.1 5G coverage developments

In the EU

The rollout and expansion of 5G networks across the EU have progressed since the last report to 94.3% of household's coverage, from 89% in the previous report of June 2024 (combining both 5G SA and NSA). Various operators have announced new 5G coverage milestones in recent months.

In January 2025, Telefonica Spain announced that its 5G network reached 90% of the population, with 1,500 municipalities benefitting from 3.5 GHz coverage. MasOrange announced in February 2025 that its 5G network covered 90% of the Spanish population. 4ka Slovakia announced that its 5G network reached 35% of the population.

Telefónica Deutschland, under the O2 brand, has implemented 1,600 mobile network expansion measures since the start of the year, including around 100 new sites, to improve coverage and connectivity across urban and rural areas, high-traffic zones, and railways.

While 5G population coverage has increased across the EU, previous reports indicated a lack of coverage in the important mid-band frequencies like 3.6 GHz. However, since the last 5G Observatory report, the coverage of 5G in mid-band spectrum has been improved. In particular, Ericsson's latest mobility report (November 2024) estimates that Europe has achieved mid-band coverage of 45%, which is a 20% increase since the last estimate.

In the comparison countries

5G deployments are on the way in candidate countries, with Bosnia and Herzegovina, Serbia, Türkiye and Ukraine still not having undergone 5G spectrum auction as of 30 May 2025. Major 5G deployment milestones in the other candidate countries are diverse within the past year. On 25 November 2024, One Albania launched the country's first commercial 5G services after acquiring new frequencies for €5.4 million in a competitive spectrum auction. In 2024, MagtiCom became the third operator in Georgia to launch 5G services, following Cellfie Mobile and SilkNet in December 2023. Iceland maintains extensive 5G coverage, with major operators expanding their networks. The country plans to phase out 2G and 3G networks by the end of 2025. In April 2024, Moldcell launched a limited public test of 5G Non-Standalone (NSA) services in specific areas of Chisinau, becoming the first carrier in the country to do so. Montenegro has seen rapid 5G deployments, with 5G mobile network coverage reaching 91% of the population by November 2024, less than three years after the service was launched in March 2022.

Deployments are also continuing in more advanced markets, such as India, the United Kingdom and the United States. India has made significant progress in 5G deployment, with large-scale mid-band deployments expected to reach around 95% population coverage by the end of 2024[8]. In the United Kingdom, in March 2025, Virgin Media O2 announced a £700 million (€830 million) investment to improve its mobile network infrastructure, aiming to enhance 5G coverage, especially in rural, coastal, and densely populated urban areas. Additionally, O2 rolled out enhanced 5G Standalone technology around Wembley Stadium to improve connectivity during major events. In the United States, major U.S. carriers like AT&T, Verizon, and T-Mobile have continued expanding their 5G networks, with both low-band and mid-band spectrum, significantly increasing geographical coverage.

2.2.2 5G standalone progress

In the EU

There is a continued effort by EU mobile operators to launch 5G standalone (5G SA) services across the EU. 5G SA brings several benefits, including increased performance, improved end-user battery life and the enablement of new features such as 5G network slicing. 5G SA is particularly relevant for a number of use cases requiring very-high reliability, security, short latency and higher throughput such as in the field of Connected and Automated Mobiilty, eHealth etc. However, 5G SA quite often requires a denser radio coverage. This is due to

[8] Network coverage forecast – Ericsson Mobility Report

the fact that the advanced features enabled by 5G SA (such as ultra-reliable low-latency communications – URLLC, massive machine-type communications – mMTC, and network slicing) depend on the availability of consistent, high-quality signal and capacity. To meet these demanding performance levels, particularly in urban or industrial environments, network deployments must typically include a greater number of base stations and small cells, especially when operating in mid- and high-frequency bands like 3.6 GHz or mmWave, which have more limited propagation ranges. This denser infrastructure must also be supported by robust backhaul connectivity and sufficient spectrum resources. Consequently, the effective rollout of 5G SA hinges not only on technological readiness, but also on strategic planning, infrastructure investment, and supportive regulatory and policy frameworks that can facilitate widespread and efficient deployment.

Recent announcements include MasOrange successfully conducting its first VoNR call on its commercial 5G SA network in January 2025.

At Mobile World Congress 2025 in March, Ericsson revealed that O2 Telefónica has successfully implemented the world first Cloud RAN technology in a commercial 5G SA network in Germany, in the same month NOS has announced the first 5G SA call using Voice over New Radio (VoNR) technology in Portugal, Vodafone Spain signed a four-year agreement with Ericsson for the rollout of its 5G SA core network and Telefónica España, under the Movistar brand, claimed the largest 5G SA deployment in Spain with 5G SA live in over 2,000 cities and municipalities.

In April 2025, Vodafone Germany, A1 Bulgaria, and Ericsson have successfully implemented the world's first 5G Standalone (5G SA) international roaming connection between two network operators.

While many operators have now launched 5G SA configurations, measuring the overall progress of 5G SA across the EU presents a challenge for the 5G Observatory due to the reliance on public announcements and the lack of centralised data on the subject. It can also be unclear how widespread 5G SA is, when operators launch and whether it makes up a significant portion of their overall network.

The GSA's April 2025 report on global 5G SA progress indicates that most EU MSs feature at least one operator investing in public 5G SA networks, yet the extent of their investments remains unclear.

In the comparison countries

Between 2024 and 2025, the deployment of 5G SA networks has progressed variably across the candidate and comparison countries. In Asia, as one of the global leaders in 5G SA, all major operators in China (China Mobile, China Telecom, China Unicom) have nationwide SA networks launched as early as 2020-2021. At the same time, Japan's three main operators, NTT Docomo, KDDI, and SoftBank, were commercially launching 5G SA. Progress continues in private 5G, slicing, and industrial networks. In South Korea, SA networks are deployed for both consumer and industrial use, with SK Telecom, KT, and LG U+ have commercially launched SA to support edge computing and smart factory initiatives. India, having started its 5G deployment journey later, has seen its operator Jio explicitly basing its 5G rollout on a SA core.

In the UK, BT Group, in January 2025, conducted the first real-world deployment of 5G Standalone (5G SA) network slicing on the EE mobile network in Belfast. In February 2025, Virgin Media O2 activated its 5G SA network for business customers in the UK, the same month Vodafone successfully trialled the use of multiple 5G SA network slices at a live event, marking a first in the UK.

In the United States, 5G SA is widely commercially operational and integrated into user services. For example, Verizon launched Enhanced Video Calling using 5G SA and network slicing across 150+ metro areas. In the United Kingdom, integration with public events and urban infrastructure is underway. EE activated SA 5G in 15 cities; Virgin Media O2 also launched SA in key locations. In Iceland, SA readiness is linked to network modernisation with Ericsson.

In Australia and Brazil, 5G SA deployments are limited to enterprise applications and major urban areas (Australia) and select cities (Brazil).

2.3 Major international developments

Globally, we are observing continued investment in 5G networks. A new ITU report published in November 2024 notes that 51% of the global population is now covered by 5G.

The mobile industry body GSMA predicts in a recent report that 5G will grow from 25% of all mobile connections in 2024 to 57% by 2030, becoming the dominant mobile technology.

Global investment in 5G is not limited to terrestrial networks, as there is a growing interest in combining satellite and mobile functions in the development of non-terrestrial 5G networks (NTN). More partnerships have been announced in this area, and it is expected to grow in the coming years.

In March 2025, the European Space Agency and the Mobile Satellite Services Association signed a two-year agreement to enhance global connectivity by integrating satellite and terrestrial networks in line with 3GPP standards, aiming to improve access to 5G and 6G services, particularly in remote areas, through joint research, workshops, and ESA's ARTES programme.

2.4 5G spectrum awards

2.4.1 National spectrum awards

Current spectrum assignment status

A core component of the 5G Observatory's mandate is the monitoring of spectrum authorisation and utilisation. It tracks the allocation and use of the EU's pioneer 5G bands (700 MHz, 3.6 GHz, and 26 GHz) and the repurposing of harmonised bands.

The 700 MHz and 3.6 GHz bands have now been widely assigned across Member States (MSs), suggesting good progress in the assignment of these two vital 5G pioneer bands, albeit still short of the deadline of end 2020. The 700 MHz band is assigned in 25 out of 27 MSs, while the 3.6 GHz band has been awarded in all the 27 MSs. The Netherlands was the last country that to assign the 3.6 GHz band. The band's auction ended in July 2024 and spectrum licenses were available a month later, in August that year. The situation with the 26 GHz band looks different, as the band (at least 1 GHz of spectrum) has not been widely authorised across MSs, preferring mid-band spectrum like 3.5 GHz for broader 5G coverage. In particular, only 12 MSs have authorised spectrum within this band so far, and no new MSs did so since the publication of the last 5G Observatory Report in June 2024. This limited interest in the 26 GHz band is mainly attributed to the lack of demand from the mobile industry, which has pointed to the lack of compatible devices. Overall, the 5G pioneer bands are now 74,6% assigned across the EU compared to 73% at the latest report in June 2024.

Several countries outside the EU have taken more proactive steps towards millimetre-wave frequencies. Notably, Australia, Brazil, Japan, and the United States have allocated or auctioned the 26 or 28 GHz band to support high-capacity urban 5G services. In South Korea, the 28 GHz band was auctioned but got cancelled due to non-compliance with deployment obligations. Meanwhile, uptake remains low or non-existent in many southeastern European and neighbouring countries such as Albania or Moldova, often due to lack of operator demand or regulatory readiness.

Technical characteristics and differentiation of the 5G pioneer bands:

	Type	Propagation and coverage	Use cases	Bandwidth and performance	Primary purpose
700MHz	Coverage band	Excellent propagation, wide coverage, deep indoor penetration	Rural and suburb areas, transport corridors indoor environments	Lower throughput, higher latency due to limited bandwidth	Supports nationwide availability (cost-effective for coverage)
3.4-3.6 GHz	Capacity and coverage compromise band	Balanced coverage and capacity. Suitable for urban, suburban and industrial areas	Urban and industrial areas. Supports 5G SA, slicing and URLLC	Sufficient bandwidth (80-100MHz), good performance	Core band for 5G SA. Enables advanced features
26GHz	Millimeter-wave (mmWave) band	Short range, week penetration. Suitable for dense environments	Dense urban zones, campuses, AR/VR, industrial automation	Very high throughput, low latency, large bandwidth blocks (up to 1GHz)	Complementary layer. Suitable for targeted deployments

Dynamic Spectrum Sharing (DSS) also plays a key transitional role in the shift from 4G to 5G by enabling simultaneous use of the same frequency bands by both LTE and 5G NR (New Radio). This allows operators to deploy 5G services on existing 4G spectrum (e.g. 1800 MHz or 2100 MHz) without waiting for the availability of new dedicated 5G spectrum. While DSS facilitates a cost-efficient and accelerated rollout of 5G Non-Standalone (NSA) networks, it offers however limited performance benefits compared to SA, due to shared spectral efficiency and continued reliance on 4G cores. Nevertheless, it has been a pragmatic solution for early market presence, country coverage and gradual migration towards full 5G capability.

Additionally, other bands than the pioneer ones have been assigned within the EU to enhance coverage, capacity, and service continuity, providing flexibility, scalability, and sector-specific deployment options as the EU continues its transition toward ubiquitous high-speed wireless connectivity. For example, Austria auctioned the 1800MHz band in March 2024. Bulgaria auctioned the 800 MHz in December 2023 and the 1800 MHz in March 2024. Latvia also auctioned de 1800 MHz in March 2024. France trialed 3.8-4.2 GHz for private 5G networks. Belgium is also looking at this band, but no auction or allocation has been held to date. Finally, Slovenia auctioned the 2.3 GHz band as private licenses for municipalities. The entire list can be found in previous 5G Observatory reports.

Recent assignments

In the European Union

Over the past twelve months, two national spectrum auctions have taken place in the EU; in Netherlands and Poland.

In June-July 2024, the Netherlands held a 5G spectrum auction in the 3.45–3.75 GHz band, awarding 300 MHz of spectrum through a multi-round clock auction. KPN acquired 3650–3750 MHz, Odido secured 3550–3650 MHz, and VodafoneZiggo obtained 3450–3550 MHz. Each operator paid €39.22 million for one 60 MHz license and approximately €19.2 million for four 10 MHz licenses, bringing total auction revenue to €174.4 million. The licenses are valid until December 31, 2040, and include rollout obligations within 2 to 5 years.

In March 2025, Poland's Office of Electronic Communications (UKE) auctioned six 2×5 MHz blocks in the 700 MHz band and one 2×5 MHz block in the 800 MHz band, adding valuable low-band spectrum for nationwide 5G coverage. Orange, Play, T-Mobile, and Polkomtel secured licenses, with individual prices ranging from PLN 356 million to PLN 425 million. The total auction revenue reached PLN 2.58 billion (approx. €600 million).

In comparison countries

In August 2024, the Albanian telecom regulator AKEP initiated the country's first 5G spectrum auction, offering five blocks in the 3400–3800 MHz band. The auction featured two 80 MHz blocks and three 40 MHz blocks, with minimum bids set at €3.634 million and €1.812 million, respectively.

Georgia launched a second 5G auction in October 2024, with MagtiCom and Silknet securing 5G spectrum. In the first auction, in 2023, only Cellfie acquired 5G spectrum.

Moldova concluded its latest spectrum auction in January 2025, allocating various frequency bands (in the 700 MHz, 900 MHz, 1500 MHz, and 3400–3800 MHz bands) to the three telecommunications companies. The auction raised €26.31 million, although this figure reportedly fell below initial expectations.

In April 2025, North Macedonia's Agency for Electronic Communications (AEK) opened a 5G spectrum tender for new operators. The tender includes national licenses across three bands with strict rollout requirements.

In the United Kingdom, Ofcom announced plans to auction licenses for the 26 GHz and 40 GHz (mmWave) spectrum bands in certain parts of the UK. The principal stage of the auction is scheduled to begin in October 2025.

2.4.2 Local spectrum awards

As the demand for secure, high-performance wireless connectivity continues to grow, local 5G spectrum awards are emerging as a key enabler for private 5G networks. By allocating dedicated spectrum to specific geographic areas or sectors, regulators empower industries, enterprises, and public institutions to deploy tailor-made 5G networks that meet their unique operational needs.

There has been few news about local spectrum assignment procedures across EU MSs since the last report released in June 2024.

In July 2024, France's telecommunications regulator, ARCEP, launched a public consultation to assign spectrum in the 3.8–4.2 GHz band for local private mobile networks. This initiative is intended to meet the connectivity needs of the industrial sector and other verticals, aligning with European Commission recommendations for local 5G applications.

A growing number of EU Member States have assigned specific spectrum bands to support the deployment of private 5G networks, enabling vertical sectors, such as manufacturing, logistics, energy, and public services, to implement tailored, high-performance connectivity solutions.

- Germany leads in this area with the allocation of the 3.7–3.8 GHz band, primarily in industrial environments.
- France has made the 3.8–4.0 GHz band available for local licensing, with up to 100 MHz per site and more than a dozen licenses issued since 2022.
- In Sweden, both the 3.7–3.8 GHz and 26 GHz bands are in use for private networks.
- Finland has also taken a proactive approach by allocating the 2.3 GHz and 24.25–25.1 GHz bands for private use and was among the first to issue a license in the upper portion of the 26 GHz band.
- Several other Member States are actively enabling or planning private 5G access. Belgium and Denmark have taken steps to open the 3.8–4.2 GHz band for private networks, with similar initiatives underway in Spain. Slovenia has auctioned the 2.3 GHz band for private networks targeting local administrations, while the Netherlands has issued local licenses across multiple bands including 2.3 GHz, 3.5 GHz, and 3.7–3.8 GHz, catering to sector-specific connectivity demands.

3. 5G scoreboard

3.1. EU-27 progress so far

The 5G scoreboard summarises the status of 5G commercial launches, spectrum assignments, and of the 5G corridors for Connected and Automated Mobility in EU-27:

- All EU countries now have commercial 5G service available at least in a part of the country (please see the section on Latest Commercial Developments).
- A total of just above 351,600 5G base stations are now active in the EU, excluding DSS.
- The most common type of 5G base station makes use of 4G bands in a Dynamic Spectrum Sharing (DSS) configuration, mostly in the 700MHz band.
- Over 94% of the EU's population was covered by at least one basic 5G network at end-2024.

Figure 1: EU 5G coverage[9]

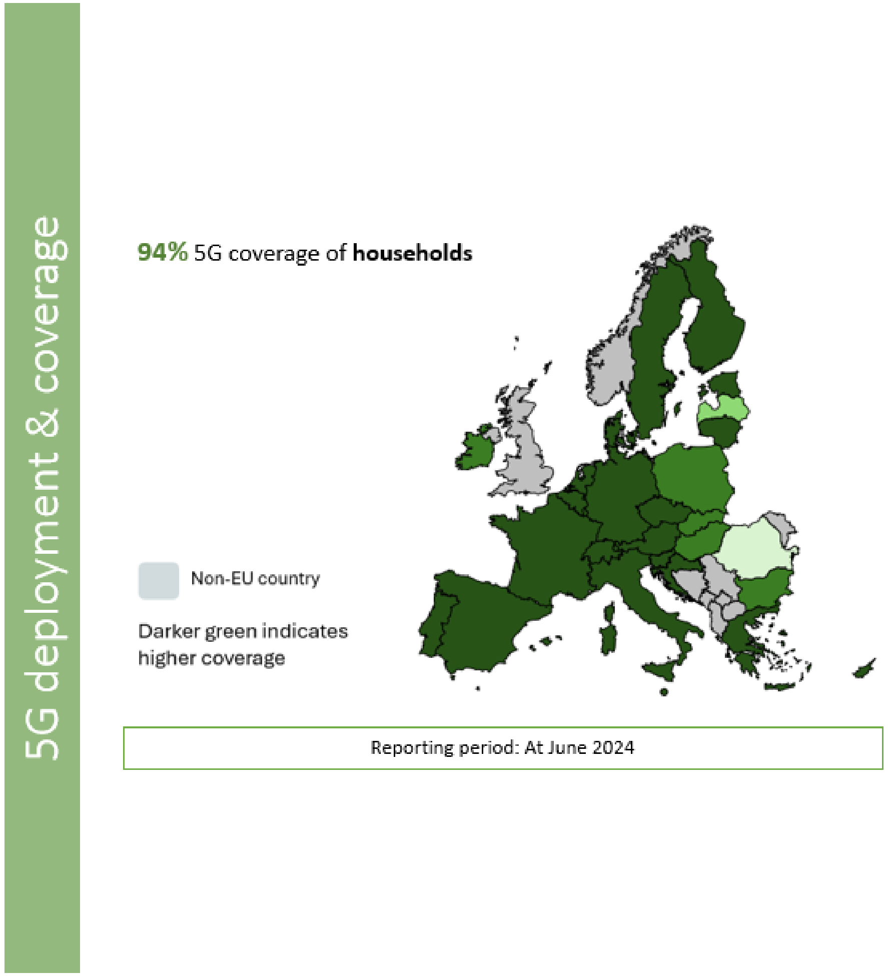
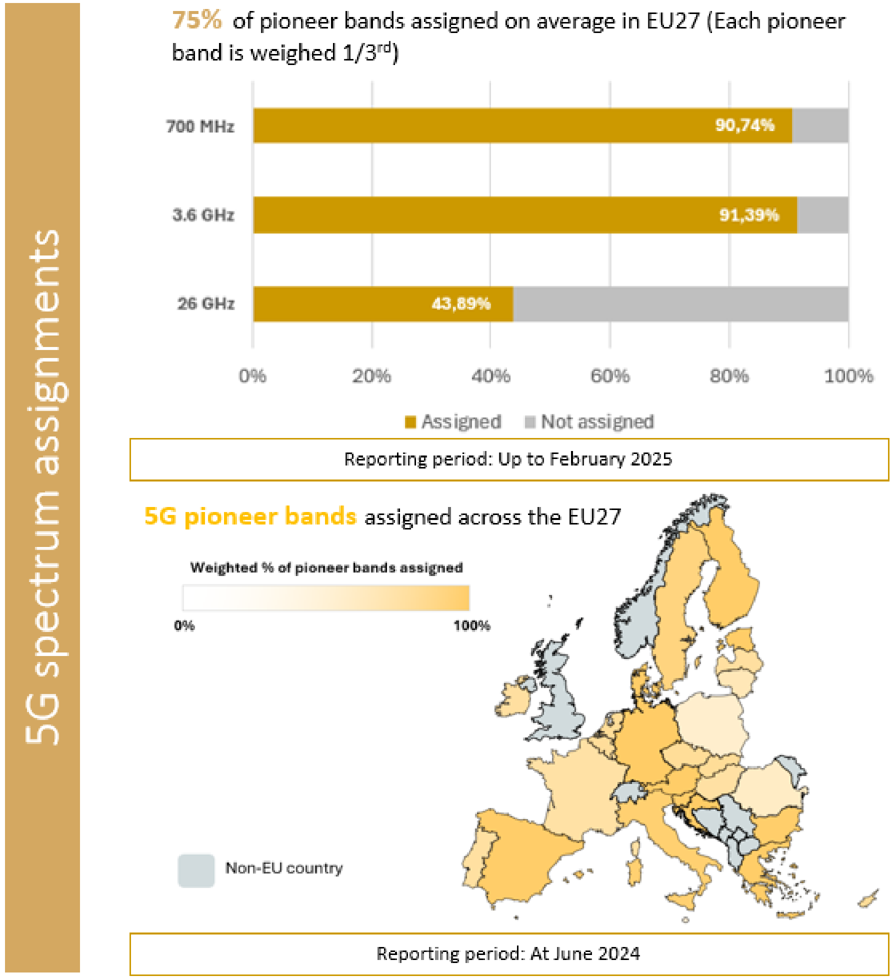


Figure 2: EU 5G spectrum[10]

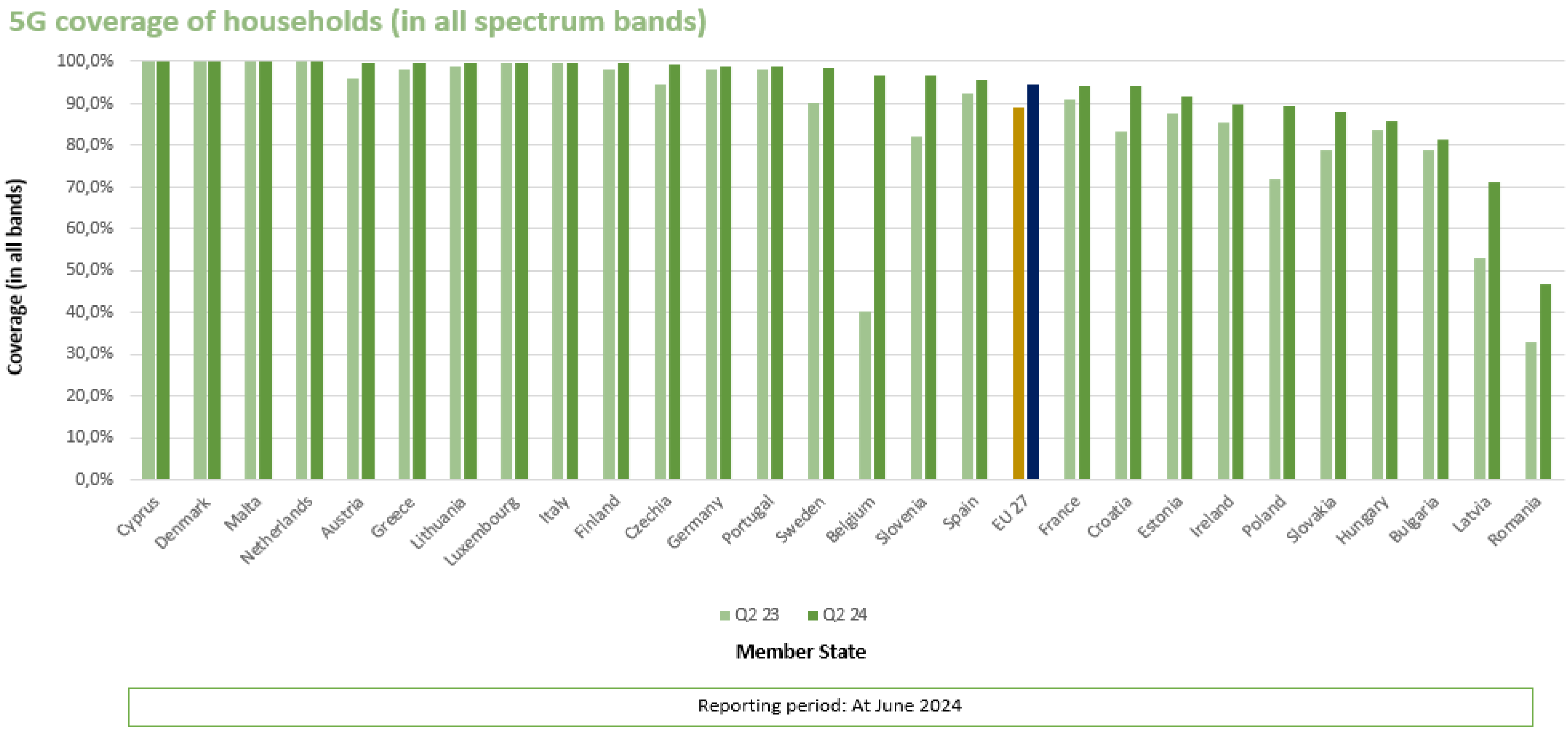


(Source: **Household 5G coverage**: Omdia/Point Topic - Broadband Coverage in Europe 2024, study carried out for the European Commission. Household coverage data is collected through a survey of national regulatory authorities and operators at a regional NUTS3 level; **Spectrum data** is collected from the annual DESI dashboard, with figures at February 2025.)

[9] 5G Coverage in all bands is a general indicator that does not presume any particular quality of service measures. All 5G coverage is included, including that using DSS. Location covered by at least one operator

[10] EU 5G Spectrum: Countries need to assign 60 MHz in 700 MHz; 400 MHz in 3.6 GHz and at least 1000 MHz in 26 GHz to receive a 100% score

Figure 3: EU 5G coverage of households[11]

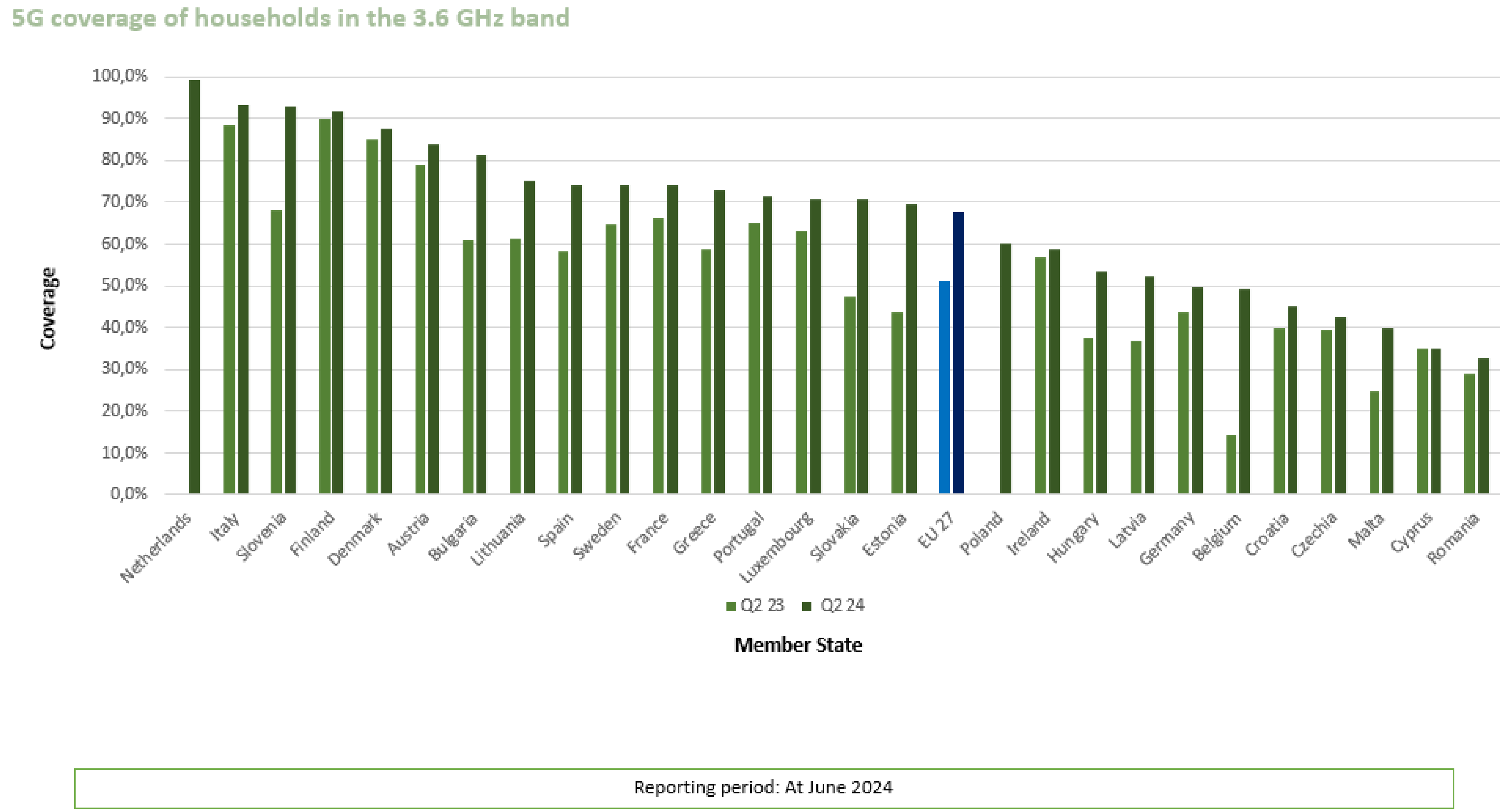


(Source: Omdia/Point Topic: Broadband Coverage in Europe 2024, study carried out for the European Commission. Household coverage data is collected through a survey of National Regulatory Authorities and operators on a regional, NUTS3 level.)

[11] 5G Coverage in all bands is a general indicator that does not presume any particular quality of service measures. All 5G coverage is included, including that using DSS. Location covered by at least one operator.

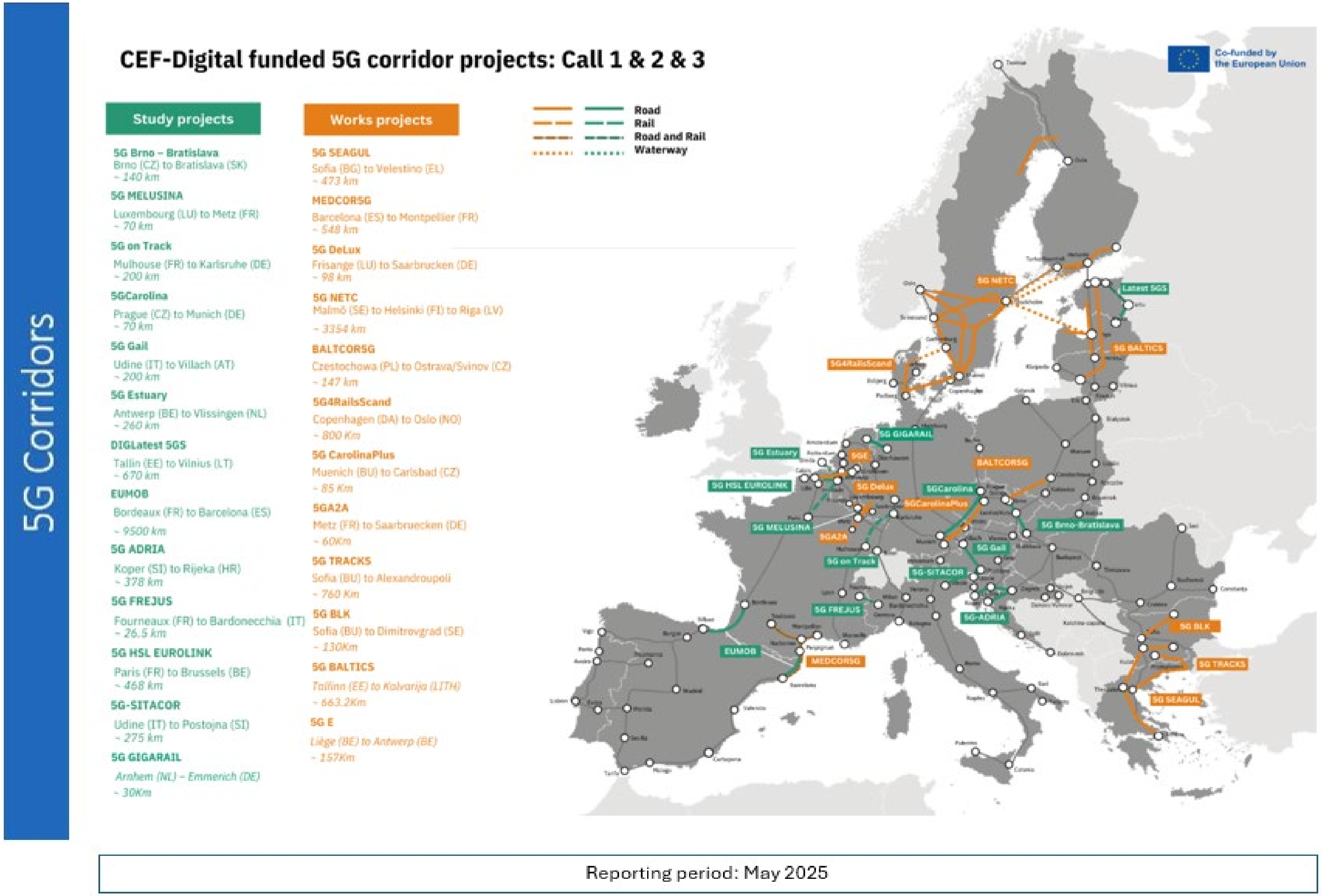
Figure 4: EU 5G coverage of households in the 3.6 GHz band (3.4-3.8 GHz)

EU 5G progress



(Source: Omdia/Point Topic: Broadband Coverage in Europe 2024, study carried out for the European Commission. Household coverage data is collected through a survey of National Regulatory Authorities and operators on a regional, NUTS3 level.)

Figure 5: CEF-Digital



Source: [GUIDE project](), a Coordination and Support Action funder under CEF Digital

3.2. International developments

The international version of the scoreboard details the current status of 5G commercial launches and spectrum plans worldwide, including metrics such as "5G base stations per 100,000 inhabitants", which represents the extent of deployment of 5G in each country. The following developments can be highlighted[12]:

- South Korea has the highest number of 5G base stations per 100,000 inhabitants: around six times more than the EU. Meanwhile, China has the second most 5G base stations per 100,000 inhabitants.
- Japan leads in the number of 5G subscribers, with over 120,399 subscribers per 100,000 inhabitants. China is a close second at 73,142 subscribers per 100,000 inhabitants.
- The United States has awarded the largest amount of high-band spectrum in the mmWave range (26-28 GHz), with a total of 4950 MHz assigned to operators. Following a recent decision to revoke licences, South Korea has only assigned 800 MHz in the band.
- The largest percentage of 5G pioneer bands spectrum already awarded in Europe is located in the mid-band (3.6 GHz), followed by the low band of 700 MHz.

[12] Please notice that there may be discrepancies between the reported figures, as the method for calculating the number of base stations is not standardised between regions

Figure 6: Comparison of 5G rollout in international markets (Q4 2024)

	EU	Australia	Brazil	China	India	Japan	South Korea	UK	USA
Approximate number of base stations[13]	351,600	17,880	22,800	4,251,000	464,990	151,985	346,460	23,100	140,000
Total country population	449,206,579	26,658,948	211,140,729	1,410,710,000	1,438,069,600	124,516,650	51,712,619	68,350,000	334,914,895
5G base stations per 100,000 inhabitants	78	67	11	301	32	122	670	34	42
Indicative 5G subscribers[14]	159,716,320	17,045,000	36,527,346	1,031,825,433	160,285,747	149,916,953	35,083,274	57,285,304	323,202,570
Indicative 5G subscribers per 100,000 inhabitants	35,550	63,937	17,300	73,142	11,146	120,399	67,843	83,812	96,503

(Sources: **5G base station data:** EU: sum of reported or estimated base stations per country. Australia: Estimate based on RedSearch and The Australian. Brazil: Anatel. China: Ministry of Industry and Information Technology (MIIT). India: Department of Telecommunications. Japan: Estimates based on operators' data. South Korea: Mk.co.kr. UK: IDATE estimates. USA: Estimate based on Steel in the Air. **Population data:** EU: Eurostat. All other countries: International Monetary Fund (IMF). **5G subscribers:** EU: End of year estimates based on country's regulators' reports. Australia: End of year estimate based on ACMA's data. Brazil: Anatel. China: MIIT. India: TRAI. Japan: SUOMO. South Korea: Korea Communications Commission (KCC). UK: IDATE estimates. USA: End of year estimates based on FCC.)

[13] International 5G Base stations: This figure is approximate. There may be discrepancies between the reported figures, as the method for calculating the number of base stations is not standardised between regions. The Australian and US number of 5G base stations is an estimate based on available information

[14] International 5G Subscribers: End of year estimates based on regulators' data

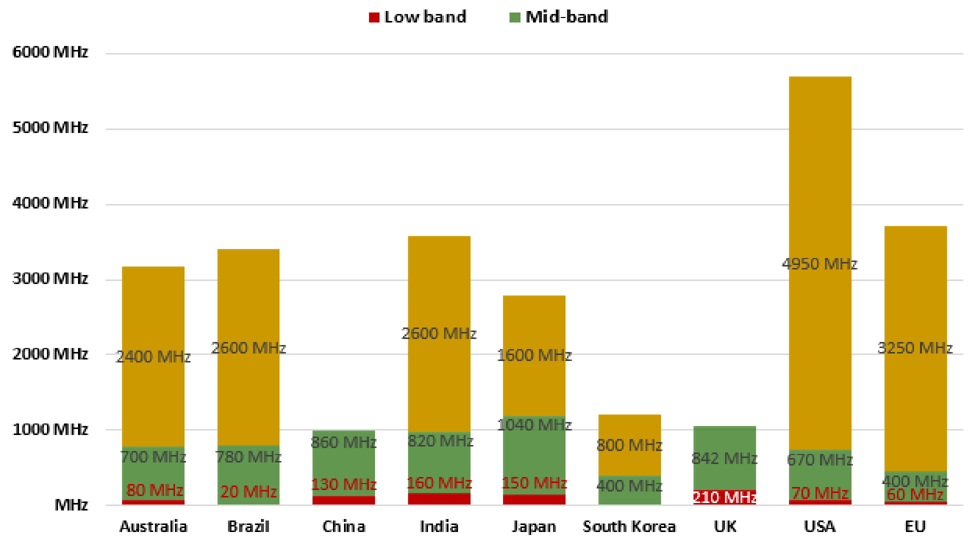
Figure 7: International 5G spectrum[15]

5G spectrum

Main bands authorised for 5G in international markets

Country	Low-Band (< 1GHz)	Mid-band (1-6 GHz)	High-band (> 6 GHz)
Australia	850 MHz 900 MHz	1.8 GHz 2.1 GHz 3.4-3.7 GHz	25-27 GHz
Brazil	700 MHz	1.8 GHz 2.3 GHz 2.6 GHz 3.5 GHz	26GHz
China	700 MHz 800 MHz 900 MHz	2.1 GHz 2.5 GHz 3.5 GHz 4.9 GHz	n.a
India	700 MHz	3.5 GHz	25-27 GHz
Japan	700 MHz 800 MHz	3.4-3.9 GHz 4 GHz 4.5 GHz	27-29 GHz
South Korea	n.a	3.5 GHz	28 GHz
UK	700 MHz 800 MHz 1800 MHz 2100 MHz 2300 MHz	3.4-3.8 GHz	24.25-27.5 GHz 40.5-43.5 GHz
USA	600 MHz 800 MHz	2.5 GHz 3.45-3.55 GHz 3.5-3.7 GHz 3.7-3.98 GHz	24 GHz 28 GHz 39 GHz 47 GHz
EU	700 MHz	3.6 GHz	26 GHz

Authorised 5G spectrum in international markets



Reporting period: Up to May 2025

(Source: Regulators, Spectrum Tracker)

[15] **International 5G Spectrum**: USA data shows all spectrum made available to mobile operators by the FCC. Not all of this spectrum will have been sold to operators so the final amount of spectrum assigned to operators may be slightly lower. For the **EU, spectrum assignments** differ among EU MSs. Because of this, the number used in the scoreboard shows how much spectrum has been harmonised at an EU-level. Some individual countries may have more spectrum assigned for 5G, while some may have less.

4. Progress against monitored targets and strategic implications

The table below presents major strategic implications referring to the overall performance of EU-27 against relevant 5G-related targets. These targets to be monitored in all European 5G Observatory reports have been sourced from EU policy, including the 5G Action Plan,[16] the Digital Decade Policy Programme (DDPP),[17] and the EU 5G Cybersecurity Toolbox.[18]

[16] Communication – 5G for Europe: An Action Plan and accompanying Staff Working Document | Shaping Europe's digital future
[17] Europe's Digital Decade | Shaping Europe's digital future; Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030, OJ L 323, 19.12.2022
[18] The EU toolbox for 5G security | Shaping Europe's digital future

Table 2: Progress against monitored targets and strategic implications

Targets: 5G Action Plan; Digital Decade; Cybersecurity Toolbox	Performance/status	Bottlenecks identified	Solution/recommendation
All populated areas covered by next-generation wireless high-speed networks with performance at least equivalent to that of 5G.	According to the latest DESI indicators based on the data collected by Omdia/Point Topic with figures at Q4 2024, the estimated overall 5G coverage in the EU is 94%.[19] With regards to historical data, the baseline trajectory of 5G coverage in the EU was set to reach 97% by the end of 2023 and 99% by the end of 2024 in the European Commission's Communication establishing the Union-level projected trajectories for the digital targets from September 2024.[20] with figures at Q4 2024, the estimated overall 5G coverage in the EU is 94%.[21] With regards to historical data, the baseline trajectory of 5G coverage in the EU was set to reach 97% by the end of 2023 and 99% by the end of 2024 in the European Commission's Communication establishing the Union-level projected trajectories for the digital targets from	Limited and uneven deployment of 5G SA across EU MSs, regulatory and administrative barriers (variations in national regulations) and financial constraints and investment challenges still hamper 5G deployment in the EU. According to a 2023 study by WIK Consult on the investment and funding needs to reach the Digital Decade connectivity targets, a further €33.5 bn of investment is needed for the full coverage of 'full 5G service' in the EU. Meanwhile, providing 'basic 5G service' will entail limited additional investment. [23]	The European Commission has continued to provide funding for digital connectivity, including through the Connecting Europe Facility to strengthen cross-border infrastructures, the Recovery and Resilience Facility,and the Digital Europe Programme. [24] Member States have claimed about €13.6 bn of the Resilience and Recovery Fund in order to speed up the deployment of more energy efficient fixed and 5G broadband networks. However, following the study by WIK Consult, EU funds alone would not be adequate to cover the connectivity gap, and supplementary national and regional, as well as

[21] DESI indicators - Digital Decade DESI visualisation tool
[23]Full coverage of 'basic 5G service' or the upgrading of existing 4G base stations and operating 5G core network on top is estimated to entail a further €11.5 of investment. High quality or 'full 5G service' requires the installation of more base stations and small cells to enable wider bandwidths and more reliable connectivity. Source: Investment and funding needs for the Digital Decade connectivity targets | Shaping Europe's digital future
[24] The Digital Europe Programme | Shaping Europe's digital future

	September 2024.[22]		private funding would, thus, be needed. [25] Nevertheless, the current key performance indicator (KPI) used to measure the 5G targets of the Digital Decade only encompasses the percentage of households covered by at least one 5G network regardless of the spectrum band used. As such, the KPI does not specify further the quality or the extent of the performance of the 5G network (both for regular consumers and professional users). Consequently, this may lead to superficial or quasi-complete announcement of 5G coverage. In parallel with the introduction of more 5G indicators in the DESI (i.e. 5G in the 3.4 – 3.8 GHz band), the KPI can move towards a more layered approach to reflect the different levels of quality of services to be expected for future use cases, instead of a single population coverage indicator.

Targets: 5G AP; Digital Decade; Cybersecurity Toolbox	Performance/status	Bottlenecks identified	Solution/recommendation

[22] Communication establishing the Union-level projected trajectories for the digital targets | Shaping Europe's digital future
[25] Investment and funding needs for the Digital Decade connectivity targets | Shaping Europe's digital future

Digital technologies, including 5G at the core of new products, new manufacturing processes and new business models (5G coverage of households)	Private 5G networks are experiencing significant growth in the EU. There were about 166 5G private networks in the EU at end 2024, with Germany (65) and France (45) leading the way. Germany had already increased to 80 networks by Q1 2025 and France to 59 in May 2025 according to ARCEP[26] ; an increase of 23% and 31%, respectively. Other major countries in terms of 5G Private Network deployment in the EU are Belgium, Greece, Italy and Spain. Industries such as manufacturing, logistics, and healthcare are increasingly adopting private 5G networks to enhance operations. The deployment of 5G private networks in the EU remains however below major other economies, such as China (over 77,000), U.S. (1,690), and slightly above (as a whole) Japan (128) and South Korea (126), at end 2024.	According to BEREC[27], the absence of a harmonized regulatory framework across EU Member States leads to inconsistencies in spectrum allocation and licensing procedures, hindering the seamless deployment of private 5G networks. Moreover, the fact that different spectrums are awarded in different MSs hinder the possibilities of economies of scale across the EU. Another bottleneck, particularly for Small and Medium Entreprises (SMEs) is the substantial initial investment required for infrastructure, coupled with operational expenses.	Continued efforts are needed to harmonise spectrum and unlock cross-border 5G projects. According to BEREC[28], the EU should strive for a unified regulatory approach to spectrum allocation and licensing for private 5G networks, reducing complexity and fostering cross-border deployments In June 2024, the Electronic Communications Committee (ECC) approved ECC Report 358, which outlines the shared use of the 3.8–4.2 GHz band by wireless broadband systems. [29] Following the report, a draft ECC Decision was developed in July 2024 to establish harmonised technical conditions for the shared use of the 3.8–4.2 GHz band by low/medium power wireless broadband systems. This decision aims to support the deployment of private networks and small cells across Europe.[30] In terms of financial support, more funds should be allocated to SMEs through the CEF2 Digital programme[31], and the 5G Smart Communities' project.

[26] Interview done in May 2025 with ARCEP

[27] BoR (24) 150 Draft BEREC Report on the Evolution of Private and Public 5G Networks in Europe CLEAN

[28] BoR (24) 150 Draft BEREC Report on the Evolution of Private and Public 5G Networks in Europe CLEAN

[29] ECC - ECC - News - 64th ECC plenary meeting, 25 – 28 June 2024

[30] ECC Opens 3 Public Consultations - Approve IT

[31] 5G for smart communities | Shaping Europe's digital future

Authorising 5G spectrum bands	On average, 75% of pioneer bands have now been assigned in the EU-27. The 3.6 GHz band remains the most widely assigned one, with all MSs having assigned at least 50% of the targeted spectrum in this band. The 700 MHz band is still the second most popular band, which has been assigned by 26 out of 27 MSs, with Poland being the latest addition. The 26 GHz remains the least popular band, which has only been assigned at least 50% of the targeted spectrum in 12 MSs following Austria's auction of the band. In terms of shaping the EU's radio spectrum policy, several updates[32] were given to CEPT[33] mandates since the last 5G Observatory: - 24 January 2025: revision of the harmonised technical and operational conditions for the 5875–5935 MHz (5.9 GHz) band - 12 December 2024: CEPT to assess the feasibility and defining the least restrictive harmonised technical conditions for shared use of the 6425–7125 MHz band - 30 July 2024: CEPT to develop harmonised technical conditions for implementing the latest technological advancements in the Future Railway Mobile Communications System (FRMCS) within the 900 MHz frequency band.	There is a lack of demand for the 26 GHz band in Europe. Spectrum assignments may differ amongst EU MSs. Consequently, a harmonised approach to spectrum sharing for local networks needs to be further developed.	Complete authorisation in MSs where assignment is still pending for the 700 MHz and 3.6 GHz bands, enforcing rollout obligations to ensure timely deployment, and encourage rapid authorisation of the 26GHz band in remaining countries for adoption in dense urban zones and for high-traffic scenarios. Harmonise spectrum licensing frameworks across the EU (national licence terms, renewals, and technology-neutral conditions) and streamline authorisation procedures and reduce administrative burden through standardising licensing templates and conditions at EU level. Promote efficient use of assigned bands (for those remaining underused) and support 5G deployment in rural and remote region, in line with Digital Decade target, and densification in urban and transport corridors. Preparation for future needs (6G and beyond) by identifying potential 6G spectrum bands (e.g., 7–24 GHz, THz bands), coordinating spectrum roadmaps across MSs and aligning spectrum strategy with EU SNS JU[34] research and standardisation tracks. CEPT studies are nearing completion, with a draft ECC Decision under consultation. Remaining actions include finalising and adopting an EU Implementing Decision based on CEPT output, and ensuring national implementation across all MSs to enable consistent deployment of private/local 5G networks.

[32] [Radio Spectrum CEPT Mandates | Shaping Europe's digital future]

[33] The European Conference of Postal and Telecommunications Administrations (CEPT) plays a crucial role in shaping the European Union's (EU) radio spectrum policy. Under Article 4(2) of the Radio Spectrum Decision (Decision No. 676/2002/EC), the European Commission issues mandates to CEPT to develop technical implementing measures for harmonising the use of radio spectrum across Member States. These mandates aim to ensure the efficient and coordinated use of spectrum, facilitating the deployment of services such as 5G and beyond

[34] [HOME - SNS JU]

Targets: 5G AP; Digital Decade; Cybersecurity Toolbox	Performance/status	Bottlenecks identified	Solution/recommendation
Promoting pan-European multi-stakeholder trials [35]/ Developing Pan-European deployment of 5G corridors	As of early 2025, 25 projects have been awarded under the Connecting Europe Facility (CEF) Digital programme, with a total budget allocation of €800 million for 2021–2027, and €97 million already granted. [36] In October 2024, 53 projects were selected for up to €274 million in funding, about the deployment of high-performance 5G for transport corridors and Smart Communities, the enhancement of backbone terrestrial and submarine cables, and the development of satellite connectivity within and from the EU. [37] By October 2024, the first two calls under CEF Digital had funded 65 projects[38], including: 30 backbone connectivity projects for the Digital Global Gateways, 17 projects promoting 5G for Smart Communities, and 18 projects focusing on 5G cross-border corridors.	Several projects are still in planning or pilot phases, with slow administrative approvals delaying execution. Post-award project execution often faces bottlenecks in procurement, cross-border coordination, and environmental approvals. Despite EU-level guidance, varying national regulations and standards across Member States hinder seamless cross-border 5G deployment. Differences in spectrum allocation, licensing conditions, and deployment obligations create complexities for operators aiming for uniform service delivery across borders.	To address disparities in project management capacity, the CEF Digital programme should support the sharing of best practices via an EU-hosted repository and provide targeted training in governance, procurement, and compliance. Regional coordination forums should also be promoted to ensure inclusive stakeholder engagement in project delivery. To future-proof investments, projects should adopt technical standards that enable upgrades toward advanced capabilities such as network slicing, edge computing, and 6G. These forward-looking requirements should be integrated into project guidelines from the outset. In parallel, governance structures must involve key stakeholders early and consistently to ensure strategic coherence, while linking corridor infrastructure to EU research and innovation ecosystems would help transform them into testbeds for emerging technologies.
5G security toolbox implementation	The NIS Cooperation Group published its second report on MSs' progress in implementing the 5G Cybersecurity toolbox in June 2023.[20] There have been no major developments regarding the progress since the last report. The EC has expressed concerns over the slow and uneven implementation, warning that reliance on high-risk suppliers could jeopardize the security of users and critical infrastructure. In response, Commissioner Henna Virkkunen announced on March 2025 plans to expedite the enforcement of 5G security measures, suggesting that the approach used for 5G could extend to other technologies. [39]	Decisions to exclude certain suppliers have faced legal challenges and diplomatic pushback, particularly from countries like China. This has made some Member States wary of implementing strict restrictions. [40] Smaller MSs and operators may lack the necessary resources and expertise to fully implement the recommended security measures, leading to delays and partial compliance.	To ensure effective and fair implementation of the EU's 5G Cybersecurity Toolbox, MSs should focus on objective, risk-based assessments, promote supplier diversification to avoid overdependence, and encourage transparency through existing EU-based certification and oversight mechanisms. Coordinated guidance at EU level and alignment with international standards will help ensure consistency, strengthen security, and maintain an open, competitive market without resorting to discriminatory measures.

[35] The original 5G AP target Source: https://digital-strategy.ec.europa.eu/en/policies/5g-action-plan can be linked to the Digital Decade reference to Multi-Country Projects (MCPs): large-scale projects facilitating the achievement of the targets for digital transformation of the Union and industrial recovery

[36] 5G coverage along transport corridors - European Commission

[37] 53 projects selected for up to €274 million under third CEF Digital calls - European Commission

[38] Commission to invest €865 million under CEF

[39] EU Commission looking to speed up 5G defence from foreign interference | Euronews

[40] Lawmakers call for binding 5G security measures in wake of Huawei scandal | Euronews

The table below presents the most recent data[41] on the number of base stations per MS and band type.

Table 3: Number of base stations per Member State and band type[42]

Indicator	AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LV	LU	MT	NL	PL	PT	RO	SE	SI	SK
Number of operating 5G base stations	12,400	5,440	4,912	696	12,483	56,558	9,900	850	9,882	53,742	16,060	60,000	3,241	5,291	3,289	30,546	2,782	1,450	950	1,200	14,253	12,600	13,089	4,961	9,143	2,398	3,490
700 MHz band	5,300	2,679	2,419	343	6,147	27,850	4,875	419	9,882	26,464	7,908	21,000	2,820	2,605	1,620	15,042	1,600	714	468	0	7,019	6,205	6,445	2,443	4,502	1,181	1,719
3.4-3.8 GHz band	5,800	2,863	2,585	366	6,569	29,762	5,210	447	0	28,280	8,451	38,000	1,211	2,784	1,731	16,074	1,000	763	500	330	7,500	6,630	6,888	2,611	4,811	1,262	1,837
26GHz band	0	0	8	0	0	98	17	1	0	93	28	0	1	0	0	53	0	0	0	0	0	0	0	0	16	4	0
Percentage of dynamic spectrum sharing, DSS)	4.1%	0%	10.5%	3.2%	16.7%	92%	0%	0%	83.7%	11.7%	0%	55.5%	4.1%	13.4%	58.9%	2%	11.1%	9.2%	100%	100%	29%	19.6%	21%	7.4%	30.7%	70%	21.2%

Notes: The total number of 5G base stations may not match the sum of base stations reported for each individual frequency band. This is because a single 5G base station can operate on multiple bands simultaneously—for example, both 700 MHz and 3.5 GHz. In addition, the use of Dynamic Spectrum Sharing (DSS) further complicates the distinction between bands. As a result, adding up the figures for each band may lead to overcounting and does not accurately reflect the total number of unique 5G base stations.

Source: Interviews with EU regulators and IDATE estimates for DSS where interviews didn't provide the figure

[41] As of Q4 2024, estimates at end of year or confirmed figures.
[42] Source: interviews with European regulators, specific mentions to: RTR, BIPT, EETT, ARCEP, RRT, SPRK.

5. Expected Outlook on 5G deployment 2025

This chapter contains a summary of existing projections for the forecasting towards 2025 5G-related targets and, in some cases, even later.

5.1. Ericsson, Mobility Report,[43] November 2024. Scope: Global

5.1.1. Methodological framework / approach

The forecast on mobile subscription and network traffic is based on historical data from several sources, which are then corroborated with internal data from Ericsson. The forecast is scoped for a six-year time horizon, and future developments are approximated via technological advancements, market maturity, and user and macroeconomic trends.

5.1.2. Outcome summary

In 2024, the share of 5G subscriptions in Western Europe reached around 41% of the market (amounting to almost 226 million subscriptions) from around 26% in 2023.[44] Meanwhile, 4G technology remains dominant, with the subscription penetration reaching almost 56% at the end of 2024, although this represents a decline of around 12% of the market share from the end of 2023. In the next few years, 5G technology is expected to increase its stronghold in Western Europe, with a projected penetration of 92% by 2030. Concurrently, in Central and Eastern Europe,[45] 5G subscription penetration has only slightly grown from around 2% of the total market in 2023 to around 5% at the end of 2024. 4G technology continues to prevail with over 86% market share, which is partly explained by slower spectrum allocation processes for 5G deployments. Nonetheless, only 5G technology is expected to grow from 2025 onwards and is projected to reach 58% of the total market share by 2030.

5.2. GSMA, "The Mobile Economy",[46] 2025. Scope: Global

5.2.1. Methodological framework / approach

Representing the interests of mobile operators worldwide, the GSMA is considered as an industry reference point for global mobile operator data, analysis, and forecasts, publishing annual industry reports and research. GSMA's annual state of mobile economy reports (global and regional versions) provide market intelligence (technology, socio-economic and financial datasets) through their in-house research team (i.e. proprietary models/forecasting methodology and datasets).

5.2.2. Outcome summary

According to the Mobile Economy report 2025, in 2024, 5G subscriptions made up 30% of the market in Europe, exhibiting an almost 10% market share increase from 2023. Although 4G still accounts for almost 64% of the market in 2024 in Europe, its dominance is expected to decline in the coming years as 5G is projected to attain 81% of the market by 2030. At the same time, overall mobile subscriber penetration in Europe is expected to fractionally grow from 88% in 2024 to 89% by 2030, along with a modest rise in smartphone adoption from 82% in 2024 to 91% by 2030.

[43] Ericsson Mobility Report November 2024

[44] Ericsson Mobility Report November 2024. According to the Ericsson Mobility Visualizer, Western Europe comprises of Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Iceland, Italy, Luxembourg, Malta, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

[45] Ericsson Mobility Report November 2024. According to the Ericsson Mobility Visualizer, Central and Eastern Europe comprises of Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Bosnia and Herzegovina, Croatia, Czechia, Estonia, Georgia, Hungary, Kosovo, Kyrgyzstan, Latvia, Lithuania, Moldova, Montenegro, North Macedonia, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

[46] GSMA, The Mobile Economy, 2025

Annex I: Latest developments per country

This Annex I provides an update of the latest developments per country to reflect the situation on 30 May 2025.

A1.1 Latest commercial developments

Commercial 5G is now available in all 27 Member States.[47] The full overview of commercial launches per operator offering 5G services across the EU27, detailing their frequency usage and, where applicable, highlighting the use of DSS technology, network configuration, i.e. 5G NSA vs 5G SA implementations, and announced coverage targets is available on the European 5G Observatory website. Below is a summary of the main changes compared to the previous edition of the 5G Observatory report:

Austria:

- In March 2025, Ericsson and Drei Austria have successfully tested W-band microwave technology (92–115 GHz) as a high-capacity backhaul solution to enhance 5G connectivity in dense urban areas, demonstrating its ability to complement congested E-band networks and support growing data demands with reliable, ultra-high-speed wireless links.

Belgium:

- In April 2025, Ericsson's has been selected by Proximus to improve 4G/5G indoor coverage using the Radio Dot system. In November 2024, In November 2024, Ericsson and Orange Belgium successfully completed a project enabling end-to-end automation of 5G network slicing to support future enterprise applications.
- In June 2024, BIPT reports that 95% of households now have adequate outdoor 5G coverage, up from 87% in December 2023, while 76% have access to an indoor signal.

Bulgaria:

- In February 2025, the Communications Regulation Commission (CRC) of Bulgaria awarded new spectrum licenses for three telecom operators, A1 Bulgaria, Yettel and Vivacom, for the use of radio frequency spectrum in the 900 MHz and 1800 MHz bands.

Germany:

- In March 2025, Telekom Deutschland announced the activation of 5G in 118 new sites, reaching 98% of population coverage with 5G.
- In April 2025, Vodafone Germany with A1 Bulgaria and Ericsson have implemented the first 5G SA international roaming between two operators. The same month O2 Telefonica Germany and Siemens partnered on a 5G slicing product for water industry.

Czechia:

- In January 2025, Vodafone Czech Republic announced that in 2024 it had deployed 106 new 5G base stations, expanding coverage to 96.67% of the population and 96.48% of the territory, and becoming the first operator to meet national 5G coverage requirements on road and rail networks, including 100% of motorways and 99.87% of main railway corridors.

Estonia:

- In February 2025, Elisa Estonia launched the first 5G SA network in the country.
- As of December 2024, Tele2 Estonia announced a 68% 5G network coverage of the Estonian population.

[47] The first commercial 5G service has been launched in Lithuania in January 2022, completing EU27 deployment in 2022, Source: Telia.

Spain:

- In May 2025, MasOrange has launched the country's first 5G Advanced network in Seville, enhancing its 5G Standalone infrastructure with 26GHz and 3.5GHz spectrum to enable innovative services like network sensing and 5G New Calling.
- As of March 2025, Movistar's 5G SA network is the largest in the country with more than 2,000 locations, the total 5G coverage of the operator reach 91% of the population. Vodafone Spain 5G network cover more than 80% of the population, the operator selected Ericsson to deploy 5G SA core network for consumer. MasOrange which selected Ericsson in October 2024 for rural 5G rollout and network integration switched on 5G SA in twelve locations around Barcelona in February 2025

Finland:

- Elisa announced in February 2025 the launch of the first 5.5G FWA solution for home internet connection.
- In December 2024, Elisa and Nokia successfully completed a commercial 5G Cloud RAN deployment, the same month DNA completed its nationwide 5G upgrade with 5G coverage close to 100%.

France:

- In February 2025, Nokia and Orange signed a four-year contract extension on 5G infrastructure deal.
- In September 2024, Free launched the first 5G SA network at national scale in France.

Hungary:

- Magyar Telekom completed in December 2024 its five-year network modernisation with 5G switch-ons at a significant proportion of the modernised stations.

Italy:

- As of March 2025, Iliad 5G network covers more than 7,000 municipalities.
- In February 2025, EOLO contracted Mavenir on 5G SA core network solution.
- EOLO signed in December 2024, a four-year contract with Nokia to deploy the Europe's first 5G SA mmWave RAN network.

Latvia:

- In February 2025, Latvian operators Bite and Tele2 have announced fibre network investments, with Bite investing €3 million in 2025 to upgrade its core and access networks, improve speeds, and connect more mobile base stations, while Tele2 will spend €150,000 to connect all base stations in Daugavpils to fibre, aiming to increase 4G and 5G network capacity tenfold.
- In January 2025, Bite announced plans to reach 85% of the population with 5G, an infrastructure development plan of €20 million also aims to launch 5G+ services.

Poland:

- The 5G auction for 700 MHz and 800 MHz bands in Poland took place in March 2025 raising PLN2.58 billion, T-Mobile acquired a 2x5MHz block in each band, Play and Orange acquired two blocks in 700 MHz and Plus one block in 700 MHz band.
- In January 2025, Orange Poland announced that C-band network 70% of its data traffic.
- As of August 2024, the T-Mobile Poland C-band 5G network covered one-third of the population with more than 3,000 base stations.

Portugal:

- In March 2025, NOS became the first Portuguese operator to complete a VoNR call over 5G SA infrastructure.
- In July 2024, MEO signed a multi-year deal with Nokia for 5G RAN infrastructure.

Romania:

- As of April 2025, Orange Romania's 5G and 5G+ network is live in 50 cities, eight new localities over the past 6 months.

Slovakia:

- As of October 2024, O2 Slovakia it's the first operator in terms of 5G coverage reaching 82.8% of the population, Orange its at the second place with 78.8% and 4ka coverage remain low with around 20% of the population covered.

A1.2 Households coverage

As already introduced in previous editions of this report, according to data collected by Omdia/Point Topic for the European Commission in 2020, the baseline for 5G coverage in the EU was 14% of households at the time when the Digital Decade announcement was first made in March 2020 (with the breakdown per Member State).

Following a change of methodology compared to previous reports, currently, all reports use data collected by Omdia/Point Topic for the European Commission for the DESI, ensuring consistency going forward. The number of households is calculated using annual NUTS 3 level population data and the average household size figures for each country, both published by Eurostat. The following results are at June 2024 for EU countries and at December 2024 for comparison countries.

Table 4: 5G coverage in the EU

Country	Households coverage (end-2024 figures)	Source
Austria	99.5%	Omdia/Point Topic
Belgium	96.9%	Omdia/Point Topic
Bulgaria	81.3%	Omdia/Point Topic
Cyprus	100.0%	Omdia/Point Topic
Czechia	99.1%	Omdia/Point Topic
Germany	99.1%	Omdia/Point Topic
Denmark	100.0%	Omdia/Point Topic
Estonia	91.5%	Omdia/Point Topic
Greece	99.8%	Omdia/Point Topic
Spain	95.7%	Omdia/Point Topic
Finland	99.5%	Omdia/Point Topic
France	94.3%	Omdia/Point Topic
Croatia	94.2%	Omdia/Point Topic
Hungary	85.6%	Omdia/Point Topic
Ireland	89.9%	Omdia/Point Topic
Italy	99.5%	Omdia/Point Topic
Lithuania	99.7%	Omdia/Point Topic
Latvia	71.1%	Omdia/Point Topic
Luxembourg	99.6%	Omdia/Point Topic
Malta	100.0%	Omdia/Point Topic

Netherlands	100.0%	Omdia/Point Topic
Poland	89.3%	Omdia/Point Topic
Portugal	98.7%	Omdia/Point Topic
Romania	46.8%	Omdia/Point Topic
Sweden	98.6%	Omdia/Point Topic
Slovenia	96.7%	Omdia/Point Topic
Slovakia	87.9%	Omdia/Point Topic
EU 27	94.3%	Omdia/Point Topic

Table 5: 5G coverage in the candidate countries and the UK

Country	Households coverage (end-2024 figures)	Source
Albania	0.5%	IDATE estimate
Bosnia and Herzegovina	0.0%	Not launched
Georgia	44.2%	COMCOM
Iceland	99.0%	IDATE estimate, based on ECOI data
Liechtenstein	99.9%	LIV
Moldova	40.7%	IDATE estimate based on operators reported data
Montenegro	80.0%	EKIP
North Macedonia	93.0%	IDATE estimate based on operators reported data
Norway	99.0%	Telia
Serbia	0.0%	Not launched
Türkiye	0.0%	Not launched
Ukraine	0.0%	Not launched

Table 6: 5G coverage outside of Europe

Country	Households coverage (end-2024 figures)	Source
Australia	91.0%	IDATE estimate end of year, based on operators' data
Brazil	63.71%	Anatel
China	95.0%	Ericsson Mobility Report
India	95.0%	Ericsson Mobility Report
Japan	99.1%	IDATE estimate, based on operators' data
South Korea	100%	Korean Ministry of Science and ICT (MSIT)
United Kingdom	95.0%	Ofcom
USA	97.0%	T-Mobile

A1.3 5G deployment comparison between EU and other world regions

Although the 5G Observatory primarily tracks developments in EU countries, it also follows significant international developments in the 5G sector. It is important to note that most of the figures collected on the number of 5G base stations are provided by governments, but in some cases, such as the US and Japan, they are based on market research estimates. It is possible that some market-based estimates are not entirely up-to-date or accurate. However, they allow for an indicative overview of the state of 5G deployment internationally.

Globally, South Korea is the clear leader in 5G deployment. According to the country's Communication Agency, it now has 346,460 5G base stations. [48] If the country's population is taken into account, this equals 670 5G base stations per 100,000 inhabitants. Following South Korea's lead is China, which has now deployed 4,251,000 base stations. Despite China's significant population size, this works out to 301 5G base stations per 100,000 inhabitants. After China, Japan stands at 122 5G base stations per 100,000 inhabitants with an estimate of 152,000 5G base stations deployed. The EU ranks ahead of the US, with approx. 351,600 base stations. This works out to 78 5G base stations per 100,000 inhabitants (vs. 42 for the US). Australia has approximately 67 5G base stations per 100,000 inhabitants, which is more than double the density in India, where the figure stands at around 32 per 100,000. In Brazil, the deployment is even lower, with approximately 11 5G base stations per 100,000 inhabitants.

In terms of the assigned 5G spectrum, the 3.6 GHz band has proved to be the most used 5G band globally. All seven regions in this comparison have assigned this valuable mid-band spectrum. The 28 GHz band has been assigned in South Korea (then cancelled), Japan, Brazil, Australia, India and the US. In the EU, the situation is more complex as each country assigns their own spectrum. However, all countries have assigned at least the 3.6 GHz band for 5G deployment, while only 12 EU MSs have assigned the 26 GHz band, for which the demand has been lowest so far. See the spectrum assignment chart in Section 2.

[48] Source: Mk.co.kr citing Ministry data

A1.4 5G spectrum comparison between EU and other world regions

In this section, we compare 5G spectrum use by first introducing the "pioneer bands" identified at the EU level for the initial launch of 5G service, providing an overview of current spectrum assignment trends in the EU and contextualising these by introducing international developments.

Since the last 5G Observatory Report published in June 2024, there have been several spectrum auctions across the EU. Overall, the weighted percentage of 5G pioneer bands assigned across the EU now lies at 75%. Poland's recent auction of the 700 MHz band, and Netherlands' auction of the 3.6 GHz band has increased the overall average by 2% since the publication of the last report.

The 700 MHz band and the 3.6 GHz band remain the most widely assigned bands, as 26 out of 27 MSs have assigned 700 MHz and 27 out of 27 have assigned 3.6 GHz. The 26 GHz band has been assigned in just 12 MSs and remains the least assigned pioneer band.

Note: Poland[49] and the Netherlands[50]

Overview of pioneer bands

In 2016, with the release of the 5G Action Plan, the European Commission proposed establishing three 5G pioneer bands for the initial launch of 5G services. It proposed bands in three categories of radio spectrum: below 1 GHz, between 1 GHz and 6 GHz and in millimetre waves.

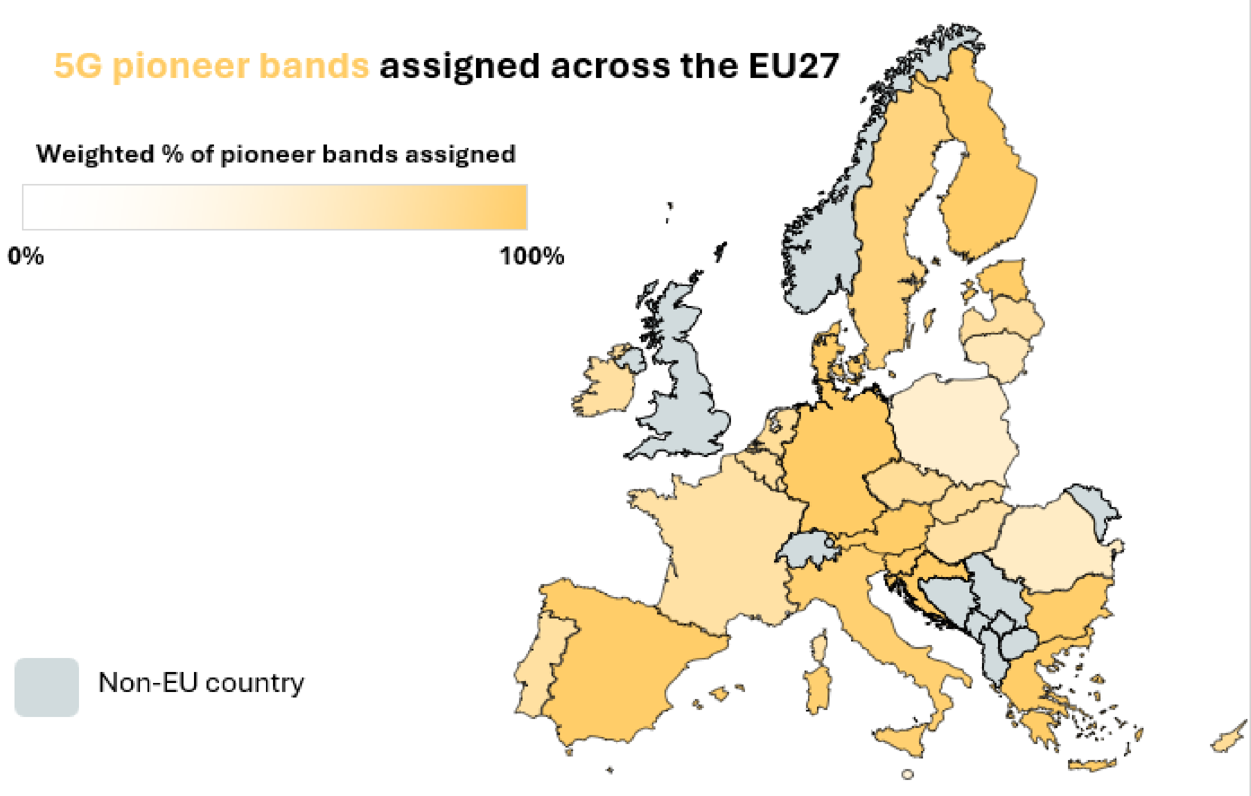
The 5G pioneer bands identified at the EU level (RSPG Opinions on a strategic roadmap towards 5G for Europe) are as follows:

- 700 MHz (703-733 MHz and 758-788 MHz)
- 3.6 GHz (3400-3800 MHz)
- 26 GHz (at least 1000 MHz within 24250-27500 MHz)

In the years following the 5G Action Plan and the adoption of the EECC, the European Commission successfully harmonised the frequencies in these bands. The 26 GHz band was the final frequency band to be harmonised. This occurred in May 2019 with the Commission Implementing Decision (EU) 2019/784.[51] Although the technical conditions for these three bands have been harmonised at the EU level, not all Member States have assigned the pioneer bands, despite the deadlines set out in the UHF Decision (EU) 2017/899 and the EECC, stating that they should assign 700 MHz by 30 June 2020, and 3.6 GHz and 26 GHz by 31 December 2020, provided that there is market demand for the latter and there are no significant constrains to clearing the bands.

[49] Poland completes auction for 700 MHz, 800 MHz bands within two days - Telecompaper
[50] Netherlands opens 3.6 GHz band for private 5G
[51] Implementing decision - 2019/784 - EN - EUR-Lex

Figure 8: 5G pioneer bands assigned across EU27



Source: Data from the annual DESI index

Pioneer bands assigned

The table below outlines how much spectrum each MS has assigned in the pioneer bands. According to the 700 MHz Decision[52] and related Commission Implementing Decision[53] and the EECC, a country must assign 60 MHz in the 700 MHz band; 400 MHz in the 3.6 GHz band and at least 1000 MHz in the 26 GHz band to achieve 100%. The percentages displayed present how much spectrum has been assigned to operators compared to these numbers.

Amongst MSs, the 3.6 GHz band has been most widely assigned. Following the recent Netherlands spectrum assignement, all MSs have now assigned at least 50% of the targeted spectrum in this band (meaning at least 200 MHz out of 400 MHz).

The second most assigned band is the 700 MHz band, where 26 out of 27 MSs have assigned at least 50% of the targeted spectrum (meaning at least 30 MHz out of 60 MHz). This band has seen a minor increase in assignment percentage since the last report, following Poland's recent spectrum auction in the 700 MHz band.

The least assigned band is the 26 GHz band. The 26 GHz band has only been majority-assigned in 12 MSs, meaning only 12 MSs have assigned at least 50% (500 MHz) of the targeted 1000 MHz. There has been no change since the last report.

[52] Decision - 2017/899 - EN - EUR-Lex
[53] Implementing decision - 2016/687 - EN - EUR-Lex

Table 7: Pioneer bands assigned in the EU

Country	% of band assigned		
	700 MHz	3.6 GHz	26 GHz
Total harmonised spectrum (100%)	60 MHz	400 MHz	1000 MHz
Austria	100.00%	97.50%	100.00%
Belgium	100.00%	97.50%	0.00%
Bulgaria	100.00%	90.00%	100.00%
Croatia	100.00%	100.00%	100.00%
Cyprus	100.00%	100.00%	0.00%
Czechia	100.00%	100.00%	0.00%
Denmark	100.00%	97.50%	100.00%
Estonia	100.00%	97.50%	100.00%
Finland	100.00%	97.50%	100.00%
France	100.00%	77.50%	0.00%
Germany	100.00%	100.00%	100.00%
Greece	100.00%	97.50%	100.00%
Hungary	83.33%	97.50%	0.00%
Ireland	100.00%	87.50%	0.00%
Italy	100.00%	80.00%	100.00%
Latvia	100.00%	87.50%	0.00%
Lithuania	66.67%	75.00%	0.00%
Luxembourg	100.00%	82.50%	0.00%
Malta	0.00%	75.00%	0.00%
Netherlands	100.00%	75.00%	0.00%
Poland	100.00%	100.00%	0.00%
Portugal	83.33%	100.00%	0.00%
Romania	50.00%	65.00%	0.00%
Slovakia	100.00%	100.00%	0.00%
Slovenia	100.00%	95.00%	100.00%
Spain	100.00%	95.00%	100.00%

Sweden	66.67%	100.00%	85.00%
Number of countries that have assigned at least 50% of the band	26	27	12

Source: DESI 2025, figures at February 2025

International trends in spectrum allocation

The three 5G pioneer bands harmonised by the European Commission roughly fit into the three categories of 5G frequencies often used by spectrum policy makers: low-band, mid-band, and high-band.

Although there are international discrepancies on which bands are used in each category, classifying the spectrum in this way allows for an easier international comparison of the state of 5G spectrum harmonisation and assignment. The following table provides an overview of which spectrum bands are assigned for 5G in various international markets.

Table 8: Overview of which spectrum bands are assigned for 5G in various international markets[54]

Country	**Low-band (<1 GHz)**	**Mid-band (1 - 6 GHz)**	**High-band (>6 GHz)**
Australia	700 MHz 850 MHz 900 MHz	2.3 GHz 3.5 GHz	26 GHz
Brazil	700 MHz	1.8 GHz 2.3 GHz 2.6 GHz 3.5 GHz 4.9 GHz	26 GHz
China	700 MHz 900 MHz	2.1 GHz 2.6 GHz 3.6 GHz 4.9 GHz	-
India	700 MHz	3.5 GHz	26 GHz
Japan	700 MHz	3.6 GHz - 4.1 GHz 4.5 GHz	28 GHz
South Korea	700 MHz	3.6 GHz	28 GHz (cancelled)
UK	700 MHz 900 MHz	2.1 GHz 3.5 GHz 3.8-4.0 GHz	-

[54] Source: Data on international spectrum assignments is sourced from regulators and Spectrum Tracker

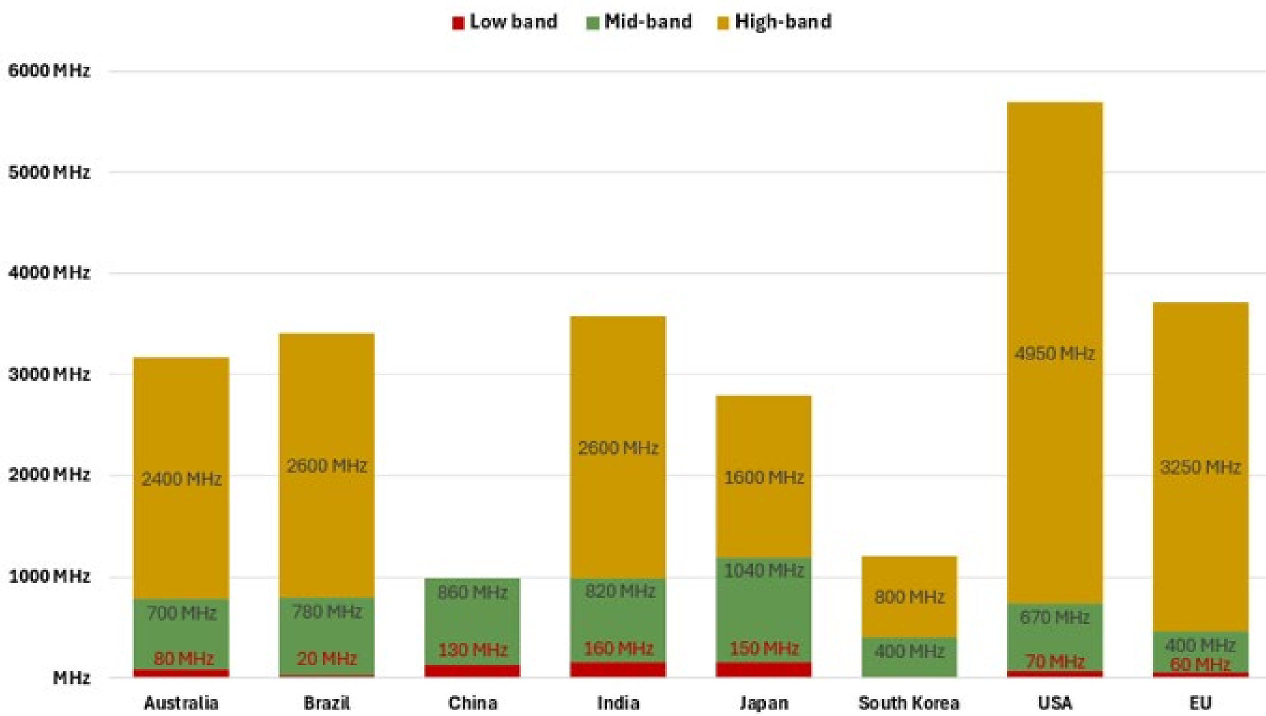
USA	600 MHz 700 MHz 850 MHz	2.5 GHz 3.45 - 3.55 GHz 3.5 - 3.7 GHz 3.7 - 3.98 GHz	24 GHz 28 GHz 39 GHz 47 GHz
EU	700 MHz	3.6 GHz	26 GHz

Internationally, the mid-band 5G spectrum has been established as the workhorse band for 5G. It has been assigned in most major markets, including China, South Korea, Japan, Brazil, Australia, India and the US. Japan is leading with mid-band 5G assignments. The country has allocated 980 MHz of spectrum in the band for 5G services. China comes in second with 860 MHz assigned.

The low-band spectrum has proven to be slightly less popular. In fact, in South Korea's initial 5G auction in 2016, the 700 MHz low-band spectrum remained entirely unsold. More recently, however, the country decided to award 20 MHz of 700 MHz spectrum to a new entrant called Stage X.

Initially, 5G frequencies in the high bands proved to be very popular. The US led the world in making the high bands available for 5G, and Japan and South Korea quickly followed. The United States leads with 4950 MHz of spectrum assigned in the high-band. However, it appears that there is less demand for this band in Europe. In South Korea, meanwhile, the country's regulator, the Ministry of Science and ICT (MSIT), decided in early 2023 to revoke 28 GHz band licences from KT and LG Uplus, later re-assigning the band to Stage X and finally re-cancelled it in July 2024.

Figure 9: Authorised 5G spectrum in international markets[55]



A note on methodology:

Australia, Brazil, China, India, Japan, South Korea

The source of data for Australia, Brazil, China, India, Japan and South Korea is based on the PolicyTracker spectrum database and the update was cross-checked with information from regulators and data from Spectrum Tracker and CMS Law.

All national spectrum licenses were added up to find the total amount of spectrum that was assigned to mobile operators in each country. Only bands shown on the left side of the scoreboard were included in this. All of these bands are used to provide 5G services in their respective country.

[55] Note: Due to the nature of spectrum assignments in the US being regional, only the three big national operators were included: T-Mobile; AT&T and Verizon. The final spectrum amount was divided by the number of licenses to give a picture of how much spectrum is assigned in an average licensing area. For the EU, the data shows how much spectrum has been harmonized at an EU-level. Some individual countries may have more spectrum assigned for 5G, while some may have less or none. Source: Data on international spectrum assignments is sourced from regulators and Spectrum Tracker

US

No new spectrum auction since the last edition of the 5G observatory in June 2024.

In the United States, licences are usually awarded regionally, a common example being the use of PEAs (partial economic areas) of which there are 406.[56] This makes it difficult to know how much spectrum mobile operators hold on a national level, as they hold different amounts of each band in each licence area. Because of this, we have chosen to instead use the amount of spectrum that was initially made available to mobile operators by the country's spectrum regulator, the Federal Communications Commission (FCC), at auction. This data comes directly from the FCC, and the list of awards can be found in the table below.

In the 2.6 GHz band spectrum, licenses are held by educational institutions. These are called Educational Broadband Service (EBS) licenses. T-Mobile leases a majority of these licences and has purchased some.[57] The total number of spectrum that T-Mobile holds in these licences is unknown. However, an estimate made by the FCC suggests the operator holds 155 MHz of spectrum in this band.[58] This is the estimate used in our data.

Regarding the CBRS auction, we have only counted the priority access licences (PAL), and the other spectrum made available is on an unlicensed basis.

Not all spectrum made available at these auctions will have been sold to operators. However, the amount of unsold spectrum licenses in these auctions is small. Furthermore, the amount of spectrum was cross- checked with the PolicyTracker spectrum database. This is a comprehensive database of spectrum assignments in over 100 countries.

Low-band spectrum	**MHz**	**Source URL**
600 MHz (Incentive auction)	70	https://auctiondata.fcc.gov/public/projects/1000

Mid-band spectrum	MHz	Source URL	Comments
CBRS (PAL licences)	70	https://www.fcc.gov/auction/105/factsheet	70 MHz was awarded as priority licences. However, operators may be able to use the entire CBRS range of 100 MHz in some circumstances.
3.45 - 3.55 GHz (Auction 110)	100	https://www.fcc.gov/auction/110/factsheet	
3.7 - 4.2 GHz (Auction 107) (C-band auction)	280	https://www.fcc.gov/auction/107/factsheet	

56 https://www.fcc.gov/oet/maps/areas
57 https://www.lightreading.com/5g/inside-the-messy-world-of-t-mobiles-midband-5g-spectrum-licenses/d/d-id/774745
58 https://www.fcc.gov/reports-research/reports/consolidated-communications-marketplace-reports/CMR-2020

2.6 GHz (T-Mobile's holdings of education spectrum)	155	https://www.fcc.gov/reports-research/reports/consolidated-communications-marketplace-reports/CMR-2020	FCC estimate from 2020 marketplace report (p.24)
Total	605		

High-band spectrum	MHz	Source URL
28 GHz (Auction 101)	850	https://www.fcc.gov/auction/101/factsheet
24 GHz (Auction 102)	700	https://www.fcc.gov/auction/102/factsheet
37 GHz and 39 GHz (Auction 103)	2400	https://www.fcc.gov/auction/103/factsheet
47 GHz (Auction 103)	1000	https://www.fcc.gov/auction/103/factsheet
Total	4950	

European Union

Because spectrum assignments differ across EU MSs, the number used in the scoreboard shows how much spectrum has been harmonised at the EU level. Some individual countries may have more spectrum assigned for 5G, while some may have less.

A1.5 5G verticals and trials

Overview

Whereas previous generations of mobile technologies primarily focused on human communication, including voice, data, and the internet, 5G has the ability to provide services for a range of industries where mobile telecoms have so far had little purchase. Because 5G features low latency and high speeds, it is well suited to enter the so-called "vertical" markets such as industrial and agricultural automation, the automotive industry, transport and healthcare. Early in the development of 5G/IMT-2020, the ITU identified 5G as a "key driver" for industrial and societal changes.

The 3GPP standardisation body released the first 5G specification in 2017 (Release 15). After the release of Release 15, the focus quickly turned to optimising 5G for vertical domains in Release 16, which is informally referred to as '5G Phase 2'.

In June 2020, Release 16 was published, focusing on the verticals' needs. Enhancements were made to 5G System enablers for verticals, including industrial automation, time-sensitive communication (TSC), Ultra-Reliable and Low Latency Communication (URLLC) and Non-Public Networks (NPNs). Enhancements were also made to the Cellular Internet of Things (CIoT) and support for 5G system Vehicle-to-Everything (V2X) communication.

Release 17, which was frozen in March 2022, introduced several important features for 5G verticals, including the new NR-Light standard for reduced-capability IoT devices and initial support for non-terrestrial networks (NTNs). It also expanded 5G spectrum support to include higher frequency bands in the 52.6–71 GHz range. Release 18, which was frozen in June 2024, built upon these advancements with additional specifications tailored to vertical industries. Its system architecture incorporated features such as 5G multicast broadcast services, vehicle-mounted relays, and Personal IoT Networks. Release 18 also enabled new applications including enhanced V2X communications, UAS (drone) support, 5G messaging, Future Factory use cases, and improved exposure of network capabilities for IoT platforms.[59]

Release 19, which is expected to be frozen by mid-2025, continues to expand the 5G vertical ecosystem with new specifications targeting enhanced industrial IoT, integrated sensing capabilities, and advanced critical communication services. The system architecture introduces improvements for non-terrestrial networks including satellite and UAV connectivity, extended support for railway communication systems, and AI-driven network optimisation. R-19 also identifies further applications such as ambient IoT, sensing-as-a-service, enhanced mission-critical communications, and support for XR and metaverse services with improved QoS management. Release 20, anticipated for freezing around mid-2026, marks a transition towards 6G readiness by incorporating cutting-edge technologies aimed at expanding vertical use cases with future-proof network solutions. It introduces specifications for multi-orbit non-terrestrial networks to ensure ubiquitous coverage, advanced AI and machine learning integration for network automation and resource efficiency, and new frameworks for immersive XR and metaverse applications. R-20 further emphasizes energy efficiency and sustainability, supports expanded IoT platforms, and enables enhanced connectivity for automotive, industrial, and public safety verticals.

5G verticals in the EU

With the announcement of the EU Digital Decade Communication, the European Commission has put emphasis on the importance of the digital transformation of business. The communication outlined that 5G will play an important part in this transformation. It states, *"digital technologies including 5G, the Internet of Things, edge computing, Artificial Intelligence, robotics and augmented reality will be at the core of new products, new manufacturing processes and new business models based on fair sharing of data in the data economy."*

In Europe, the development and testing of 5G verticals have been strongly supported through the 5G Public-Private Partnership (5G PPP), a flagship initiative co-funded by the European Union with over €700 million in research grants and matched by approximately €3.5 billion in private investment between 2014 and 2020. The 5G PPP brought

[59] Release 18; Release 19; Release 20

together 783 organisations across 93 projects, engaging nearly 85,000 person-months of effort. Beyond its significant scientific output with over 1,200 contributions to global standards and more than 2,500 publications, the program played a pivotal role in driving large-scale trials and cross-sector use cases, showcasing 5G's transformative potential across industries such as manufacturing, automotive, healthcare, and media. With the publication of more than 50 white papers and the implementation of numerous pilot projects, the 5G PPP helped to position Europe as a leader in next-generation mobile communications.

Furthermore, the 5G-PPP Vertical Engagement Task Force (VTF) has been established to coordinate and monitor activities related to working with the vertical sector. The vertical sectors considered by 5G-PPP VTF are:

- Automotive
- Manufacturing
- Media
- Energy
- E-Health
- Public safety
- Smart cities

5G vertical spectrum: Is there a need for a dedicated spectrum?

The licensing model (or model***s***) needed for 5G verticals is the subject of an ongoing debate in spectrum management circles. 5G verticals can either use spectrum already assigned to mobile operators or they can rely on dedicated spectrum licenses issued by national regulatory authorities.

Some stakeholders argue in favour of a dedicated spectrum. They say that dedicated spectrum access regimes enable innovation and competition, as they provide a new spectrum access option for industries.[60] It is also argued that a dedicated spectrum is better suited for some applications which have particularly demanding quality of service (QoS) requirements, such as utilities.

There are also arguments against the dedicated spectrum. The mobile industry association, GSMA, says[61] that doing so may cause fragmentation. The organisation says that this could make it harder for operators to achieve contiguous blocs – which will then result in reduced speeds and QoS.

Despite this ongoing debate, an increasing number of countries are adopting a local licensing model that uses dedicated spectrum for 5G verticals. Germany was the first country to decide to reserve the 3700-3800 MHz band for verticals. This may be because of the potential benefits for industrial companies, which account for about 20% of the country's GDP.[62]

In total, 13 EU countries have proposed or implemented a local licensing model. These countries are as follows:

- Austria
- Belgium
- Croatia
- Denmark
- Finland
- France

[60] 'America's inventive spirit at its finest' – CBRS model must be extended, says industry
[61] Mobile Networks for Verticals and MNOs - a How-To for Regulators - Spectrum
[62] Germany - Share of economic sectors in gross domestic product (GDP) 2024| Statista

- Germany
- Netherlands
- Poland
- Portugal
- Spain
- Slovenia
- Sweden

Although many European countries have adopted the approach of dedicating spectrum for verticals, the exact portions of spectrum used for these licences vary across Europe. This can cause issues when it comes to harmonisation efforts or standardising equipment. However, the 3.8-4.2 GHz band is emerging as a potential solution for this problem. The band has the potential to become the de facto vertical band for Europe.

The UK was the first European country to release[63] the band in 2019 exclusively for local private and shared networks. France has also followed in the UK's footsteps by opening up the 3.8-4.0 GHz band for 5G verticals licences.[64] Norway has also begun offering free trial licences in the 3.8-4.2 GHz range.[65] Meanwhile, the Belgian regulator BIPT has also opened up the band. In January 2024, BIPT announced that it would begin accepting local licence applications in the band.[66]

The European Radio Spectrum Policy Group (RSPG) has previously published a consultation recommending Member States to explore the use of the 3.8 – 4.2 GHz band for 5G verticals.[67] In 2021, the European Union's Radio Spectrum Committee (RSC) mandated CEPT to develop harmonised technical conditions for the shared use of 3.8-4.2 GHz. However, the work on these efforts is still ongoing within the technical body.

In November 2024, the Electronic Communications Committee (ECC) of the European Conference of Postal and Telecommunications Administrations (CEPT) published its final response to the European Commission's 2021 mandate concerning the shared use of the 3.8–4.2 GHz band (https://eccwp.cept.org/WI_Detail.aspx). This response comprises ECC Decision (24)01, which establishes harmonised technical conditions for the shared use of the band by low and medium power terrestrial wireless broadband systems offering local-area network connectivity. It also includes CEPT Report 088, which outlines the technical and regulatory framework supporting this shared use, aiming to facilitate the deployment of local 5G networks for industrial and enterprise applications.
Together, these documents are intended to ensure a consistent approach across EU Member States, enabling the development of private 5G networks while maintaining compatibility with existing incumbent services.
In response to these developments, several European countries have begun implementing the harmonised conditions. In France, the regulatory authority ARCEP launched a public consultation in July 2024 to solicit feedback on assigning the 3.8–4.2 GHz band for local private mobile networks. The consultation closed on 4 November 2024, with final decisions expected in 2025. Meanwhile, in the United Kingdom, Ofcom has revised its Shared Access framework to enhance the use of the 3.8–4.2 GHz band. The updates include the removal of terminal registration requirements for all Low Power users and more flexible access to Medium Power use in most urban areas, alongside adjustments to spectrum fees designed to promote efficient usage.

[63] https://www.policytracker.com/ofcom-makes-3-8-4-2-ghz-available-for-private-networks/
[64] https://www.policytracker.com/france-seeks-to-expand-industrial-5g/
[65] https://www.policytracker.com/norway-offers-free-3-8-4-2-ghz-private-network-test-licences-to-businesses/
[66] https://www.bipt.be/operators/publication/decision-of-19-december-2023-concerning-local-private-networks-in-the-3800-4200-mhz-band-and-the-assignment-of-e.212-mobile-network-codes
[67] https://www.policytracker.com/3-8-4-2-ghz-gains-momentum-after-rspg-backing/

In Asia, the notion of 5G private networks has some traction. In Japan,[68] a significant number of major companies have already acquired a spectrum licence.[69] The country's communications ministry started to issue licences for the deployment of local 5G networks in 3.7 GHz, 26 GHz and 28 GHz frequency bands as early as December 2019. In South Korea, the Ministry has made 100 MHz in the 4.7 GHz band and 600 MHz in the 28 GHz band available for campus networks at a fee of up to USD 88 per block.[70]

In China, The Ministry of Industry and Information Technology (MIIT) granted its first 5G private network licence in December 2022 to a domestic aeroplane manufacturer. The company will receive spectrum in the 5925-6125MHz and 24.750-25.15 GHz bands. The Chinese government is trying to promote industrial 5G networks, which it says is key to "boosting manufacturing prowess".[81]

India has developed a specific framework for setting up private 5G networks, known as Captive Non-Public Networks (CNPN)[71]. Enterprises can obtain spectrum without an annual license fee, subject to a one-time entry fee and spectrum usage charges. Eligibility criteria include being an Indian company with a net worth of at least INR 100 crores (approximately USD 12.12 million).

In the US, the FCC is hoping that its three-tier CBRS (Citizens Broadband Radio Service) approach will allow enterprises to deploy private 4G and 5G networks and verticals. The CBRS regime has seen steady growth over the years as more companies begin using the band. A report by the National Telecommunications and Information Administration (NTIA) suggests the band is being widely adopted. It found that between April 2021 and July 2024, the number of CBRS devices grew by nearly 210%. Over 400,000 CBRS devices[72] has already been deployed in July 2024, with the majority operating under the General Authorized Access (GAA) tier, and Priority Access Licenses (PALs) showing a fourfold increase since 2021. Approximately 70% of deployments are in rural areas, highlighting CBRS's contribution to expanding broadband access. Meanwhile, nearly 12% of CBRS deployments support 5G services, reflecting its growing role in next-generation connectivity. Regulatory developments include ongoing efforts by the FCC and NTIA to evaluate dynamic spectrum sharing and future band reorganisation[73], with legislative decisions also shaping access to adjacent spectrum bands.

Nevertheless, internationally, the majority of the countries have not yet reserved frequencies for enterprises. In these markets, verticals will have to rely either on unlicensed spectrum, services provided by MNOs or secondary access to mobile spectrum. Unlicensed spectrum may prove to be successful for certain private network scenarios, but mission-critical applications are wary of unlicensed spectrum, which could have severe interference issues from other users.

Trends related to vertical trials

The 5G Observatory has been tracking the announcements of 5G trials in Europe and Internationally since 2018. The initial purpose of this was to monitor progress toward the 5G Action Plan. However, as commercial 5G networks have now launched in all EU-27 countries and the EU Digital Decade has realigned policy priorities, the 5G Observatory has shifted its focus to vertical trials.

5G verticals are still in the growth phase. 3GPP Release 16, which specifically focused on 5G vertical needs, was finalised in early 2020. Release 17, meanwhile, which introduced more vertical features, is expected to be frozen soon. Some industry stakeholders have referenced this as a potential reason for the slow development of 5G verticals, particularly when compared to the rollout of commercial 5G. Furthermore, the COVID-19 pandemic may have also contributed to delays.

5G verticals appear to be particularly developed in ports and have been extensively tested in several countries.

[68] https://www.policytracker.com/japan-awards-its-first-commercial-licences-for-local-5g/
[69] https://www.policytracker.com/japan-awards-its-first-commercial-licences-for-local-5g/
[70] https://www.policytracker.com/south-korea-to-allocate-local-5g-spectrum-for-the-first-time/
[71] TRAI pushes for direct 5G spectrum access for enterprises
[72] An Analysis of Aggregate CBRS SAS Data from April 2021 to July 2024 | National Telecommunications and Information Administration
[73] Advanced Dynamic Spectrum Sharing Demonstration in the National Spectrum Strategy | National Telecommunications and Information Administration

Notable examples include:

Belgium: Proximus and the Port of Antwerp have announced a 6-month trial of a private 5G network.[74]

Belgium: The Port of Zeebrugge and Citymesh have launched a private 5G network in the Port of Zeebrugge. The first phase involved connectivity for tugboats, air pollution detectors, cameras, and quay sensors.[75]

Germany: The Hamburg Port Authority, Deutsche Telekom and Nokia have conducted an 18-month field test at the 'smart seaport' in Hamburg, Germany. This test focused on the integration of 5G in traffic and infrastructure control.[76]

Estonia: Tallinn, Telia, Ericsson and Intel have created a 5G test and exploration area in the Port of Tallinn. This trial enabled internet connectivity for commercial cruise ship passengers while in port.[77]

Spain: Telefónica and APM Terminals have trialled 5G at the port of Barcelona. This test included connecting cranes, vehicles and people.[78]

Spain: Spanish telecom group MasOrange has launched a 5G Standalone (SA) virtual private network at the Port of Barcelona[79], requiring a €3.6 million investment over five years to enhance mobility services through upgraded infrastructure.

Spain: The Port of València[80] is advancing its transformation into a Smart Port with a €6 million EU-backed private 5G network capable of supporting over 25,000 connected devices across its operations.

Italia: The Port of Ravenna[81] is becoming a smart port through a new private 5G network deployed by the recently merged Fastweb and Vodafone Italia, marking one of their first major joint initiatives to enhance port operations and logistics.

Lithuania: Telia Lietuva is set to trial a 5G Standalone (SA) network at the Klaipeda port[82] to demonstrate the benefits of private 5G for critical infrastructure and prepare for broader national deployment.

Latvia: Latvijas Mobilais Telefons (LMT) and Druid Software have deployed the Baltic region's first private 5G network at the Freeport of Riga's Baltic Container Terminal[83], marking a major step in industrial connectivity.

---

[74] https://www.proximus.com/news/2020/20200205-Proximus-and-Port-of-Antwerp-are-preparing-for-the-port-s-digital-transformation-by-developing-a-private-5G-network-.html
[75] https://citymesh.com/en/news/port-of-zeebrugge-accelerates-innovation-by-investing-in-a-5g-network
[76] https://www.telekom.com/en/media/media-information/archive/port-of-hamburg-is-ready-for-5g-574536
[77] https://www.ericsson.com/en/cases/2017/5g-telia-tallink
[78] https://enterpriseiotinsights.com/20210311/channels/news/telefonica-apm-terminals-to-deploy-5g-and-c-v2x-port-of-barcelona?utm_campaign=20210311%20Enterprise%20IoT%20NewsletterThurs&utm_medium=email&utm_source=Eloqua
[79] El Port de Barcelona, líder europeo en 5G con Orange | Port de Barcelona
[80] Building the Smart Port: València's Private 5G Network Initiative - PrivateLTEand5G.com
[81] Ravenna Port Embraces Future with Private 5G Network - PrivateLTEand5G.com
[82] Klaipėda Port to pioneer Lithuania's first private 5G standalone network
[83] LMT and Druid Software Pioneer First 5G Private Network in the Baltics - PrivateLTEand5G.com

A1.6 5G private local networks

Deployment of 5G private local networks is growing exponentially across EU countries. These networks are not typically utilised by consumers (for mobile voice and data services) but use network elements and resources to provide dedicated secure services to private enterprises such as factories, plants, large campuses, ports and airports.

The 5G Observatory has produced a non-exhaustive list of private 5G networks, which is based on research of publicly available information. The Observatory team endeavour to obtain as much information on published private 5G network deployments as possible.

Over the past six months, the European landscape of private 5G network deployments has witnessed remarkable growth – with more than 45 new deployments identified since the last 5G Observatory report.

Over the last half-year, there has been significant growth in private 5G network installations across Europe, with more than 30 new deployments noted since the last report.

Most of these deployments (nine) occurred in the United Kingdom, benefiting from a dedicated 5G spectrum for vertical networks. These included installations in sectors such as automotive manufacturing, education, agriculture, ports, research, sport and smart cities.

More recently, Virgin Media O2 Business and the River Severn Partnership Advanced Wireless Innovation Region (RSPAWIR) have launched a pioneering 5G connectivity trial at Overbury Farms, a digitally advanced estate on the Worcestershire–Gloucestershire border. Covering a 1-kilometer test area, the portable private 5G network will support innovative agricultural solutions, including AI-enabled pest detection, IoT water and fertilizer monitoring, and advanced weather data collection to enhance efficiency, animal welfare, and sustainability.

Other countries in Europe with notable private 5G deployments in the last six months include Belgium, where it is being implemented at the largest printing facility and at the Belgian cup final; Italy, for the port of Ravenna; Germany, for education and broadcasting; France, for broadcasting during the Paris 2024 Olympic Games; Spain, in mining site and ports.

Other countries outside Europe with notable private 5G deployments in the last 6 months include USA, with ten private 5G deployment announcements in different verticals including military, hospitality, mining, agriculture, transportation, energy, public safety, manufacturing and venues; South Korea with deployments in military, manufacturing and healthcare; China with deployments in energy and manufacturing and India with a private 5G network in a coal mine.

A1.7 EMF (Electromagnetic Fields) developments related to 5G policy goals

An EMF explainer is available online here.

Key highlights

The application of EMF limits remains inconsistent across MSs.

In April 2024, the Italian Ministry of Business and Made in Italy raised the EMF limits in the country from the previous limit of 6 volts per meter (V/m) to 15 V/m.

In May 2024, Denmark reaffirmed its commitment to limiting occupational and public exposures to radiofrequency EMF in accordance with internationally harmonized CENELEC standards, based on the 1999/519/EC recommendation.

In June 2024, the Netherlands introduced legal exposure limits for radiofrequency EMF in publicly accessible areas and homes, aligning with the 2020 ICNIRP guidelines. This move replaced the previous voluntary agreement and aims to standardize EMF exposure regulations nationwide.

Key highlights' references: Italy[84], Denmark[85] and the Netherlands[86].

The EECC recommends setting limits on exposure to electromagnetic fields (EMF) in line with the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines, which are about 50 times less than the level where there has been substantiated evidence of health damage. However, these limits are not binding on Member States, and there is inconsistency in how they are applied, and this can restrict the economic and social benefits of including 5G. Current EMF policies in the Member States are shown in the table below.

The Commission mandated[87] in June 2021 the Scientific Committee on Health, Environmental and Emerging Risks (SCHEER)[88] to provide an opinion on the need for a technical revision of the annexes to the Council Recommendation 1999/519/EC[89] and Directive 2013/35/EU[90] for the frequency range 100 kHz to 300 GHz in view of the latest scientific evidence available, in particular the ICNIRP guidelines updated in 2020. This mandate further tasks SCHEER to update the SCENIHR Opinion of 2015 in light of the latest scientific evidence with regard to frequencies between 1 Hz and 100 kHz.

In its opinion published in April 2023, SCHEER advises positively on the need for a technical revision of the annexes in Council Recommendation 1999/519/EC and Directive 2013/35/EU with regard to radiofrequency electromagnetic fields (100 kHz to 300 GHz), because there is a need to recognise the recently introduced dosimetric quantities and establish limits for them.[91]

[84] Italy raises electromagnetic limits to boost 5G - Telecompaper
[85] Microsoft Word - National report from Denmark 2024 - EMF.docx
[86] emf-2024-netherlands.pdf
[87] https://health.ec.europa.eu/system/files/2021-07/scheer_q_023_0.pdf
[88] https://ec.europa.eu/health/system/files/2021-07/scheer_q_023_0.pdf
[89] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31999H0519
[90] Directive 2013/35/EU of the European Parliament and of the Council of 26 June 2013 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (20th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) and repealing Directive 2004/40/EC: https://eur-lex.europa.eu/legal- content/EN/TXT/?uri=celex%3A32013L0035
[91] https://health.ec.europa.eu/consultations/scheer-public-consultation-preliminary-opinion-scientific-evidence-radiofrequency_en

Table 9: Current EMF policies in the Member States

Countries	ICNIRP limits used?	Details
Austria	Yes	
Belgium	No	More restrictive than ICNIRP. Each region has its own limits, but those in Brussels were relaxed in August 2021
Bulgaria	No	Public exposure limit of 0.1 W/m^2 (300 MHz to 30 GHz)
Cyprus	Yes	ICNIRP limits adopted in 2004
Czech Republic	Yes	ICNIRP limits adopted in 2000
Germany	Yes	
Denmark	Yes	Stricter national precautionary measure in practice
Estonia	Yes	ICNIRP limits adopted in 2002. No permit for ERP power <100W
Greece	No	60% of ICNIRP guidelines for base stations located less than 300 m from schools, hospitals... 70% of ICNIRP guidelines in other areas
Spain	Yes	ICNIRP limits adopted in 2001
Finland	Yes	
France	Yes	ICNIRP limits adopted in 2002
Croatia	No	Power density limits are 16% of the ICNIRP guidelines
Hungary	Yes	ICNIRP limits adopted in 2004
Ireland	Yes	
Italy	No	20 V/m as a general limit in open areas. 12 V/m inside buildings
Lithuania	Yes	
Latvia	Yes	
Luxembourg	No	Limit at 3 V/m per operator and per antenna system. About 0.2% of ICNIRP limits above 2 GHz
Malta	Yes	
Netherlands	Yes	
Poland	Yes	ICNIRP limits adopted in 2020
Portugal	Yes	ICNIRP limits adopted in 2004
Romania	Yes	

Sweden	Yes	
Slovenia	No	For sensitive and protected areas limits are lower
Slovakia	Yes	ICNIRP limits adopted in 2007
UK (non EU)	Yes	ICNIRP limits adopted 2000

A1.8 5G corridors

Under the third CEF Digital calls for proposals, a further fifty-three projects were selected, covering 5G infrastructure deployments along transport corridors. More details on the projects can be found below.

Call Four was launched in October 2024 and closed on February 2025. It marks the first call issued under the second CEF Digital Work Programme (2024–2027), which was adopted in October 2024. The proposals submitted under this call and selected for funding will be officially announced in the fourth quarter of 2025, following the completion of the evaluation process.

As part of the third round of calls under the Connecting Europe Facility (CEF) Digital programme, the European Commission has selected 53 projects to receive up to €274 million in funding. These projects mark a significant step forward in the EU's ambition to deploy high-performance digital infrastructure. The focus is particularly strong on 5G connectivity along transport corridors, in smart communities, and through advanced edge cloud and digital backbone infrastructure.

The selected projects cover a broad range of digital deployment and planning activities. These include the cross-border rollout and upgrade of network elements along the Trans-European Transport Network (TEN-T). In addition to transport, the initiative brings 5G capabilities to key community hubs such as airports, hospitals, and universities. This aims to ensure secure, sustainable, and high-speed connectivity. Several projects also address the expansion of terrestrial and submarine digital backbone infrastructure, as well as satellite connections within the EU and in its overseas territories.

With 215 partners from 28 countries participating, the initiative demonstrates the EU's strong commitment to cross-border collaboration and digital innovation. The projects receive co-funding from EU grants combined with national contributions. The level of co-financing depends on the type of project, whether it involves feasibility studies or full-scale deployment.

The CEF-Digital programme provides a total budget of €1.527 million for the 2021 to 2027[92] period. It is designed to enhance Europe's digital sovereignty and competitiveness by supporting the development of robust and secure digital infrastructure across key sectors. After receiving a positive opinion from EU Member States in September 2024, the European Commission adopted the formal selection decision. The European Health and Digital Executive Agency (HaDEA) is now finalising the grant agreements with selected applicants. The list of funded projects is expected to be published once this process is completed, likely later in 2025.

The selection of projects following the third calls can be found here.

[92] https://digital-strategy.ec.europa.eu/en/policies/cross-border-corridors

A1.9 5G cybersecurity toolbox implementation

Cybersecurity has been an important priority in the context of 5G development. The EU toolbox for 5G security is a set of robust and comprehensive measures for an EU-coordinated approach to secure 5G networks. The full paper providing an overview of the toolbox, as well as measures already taken by Member States can be found here.

There have been no major developments in the implementation of the 5G Cybersecurity toolbox since the last report.