



5G Observatory

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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.



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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
CAGR	Compound Annual Growth Rate
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
NRA	National Regulatory Authority

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
SLA	Service Level Agreement
SNS JU	Smart Networks and Services Joint Undertaking
V2X	Vehicle-to-Everything
VR	Virtual reality
WRC-27	World Radiocommunication Conference 2027
XR	Extended reality

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Executive summary

An integral part of the Digital Decade, the European 5G Observatory is the Commission's key repository for data related to 5G (and in the future 6G). The current edition shows that **the EU is very close to achieving full basic 5G population coverage (96.8% of households) and slightly less close in terms of basic 5G rural coverage**, which stands at 88.9%. All EU Member States have basic 5G household coverage above 90%, except Romania. Rural coverage improved significantly in 2025, reaching above 90% for most Member States, except for seven countries: Romania (22.7%), France (80.3%), Hungary (81.9%), Poland (84.3%), Slovakia (84.6%), Bulgaria (86.8%), and Ireland (89.1%).

Mid-band deployment – which allows, when associated with 5G standalone (5G SA), high-capacity, ultra-high reliability, security and low latency – remains a bottleneck. 5G mid-band coverage in the 3.4–3.8 GHz spectrum band is substantially lower than general 5G coverage in many Member States (74.8% overall household coverage in this band). Rural mid-band coverage is particularly weak. The EU27 average of 5G rural household coverage in the 3.4–3.8 GHz band remains at around 33.7%, indicating that high-capacity 5G remains largely urban. With these figures, the EU lags behind key international players in basic 5G deployment. South Korea, Japan, China, India and the US all have higher household coverage.

Across the EU Member States, **5G deployment remains predominantly based on non-standalone (NSA) architecture, which relies on existing 4G core, including in areas where mid-band has already been deployed. The number of 5G SA base stations is only at 20.9% of all mobile base stations.** Most EU countries launched NSA networks between 2019 and 2021, enabling early market rollout. However, the transition to 5G SA, which introduces a fully virtualised 5G core and enables advanced capabilities such as network slicing, ultra-low latency, and private network services, i.e. capabilities that are important for competitiveness of EU industry, has been more gradual and uneven. In contrast to the EU (20.9%), 5G SA deployment in other advanced economies is higher and in 2025 stands at 36.2% in the US, 34.8% in China, 26.3% in Japan and 26.2% in South Korea. Australia (18.1%), Brazil (14.9%) and India (10.0%) are below the EU27 average.

Relative to leading global markets, the EU remains also less advanced in 5G investment intensity. Its 50.6% 5G share of all mobile investments is significant but below that of China (72.0%), South Korea (67.0%), the US (62.0%), and Japan (58.0%).

By 2025, the EU had reached 75.3% harmonised spectrum assignment, with many Member States at near or full assignment. However, the distribution across the EU27 remains uneven. Several Member States still report relatively low harmonised assignment despite otherwise advanced mobile markets. There is also very wide variation in reliance on dynamic spectrum sharing (DSS), suggesting that the EU spectrum environment remains only partially converged.

In terms of “basic” 5G SIM cards penetration among all SIM cards as a means for take-up, the EU stands at 28.1%, which again places the region behind the leading developed countries. The US (56.7%), both Japan and Australia (54.7%), South Korea (41.0%), China (39.6%), and India (32.6%) all have higher rates, reflecting faster 5G adoption. Brazil (21.1%) falls below the EU average.

Next to an overview of 5G indicators in the EU and internationally, this edition of the European 5G Observatory provides a deep dive into 5G private networks and 6G, with two dedicated focus sections. **In relation to 5G private networks, the report shows that the EU trails other regions in terms of commercial deployment.** The global market for 5G private networks (on private, public or hybrid bands) is experiencing rapid expansion, with over 68 180 deployments worldwide and double-digit annual growth rates. In the EU27,

the number of 5G Private Networks reached 689 by the end of 2025, driven by increasing industrial digitalisation and supportive regulatory frameworks that facilitate spectrum access for enterprises and private slices. Germany (500) and France (65) are leading in adoption, with the region, as a whole, expected to maintain strong growth momentum. Compared to the EU, the US (2 689) has a higher number of early deployments, while China (64 000) dominates in both scale and innovation. Emerging markets such as Brazil and India are accelerating adoption, supported by targeted spectrum policies.

While it is too early to say who will lead on 6G, Europe's position relative to other parts of the world will not be determined solely by leadership in radio technologies, but by its capacity across the converged digital communications stack, from advanced semiconductors to AI-driven network orchestration and cloud-edge integration. In this context, progress in 5G SA deployment will be a key determinant, as it represents a critical bridge towards 6G. This is because 6G will build on the architecture and capabilities introduced by 5G SA, including network slicing, cloud-native cores, and edge computing, which together form the foundation for next-generation services and architectures.

The EU approaches the transition to 6G with a mix of structural strengths and growing dependencies. It benefits from globally competitive infrastructure suppliers, strong RAN engineering capabilities, and recognised leadership in energy-efficient networks, supported by a coordinated research and standardisation framework, notably through the Smart Networks and Services Joint Undertaking (SNS JU). These assets strengthen Europe's ability to influence global standards and ensure interoperability. However, challenges persist, including weaknesses in hyperscaler cloud services and AI development, reliance on external semiconductor supply chains, risks of diminished value capture in increasingly software-driven architectures, and exposure to geopolitical tensions and market fragmentation. As value shifts toward cloud management software and AI orchestration, the EU risks losing ground in higher-margin segments if these capabilities remain externally dominated.

1. Introduction

Launched by the European Commission in 2018, the 5G Observatory supports EU's policy on digital transformation, by monitoring the deployment and take-up of 5G networks and analysing related market, policy, and technological developments across the EU and beyond. Since then, it has evolved into a tool for evidence-based policy-making under the Digital Decade Policy Programme (DDPP). The 5G Observatory delivers regular, structured, and policy-relevant data and analysis, which help the Commission and the EU27 Member States to assess progress, guide decision-making, and advance the EU's digital objectives for 2030.

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.¹ This includes indicators such as population coverage per spectrum band and the number and distribution of base stations. The data collected supports the Commission's annual reporting cycle under the Digital Decade framework, notably the yearly "State of the Digital Decade" report, and contributes to tracking progress towards the EU's 2030 digital connectivity targets.

Since 2025, the 5G Observatory has been more tightly integrated with the implementation of the DDPP. In this context, it relies on a number of core "Digital Economy and Society Index" (DESI) indicators in the area of 5G and contributes to refining performance metrics and data-collection methodologies in close collaboration with Member States, supporting the definition and harmonisation of indicators used to monitor progress towards EU digital connectivity targets. Through these activities, the 5G Observatory helps ensure methodological consistency, data accuracy, and comparability across the EU, 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 5G network deployment in relation to 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.

In support of investment monitoring, the 5G Observatory collects data on public and private investments in digital infrastructure, distinguishing between the radio access network and the core network. 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: sustainability², trustworthiness³, AI-native design⁴, integrating sensing and communications⁵, extreme performance⁶, global coverage⁷ and multi-dimensional

¹ While this report focuses on the most pertinent indicators, more can be found on the [5G Observatory website](#) (which also includes updated data received after April 2026), Brussels 2026.

² 6G will be designed with strict energy efficiency, carbon neutrality goals, and circular economy principles.

³ Enhanced security, privacy, and resilience-by-design across all layers of the architecture.

⁴ Embedded machine learning and AI at the edge, core, and radio layers to enable zero-touch automation.

⁵ Networks will natively support environment sensing (e.g., location, motion, health signals).

⁶ Peak data rates of 1 Tbps, latency below 100 µs, and high reliability for critical services.

⁷ Seamless integration of terrestrial and non-terrestrial networks (e.g., satellites, drones).

services⁸. First commercial deployments are expected in 2028-2030.

As of its 2026 edition, the 5G Observatory has expanded its scope beyond its internal EU focus as well as selected third countries to include a more extensive global benchmarking. It collects comparable data from key non-EU countries and regions, including EU neighbouring countries (Albania, Bosnia and Herzegovina, Georgia, Moldova, Montenegro, North Macedonia, Serbia, Türkiye, the UK, and Ukraine), as well as major international economies such as Australia, Brazil, China, India, Japan, South Korea, and the US. For the EU, the inclusion of neighbouring countries supports strategic objectives by fostering regulatory alignment, digital interoperability, and infrastructure preparedness in its neighbourhood. This contributes to reducing digital fragmentation at the EU'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 to enhance global competitiveness in mobile and wireless technologies and to promote the EU's digital leadership beyond its current membership.

Next to an overview of 5G indicators in the EU and internationally, this year's report provides a deep dive into 5G private networks and 6G, with two dedicated focus sections. They provide a comprehensive overview of the current landscape and future direction of private 5G networks and the emerging 6G ecosystem. The section on 5G Private Networks examines the conceptual foundations, deployment models, and operational benefits of such networks, with a particular focus on their role in driving industrial digital transformation and enabling secure, mission-critical communications. The analysis encompasses regulatory trends and market developments in the EU and internationally, highlighting the growing strategic importance of spectrum management and digital sovereignty. The section on 6G analyses the main progress in the field, exploring its technological pillars, research initiatives, and the shifting policy and industrial context that will shape the next generation of digital connectivity infrastructure, at EU and national levels, as well as in neighbouring and international markets.

⁸ Support for immersive XR, digital twins, tactile internet, and real-time holography.

2. Main policy developments

2.1 EU policy developments

Key findings

- In 2025, the EU has increasingly focused on full-scale implementation of advanced networks, namely faster network roll-outs, stronger economic security, and greater technological autonomy.
- Key Regulations like the Gigabit Infrastructure Act (fully applicable since 2025), the proposed Digital Networks Act and the review of the Cybersecurity Act (both in early 2026) are expected to drive harmonisation, streamlined permitting and promote trusted suppliers, especially for 5G and future 6G networks.
- The Commission is pursuing a simplification agenda, as shown by the recent political agreement on the Digital Omnibus, with the aim of promoting innovation and reducing regulatory burden.
- There is an ambition to reduce economic dependencies and promote competitiveness, as shown by the Technology Sovereignty Package, which includes the Cloud and AI Development Act, the review of the Chips Act and a strategy to reinforce Europe's Open Source community.
- These developments are expected to provide greater market certainty, support innovation, and aim to strengthen the EU's global digital position, although progress will depend on consistent national implementation and ongoing investment in skills and resilience.

2.1.1 Main developments in 2025 in the EU27

In 2025, the European Union's digital policy agenda entered a phase of policy implementation and operational delivery, following several years of legislative activity and strategic consultations. This transition is reflected in the move from high-level framework-setting to the application of instruments such as the Gigabit Infrastructure Act (GIA)⁹ and the Digital Decade Policy Programme¹⁰. The Digital Networks Act (DNA) legislative proposal adopted by the European Commission on 21 January 2026¹¹ marks a push towards further streamlining and simplification of the connectivity rulebook.

A number of trends have characterised EU digital policy since last year's publication of the 2025 Annual 5G Observatory Report, in June 2025:

- **Resilience, economic security, and technological autonomy:** In light of an increasingly tense geopolitical environment, the EU updated its strategic approach to economic security, most notably with its 2025 Joint Communication on Strengthening EU economic security¹².
- **Closer coupling of digital and industrial policy:** The Digital Decade initiative¹³ has evolved from a monitoring framework to a mechanism for governance and accountability, influencing national 5G/6G strategies, investment priorities, and implementation of KPIs. The 2025 State of the Digital Decade

⁹ Regulation (EU) [2024/1309](#) of the European Parliament and of the Council of 29 April 2024

¹⁰ Decision (EU) [2022/2481](#) of the European Parliament and of the Council of 14 December 2022

¹¹ European Commission, [Proposal for a Digital Networks Act](#), COM(2026) 16 final

¹² Joint Communication to the European Parliament and the Council: Strengthening EU economic security, [JOIN\(2025\) 977](#) final

¹³ Decision (EU) [2022/2481](#) establishing the Digital Decade Policy Programme 2030, OJ L 323, 19.12.2022.

report underscored the need for coordinated action between digital and industrial policy to achieve connectivity, skills, and digital transformation targets.

- **Administrative simplification and regulatory support:** The GIA entered into effect in November 2025 and aims to streamline permit processes for gigabit networks, particularly in rural and underserved areas. Its effectiveness will depend on national implementation and enforcement. Moreover, the DNA proposed in January 2026 seeks to address market fragmentation and simplify infrastructure rules across Member States, with new provisions for spectrum management, licence renewal, and spectrum sharing.
- **Spectrum policy:** In 2025, the Radio Spectrum Policy Group (RSPG) advanced preparations for 6G, including harmonised spectrum allocation and engagement with the World Radiocommunication Conference 2027 (WRC-27)¹⁴. Uncompleted 5G assignments remain a focus in several Member States.
- **6G R&D and standardisation:** The Smart Networks and Services Joint Undertaking (SNS JU) expanded its funding and project portfolio in 2025. Contribution to standardisation bodies such as ETSI and 3GPP is central to EU strategy¹⁵.
- **EU funding:** Digital targets are increasingly embedded in industrial policy and supported by EU funding instruments, such as the Recovery and Resilience Facility (RRF) and the Connecting Europe Facility (CEF), with the latter's Work Programme amended in February 2026¹⁶.
- **Other digital policies:** Regulatory focus has shifted from adoption to enforcement of headline acts, including the AI Act¹⁷, Data Act¹⁸, and related strategies (AI Continent Action Plan¹⁹, Apply AI Strategy)²⁰. The integration of cybersecurity into competitiveness and resilience frameworks is reflected in the 2026 Commission proposal to revise the Cybersecurity Act as well as amendments to the NIS2 Directive²¹. In May 2026, EU co-legislators agreed on the Digital Omnibus simplification package.²²

2.1.2 EU Policy Agenda for the year ahead

For the year ahead, the EU's agenda will focus on the delivery of digital policies, with negotiations on key digital initiatives but also the MFF to continue. The 2027 Digital Decade reporting cycle will be influenced by the results of the ongoing review, with progress on 5G standalone deployment expecting to gain more importance compared to basic 5G coverage.

Negotiations will continue on the CSA and DNA proposals, particularly regarding spectrum management, market integration, and infrastructure resilience. The GIA's success as regards mobile connectivity depends

¹⁴ Radio Spectrum Policy Group (2025), [RSPG Report on 6G Strategic Vision](#), RSPG25-006 Final, February 2025.

¹⁵ Smart Networks and Services Joint Undertaking (SNS JU) (2025), [SNS JU Work Programme 2025 released](#), Brussels, 2025

¹⁶ European Commission (2024), Connecting Europe Facility (CEF Digital) – [Multiannual Work Programme 2024–2027](#), Brussels, 2024

¹⁷ Regulation (EU) [2024/1689](#) of the European Parliament and of the Council of 13 June 2024

¹⁸ Regulation (EU) [2023/2854](#) of the European Parliament and of the Council of 13 December 2023

¹⁹ European Commission (2025), [AI Continent Action Plan](#), Brussels, 2025

²⁰ European Commission (2025), Communication from the Commission to the European Parliament and the Council: [Apply AI Strategy](#), COM(2025) 723 final,

²¹ European Commission (2026), [Commission strengthens EU cybersecurity resilience and capabilities](#), Press release IP/26/105, Brussels, 2026

²² Council of the EU (2026), [Artificial Intelligence: Council and Parliament agree to simplify and streamline rules](#), Brussels, 2026

on a prompt, effective and consistent implementation across Member States, especially for small-cell deployment and campus networks.

Spectrum policy work will intensify ahead of WRC-27 in November 2027, including further studies on the upper 6 GHz band and other candidate frequencies²³. Outstanding 5G assignments and spectrum strategies remain a priority.

The SNS JU will continue supporting large-scale pilots and pre-standardisation activities, with closer engagement with global standardisation bodies²⁴, in particular in view of the upcoming Release 21 of 3GPP, the first normative one for 6G, which is starting at the end of 2026.

The implementation of the AI Act, Data Act, and related legislative packages, including the Digital Omnibus²⁵, will continue to influence the telecoms sector, with 5G and 6G expected to underpin AI, cloud, and data-intensive services. In particular, the Commission's 2026 Tech Sovereignty Package, including proposals for a Cloud and AI Development Act and a new Chips Act, is expected to support these developments, not least against a backdrop of continuing negotiations on the next EU budget 2028-34 (MFF), with its new Horizon and European Competitiveness Fund (ECF) programmes.

2.1.3 Market Impacts

The evolving policy landscape is expected to have several impacts:

- 1 **Regulatory certainty:** Operators and technology suppliers will have greater visibility over EU priorities in spectrum planning and infrastructure deployment, though with increased expectations for compliance and reporting, as mapped by the State of the Digital Decade 2026.
- 2 **Deployment pace:** Regions with effective GIA implementation and coherent funding are expected to deploy 5G and fibre infrastructure more rapidly. Disparities will persist due to differences in administrative capacity.
- 3 **5G Private Networks:** The regulatory framework for private and industrial 5G networks based on 5G standalone is developing, with initiatives to allocate local spectrum and enable network slicing for enterprise use cases (see Section 5 below for more information).
- 4 **Interoperability and standardisation:** Continued EU engagement in ETSI and 3GPP is intended to ensure interoperability and minimise supplier lock-in²⁶.
- 5 **Security and supply chains:** Initiatives such as the NIS2 Directive and supplier diversification strategies are raising expectations for security and resilience.
- 6 **Edge and AI-driven models:** The convergence of AI, cloud, and telecoms policy is supporting the

²³ Radio Spectrum Policy Group (2025), RSPG 6G Spectrum Roadmap, RSPG25-015, June 2025

²⁴ Smart Networks and Services Joint Undertaking (SNS JU) (2025), [SNS Journal 2025](#), Brussels, 2025

²⁵ European Commission (2026), [An agile Digital Rulebook for the EU](#), Brussels, 2026

²⁶ European Telecommunications Standards Institute (ETSI) (2025), [ETSI Annual Report 2024](#), Sophia Antipolis, 2025

emergence of new service models, as noted in the Digital Decade and AI Act implementation strategies, and supported by the Tech Sovereignty Package.

- 7 **Sustainability and skills:** The European Green Deal²⁷ and digital skills policies²⁸ are increasingly influencing market performance, with EU support for training and technical capacity-building. Specifically for telecoms, the 2026 EU Code of Conduct²⁹ developed including the industry is expected to support more standardised progress measurement.

2.2 EU Member State policy developments

Key findings

- Member States are implementing EU digital law and policy and complement it with tailored national measures and legislation, focusing on areas such as 5G, 6G, spectrum management, cybersecurity, and digital infrastructure. These initiatives include measures to accelerate network deployment, streamline administrative procedures, and strengthen security requirements, with notable reforms in France, Germany, Italy, Poland, and Spain.
- Countries such as France and Germany are seeking to position themselves as leaders in spectrum planning, network security, and next-generation technology, while Italy, Poland, Spain, and others are driving regulatory simplification, private network incentives, and innovation through public-private partnerships and research initiatives.

On top of the EU framework, in 2025 and (planned for) 2026, several specific EU Member States have adopted or are preparing national laws and regulations that complement or implement European-level legislation in the areas of 5G, 6G, spectrum management, cybersecurity, and digital infrastructure.

France: In January 2025, the regulator ARCEP announced its intention to contribute to European efforts towards the harmonisation of the upper 6 GHz band³⁰, ahead of an anticipated EU decision in 2026 regarding use of the band for mobile networks or Wi-Fi. This was followed by the launch, in October 2025, of a public consultation on the “frequencies 2030” strategy³¹, explicitly recalling the European timetable for identifying and harmonising the upper 6 GHz band for mobile services. Also in 2025, France updated its “Loi sur la Sécurité des Réseaux³²” (Law on Network Security), imposing enhanced obligations on telecoms operators regarding suppliers and critical infrastructure, closely aligned with the EU’s cyber resilience measures. In parallel, ARCEP issued revised guidelines for small cell deployment to facilitate the densification of urban 5G networks³³. Further reforms are anticipated to simplify the processing of administrative procedures for telecoms infrastructure rollout and to ensure national spectrum assignments are fully aligned with anticipated

²⁷ European Commission (2019), [The European Green Deal](#), COM(2019) 640 final, Brussels, 11 December 2019.

²⁸ European Commission (2026), [Digital skills](#), Brussels, 2026

²⁹ European Commission Joint Research Centre (JRC) (2025), [Environmentally sustainable telecommunications networks](#), Brussels, 2025

³⁰ ARCEP (2025), [L’Arcep publie une étude relative à l’évolution des usages et au dimensionnement des réseaux sans fil](#), 29 September 2025

³¹ ARCEP (2025), L’Arcep lance une consultation publique pour préparer les futures attributions de fréquences radioélectriques aux opérateurs mobiles dans l’Hexagone, Paris, 13 October 2025

³² French Senate (2025), [Projet de loi relatif à la résilience des infrastructures critiques et au renforcement de la cybersécurité](#), first reading, March 2025

³³ ARCEP (2025), [Etude portant sur l’évolution des usages sur les réseaux de télécommunications sans fil et le dimensionnement des réseaux sans fil](#).

European 6G bands.

Germany: Germany has implemented the “Telekommunikationsgesetz (TKG) 2021³⁴”, its telecommunications law that is regularly updated to reflect evolving EU directives and the Gigabit Infrastructure Act. In March 2025, the regulator Bundesnetzagentur (BNetzA) decided against an immediate auction for expiring mobile spectrum in the 800 MHz, 1800 MHz, and 2600 MHz bands³⁵, instead extending existing usage rights (some until 2036) to provide planning and investment certainty. This approach also allows scope for more extensive award proceedings in the future, including those anticipated for 2028. Later in 2025, further amendments to the TKG³⁶ streamlined permit procedures for fibre and 5G/6G infrastructure deployment and strengthened security requirements for critical suppliers in mobile networks, in line with the EU 5G Cybersecurity Toolbox. These regulatory changes are expected to accelerate the rollout of gigabit networks, minimise bureaucratic delays, and enhance the resilience of critical infrastructure. Germany is expected to introduce in 2026 a legislative package to advance 6G research testbeds and spectrum allocation. This may include revisions to the national frequency plan (Frequenzplan) to support 6G pilot projects.

Italy: Italy has enacted its “Decreto Semplificazioni” (Simplification Decree) in 2025³⁷, which includes measures to reduce bureaucracy for fibre and mobile network permits, particularly in underserved and rural areas. The Italian government has also updated cybersecurity certification obligations for telecoms operators. Italy is expected to introduce new incentives for private 5G/6G networks in industrial districts and to align national legislation with the forthcoming Digital Networks Act in 2026.

Poland: In 2025, Poland amended its Electronic Communications Act to facilitate 5G spectrum auctions and strengthen cybersecurity requirements for telecoms infrastructure, with a particular focus on non-EU suppliers. In the same year, the amended Polish National Recovery and Resilience Plan (Krajowy Plan Odbudowy – KPO)³⁸, approved at EU level under the Recovery and Resilience Facility (RRF)³⁹, expressly envisaged changes to the Regulation on Telecom Infrastructure Inventory and to technical regulations. These adjustments are significant, as accurate infrastructure inventory, access, and civil-works data are essential for accelerating fibre and mobile deployment, especially for denser 5G and future 6G networks. Planned legislation in 2026 aims to further streamline the deployment of fibre and wireless infrastructure and to support 6G research initiatives through public-private partnerships.

Spain: Spain’s General Telecommunications Law (Ley General de Telecomunicaciones⁴⁰), revised in 2024 and operational in 2025, mandates faster permit processing and sets new requirements for the sharing of passive infrastructure. The Spanish government has also issued a national 6G research roadmap. Further legislative adjustments are expected in 2026 to harmonise national spectrum management with WRC-27 preparations and to encourage private network deployment in key economic sectors.

³⁴ Federal Republic of Germany (2021), [Telekommunikationsgesetz \(TKG\)](#) vom 23. Juni 2021, BGBl. I S. 1858

³⁵ Bundesnetzagentur (2025), [Decision on not ordering award proceedings and on extending spectrum rights at 800 MHz, 1800 MHz and 2600 MHz and decision on carrying out competitive proceedings at a later point in time](#), BK1-22/001, March 2025

³⁶ Federal Republic of Germany (2025), [Gesetz zur Änderung des Telekommunikationsgesetzes und zur Feststellung des überragenden öffentlichen Interesses für den Ausbau von Telekommunikationsnetzen](#) (TKG-Änderungsgesetz 2025), BGBl. 2025 I Nr. 181, 29 July 2025

³⁷ Italian Republic (2025), [Decreto 17 luglio 2025](#), n. 130

³⁸ Republic of Poland, Ministry of Development Funds and Regional Policy (2025), [The Council of Ministers has approved amendments to the NRP](#), 29 January 2025

³⁹ Regulation (EU) 2021/241 establishing the Recovery and Resilience Facility

⁴⁰ Kingdom of Spain (2022), Ley 11/2022, de 28 de junio, General de Telecomunicaciones, Boletín Oficial del Estado (BOE-A-2022-10757), 29 June 2022

Other Member States: Other Member States, such as Finland, Sweden, and the Netherlands, have also updated national telecoms legislation to accelerate gigabit connectivity, each with measures tailored to their market conditions. For example, the Netherlands has focused on administrative simplification for small cell permits, while Finland emphasises the integration of 5G/6G deployment with digital skills and green transition objectives.

Taken together, these national initiatives are already having a noticeable impact across the European Union. They are helping to speed up the deployment of gigabit and next-generation networks, which supports the EU's Digital Decade targets. At the same time, they are strengthening the security and resilience of Europe's telecommunications infrastructure. The measures are encouraging innovation, particularly in the development of 6G, through research and public-private collaboration. Furthermore, by reducing fragmentation and promoting greater regulatory alignment between Member States, these actions are making it easier for businesses to invest and operate across borders within the EU.

2.3 Non-EU countries' policy developments

Key findings

- 2025 marked a transition from 5G planning to operational deployment in several neighbouring markets. Countries including Georgia, North Macedonia, Serbia, Moldova, and Montenegro, and lately Türkiye (October 2025), launched 5G spectrum award processes, signalling a broader regional shift towards commercial 5G deployment.
- Moreover, Western Balkan and Eastern Partnership countries accelerated reforms aligned with the European Electronic Communications Code (EECC), the EU 5G Cybersecurity Toolbox and NIS2-type cybersecurity principles, particularly in spectrum management, electronic communications regulation and telecoms security frameworks.
- 6G preparation became an increasingly visible strategic priority globally in 2025. Major international markets including China, India, South Korea, Japan and the US strengthened national 6G strategies, spectrum planning, standardisation activities and international cooperation initiatives, while several neighbouring European countries announced intentions to participate in EU-led 6G pilot programmes.
- Security, supply-chain resilience and spectrum efficiency emerged as key policy priorities beyond basic coverage expansion. Neighbouring markets including Türkiye, Ukraine and the UK strengthened telecoms security frameworks and maintained restrictions on high-risk suppliers. Iceland and Norway accelerated the shutdown of legacy 2G/3G networks to support spectrum refarming for more efficient 4G and 5G use.
- Meanwhile, regulators in markets such as Australia and the US advanced more sophisticated spectrum management approaches, including consultations on 6 GHz sharing frameworks, CBRS-type local spectrum access models and preparations linked to future WRC-27 discussions.

2.3.1 In neighbouring markets

Albania: In March 2025, Albania adopted a revised National Broadband Plan⁴¹, aligning national connectivity objectives more closely with European targets and providing a clearer basis for future 5G deployment and longer-term 6G preparedness. In 2026, further regulatory clarification of the electronic communications framework was issued in the early part of the year.

Bosnia and Herzegovina: In 2025, Bosnia and Herzegovina continued discussions on 5G spectrum allocation and regulatory alignment with the EU framework, but it did not complete a 5G licensing cycle. In 2026, the national regulator is expected to move towards a first formal 5G tender process, while work is also expected to continue on closer alignment with the EU electronic communications framework and on a stronger national cybersecurity strategy.

Georgia: In January 2025, Georgia adopted the national strategy Digital Georgia 2025⁴², setting out a roadmap for 5G deployment and longer-term 6G preparedness. In May 2025, the Georgian Communications Commission planned a 5G spectrum auction, with licences expected to become effective from July 2025. In parallel, amendments to the Law on Information Security, intended to align more closely with EU NIS2-type principles, were expected to be enacted in November 2025. 2026 will see the continuation of the implementation process.

Iceland: In 2025, Iceland did not adopt a dedicated 5G or 6G law, but operators moved to shut down 2G and 3G mobile services by the end of 2025, enabling spectrum refarming for more efficient 4G and 5G use.

Liechtenstein: In 2025, Liechtenstein issued a 2025 Ordinance on Numbering Resources⁴³, maintained 5G coverage within its national telecoms reporting framework, and updated its national frequency allocation plan in late 2025.

Moldova: In March 2025, Moldova strengthened cooperation with BEREC, marking a significant step towards closer integration with the European regulatory community. During 2025, the country also advanced a draft Law on Electronic Communications. The National Regulatory Agency for Electronic Communications and Information Technology (ANRCETI) was expected to finalise 5G spectrum allocation in August 2025, with licences becoming effective from October 2025. Legislative amendments to align Moldova's framework with the EU Electronic Communications Code were expected to be adopted in December 2025. In 2026, Moldova plans to participate in regional 6G pilot initiatives.

Montenegro: In 2025, Montenegro focused on implementation planning and broadband development. The Agency for Electronic Communications and Postal Services (EKIP) was expected to conduct a 5G spectrum auction in June 2025, with licences becoming effective from August 2025. The country also developed the National Plan for Broadband Network Development for 2025-2029⁴⁴. In January 2026, amendments to the

⁴¹ Republic of Albania, Ministry of Infrastructure and Energy (2020), [Plani Kombëtar për Zhvillimin e Qëndrueshëm të Infrastrukturës Digjitale Broadband 2020–2025](#)

⁴² Government of Georgia, [Digital Governance Strategy of Georgia 2024–2028](#)

⁴³ Principality of Liechtenstein (2025), [Verordnung vom 14. Januar 2025 über Nummerierungsressourcen im Bereich der elektronischen Kommunikation \(Nummerierungsressourcenverordnung; NRV\)](#), [Liechtensteinisches Landesgesetzblatt \(LGBI.\)](#) 2025 Nr. 54, 23 January 2025

⁴⁴ Republic of Montenegro (2024), [Nacionalni plan razvoja mreža za širokopojasni pristup internetu 2025–2029](#), Government of Montenegro, Podgorica, December 2024

Law on Electronic Communications⁴⁵ were expected to enter into force. Montenegro also signalled an intention to participate in 6G pilot initiatives in the second half of 2026.

North Macedonia: In March 2025, the Agency for Electronic Communications (AEC) completed the country's first 5G spectrum auction, with commercial services expected to launch by September 2025. A new Law on Cybersecurity, aligned with the principles of the EU NIS2 Directive, was expected to enter into force in October 2025. In January 2026, One Macedonia was granted a licence to become the country's third mobile operator. The government is also preparing a national 6G strategy, with publication anticipated in Q2 2026.

Norway: In 2025, Norway continued to advance through practical implementation rather than new headline legislation. Major operators planned the closure of legacy GSM networks during 2025, supporting spectrum refarming and more efficient use of frequencies for advanced mobile technologies. In 2026, Norway is expected to continue its policy alignment in international spectrum discussions relevant to WRC-27 and the future use of the upper 6 GHz band.

Serbia: In 2025, Serbia made substantial progress on 5G implementation. The Regulatory Agency for Electronic Communications and Postal Services (RATEL) was expected to finalise 5G spectrum allocation in July 2025, with licences taking effect from September 2025. Amendments to the Law on Electronic Communications, designed to align Serbian legislation more closely with the EU Electronic Communications Code, were scheduled for adoption in December 2025. In Q1 2026, an updated National Cybersecurity Strategy aligned with European standards and the EU 5G Cybersecurity Toolbox was expected. Serbia also intends to participate in EU-led 6G pilot initiatives in late 2026.

Türkiye: In 2025, Türkiye prepared a national 5G spectrum auction, with a presidential decree reportedly establishing reserve prices and spectrum packages. The auction was then successfully completed in October 2025 and commercial 5G launch is scheduled for April 2026. The country also promoted a National 5G Action Plan in 2025, including incentives for domestic research and development and tighter security requirements for imported telecommunications equipment. In 2026, commercial 5G service launch is planned, and Türkiye has signalled interest in 6G research consortia and possible spectrum preparation initiatives.

Ukraine: In March 2025, Ukraine adopted the Digital Ukraine 2025 strategy, which includes objectives for 5G development and longer-term 6G research. In 2025, Ukraine continued preparations for future 5G deployment, including spectrum planning, regulatory work and technical compatibility testing linked to wartime security requirements. It also adopted a Protocol of Intent on 5G Security, aligned with the EU 5G Cybersecurity Toolbox and signalling the exclusion of high-risk suppliers. In January 2026, additional telecommunications cybersecurity regulations aligned with EU NIS2 principles are expected to enter into force. Ukraine has also expressed its intention to participate in EU-funded 6G pilot initiatives from mid-2026.

United Kingdom: In 2025, the UK continued to implement the priorities set out in its Wireless Infrastructure Strategy 2023–2025, including nationwide 5G coverage, accelerated small-cell deployment and market-led research into future 6G technologies. During 2025, regulatory frameworks maintained strict controls on high-risk suppliers. In 2026, the UK is expected to pursue further spectrum policy initiatives relevant to future 6G bands, expand regulatory incentives for Open RAN architectures, and continue strengthening telecoms supply chain diversification.

⁴⁵ Republic of Montenegro (2026), [Predlog zakona o izmjenama i dopunama Zakona o elektronskim komunikacijama](#), Government of Montenegro, April 2026

2.3.2 In international comparison markets

Australia: In 2025, the Australian Communications and Media Authority (ACMA) published its draft Five-Year Spectrum Outlook 2025–2030⁴⁶, identifying 5G and emerging 6G technologies as central priorities. ACMA also launched consultations on expiring spectrum licences in the 850 MHz and 1800 MHz bands and opened a consultation on automatic frequency coordination-based sharing in the 6 GHz band. In 2026, renewal applications for the 850 MHz and 1800 MHz licences are scheduled to open from 18 June 2026, while the 6 GHz consultation runs until February 2026.

Brazil: In 2025, Brazil continued implementing the outcomes of earlier 5G spectrum awards and strengthened obligations for deployment in underserved areas. In March 2025, Brazil and Japan signed a memorandum of cooperation on digital infrastructure⁴⁷, covering secure and resilient networks, Open RAN, supplier diversification, private networks and future 6G development. Brazil's spectrum use plan also recognises 6G as an emerging strategic priority. In 2026, Brazil is expected to continue regulatory preparation for future mobile frequency awards, with further auctions anticipated during the broader 2026–2028 period, including in the 6 GHz and 26 GHz bands.

China: In November 2025, official Chinese sources⁴⁸ reported that China had developed a portfolio of more than 300 key 6G technologies, mobilising over 100 entities across the telecommunications and digital infrastructure supply chain. China also continued formal research programmes to support future 6G standardisation and technology development. In early 2026, authorities confirmed the launch of the second phase of national 6G technical trials.

India: In January 2025, India launched the National Broadband Mission 2.0⁴⁹, explicitly linking rapid 5G expansion with broader digital transformation. In 2025, the National Frequency Allocation Plan 2025⁵⁰ also established India's long-term spectrum framework and formally recognised 6G as a future mobile communication technology. The proposed Digital India Act remained under consultation during 2025. In early 2026, India deepened cooperation with the European Union on 6G research and standardisation.

Japan: In 2025, Japan's Government Priority Plan reaffirmed the country's Beyond 5G strategy⁵¹, with emphasis on next-generation communications infrastructure, including all-photonics networks and quantum cryptographic communications. In March 2025, the EU-Japan ICT Dialogue deepened cooperation under the EU-Japan Digital Partnership. In 2026, the Japanese government will continue to implement the Beyond 5G strategy.

South Korea: In 2025, South Korea strengthened its role in international telecommunications standardisation. According to the Ministry of Science and ICT, the country secured the chairmanship of the 3GPP RAN group

⁴⁶ Australian Communications and Media Authority (ACMA) (2025), [Five-year spectrum outlook 2025–30 and 2025–26 work program – Draft for consultation](#), Canberra, March 2025

⁴⁷ Government of Brazil, Ministry of Communications and Ministry of Internal Affairs and Communications of Japan (2025), [Memorandum of Cooperation in the field of Information and Communication Technologies and Digital Inclusion between the Ministry of Communications of the Federative Republic of Brazil and the Ministry of Internal Affairs and Communications of Japan](#), Tokyo, 25 March 2025

⁴⁸ Ministry of Industry and Information Technology (MIIT) / Xinhua (2025), [China advances innovative development of 6G](#), Beijing, 14 November 2025

⁴⁹ Government of India, Department of Telecommunications (2025), [National Broadband Mission 2.0](#), New Delhi, January 2025

⁵⁰ Government of India, Department of Telecommunications (2025), [National Frequency Allocation Plan 2025 \(NFAP-2025\)](#), New Delhi, 2025

⁵¹ Ministry of Internal Affairs and Communications (MIC), Japan (2025), [Press release on Beyond 5G / ICT policy initiatives](#), Tokyo, 11 June 2025

and a vice-chair position in the SA group for the period June 2025 to March 2029. In September 2025, South Korea also won the chairmanship of the Asia-Pacific Telecommunity Wireless Group. In January 2026, that APT chairmanship became effective. South Korea's digital strategy⁵² also targets a pre-6G service demonstration in 2026.

United States: In 2025, the Infrastructure Investment and Jobs Act continued to support 5G deployment, rural broadband and advanced wireless research and development. During the year, the FCC continued to make additional mmWave licences available, notably in the 37 GHz and 47 GHz bands, through smaller-scale auctions and reallocation processes. The FCC also continued refining the Citizens Broadband Radio Service (CBRS) licensing regime, supporting more localised and enterprise-driven spectrum access. In 2026, the delayed 3.1–3.45 GHz band auction is expected to proceed. Policy attention is also expected to shift further towards 6G, including federal funding through the Next G initiative, spectrum reallocation and strengthened security frameworks excluding Chinese suppliers.

⁵² Ministry of Science and ICT, South Korea (2022), [Korea to Come up with the Roadmap of Digital ROK](#), Realizing the New York Initiative, Sejong City, 2022

3. Main commercial developments

Key findings

- The EU mobile sector advanced to widespread commercial deployment of 5G standalone (SA) networks by 2025, delivering improved throughput, reduced latency, and network slicing. Coverage is extending from major cities to suburban and some rural areas, although rollout remains uneven between countries and regions.
- Active industry preparation for 6G is under way, with major pan-European research and standardisation initiatives positioning Europe for future leadership, despite commercial 6G not being expected before the 2030s.
- Market consolidation and infrastructure sharing are becoming more prominent, as operators and investors pursue mergers and neutral host models to balance competition, scale, and investment, aiming to accelerate 5G SA rollout and shape future 6G strategies.
- Outside the EU, commercial 5G deployment is progressing at varying speeds: neighbouring markets such as the UK, Norway, and Iceland have made notable advances, while countries like Bosnia and Herzegovina and Ukraine remain at early or preparatory stages.
- Globally, leading markets including China, Japan, South Korea, and the US are driving large-scale 5G SA expansion, pioneering advanced features, and piloting pre-6G technologies, consolidating their positions at the forefront of mobile innovation.

3.1 In the EU

By 2025, the European mobile sector had progressed into a more mature phase of 5G development, marked by the commercial shift from 5G non-standalone (NSA) to 5G standalone (SA) networks. Leading operators across the EU27 have increasingly rolled out 5G SA services, offering advanced functionalities such as fully virtualised core networks, improved service quality, reduced latency, and network slicing. While deployment remains uneven, coverage is steadily extending beyond major cities into suburban and, in some cases, strategically important rural areas.

Simultaneously, the industry has maintained a strong focus on preparing for 6G, which continues to be at the research and pre-standardisation stage. Initiatives such as the SNS JU flagship initiatives Hexa-XII⁵³ or 6G Reference⁵⁴ are driving pan-European research, cross-border trials, and standardisation efforts. These activities are positioning Europe for future leadership in wireless communications, though commercial 6G networks are not anticipated before the early 2030s.

Another significant development has been ongoing discussions around market consolidation. In several Member States, operators and investors have explored mergers and asset restructuring. Additionally, infrastructure sharing and neutral host models have become increasingly prevalent. Both passive and active sharing agreements are being adopted more widely to reduce capital expenditure, enhance deployment economics, and speed up roll-out, especially in rural or commercially challenging locations. These approaches

⁵³ Hexa-X-II Consortium (2025), [Hexa-X-II: A holistic flagship towards the 6G network platform and system](#), funded by the Smart Networks and Services Joint Undertaking (SNS JU) under Horizon Europe, Grant Agreement No. 101095759

⁵⁴ 6G-REFERENCE Consortium (2025), [6G-REFERENCE: 6G Federated Research Infrastructure for Next Generation Communication Experiments](#), funded by the Smart Networks and Services Joint Undertaking (SNS JU) under Horizon Europe

are focusing on extending 5G SA coverage and are likely to influence future strategies for 6G deployment.

France: By 2025, all four national operators (Orange, SFR, Bouygues Telecom and Free Mobile) had commercially deployed 5G SA services across metropolitan areas in France. The market is likely to concentrate in 2026 when SFR will be divided in between the other three operators.

Germany: By late 2025, Germany's three national mobile network operators (Deutsche Telekom, Vodafone and Telefónica Deutschland) had launched commercial 5G SA networks across major cities and key industrial zones. Network expansion towards suburban and rural areas continued throughout 2025.

Ireland: In 2025, Vodafone Ireland and Eir launched commercial 5G SA services in Dublin and Cork, while Three Ireland continued expanding its 5G network footprint during the same year.

Italy: During 2025, TIM and Vodafone Italy activated commercial 5G SA networks across major Italian cities, while Wind Tre continued to extend deployment in additional urban areas during the same year.

Netherlands: In 2025, both KPN and VodafoneZiggo deployed 5G SA services in key Dutch cities, representing the first phase of broader national rollout.

Poland: During 2025, Play and Plus began commercial deployment of 5G SA networks in Warsaw, Kraków and other major cities. Orange Polska and T-Mobile Polska also initiated rollout during the same period.

Spain: By 2025, Spain's main mobile operators (Telefónica, Vodafone, and MásOrange) had launched commercial 5G SA services in major urban centres. Expansion of coverage to rural areas continued during 2025, supported partly by EU recovery funding programmes.

In other EU Member States:

Austria, Belgium, Greece and Portugal: Throughout 2025, operators in these countries progressed with commercial 5G SA rollouts, initially focused on major metropolitan areas.

Baltics, Central and Eastern Europe: In 2025, operators across Hungary, the Czechia, Slovakia, Romania, Bulgaria, Croatia, Slovenia, Estonia, Latvia and Lithuania continued the commercial rollout of 5G SA networks, typically beginning in capital cities and major urban centres.

Nordics: By 2025, operators including Telia, Telenor and Elisa had deployed commercial 5G SA networks across several urban areas in Sweden, Finland and Denmark, making the Nordic region one of the earliest adopters of the technology in Europe.

3.2 Outside the EU

3.2.1 In neighbouring markets

Albania: In 2025, Albania commenced commercial 5G services in major urban centres, with leading operators prioritising coverage in Tirana and other principal cities. Wider national roll-out remains at an early stage.

Bosnia and Herzegovina: No commercial 5G services were launched in 2025. Bosnia and Herzegovina remained one of the few European markets without operational 5G services, with spectrum allocation still pending.

Georgia: Georgia launched its first commercial 5G services in 2025 following the country's first spectrum allocation process. Initial deployments began in Tbilisi and selected urban areas during the second half of 2025, marking the country's transition from trial networks to commercial 5G availability.

Iceland: By 2025, Iceland's mobile operators had achieved extensive 5G coverage in Reykjavik and key towns, with commercial services available to both consumer and business segments.

Liechtenstein: Benefiting from close integration with Switzerland, Liechtenstein launched commercial 5G services with nationwide coverage, leveraging Swiss operator infrastructure.

Moldova: Commercial 5G launches were underway in Chisinau, with initial services focused on business customers and select pilot areas. Broader consumer roll-out remains limited.

Montenegro: Montenegro introduced 5G services in Podgorica and several coastal cities. Commercial deployment is primarily focused on urban and tourist areas.

North Macedonia: North Macedonia launched commercial 5G services in 2025, following the completion of its first spectrum auction in March 2025. Operators began deploying networks, with initial commercial services expected to be available in Skopje and key regional centres by September 2025.

Norway: By 2025, Norway had achieved widespread 5G coverage.

Serbia: Serbia launched its first commercial 5G services in 2025 following spectrum allocation. After the auction process in July 2025, operators began rolling out services in Belgrade and Novi Sad with commercial availability starting from September 2025.

Türkiye: Türkiye did not launch nationwide commercial 5G services in 2025. Instead, preparations for a national 5G spectrum auction took place during the year, with commercial launch expected in 2026.

Ukraine: Ukraine did not launch commercial 5G services in 2025. Network deployment remained constrained by security conditions, although regulatory and spectrum preparations were initiated.

United Kingdom: During 2025, operators such as EE, Vodafone, O2 and Three expanded 5G coverage and continued upgrading networks, including early 5G SA deployments.

3.2.2 In international comparison markets

Australia: During 2025, operators expanded coverage and began preparing for future spectrum refarming to support more advanced network capabilities.

Brazil: Brazil's commercial 5G roll-out accelerated in 2025, with coverage in all state capitals and major cities. Expansion to secondary cities and underserved areas continued.

China: China sustained its global leadership in 5G, supported by nationwide large-scale coverage, continued standalone network expansion and extensive industrial adoption. The country also continued large-scale deployment of industrial 5G virtual private networks and accelerated research and testing activities related to future 6G technologies, including the launch of second-phase⁵⁵ national 6G technical trials in early 2026⁵⁶.

India: India's principal operators extended 5G commercial services to all major cities and many tier-two urban areas, with ongoing expansion into rural regions. Market adoption accelerated rapidly.

Japan: Japan achieved nationwide 5G standalone coverage, with commercial services available to both mass market and enterprise customers. Operators began piloting advanced 5G and pre-6G functionalities.

South Korea: South Korea remained at the forefront of 5G innovation, with comprehensive national coverage and widespread availability of advanced 5G standalone services. Operators continued to pilot 6G technologies in preparation for future commercialisation.

United States: In 2025, operators continued expanding 5G SA networks and mid-band coverage, with no single nationwide launch event but continued large-scale commercial expansion.

⁵⁵ Phase 1 focused on theoretical research, technology exploration, pre-standardisation R&D, and patents/IP, and was completed in 2025. Phase 2 will focus on prototype development.

⁵⁶ Xinhua News Agency (2026), [China commences second phase of 6G technical trials](#), 21 January 2026

4. Comparative insights and strategic implications

4.1 Coverage

Key findings

- The EU has achieved wide household coverage with basic 5G (96.8%), with most EU Member States showing household coverage above 90.0%. However, mid-band coverage remains the main bottleneck in the EU. 5G coverage in the 3.4–3.8 GHz spectrum band is substantially lower than general 5G coverage in many countries (74.8% overall household coverage in this band). Rural mid-band coverage is particularly weak. The EU27 average of 5G rural household coverage in the 3.4–3.8 GHz band remains at around 33.7%, indicating that high-capacity 5G remains largely urban.
- Among the neighbouring markets, Norway and Liechtenstein have achieved 5G household and rural coverage that meets or exceeds EU27 levels. However, others remain at intermediate or early deployment stages, with rural and overall coverage still significantly trailing the EU average. Bosnia and Herzegovina, Türkiye and Ukraine have yet to launch 5G.
- Internationally, countries such as South Korea, Japan, China, and India (in order of performance), consistently outperform the EU27 in both household and rural 5G coverage, often reaching near-universal coverage. The US and Australia are largely aligned with or slightly above the EU average, while Brazil lags significantly behind.

4.1.1 In the EU

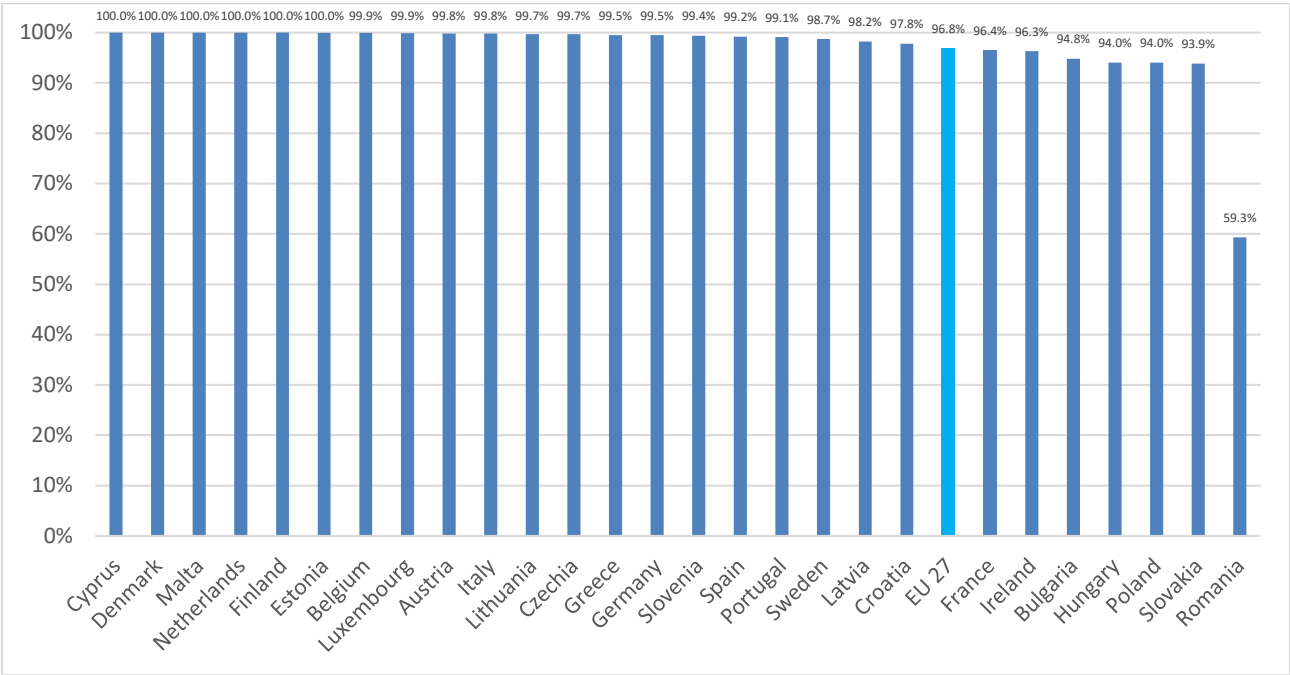
As of June 2025, according to Connectivity Coverage in Europe 2025, the EU27 average reached approximately:

- 96.8% 5G household coverage
- 88.9% 5G rural household coverage
- 74.8% 5G household coverage in the 3.4–3.8 GHz band
- 33.7% 5G rural household coverage in the 3.4–3.8 GHz band

Although overall 5G household coverage across the EU is high, both in total and rural, coverage drops significantly when considering the 3.4–3.8 GHz mid-band (which is essential for high-capacity 5G services), particularly in rural areas. Several Member States significantly outperform the EU27 average across most indicators.

The Member States with near-universal household coverage in 2025 are Austria, Belgium, Cyprus, Czechia, Denmark, Luxembourg, Malta, Netherlands. They report close to or exactly 100% household coverage, reflecting advanced network rollouts and high population density.

Figure 1: 5G coverage of households (% households) across Member States

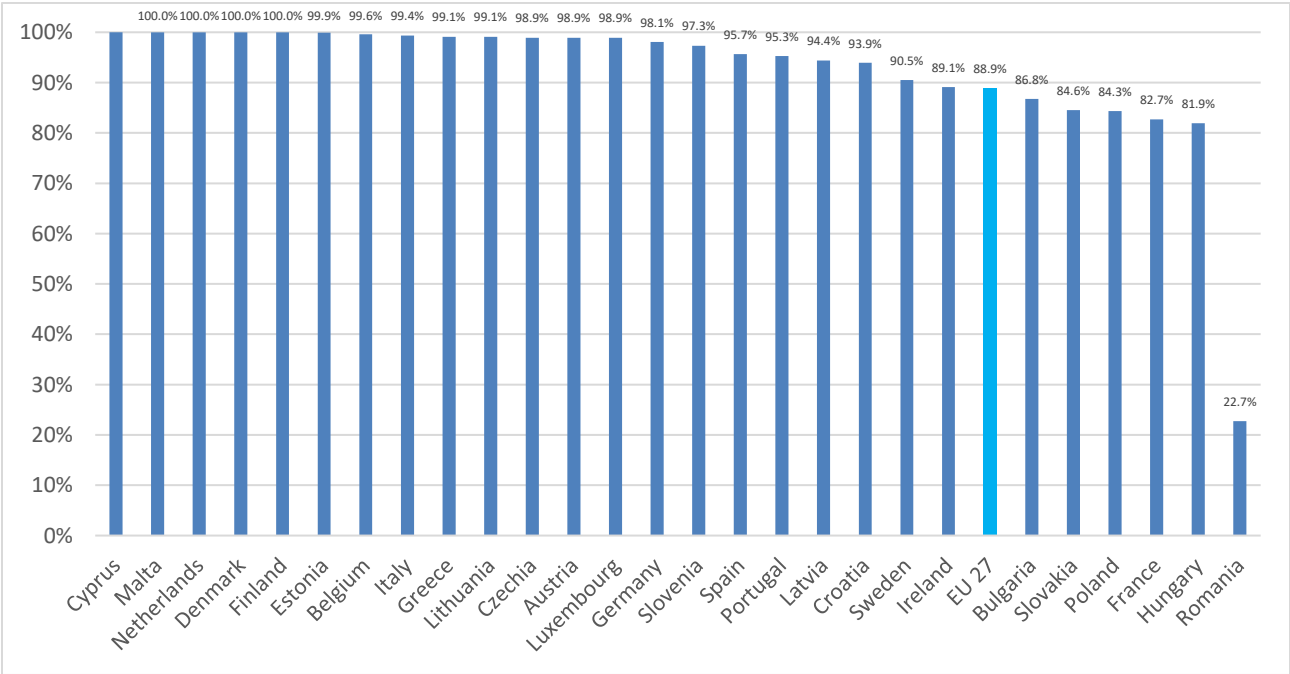


Source: Connectivity Coverage in Europe 2025 Report

Seven Member States remain below the EU average, with Romania showing the biggest distance, with household coverage of 59.3%.

Rural coverage is also high in most Member States. However, Bulgaria, Slovakia, Poland, Hungary, and France fall somewhat below the EU average, with Romania scoring less than half of the EU average.

Figure 2: 5G rural household coverage (% households) across Member States



Source: Connectivity Coverage in Europe 2025 Report

Some Member States showed significant improvement between 2024 and 2025. The most notable increases are summarised in the following table.

Table 2: Most notable 5G coverage improvements in Member States (2025 vs 2024)

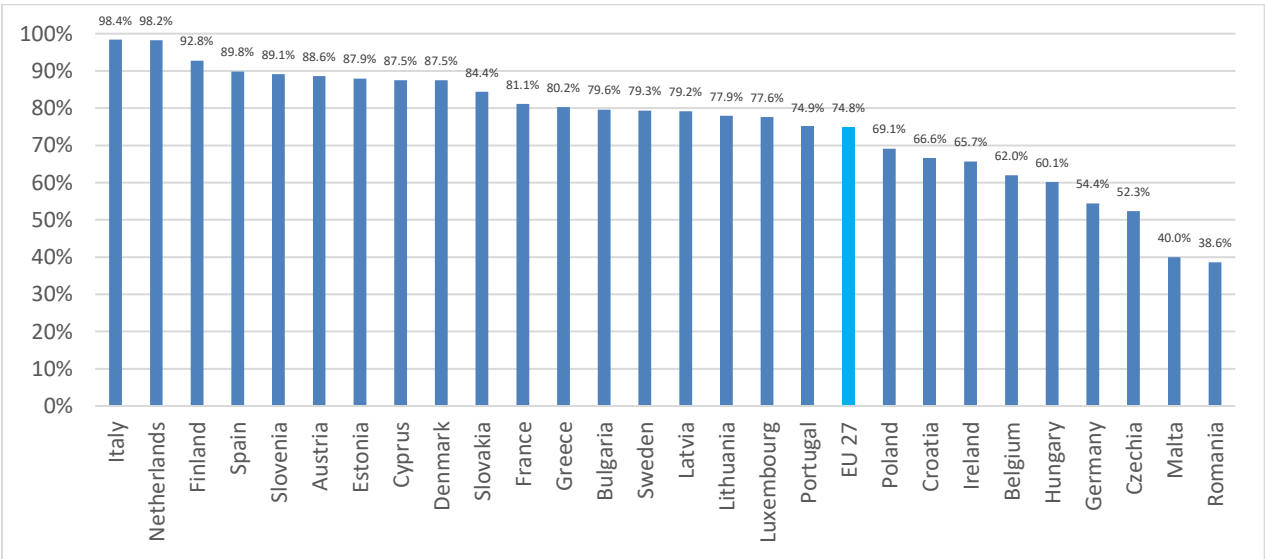
	Household coverage			Rural household coverage		
	2024	2025	Change (pp)	2024	2025	Change (pp)
Latvia	71.1%	98.2%	+27.1	15.0%	94.4%	+79.3
Bulgaria	81.3%	94.8%	+13.5	38.3%	86.8%	+48.5
Improvements on household coverage only						
Romania	46.8%	59.3%	+12.5			
Improvements on rural household coverage only						
Belgium				69.8%	99.6%	+29.8
Hungary				57.9%	81.9%	+24.0
Spain				79.6%	95.7%	+16.1
Ireland				76.4%	89.1%	+12.8
Slovakia				72.5%	84.6%	+12.1
Poland				72.4%	84.3%	+12.0

These markets appear to be moving from early rollout to large-scale network deployment.

Across the EU27, mid-band 5G coverage remains significantly stronger in overall household terms than in rural areas, with household coverage reaching 74.8% compared with only 33.7% for rural households, highlighting a persisting urban–rural deployment divide for high-capacity 5G infrastructure.

The highest mid-band coverage (3.4–3.8 GHz spectrum), which is critical for full-capacity 5G services, can be observed in Italy and the Netherlands (both above 98.0% mid-band household coverage), with another 16 Member States above the EU average (74.8%). This is an indicator that these Member States are more advanced in terms of true 5G capacity deployment, not only basic coverage. On the other hand, nine Member States fall behind EU27 average, with Malta (40.0%) and Romania (38.6%) showing the lowest figures.

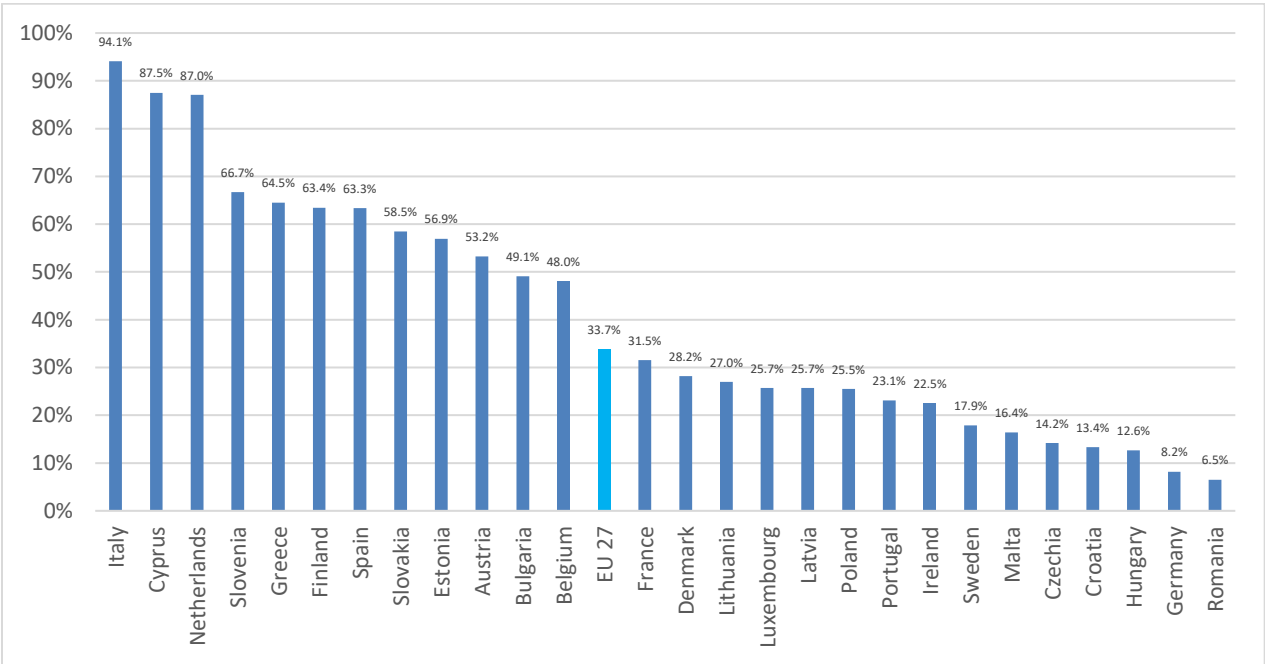
Figure 3: 5G household coverage in the 3.4-3.8 GHz (% households) across Member States



Source: Connectivity Coverage in Europe 2025 Report

The picture worsens when the focus is narrowed to rural mid-band household coverage, where 15 countries score lower than the EU27 average (33.7%).

Figure 4: 5G rural household coverage in the 3.4-3.8 GHz (% households) across Member States



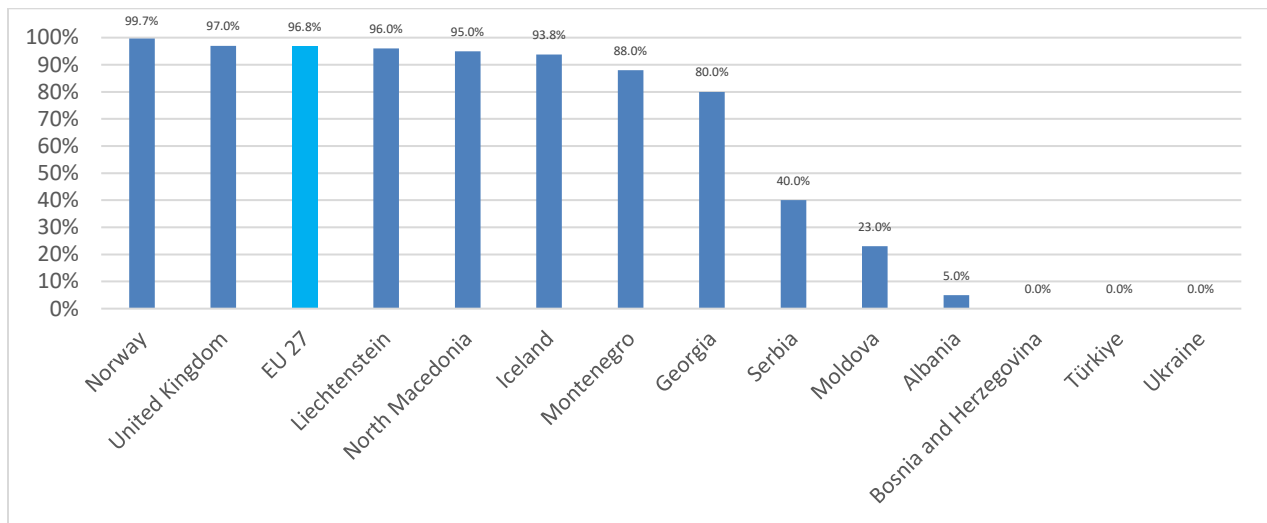
Source: Connectivity Coverage in Europe 2025 Report

4.1.2 In neighbouring markets

When comparing the EU to its neighbouring markets, the picture is mixed, as these markets are quite diverse. The Nordic and Western European neighbouring markets (Norway, the UK, Iceland, Liechtenstein) are among the most advanced in terms of 5G coverage. In contrast, several Southeastern and Eastern European countries (with the notable exception of North Macedonia) are either at the very beginning of deployment or have yet to launch 5G services.

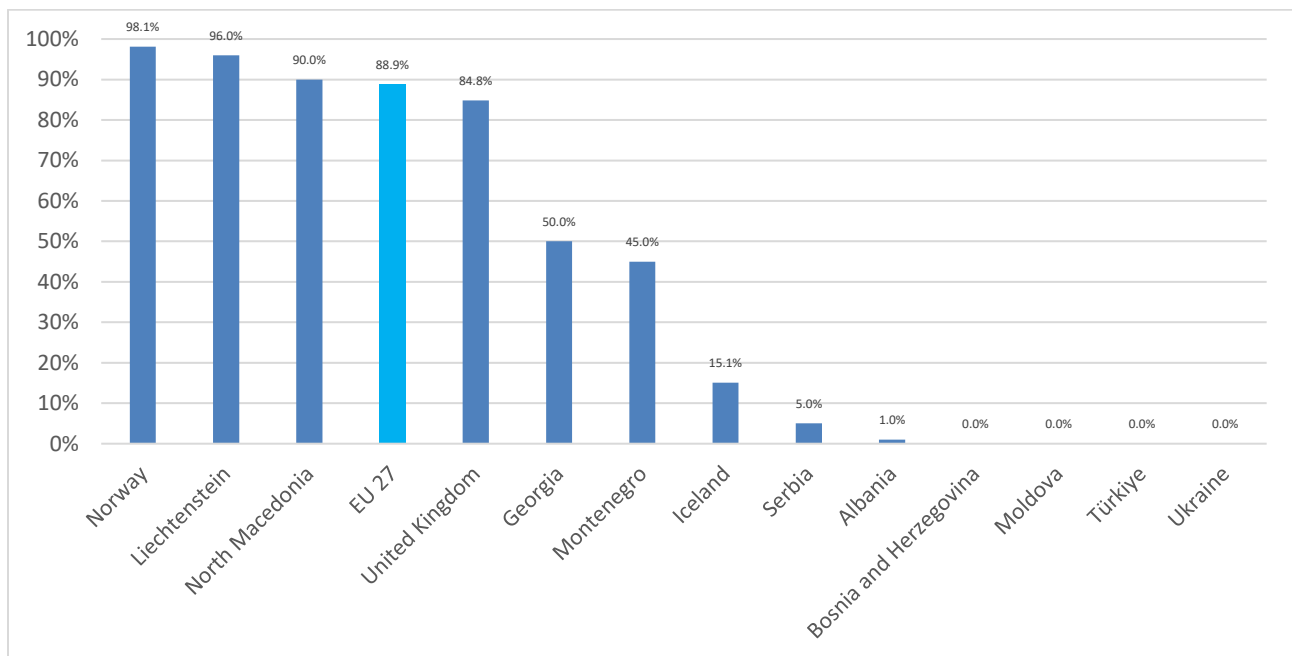
Norway, Liechtenstein, and North Macedonia are outperforming the EU average when it comes to extending 5G to rural households, with the UK closely behind. In contrast, most other countries on the list either have limited rural 5G coverage or none at all, highlighting a significant rural-urban divide in 5G deployment.

Figure 5: 5G coverage of households (% households) across neighbouring markets



Source: EU27, Iceland and the UK from Connectivity Coverage in Europe 2025 Report. Interviews from regulators for Georgia and Norway. IDATE estimates for Albania, Moldova, Montenegro and Serbia. Bosnia and Herzegovina, Türkiye and Ukraine have yet to launch 5G.

Figure 6: 5G rural household coverage (% households) across neighbouring markets

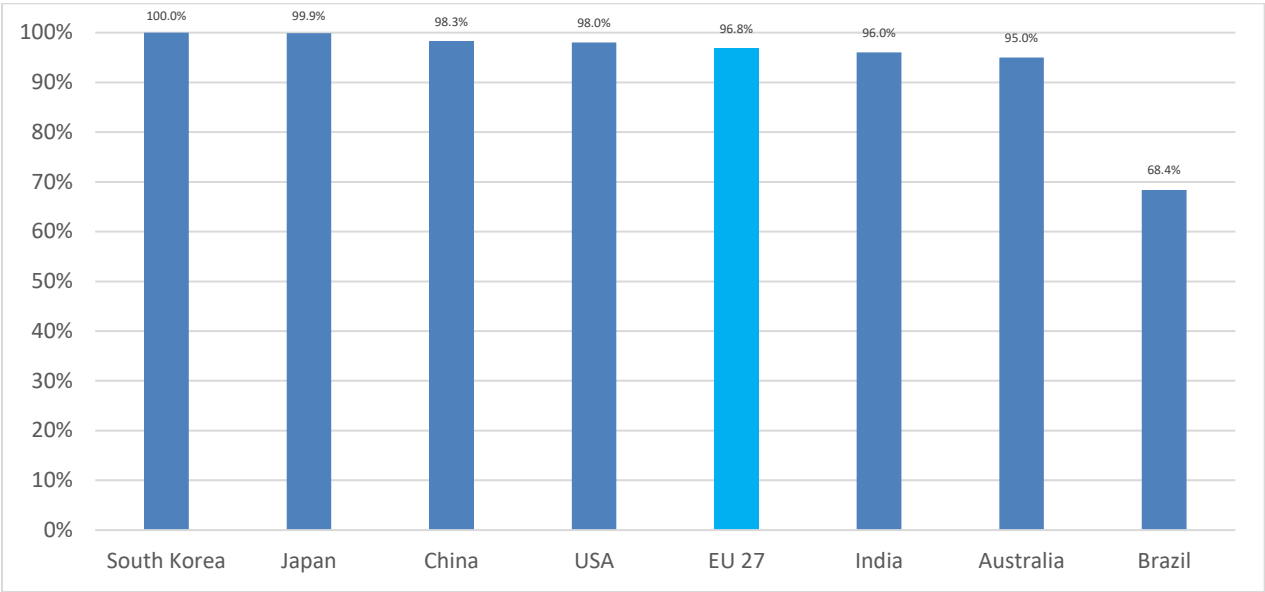


Source: EU27, Iceland and the UK from Connectivity Coverage in Europe 2025 Report. Interviews from regulators for Georgia and Norway. IDATE estimates for Albania, Moldova, Montenegro and Serbia. Bosnia and Herzegovina, Türkiye and Ukraine have yet to launch 5G.

4.1.3 In international comparison markets

In terms of overall 5G household coverage, the EU trails slightly behind South Korea, Japan, China and the United States. India and Australia follow the EU average, with Brazil furthest behind in this set of international comparison markets.

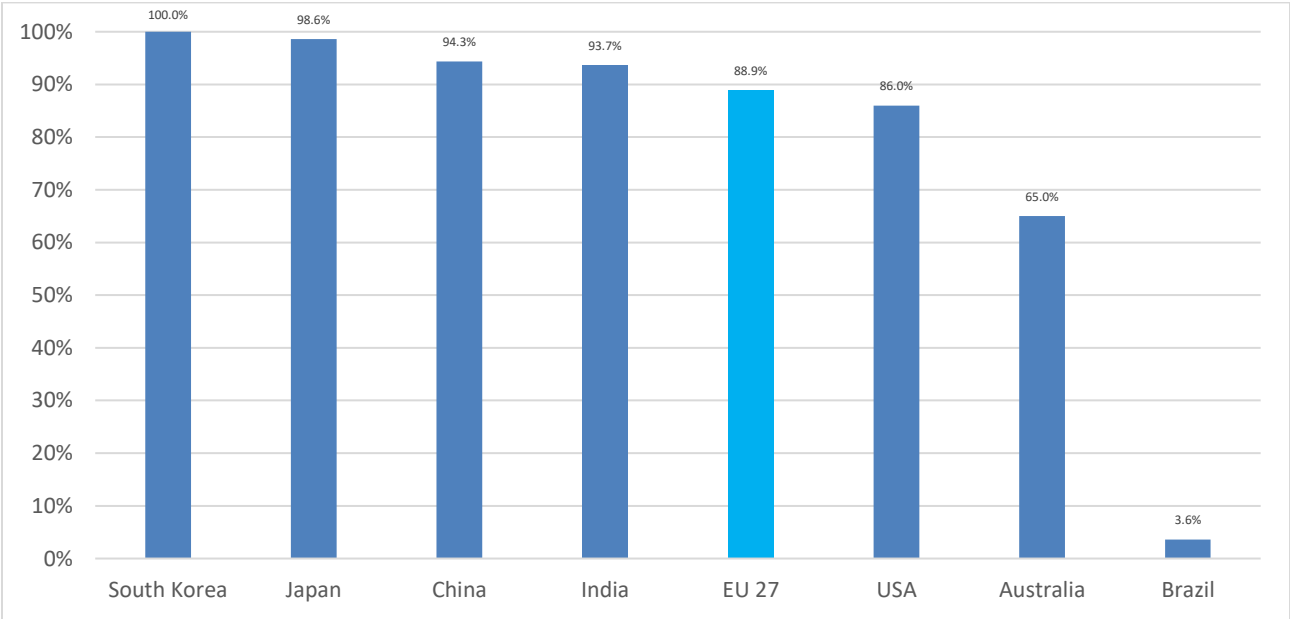
Figure 7: 5G coverage of households (% households) across international comparison markets



Source: Connectivity Coverage in Europe 2025 Report. Regulator data for Brazil and South Korea. IDATE estimates for Japan, China, India, the US and Australia.

The picture is similar in rural 5G household coverage, with India and the US switching places, indicating a higher rural coverage in India than in the US coverage. Brazil faces the greatest challenge among these countries, with rural 5G coverage remaining extremely limited.

Figure 8: 5G rural household coverage (% households) across international comparison markets



Source: Connectivity Coverage in Europe 2025 Report. Regulator data for Brazil and South Korea. IDATE estimates for Japan, China, India, the US and Australia.

4.2 Infrastructure deployment

Key findings

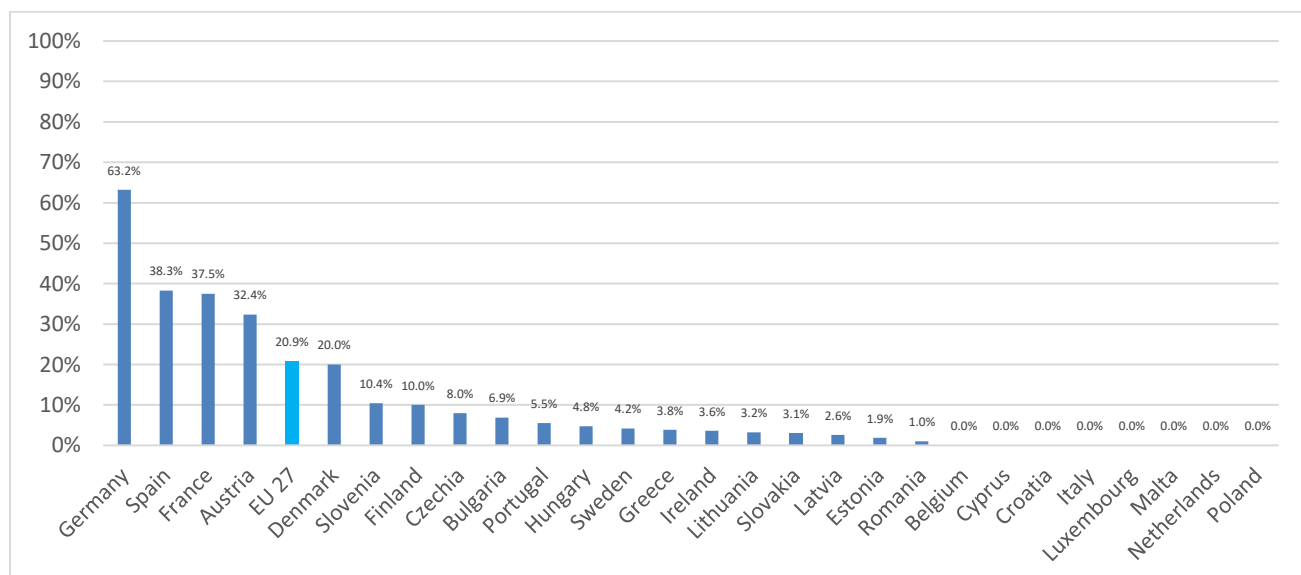
- The shift to 5G standalone (SA), which allows advanced features such as network slicing and ultra-low latency, has been slow and uneven, with only 20.9% of base stations being SA in the EU in 2025, with a very high spread ranging from 63.2% in Germany to 0.0% in six Member States. Significant progress in SA deployment has been made by a few countries (notably Austria, Germany, Spain and France), while most others are still at an early stage or have minimal SA coverage.
- The EU27 recorded a 19.7% increase in deployed overall 5G base stations from 2024 to 2025, rising from approximately 318,299 to 375,144.
- The EU's 5G infrastructure built remains overwhelmingly centred on 700 MHz and 3.4–3.8 GHz, with 26 GHz still largely limited.
- Most neighbouring non-EU countries (except for the UK with 14.1%) have not yet launched 5G SA infrastructure deployment. Internationally, the US (36.2%), China (34.8%), Japan (26.3%) and South Korea (26.2%) surpass the EU27 in 5G SA deployment, with Australia, Brazil and India lagging behind.

4.2.1 In the EU27

Across the EU Member States, 5G deployment remains predominantly based on non-standalone (NSA) architecture, which relies on existing 4G cores. All EU countries launched NSA networks between 2019 and 2021, enabling early market rollout. The transition to 5G SA, which introduces fully virtualised 5G core functions and enables advanced capabilities such as network slicing, ultra-low latency, and private network services, has been more gradual and uneven.

Across the EU, 5G SA base stations accounted, on average, for only 20.9% of total base stations in 2025. This indicator exhibits significant disparity across the EU27, which highlights the varying pace of technological transition within the EU, where some Member States are rapidly advancing towards next-generation connectivity, while others remain in the very early stages of SA implementation.

Figure 9: Penetration of 5G SA base stations (as % total base stations) across Member States



Source: IDATE estimates. Weighted average for EU27. Cyprus, Italy, Latvia, Luxembourg, Malta, the Netherlands, and Poland had yet to commercially launch 5G SA.

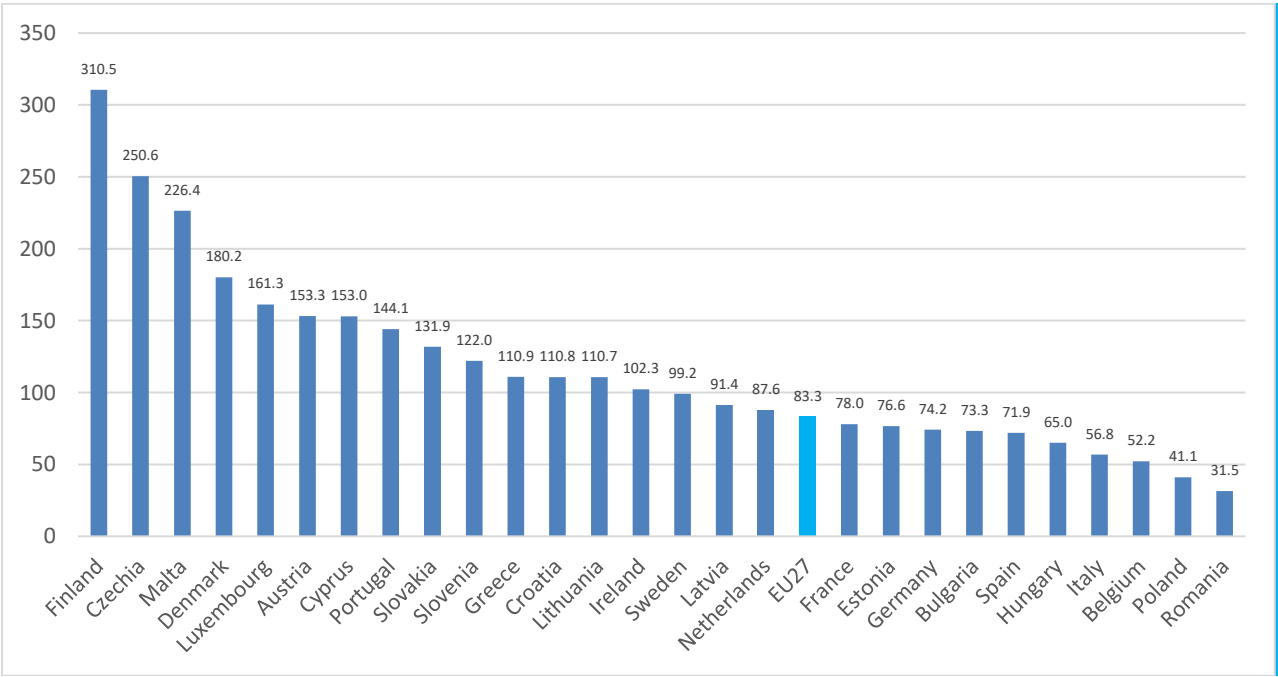
Germany is the clear leader, with 63.2% of its total base stations operating as 5G standalone, demonstrating a strong commitment to full 5G capability. Spain (38.3%), France (37.5%) and Austria (32.4%) also show considerable progress, each with approximately one third of their base stations supporting SA technology.

Denmark falls closely below the EU average, but all others are at less than half of the EU27. Belgium, Cyprus, Croatia, Italy, Luxembourg, Malta, the Netherlands, and Poland have yet to launch 5G SA. This shows the EU average currently reflects mainly the deployment of a handful of Member States, including the two largest ones.

Regarding overall 5G deployments, between 2024 and 2025, the EU27 continued to expand across all principal infrastructure indicators.

The total number of 5G base stations deployed increased from 318,299 to 375,144, a 17.9% increase in a year. Within that total, deployment in the 700 MHz band rose from 152,833 to 198,062 (+29.6%), while deployment in the 3.4–3.8 GHz band only increased from 157,899 to 166,350 (+5.4%). The 26 GHz band remained marginal, at 280 sites, confirming that millimetre-wave deployment remains highly limited across the EU.

Figure 10: Total 5G base stations per 100 000 inhabitants across Member States



Source: IDATE estimates

Adjusted per population size, Finland, Czechia, and Malta lead the way in 5G base stations deployments (per 100,000 inhabitants).

- Finland maintained its position as the frontrunner, with the number of base stations per 100,000 inhabitants rising from 286.6 in 2024 to 310.5 in 2025 (+8.3%).
- Czechia saw the most pronounced surge, with the number of base stations per 100,000 inhabitants

more than doubling from 114.5 in 2024 to 250.6 in 2025 (+118.9%).

- Malta came in third overall, with an increase of number of base stations per 100,000 inhabitants from 213.0 in 2024 to 226.4 in 2025 (+6.3%).

At the bottom of the list, Romania and Poland showed some progress, albeit starting from a low base line:

- Romania increased its number of base stations per 100,000 inhabitants from 26.0 in 2024 to 31.5 in 2025 (+21.2%).
- Poland's number of base stations per 100,000 inhabitants grew from 34.4 in 2024 to 41.1 in 2025 (+19.5%).

Overall, the gap between early and late adopters narrowed, with some Member States that were lagging in 2024 making substantial progress in 2025.

The following table summarises the Member States showing the most significant increases.

Table 3: Most notable 5G base stations improvements in Member-States (2025 vs 2024)

Country	2024	2025	Change
Czechia	114.5	250.6	+119%
Cyprus	74.5	153.0	+105%
Slovakia	64.3	131.8	+105%
Ireland	61.6	102.3	+66%

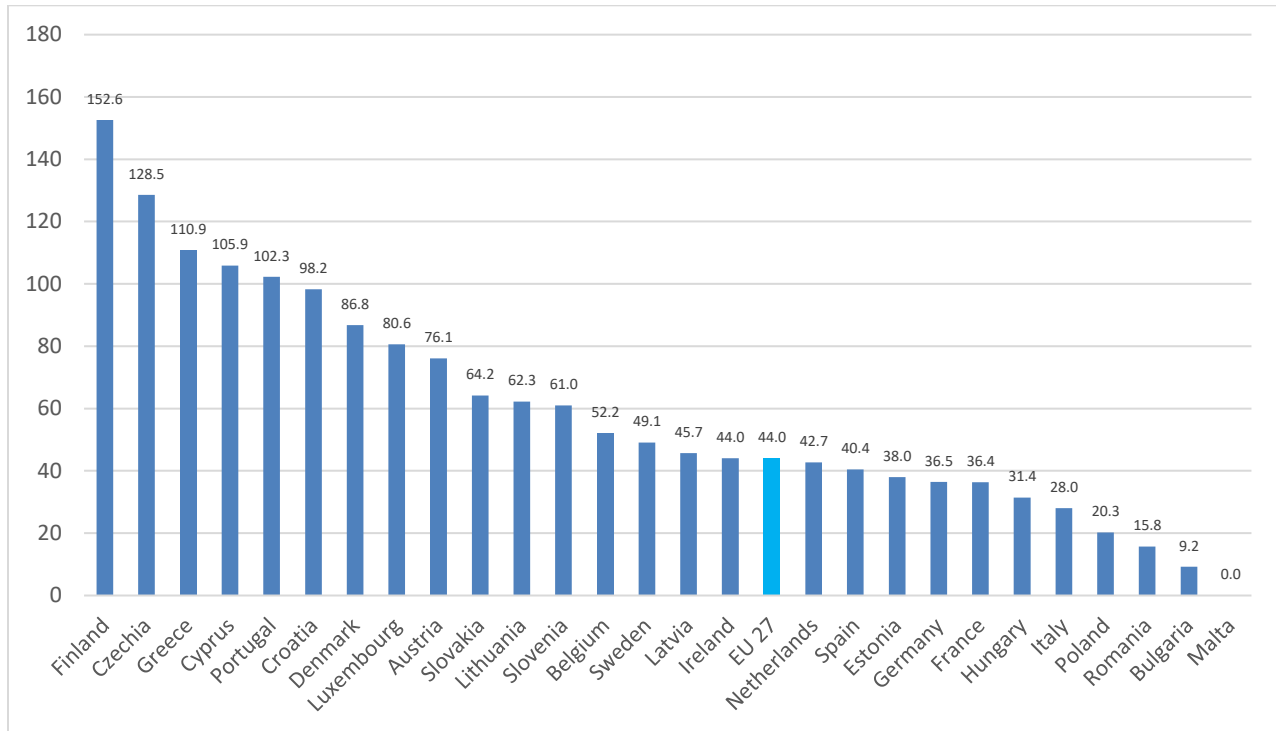
In contrast, markets with a high base line and only limited growth rates (like Finland and Malta above) reflect a more mature stage of deployment, where the initial large-scale rollout phase is largely complete, and subsequent expansion focuses on incremental improvements, densification and 5G SA migration, rather than dramatic increases in 5G base station numbers.

In 2025, the EU27 continued to prioritise the expansion of nationwide 5G infrastructure, particularly in low-band and mid-band spectrum, while the 26 GHz band remained marginal. Indeed, the majority of Member States have yet to report substantial activity in the 26 GHz band. This underscores a phased approach to 5G deployment in the EU, with initial focus on achieving widespread coverage using lower and mid-band frequencies, before expanding into the high-capacity, short-range millimetre wave spectrum.

The 700 MHz band demonstrates the broadest deployment, between 2024 and 2025, along the different 5G base stations. Finland demonstrates a robust and consistent expansion, increasing from 141.1 base stations per 100,000 inhabitants in 2024 to 152.6 in 2025 (+8.2%). Greece and the Czechia also exhibit notable growth, with Greece rising from 95.0 to 110.9 base stations per 100,000 inhabitants (+16.7%) and Czechia more than doubling its count from 56.4 to 128.5 per 100,000 inhabitants (+127.8%) over the same period. In contrast, Malta remains an outlier in this spectrum band, reporting zero stations for both years. These figures underscore the diversity of starting points and national strategies, highlighting the dynamic pace of 5G rollout across Europe.

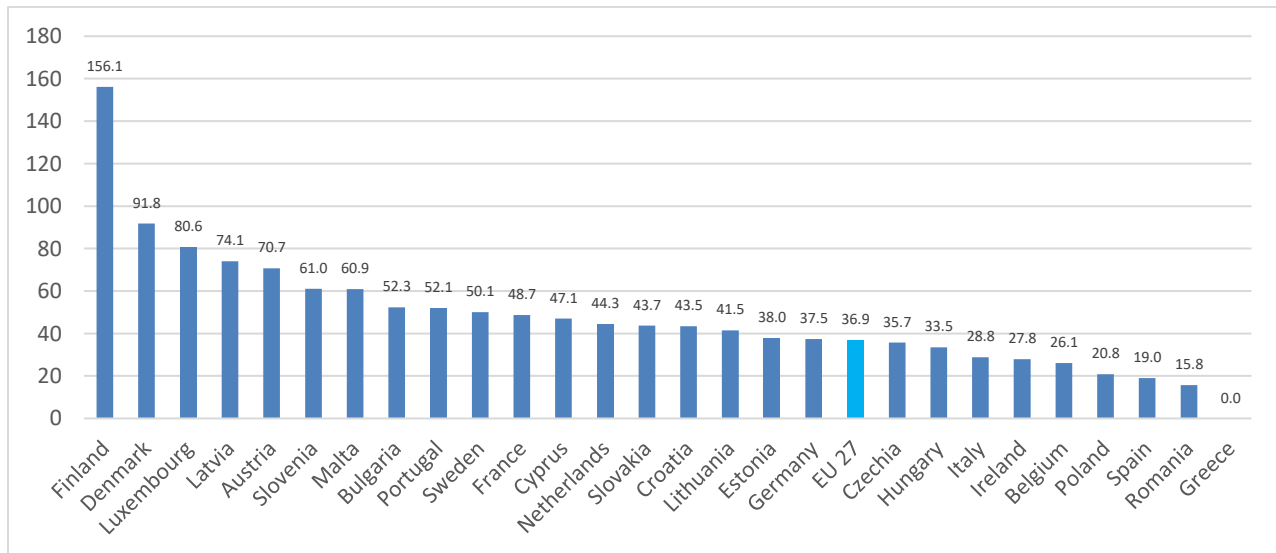
The 3.4–3.8 GHz band, while still widely deployed across the European Union, **exhibits a more moderate distribution** of 5G base stations compared to the 700 MHz band.

Figure 11: 5G base stations in the 700 MHz band per 100 000 inhabitants across Member States



Source: IDATE estimates

Figure 12: 5G base stations in the 3.4-3.8 GHz band per 100 000 inhabitants across Member States



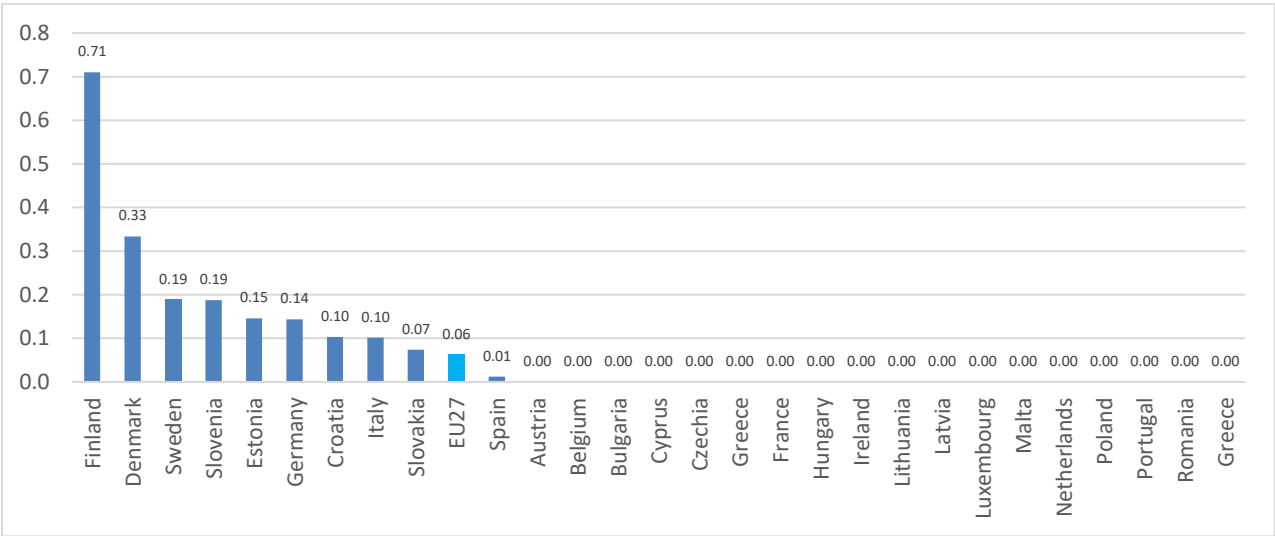
Source: IDATE estimates

In 2025, Finland remains the clear leader with 156.1 base stations per 100,000 inhabitants, reflecting the country's ongoing commitment to advanced digital infrastructure. Denmark (91.8), Luxembourg (80.6) are runner ups on this indicator. Conversely, Spain (19.0) and Romania (15.8) report low numbers. Greece still records no base stations in this band in 2025 (but was well above EU average in the 700 MHz band).

When compared to 2024, most Member States have seen only moderate increases in 3.4–3.8 GHz deployments, with the EU27 average rising from 35.1 per 100,000 inhabitants in 2024 to 36.9 in 2025 (+5.1%). The number of base stations in a number of Member States for this mid-band spectrum remains significantly lower than in the 700 MHz band.

Deployment in the 26 GHz band remains in its infancy across the EU27, with only a handful of Member States reporting any measurable activity in 2025.

Figure 13: 5G base stations in the 26 GHz band per 100 000 inhabitants across Member States



Source: IDATE estimates

Finland leads with 0.710 base stations per 100,000 inhabitants, followed by Denmark (0.334). Some deployment is also taking place in Sweden (0.189), Slovenia (0.188), Estonia (0.146), Germany (0.144), Croatia (0.103), Italy (0.102), Slovakia (0.074), and Spain (0.012). Even among these, the figures remain minimal when compared to the other frequency bands, reflecting the early stage of rollout for the 26GHz band. The majority of Member States did not report any deployment in this band in 2025.

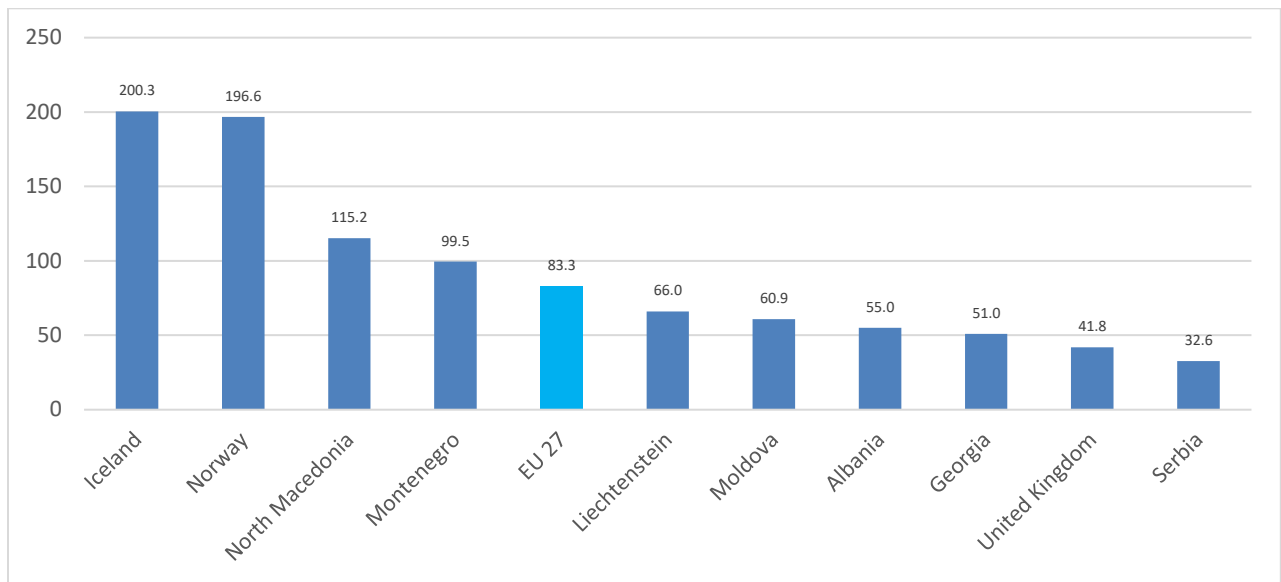
Compared to 2024, there is however progress, albeit from a low base line: Finland, for instance, increased from 0.496 to 0.710 per 100,000 inhabitants (+43.1%), Denmark from 0.287 to 0.334 (+16.4%), and Sweden from 0.150 to 0.189 (+26.0%). Thus, the EU27 average increase is pronounced from 0.062 in 2024 to 0.094 in 2025 (+51.6%).

4.2.2 In neighbouring markets

Several neighbouring markets, particularly Iceland and Norway, have established themselves as frontrunners in terms of overall 5G base station density.

Iceland stands out with the highest number of 5G base stations per 100,000 inhabitants at 200.3, followed closely by Norway with 196.6, both outperforming the EU27 in overall 5G deployment. The number of base stations per 100,000 inhabitants in North Macedonia (115.2) and Montenegro (99.5) are also above the EU27 average.

Figure 14: Total 5G base stations per 100 000 inhabitants across neighbouring markets



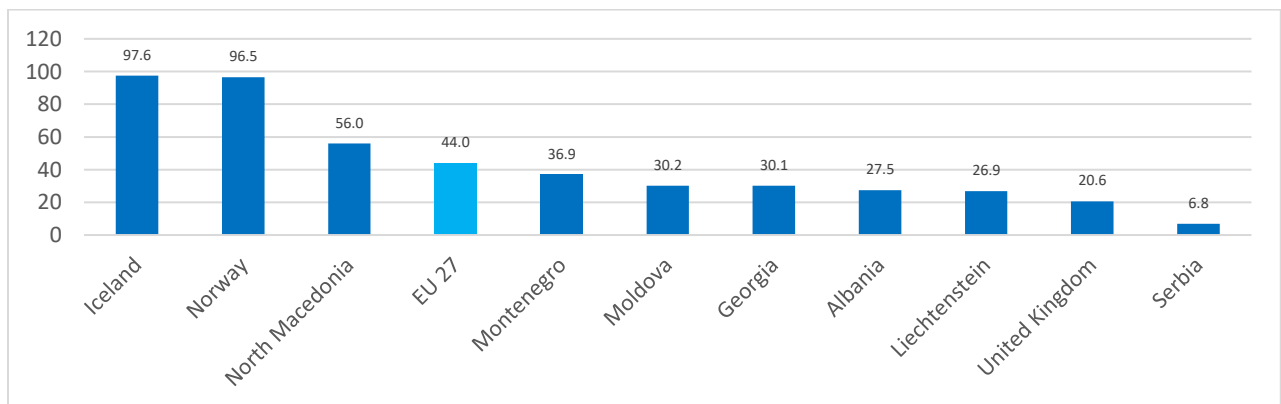
Source: IDATE estimates

The UK, with 41.8 base stations per 100,000 inhabitants in 2025 (up from 33.8 in 2024, i.e. +23.7%), stands at approximately half the EU27 average, also lagging behind most other neighbouring markets. Serbia, which launched 5G in 2025 records 32.6 base stations per 100,000 inhabitants, indicating the start of its 5G rollout.

Among this group, Georgia has shown a marked increase from 25.6 5G base stations per 100,000 inhabitants in 2024 to 50.1 in 2025 (+95.7%), while Moldova, Montenegro, and North Macedonia have also demonstrated consistent growth.

In the 700 MHz band, Iceland and Norway report the highest numbers, with 97.6 and 96.5 base stations per 100,000 inhabitants respectively in 2025 (both showing a modest rise from 85.9 (+13.6%) and 88.7 (+8.8%) respectively in 2024). North Macedonia also maintains a strong position, increasing to 56.0 base stations per 100,000 inhabitants in 2025 from 51.5 in 2024 (+8.7%). Other neighbouring markets display varied levels of deployment below the EU27 average. The UK shows steady growth, increasing from 16.6 in 2024 to 20.6 base stations per 100,000 inhabitants in 2025 (+24.1%). Serbia, which launched 5G in 2025, now records 6.8 base stations per 100,000 inhabitants.

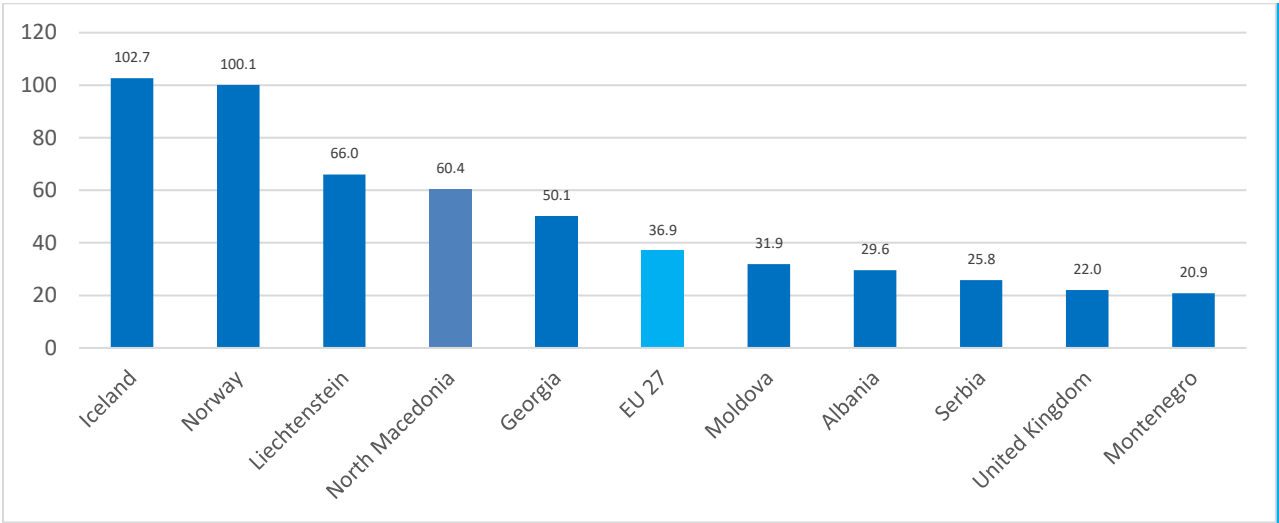
Figure 15: Total 5G base stations in the 700 MHz band per 100 000 inhabitants across neighbouring markets



Source: IDATE estimates

Also in the 3.4–3.8 GHz band, Iceland and Norway are clear leaders, with Iceland hosting 102.7 base stations in the 3.4-3.8 GHz band per 100,000 inhabitants (up from 91.8 in 2024, +11.9%) and Norway 100.1 (up from 94.8, +5.6%).

Figure 16: Total 5G base stations in the 3.4-3.8 GHz band per 100 000 inhabitants across neighbouring markets



Source: IDATE estimates

Liechtenstein and North Macedonia outperform the EU average, but Georgia stands out for its remarkable growth, more than quadrupling its base stations in the 3.4-3.8 GHz band from 12.1 in 2024 to 50.1 in 2025 per 100,000 inhabitants (+314.0%). Other neighbouring markets have also expanded their networks but rank below EU27 average in this band. None of the countries in this group had yet deployed 5G in the 26 GHz band in 2025.

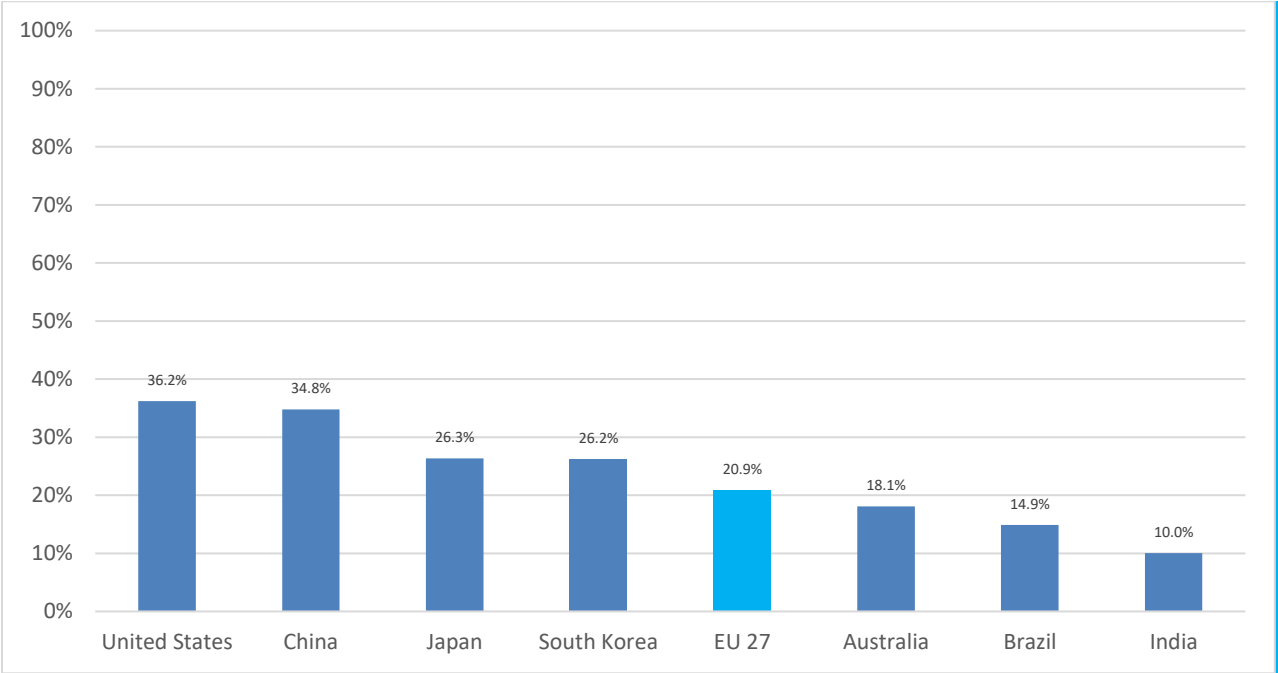
However, it is worth noting that the UK is the only neighbouring market to have launched 5G SA. 5G SA base stations represented 41% of 5G base stations in July 2025. This brings the percentage of 5G SA base stations as a percentage of total base stations in the UK to 14.1%, which falls below EU27 average (20.9%).

4.2.3 In international comparison markets

All international comparison markets had launched 5G SA before 2023, but the penetration of 5G SA as a proportion of total base stations varies considerably across international markets, reflecting differing approaches and maturity levels in 5G deployment.

The US leads with a 5G SA penetration rate of 36.2% of all base stations, indicative of an early and concerted push towards standalone architecture. China closely follows at 34.8%, supported by extensive state-driven infrastructure investment and rapid rollout of SA networks in major urban centres. Japan and South Korea exhibit similar penetration levels, at 26.3% and 26.2% respectively, both benefiting from highly coordinated national strategies and the early launch of commercial 5G SA services. Below the EU27 average (20.9%), Australia (18.1%) and Brazil (14.9%) are gradually increasing their SA deployments, with operators in both countries now moving beyond initial non-standalone launches towards more advanced standalone capabilities. India, at 10.0%, remains at an early stage of 5G SA adoption, as commercial SA networks are only just starting to emerge.

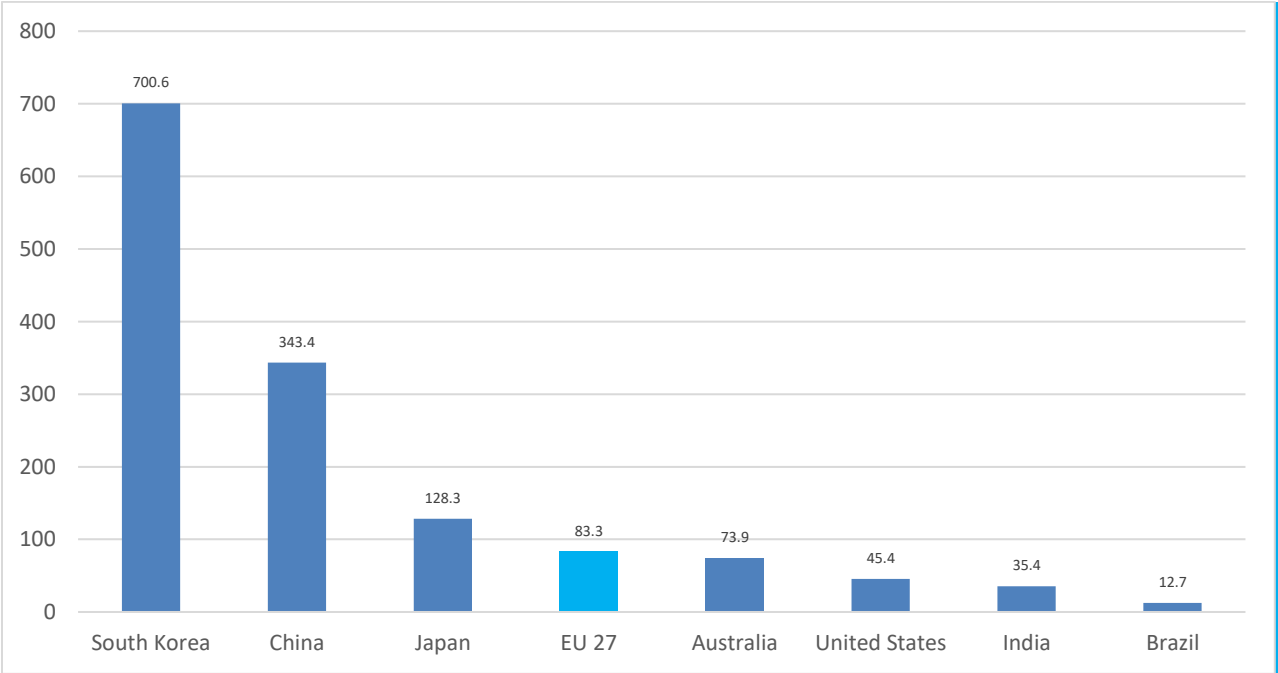
Figure 17: Penetration of 5G SA base stations (as % total base stations) across international comparison markets



Source: IDATE estimates

When comparing total 5G base stations per 100,000 inhabitants, the EU27 ranks behind South Korea, China and Japan.

Figure 18: Total 5G base stations per 100 000 inhabitants across international comparison markets



Source: IDATE estimates

While in absolute numbers, China is by far the largest market, with total 5G base stations rising from 4,251,000 to 4,838,000 between 2024 and 2025 (+13.8%), it ranks second when calculated per 100,000 inhabitants, behind South Korea:

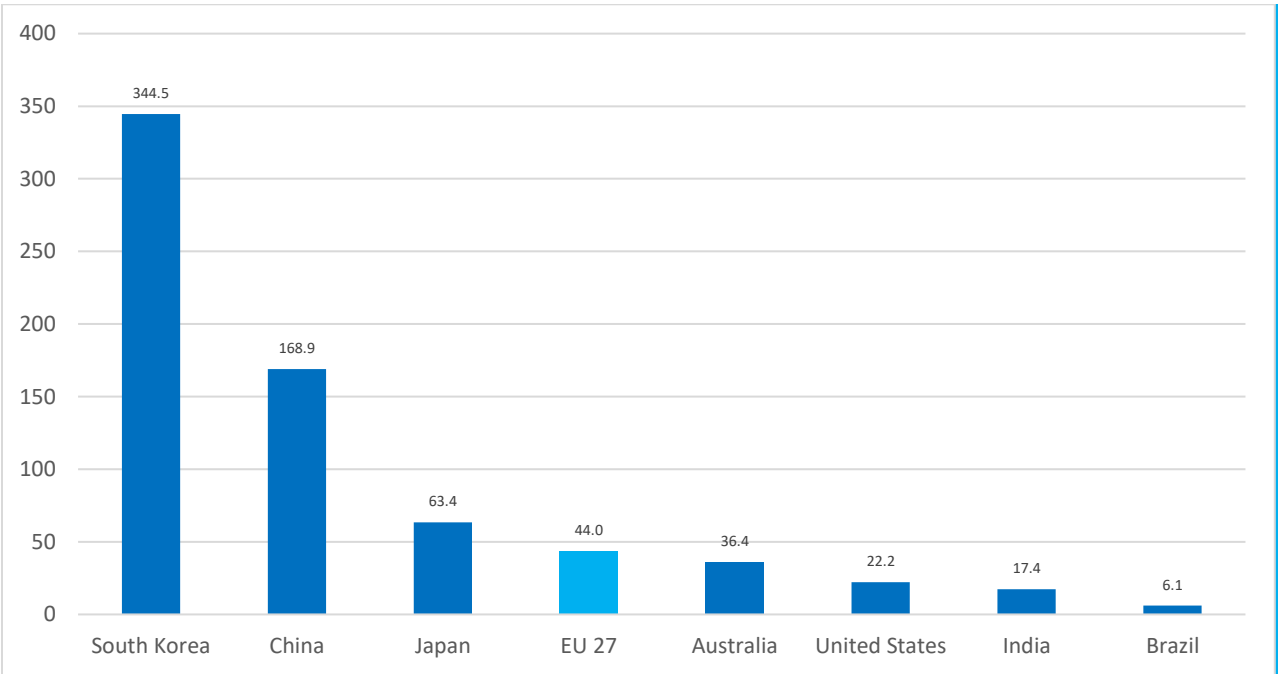
- South Korea leads by a significant margin, with 700.6 5G base stations per 100,000 inhabitants in 2025, an increase from 670.0 in 2024 (+4.6%).
- China follows, reporting 343.4 5G base stations per 100,000 inhabitants in 2025, up from 301.4 in 2024 (+13.9%).
- Japan shows less than half of that, with 128.3 base stations in 2025 compared to 122.1 in 2024 (+5.1%).

The EU27, while not leading, remains competitive, surpassing Australia, the US, India, and Brazil.

- Australia records 73.9 5G base stations per 100,000 inhabitants in 2025, up from 67.1 (+10.1%).
- The US notes an increase from 41.8 5G base stations per 100,000 inhabitants in 2024 to 45.4 in 2025 (+8.6%).
- India and Brazil also show continued growth, with India rising from 32.3 5G base stations per 100,000 inhabitants to 35.4 (+9.6%) and Brazil from 10.8 to 12.7 (+17.6%).

This overall picture is also reflected when focusing on the 700 MHz band.

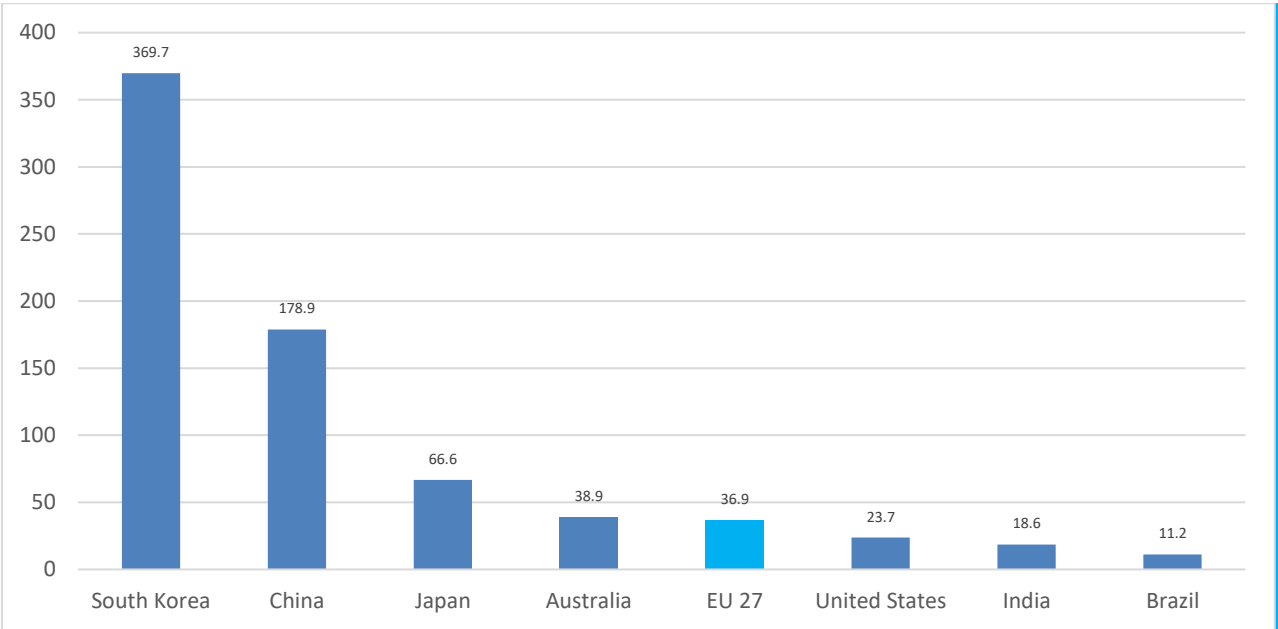
Figure 19: Total 5G base stations in the 700 MHz band per 100 000 inhabitants across international comparison markets



Source: IDATE estimates

In the 3.4–3.8 GHz band, the only change is that Australia here also slightly surpasses the EU27 with 38.9 5G base stations in the 3.4-3.8 GHz band per 100,000 inhabitants in 2025. Comparing the two bands clearly shows the EU trailing in the 3.4–3.8 GHz band, whereas the 700 MHz band was made available earlier and more widely for mobile use. All other analysed markets show more 5G base stations per 100 000 inhabitants in the 3.4-3.8 GHz band than in the 700 MHz band.

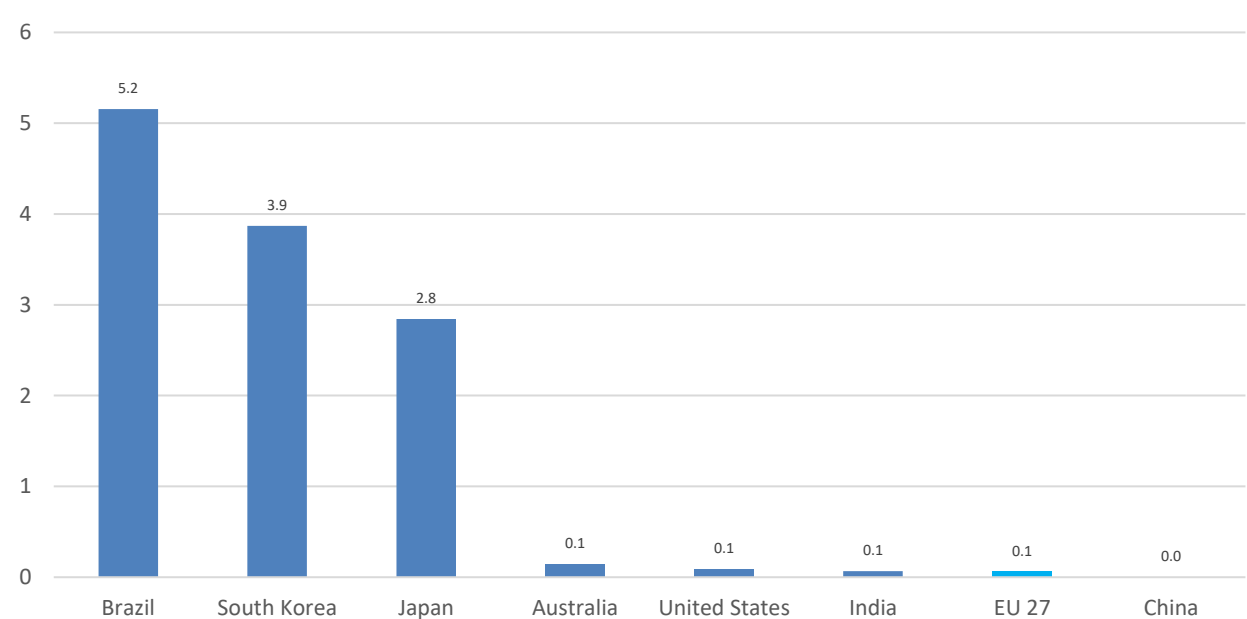
Figure 20: Total 5G base stations in the 3.4-3.8 GHz band per 100 000 inhabitants across international comparison markets



Source: IDATE estimates

In the 26 GHz band, the EU27 is projected to remain significantly behind international comparison markets in terms of 5G base station deployment, with only 0.062 thousand units per 100,000 inhabitants. By contrast, Brazil, South Korea, and Japan achieve substantially higher figures, highlighting a marked disparity in the roll-out of high-frequency 5G infrastructure across these regions. Brazil’s top is particularly noteworthy, given it was lowest in the low- and mid-band deployment. Although Australia, India, and the US also show incremental growth, their deployment levels are comparable to the EU average and remain modest relative to the leading markets. China has not yet released spectrum in the 26 GHz band.

Figure 21: 5G base stations in the 26 GHz band (thousand units per 100 000 inhabitants) across international comparison markets



Source: IDATE estimates

4.3 5G Standalone vs Non-Standalone availability

Key findings

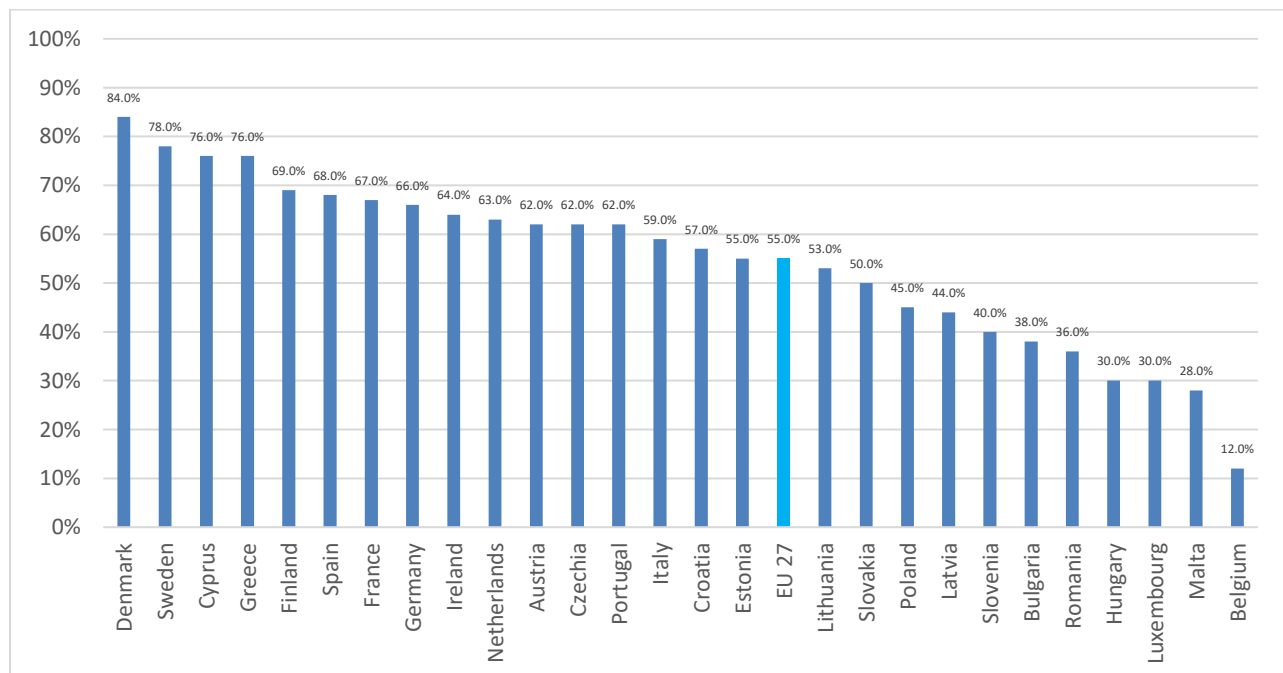
- The EU is in a transitional phase, with broader migration from NSA to SA expected to continue through 2026. However, current SA availability remains modest compared to global leaders.
- In 2025, Asia leads in SA 5G availability, with China (80.9%) and India (50.0%) well ahead of the EU. The US and the UK also exceed the EU average, while most EU neighbouring markets remain focused on non-standalone availability.

The following data presents 5G Availability as the percentage of users with 5G-capable devices spending most of their time connected to a 5G NSA network and 5G SA Availability as the percentage of users with 5G-capable devices spending most of their time connected to a 5G SA network. Data is based on Ookla⁵⁷, with IDATE estimates for the countries not covered by them.

4.3.1 In the EU

While 5G household coverage is generally very high across the EU27, actual 5G availability for users remains significantly lower, in particular 5G SA. This gap indicates that, despite the widespread technical reach of 5G networks, the proportion of users who are able to spend most of their time connected to active 5G networks is much more modest.

Figure 22: 5G NSA availability across Member States



Source: Ookla for Spain, Finland, France, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia. IDATE estimates for Austria, Belgium, Bulgaria, Cyprus, Czechia, Germany, Denmark, Estonia and Greece. Weighted average for EU27. Commercial launches only.

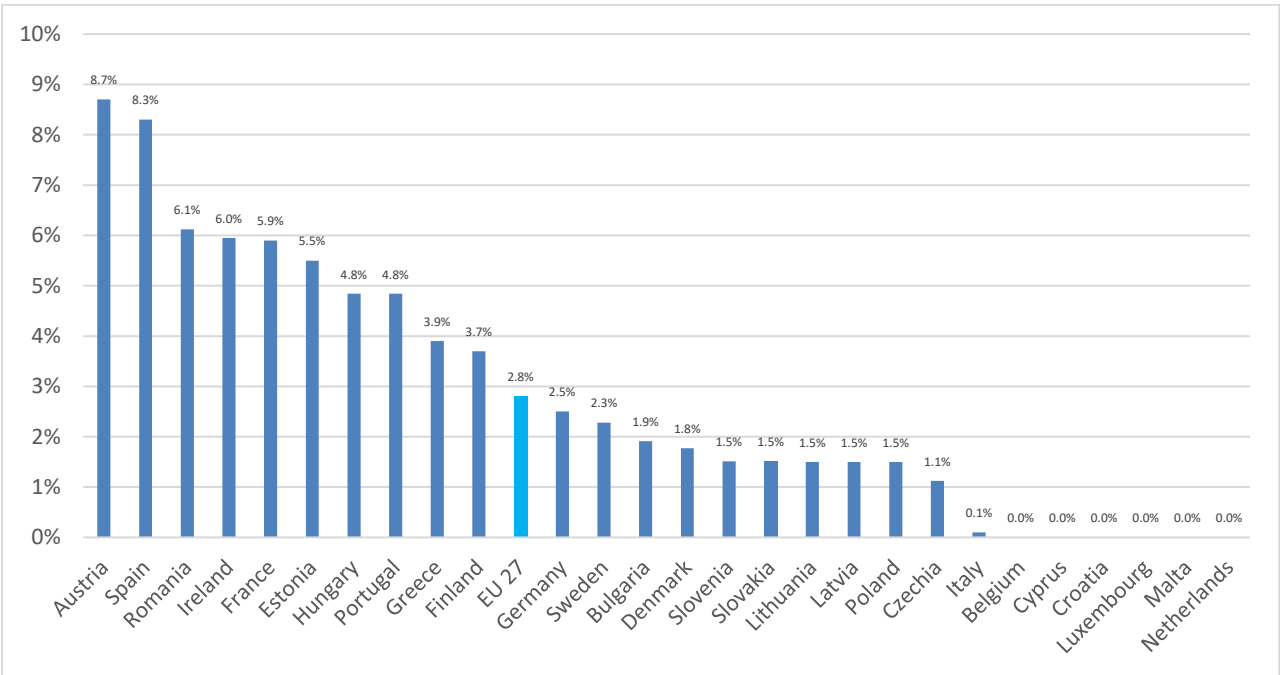
⁵⁷ Ookla and Omdia (2026), [The State of 5G Standalone 2026](#), February 2026

For instance, Austria and Czechia both report 5G household coverage close to 100%, yet 5G NSA availability stands at only 62.0%. In Belgium, the difference is particularly pronounced, with 99.9% coverage but just 12.0% NSA availability. Even in leading countries such as Cyprus and Denmark, where both coverage and availability are among the highest, availability still trails coverage by a substantial margin.

This pattern is reflected in the EU27 average, where household coverage stands at 96.8%, yet NSA availability is only 55.0%. These figures highlight the ongoing challenge of converting network deployment into tangible user experience, with factors such as network capacity, device compatibility, and the pace of standalone 5G rollout all contributing to the lag between theoretical coverage and actual availability.

Furthermore, a clear disparity exists between 5G NSA and 5G SA availability across EU Member States. SA availability remains extremely limited, with all Member States recording single-digit percentages.

Figure 23: 5G SA availability across Member States



Source: Interview from regulators from Belgium and Croatia. Ookla for Austria, Germany, Greece, Spain, Finland, France, EU27. IDATE estimates for Bulgaria, Cyprus, Denmark, Estonia, Hungary, Ireland, Portugal, Romania, Sweden, Slovenia, and Slovakia. Weighted average for EU27. Cyprus, Italy, Latvia, Luxembourg, Malta, the Netherlands, and Poland had yet to commercially launch 5G SA. Commercial launches only.

Even in the most advanced SA markets, such as Austria (8.7%) and Spain (8.3%), SA availability lags considerably behind NSA.

On average, the EU27 records SA availability of only 2.8% (compared to 55.0% for NSA availability). This pronounced gap highlights the ongoing transition phase within the EU, where the majority of users can access 5G through NSA networks, but widespread adoption and user experience of full SA capabilities is not yet a reality.

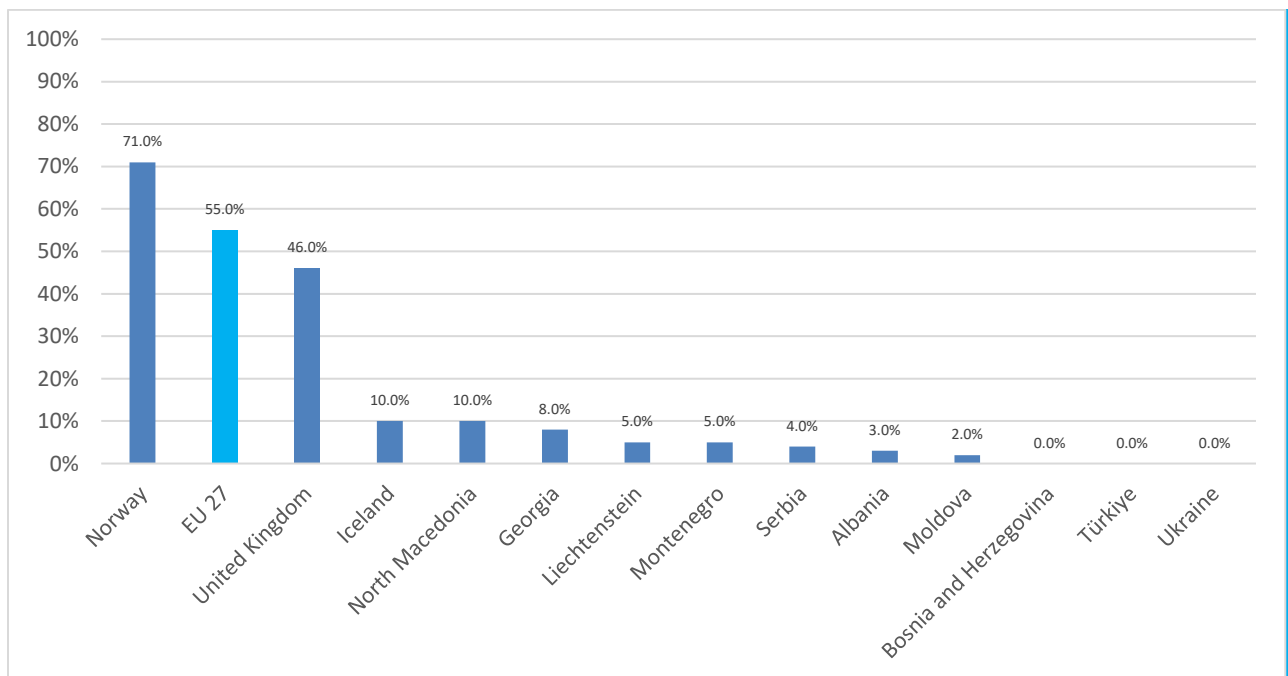
4.3.2 In neighbouring markets

Neighbouring European countries remain in early stages of rollout. Western Balkan and Eastern Partnership countries are still focusing on basic NSA rollout, with SA likely to follow later

The UK is slightly ahead of the EU average in SA availability, reflecting strong operator investment in next-generation networks. Norway remains largely NSA-based, despite high 5G coverage. Most neighbouring countries of Western Balkans and Eastern Partnership have not yet launched SA networks (Albania, Georgia, Moldova, Montenegro, North Macedonia, and Serbia). Bosnia and Herzegovina, Türkiye, and Ukraine have yet to launch 5G altogether.

There is a significant disparity in 5G NSA availability between the EU27 and its neighbouring markets, with almost all neighbouring markets lagging behind the EU27 average 5G NSA availability.

Figure 24: 5G NSA availability across neighbouring markets



Source: Ookla. Weighted average for EU27. Bosnia and Herzegovina, Türkiye and Ukraine have yet to launch 5G.

Norway is an exception, exhibiting both outstanding 5G coverage (99.7%) and the highest 5G NSA availability among the neighbouring markets (71.0%), outpacing the EU27 average (55.0%).

Other neighbouring markets, however, display far lower levels of 5G NSA availability:

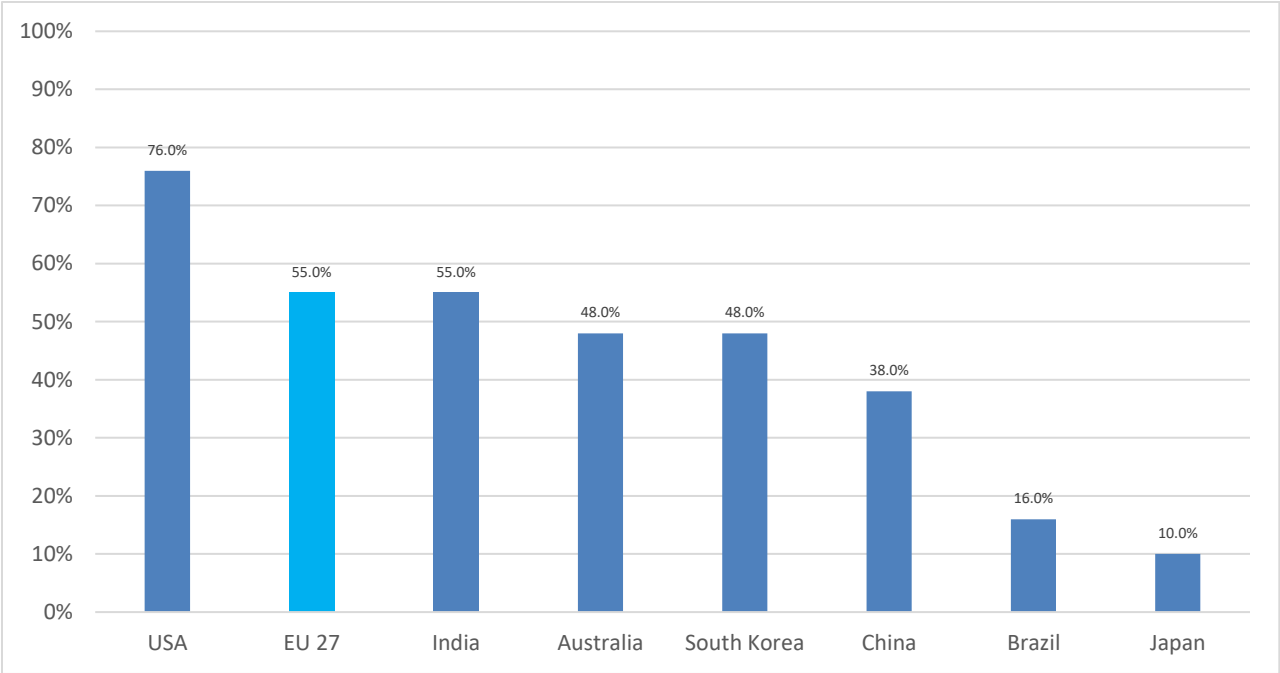
- The UK comes just below the EU27 average, with 5G NSA availability of 46.0%, despite a similar household coverage percentage than the EU27 average (97.0%).
- Iceland and North Macedonia, despite having high coverage rates (93.8% and 95.0% of households, respectively), report only 10.0% 5G NSA availability.
- Other neighbouring markets, despite varying levels of household coverage, have a 5G NSA availability of less than 10.0%.

As regards 5G SA availability, since most neighbouring markets have yet to launch 5G SA, the only reasonable comparison is the UK (7.0%), which outperforms the EU average (2.8%) with a higher 5G SA availability. This indicates that the transition to full 5G SA networks is still at a nascent stage throughout Europe and its neighbouring regions. For businesses and consumers, this highlights the ongoing need for investment and infrastructure development to fully realise the transformational potential of 5G SA.

4.3.3 In international comparison markets

There is significant variation across international comparison markets in terms of 5G NSA availability.

Figure 25: 5G NSA availability across international comparison markets



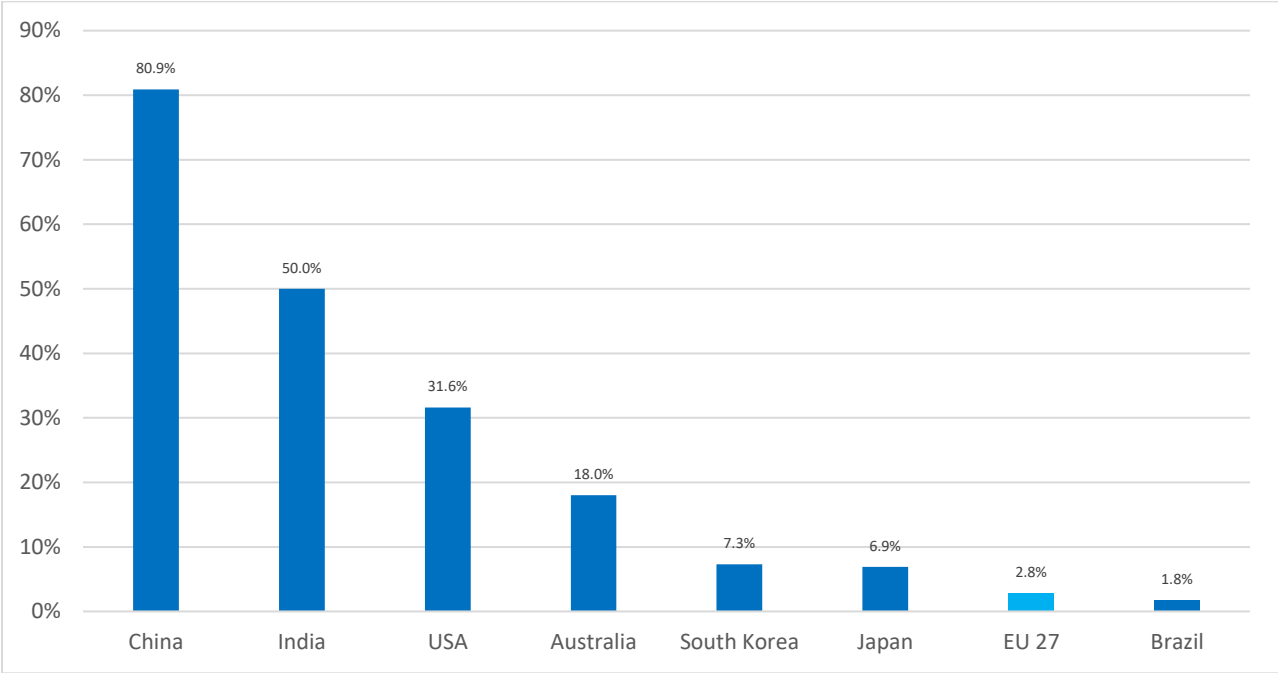
Source: Ookla. Weighted average for EU27.

The US leads with a notably high 5G NSA availability of 76.0%, reflecting widespread network adoption. The EU27 and India both report a strong 55.0% NSA availability, indicating that over half of users with 5G-capable devices are able to access the network consistently.

In contrast, China, despite its almost full 5G household coverage of 98.3%, sees a lower NSA availability rate of only 38.0%, explained however by the very high availability of 5G SA (see below). Indeed, a significant proportion of 5G traffic is already being carried over SA networks, which naturally reduces the share of NSA availability. Brazil and Japan lag behind, with only 16.0% and 10.0% 5G NSA availability respectively, highlighting challenges in network accessibility despite reasonable coverage, particularly in the case of Japan.

As regards 5G SA availability, China demonstrates the highest level of SA availability globally (80.9%), far ahead of the EU.

Figure 26: 5G SA availability across international comparison markets



Source: Ookla. Weighted average for EU27. Commercial launches only.

At a distance behind China, India has rapidly adopted SA-based architecture as the primary rollout model, particularly through Reliance Jio (SA availability in 2025 of 50.0%). Also the US and Australia significantly outperform the EU (SA availability in 2025 of 31.6% and 18.0% respectively). Only Brazil is falling behind the EU average on both 5G NSA and SA.

4.4 Investment

Key findings

- Total mobile network investment in the EU27 declined slightly from EUR 18.19 billion in 2024 to EUR 17.94 billion in 2025 (-1.4%). While overall investment numbers stayed relatively stable, there has been a distinct shift towards 5G, with the share of mobile investment allocated to 5G reaching 51.0% EU-wide (compared to 48.0% in 2024). France leads at 63.0%, but also Germany, Spain, Finland, Italy, and Sweden are with 52.0% or more, above the EU average.
- Investment in the Radio Access Network (RAN) continues to dominate, but core network investment is rising rapidly, with expenditure increasing from EUR 915.99 million in 2024 to EUR 1.26 billion in 2025 (+37.6%). This reflects the growing importance of advanced network functions and standalone 5G capability.
- The neighbouring markets show a mixed picture overall, with notably Liechtenstein and Norway consistently above the EU average and the UK below, across the analysed indicators. Internationally, the EU27 fall behind the US, South Korea, and Japan on all indicators observed, often also behind China (with the exception of per capita mobile investments, given China’s population size).

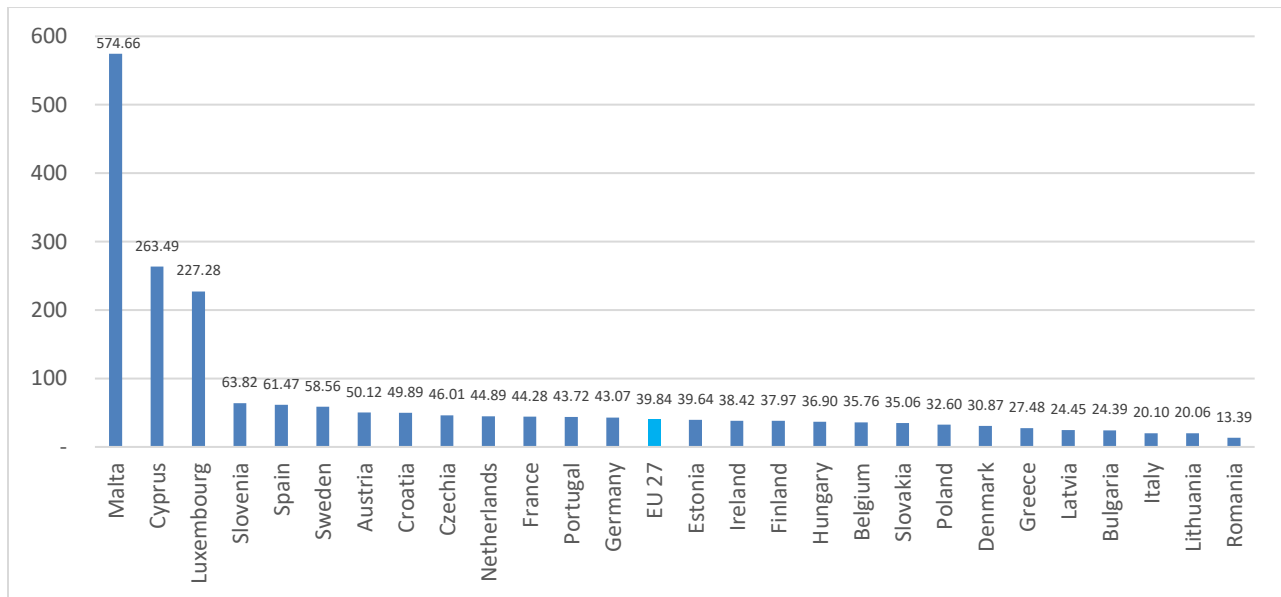
Total mobile network investments are measured as mobile CAPEX, excluding spectrum. For comparison purposes, they are analysed per capita.

4.4.1 In the EU

Between 2024 and 2025, **total mobile network investment** in the EU27 declined slightly from EUR 18.19 billion to EUR 17.94 billion (-1.4%).

Adjusted for population size, the EU27 average is at EUR 39.84 per capita, but total mobile network investment in 2025 varies significantly across EU Member States.

Figure 27: Total mobile network investment per capita (in Euros) across Member States



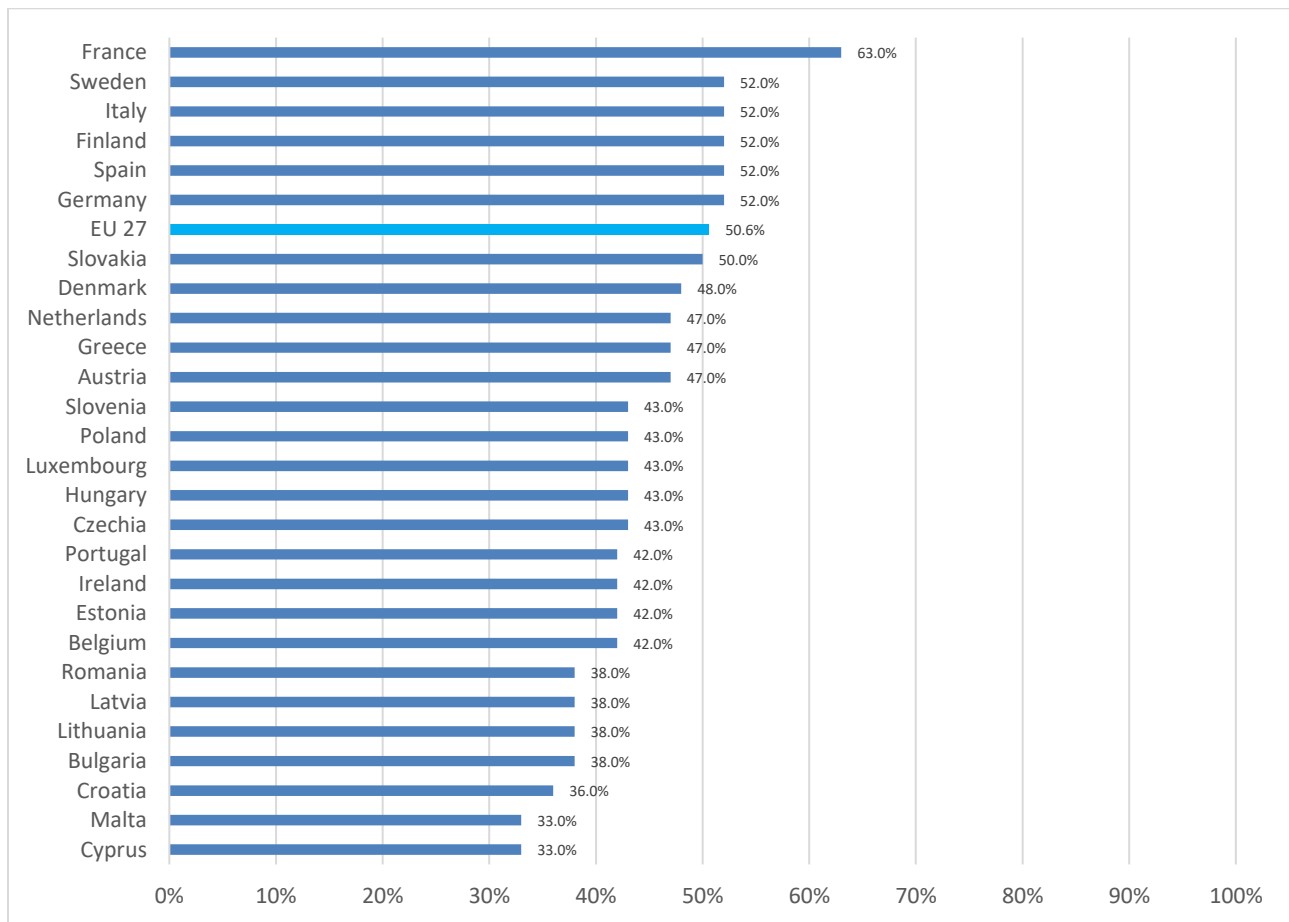
Source: IDATE estimates

Malta (EUR 574.66) stands out with the highest CAPEX per capita by a considerable margin, followed by Cyprus (EUR 263.49) and Luxembourg (EUR 227.28). This is largely attributable to their relatively small populations, which, when combined with the need for comprehensive 5G coverage, results in a higher investment per resident.

Romania (EUR 13.39), Lithuania (EUR 20.06), and Italy (EUR 20.10) show the lowest total mobile CAPEX per capita. Among the larger Member States, Spain (EUR 61.47), France (EUR 44.28), and Germany (EUR 43.07) report moderate CAPEX per capita, but all above the EU average (EUR 39.84).

It is worth noting that the wide disparities in total mobile CAPEX per capita may be influenced by various national circumstances. A better measure of strategic commitment to 5G is the **percentage of total mobile network investment allocated to 5G**. Although total mobile investment was broadly stable to slightly lower, as seen above, the composition of investment shifted more decisively towards 5G. That is consistent with a market moving from broad network modernisation to more targeted next-generation deployment. At EU27 level, total 5G mobile network investment reached 51.0% of total mobile network investment in 2025, compared to 48.0% in 2024.

Figure 28: Percentage of 5G mobile network investments (as % of total mobile network investments) across Member States

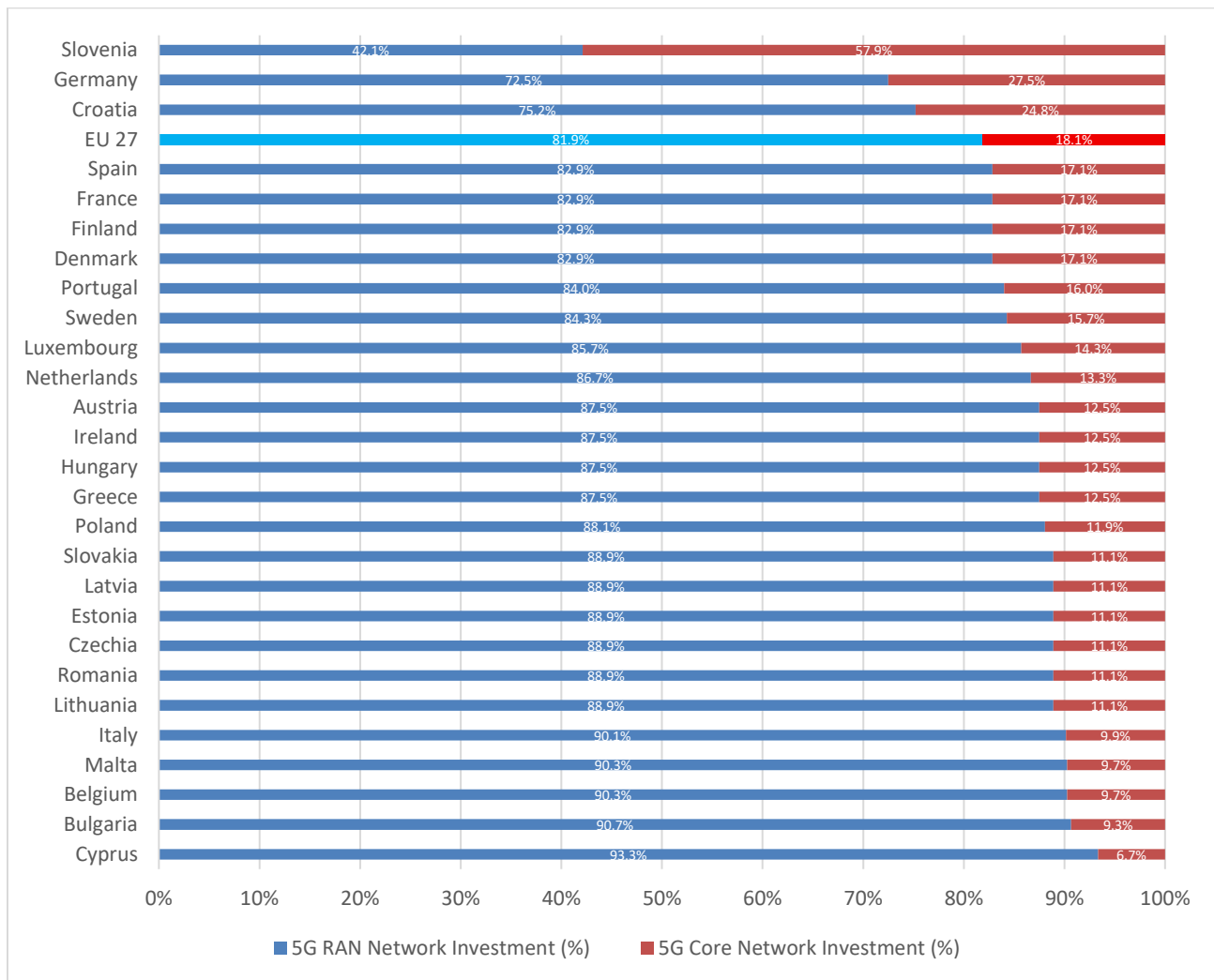


Source: IDATE estimates

Several Member States were above this level. France stands out with 63.0%, but Germany, Spain, Finland, Italy and Sweden (all at 52.0%) are also still above the EU average. By contrast, lower 5G intensity is visible in Cyprus, Malta, Croatia, Bulgaria, Lithuania, Latvia, and Romania. There is investment in these countries in 5G, but it still accounts for a share below 40.0% of total mobile capital allocation.

Across the EU, 5G RAN investment continues to dominate, but 5G core network investment is becoming increasingly important. EU27 5G RAN investment rose modestly from EUR 5.37 billion to EUR 5.45 billion between 2024 and 2025 (+1.5%), while 5G core investment increased sharply from EUR 915.99 million to EUR 1.26 billion (+37.6%). This trend suggests a gradual transition from coverage-led deployment to more advanced network functionality, including standalone readiness and core modernisation.

Figure 29: 5G RAN/Core investments across Member States



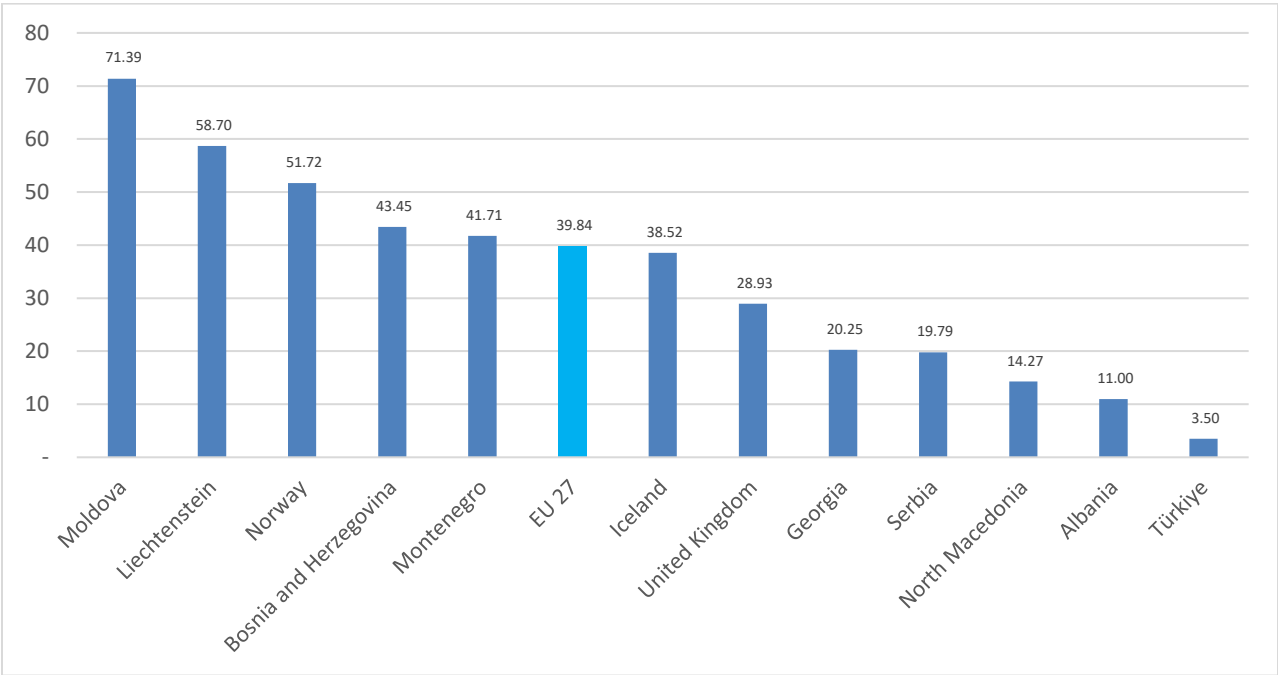
Source: IDATE estimates

4.4.2 In neighbouring markets

Significant disparities in capital expenditure per capita exist among the EU27 and its neighbouring markets. While some neighbours, such as Moldova and Liechtenstein, exceed the EU27 average, others lag considerably behind, notably Albania and Türkiye (with the latter likely related to the strong devaluation of the Turkish Lira).

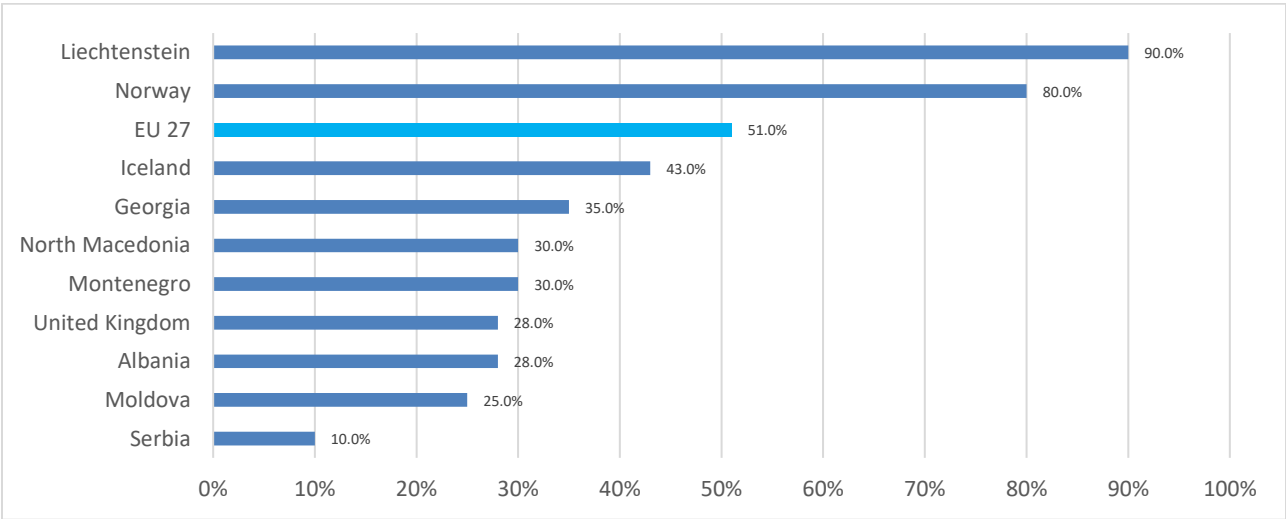
Neighbouring markets show mixed levels of commitment in 5G investments. Liechtenstein (90.0%) and Norway (80.0%) stand out, investing the overwhelming majority of their mobile network CAPEX in 5G. All other neighbouring markets invest a notably smaller share in 5G compared to the EU27 average (51.0%). Serbia (10.0%) is particularly low but expected to increase in the near future, as the country only launched 5G in 2025.

Figure 30: Total mobile network investment per capita (in Euros) across neighbouring markets



Source: IDATE estimates. No data available for Ukraine.

Figure 31: Percentage of 5G mobile network investments (as % of total mobile network investments) across neighbouring markets



Source: IDATE estimates. Bosnia and Herzegovina, Türkiye, and Ukraine have yet to launch 5G.

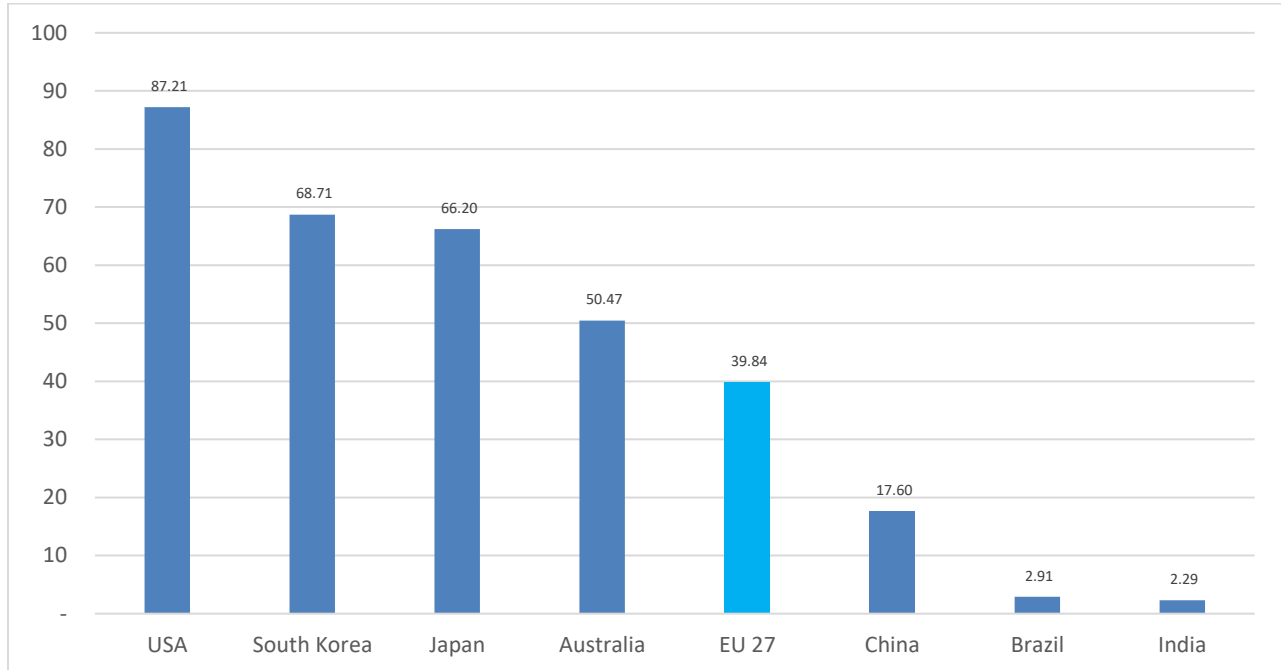
The UK is the only country to have launched 5G SA and is therefore investing in 5G core at the moment. With 17.0% of its reported 5G investment going into core, the UK only falls slightly below the EU27 average (18.0%).

4.4.3 In international comparison markets

There is a pronounced gap between advanced economies (USA, South Korea, Japan, and Australia) and emerging markets (Brazil and India) regarding **investment in mobile networks per capita**, with the US being

the clear leader. The EU27 sits in the upper-middle tier, ahead of China, Brazil and India, but well behind the other advanced economies. The low CAPEX in Brazil and India suggests that further investment will be necessary to improve connectivity and support future digital growth.

Figure 32: Total mobile network investment per capita (in Euros) across international comparison markets



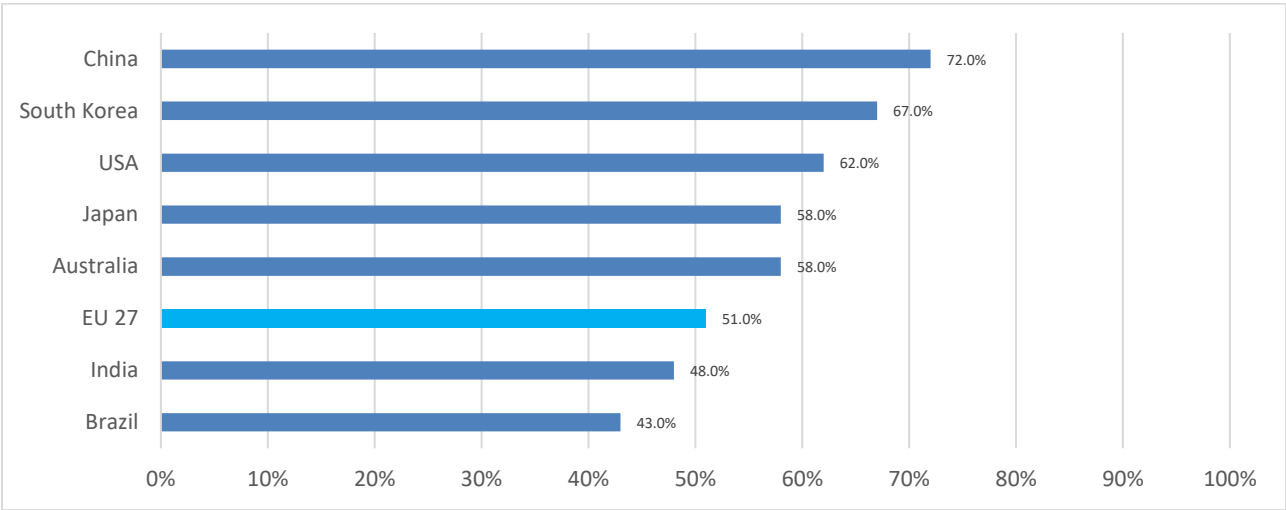
Source: IDATE estimates.

In absolute terms, between 2024 and 2025 (by amount invested), the following can be observed:

- The US is by far the largest investment market in the data, increasing from EUR 26.36 billion to EUR 29.80 billion between 2024 and 2025 (+13.1%).
- China showed the biggest increase, with total mobile investment rising from EUR 19.89 billion to EUR 24.80 billion (24.7%).
- Japan increased investment from EUR 7.99 billion to EUR 8.15 billion (+2.0%).
- India's total mobile investment rose only slightly from EUR 3.33 billion to EUR 3.35 billion (+0.6%).
- South Korea increased total mobile investment from EUR 3.22 billion to EUR 3.55 billion (+10.2%).
- Australia's investment rose from EUR 1.35 billion to EUR 1.40 billion (+3.7%).
- Brazil's total mobile investment even fell slightly from EUR 626.05 million to EUR 620.00 million (-1.0%).

China, South Korea, and the US are leading the way in 5G investment as a share of mobile network CAPEX, with Australia and Japan also showing strong commitments. The EU27 and India are investing around half of mobile CAPEX into 5G, whereas in Brazil it is a bit less (43.0%).

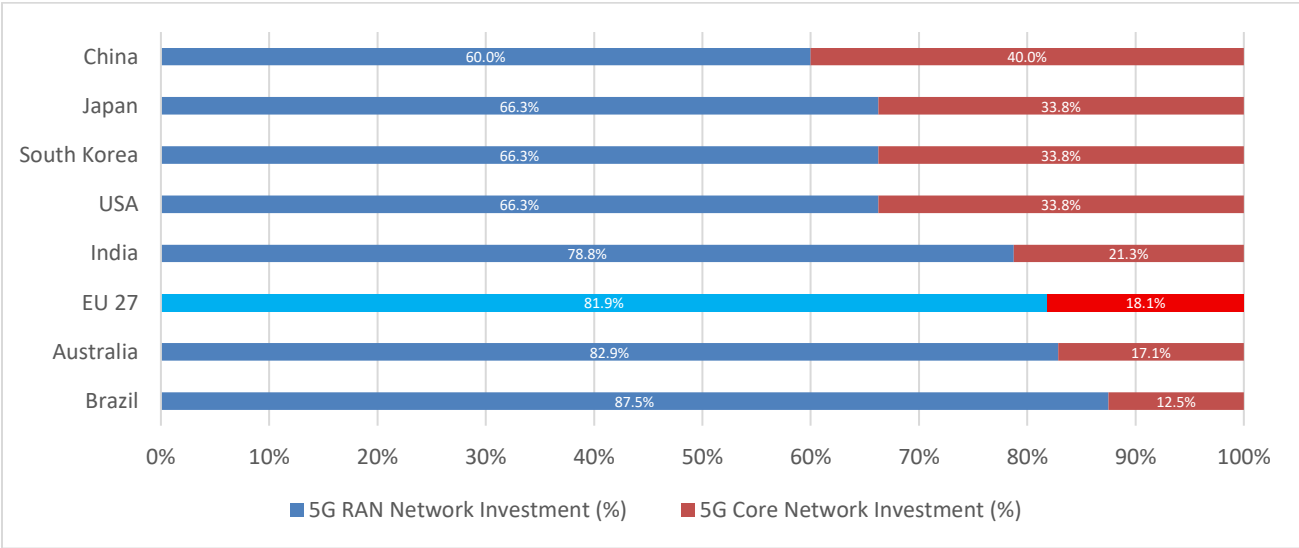
Figure 33: Percentage of 5G mobile network investments (as % of total mobile network investments) across international comparison markets



Source: IDATE estimates

As regards investments in RAN vs. core, China, Japan, South Korea, the US, and India are investing more heavily in the 5G Core network than the EU27. China leads in core network investment, with Japan, South Korea, and the US at about one third, India and the EU27 about one fifth. Australia and Brazil fall below the EU27 average.

Figure 34: RAN/Core investments across international comparison markets



Source: IDATE estimates

4.5 Spectrum assignment

Key findings

- By 2025, the EU had reached 75.3% harmonised spectrum assignment, with many Member States at near or full assignment. However, the distribution across the EU27 remains uneven. A number of Member States still report relatively low harmonised assignment despite otherwise advanced mobile markets. There is also very wide variation in reliance on dynamic spectrum sharing (DSS), suggesting that the EU spectrum environment remains only partially converged.
- The UK and Norway are the most comparable European neighbouring markets. Among global peers, India stands out for large spectrum scale.
- One of the most striking cross-market differences concerns dynamic spectrum sharing. The EU includes both very high-DSS markets, such as Germany, Malta, Luxembourg, Greece, and Lithuania, and very low-DSS markets, such as Belgium, Denmark, Finland and Latvia. Outside the EU, Montenegro, the UK, Australia and Japan use DSS substantially, while Norway, the US and South Korea appear to follow an approach of dedicated 5G spectrum.

4.5.1 In the EU

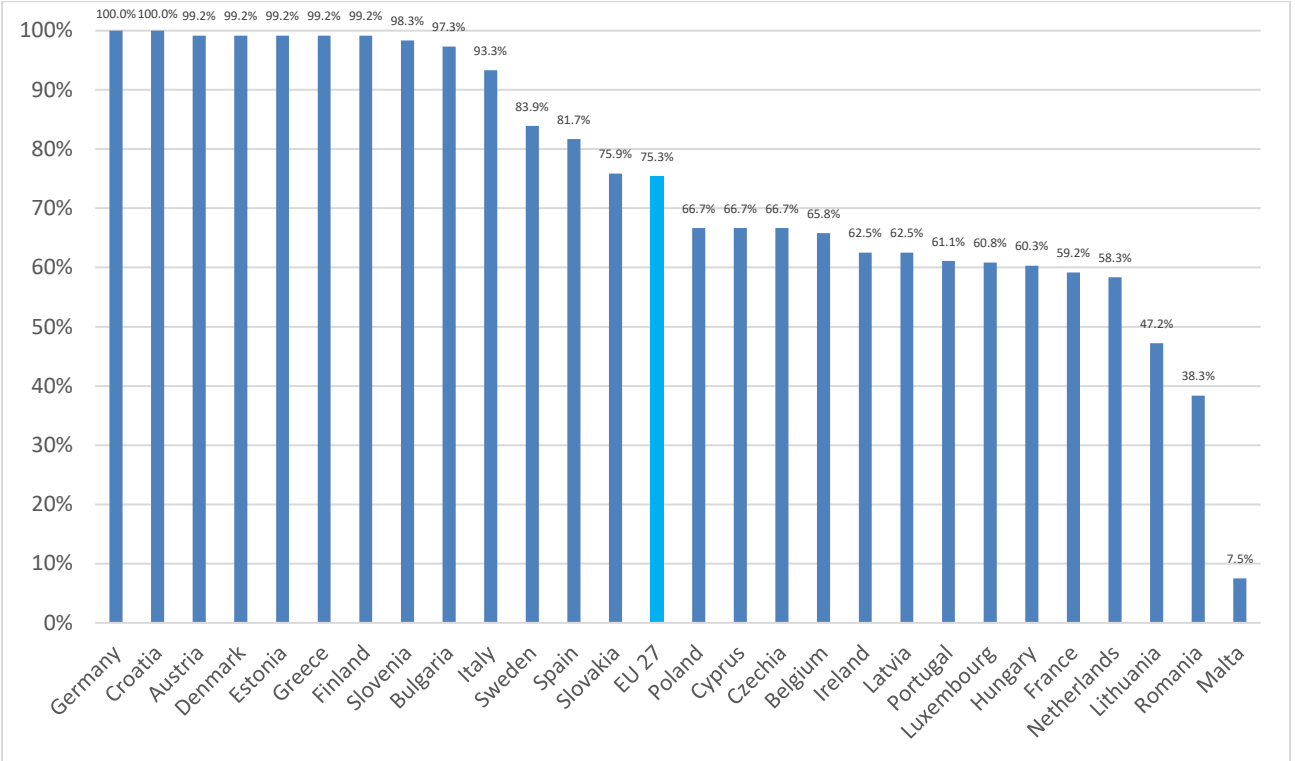
Between 2024 and 2025, the EU27 aggregate allocated 5G spectrum increased substantially from 23,130 MHz to 26,371 MHz (+14.0%). Over the same period, the share of harmonised spectrum assigned rose only marginally from 73.4% to 75.3% (+2.6 pp).

This points to continued progress in spectrum release and assignment across the EU in 2025, although the improvement in harmonised assignment remains moderate relative to the large increase in total allocated spectrum. In other words, **Member States have continued to add spectrum resources, but full harmonisation remains incomplete at EU level.**

A number of Member States are effectively at full or near-full assignment of harmonised 5G spectrum: Germany, Croatia, Austria, Denmark, Estonia, Greece, Finland, Slovenia and Bulgaria. Overall, about half of EU Member States are above the EU27 average of 75.3%, whereas the other half falls below. The gap is pronounced between the seven Member States above 97.0% and Lithuania, Romania and Malta (below 50.0%).

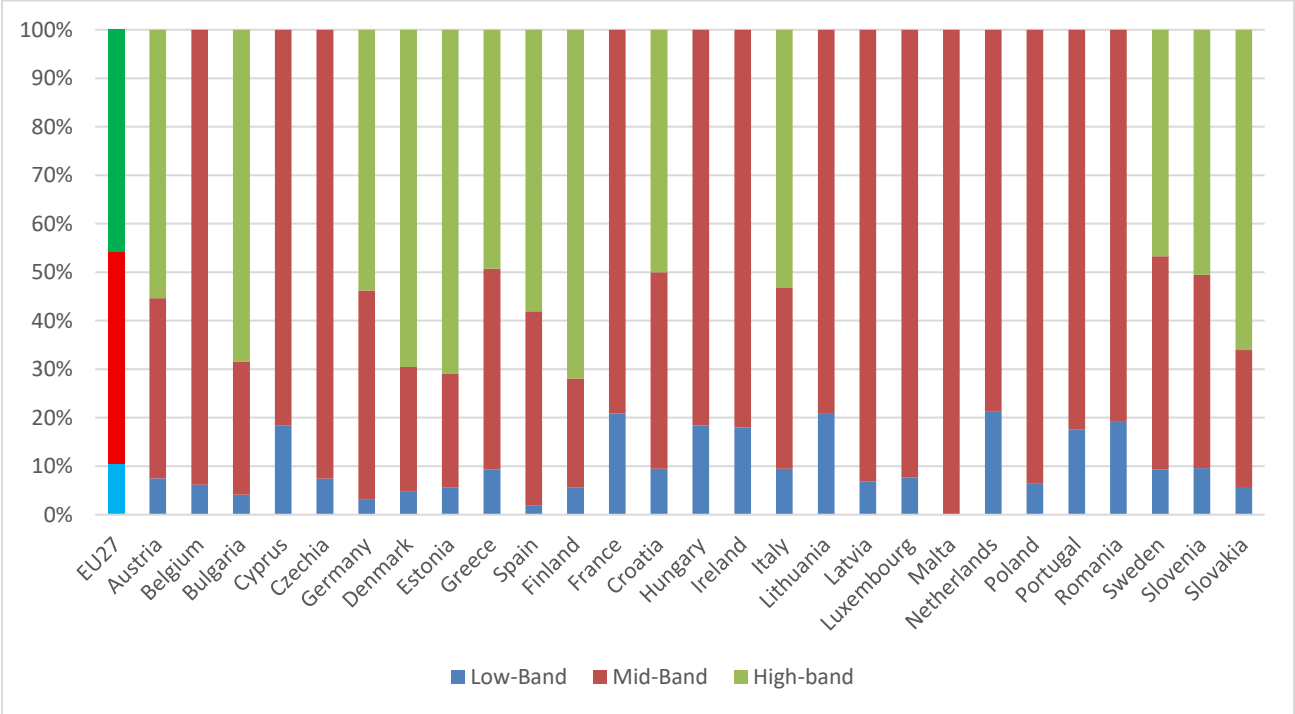
While most EU countries have comparable levels of low- and mid-band spectrum, high-band spectrum allocation is most uneven across the EU.

Figure 35: Harmonised 5G spectrum across Member States



Source: Interviews for Bulgaria, Germany, Spain, Croatia, Malta, Poland, and Slovakia. IDATE estimates

Figure 36: Authorised 5G spectrum per band across Member States



Source: Interviews for: Austria, Belgium, Bulgaria, Cyprus, Czechia, Germany, Greece, Spain, France, Croatia, Ireland, Latvia, Luxembourg, Malta, Poland, and Slovakia. Regulators. Spectrum Tracker.

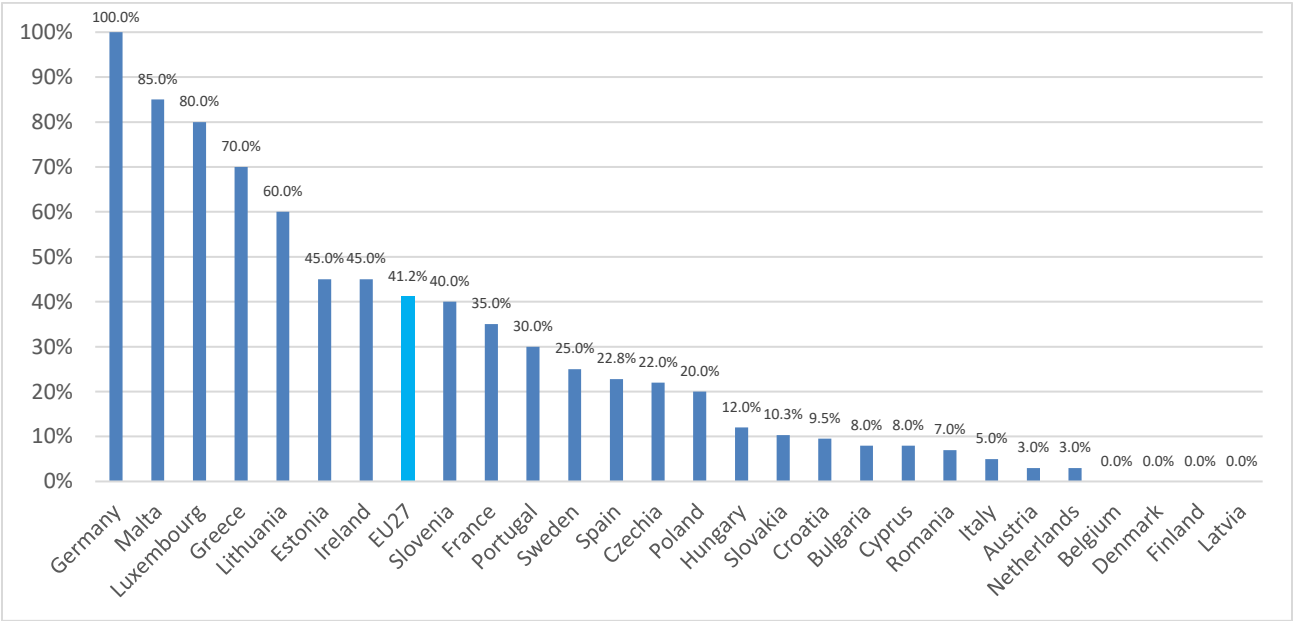
Low-band spectrum (Sub-1 GHz): Most EU countries have allocated around 180–190 MHz in the low-band, with the exception of Portugal (171.6 MHz) and Romania (160 MHz) at the lower end. Lithuania (177.2 MHz) and Latvia (80 MHz) also have below-average allocations. Several countries (Belgium, Bulgaria, Czechia, Luxembourg) have only 60 MHz in the low-band, which is notably limited.

Mid-band spectrum (1–6 GHz): Allocations in the mid-band show more disparity: Denmark (1,050 MHz), Spain (1,240 MHz), Germany (800 MHz), and Latvia (1,080 MHz) are leaders, offering substantial mid-band resources. Most countries are clustered between 700 and 900 MHz. Lithuania (669.2 MHz), France (718.4 MHz), and Romania (669.4 MHz) are at the lower end, suggesting less mid-band capacity. Countries such as Cyprus, Czechia, and Estonia also allocate close to 800 MHz, which is slightly above the median.

High-band spectrum (mmWave): High-band allocations remain even more unevenly distributed across the EU, with a few notable exceptions: Denmark stands out with a leading 2,850 MHz. Finland and Estonia both have substantial high-band allocations (2,400 MHz), followed by Slovakia (2,200 MHz) and Germany (1,000 MHz). Belgium, Bulgaria, Greece, Croatia, Hungary, Italy, Portugal, Romania, Slovenia, and Sweden, have allocated 1,000 MHz or less. A significant number of Member States (e.g., Austria, Cyprus, France, Ireland, Luxembourg, Malta, Netherlands, Poland, Lithuania, Latvia) have not allocated high-band spectrum.

5G NSA has sometimes been deployed through Dynamic Spectrum Sharing (DSS). DSS accelerates the deployment of 5G, particularly in the 700 MHz band, by enabling operators to upgrade their existing base stations without disrupting service for 4G users. The DSS uptake across the EU27 countries (41.2% weighted average) reveals significant variation in deployment strategies and technological adoption.

Figure 37: Share of DSS in 5G NSA networks across Member States



Source: Interviews Belgium, Germany, Spain, Croatia, Italy, Latvia, Slovakia. IDATE estimates.

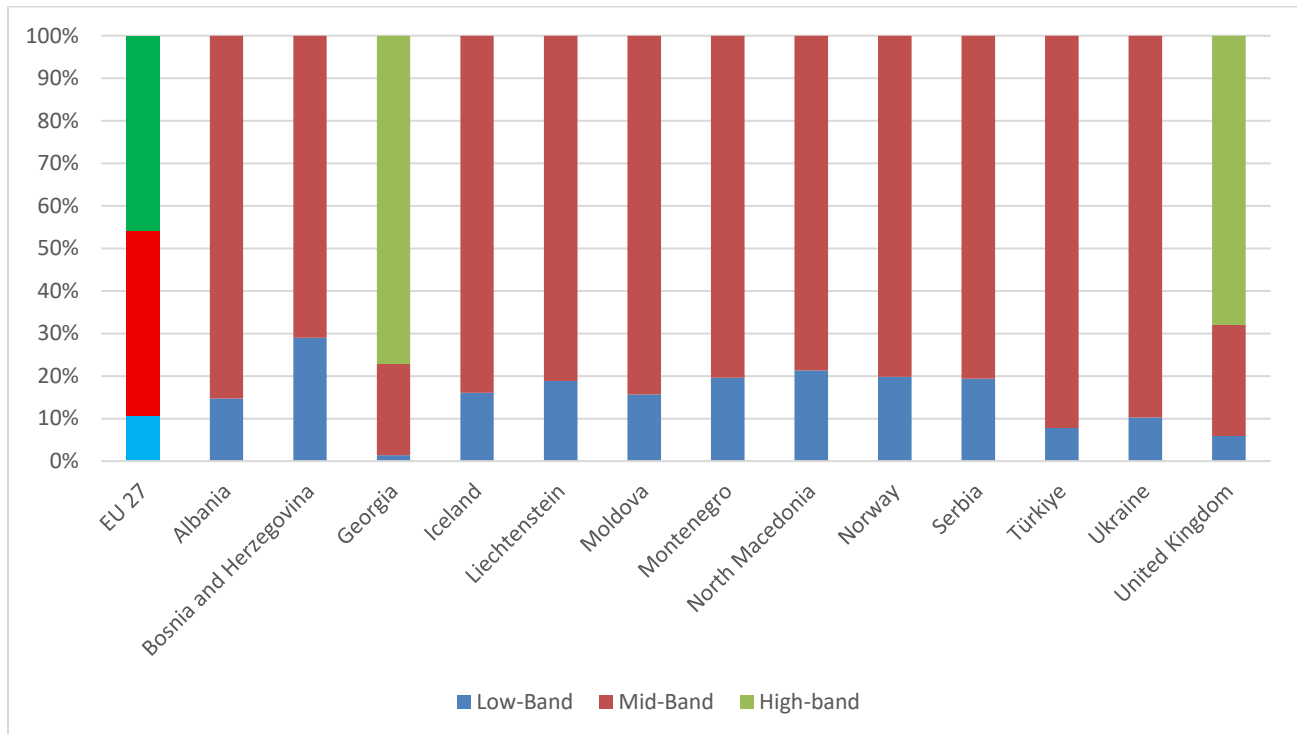
Some Member States (notably Germany, but also Malta, Luxembourg, Greece and Lithuania) rely up to more than 50% on DSS (even 100.0% in the case of Germany). Another set of Member States, including Italy (5.0%), Austria (3.0%), and the Netherlands (3.0%), show minimal DSS deployment. Notably, Belgium, Denmark, Finland, and Latvia report zero adoption, which reflect a preference for dedicated 5G spectrum.

4.5.2 In neighbouring markets

Among the neighbouring non-EU markets, the UK and Norway are the most relevant to compare with the EU. The UK increased allocated 5G spectrum from 1,051.9 MHz in 2024 to 2,870 MHz in 2025. DSS deployment stands at 35.0%. Relative to the EU27, the UK appears to combine substantial spectrum release with a significant use of DSS. Norway increased allocated spectrum from 540 MHz to 947.8 MHz between 2024 and 2025. DSS deployment is 0.0%, i.e. Norway appears to rely more on direct assigned spectrum than DSS.

There are notable disparities in the use of low-band, mid-band, and high-band frequencies between the EU27 and its neighbouring markets.

Figure 38: Authorised 5G spectrum per band across neighbouring markets



Source: Regulators, Spectrum Tracker

Low-band spectrum (sub-1GHz). Several neighbouring markets are competitive with EU averages in low- and mid-band allocations. Montenegro (190 MHz), Liechtenstein (190 MHz), Serbia (180 MHz), and the UK (209.6 MHz) are broadly in line with the EU27 average in the low-band spectrum.

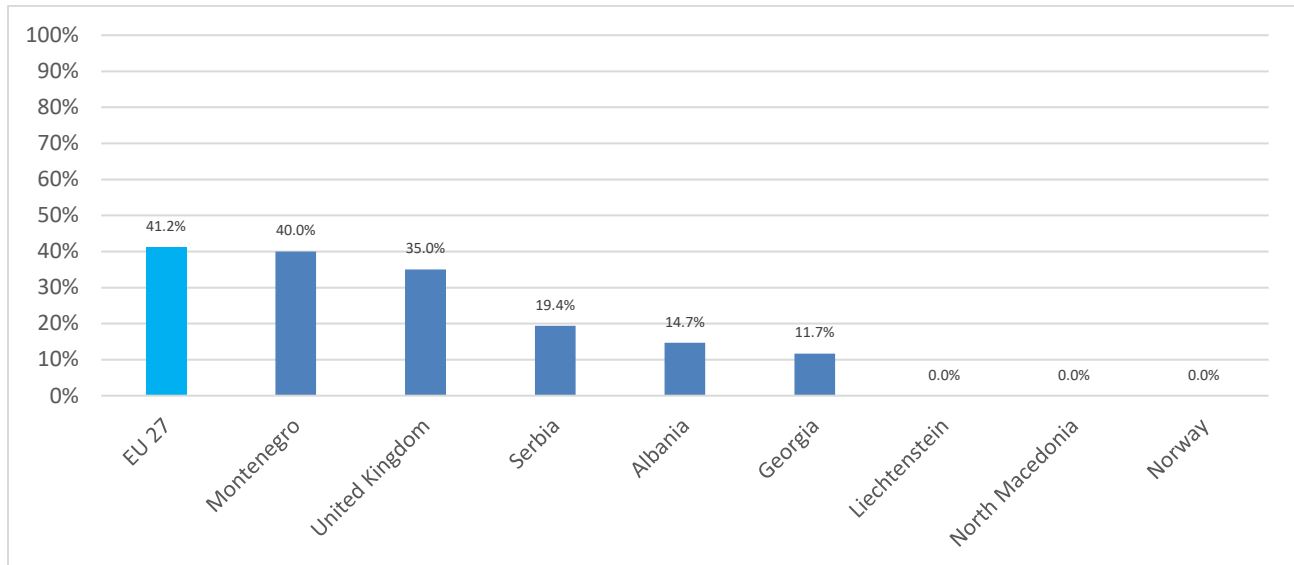
Mid-band spectrum (1-6 GHz). The UK (922.3 MHz), Georgia (900 MHz), and Liechtenstein (818.4 MHz) exceed or match the EU27 average, but the other analysed neighbouring markets fall short in mid-band spectrum.

High-band spectrum (mmWave). Only Georgia and the UK have made significant strides in high-band spectrum, while the rest of the region lags considerably behind.

Overall, most neighbouring markets show lower DSS adoption rates compared to the EU27 (41.2% weighted average), although Montenegro and the UK stand out for their relatively high uptake (with the UK being on par with France in the EU). The pattern largely mirrors the diversity found within the EU27, reflecting a mix

of strategies, with some relying more on DSS and others (like Norway) not at all.

Figure 39: Share of DSS in 5G NSA networks across neighbouring markets



Source: Interviews Georgia, Liechtenstein, North Macedonia, and Norway. IDATE estimates. Data is missing for Iceland and Moldova. Bosnia and Herzegovina, Türkiye, and Ukraine have yet to launch 5G.

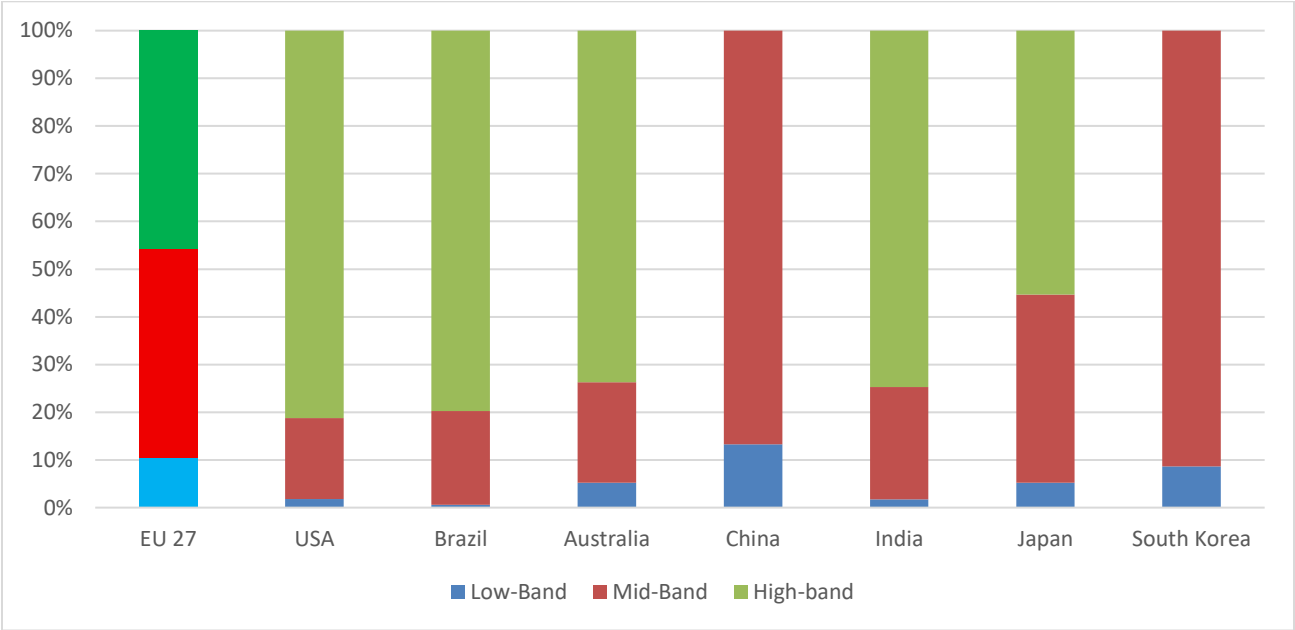
4.5.3 In international comparison markets

In terms of allocated spectrum and DSS deployment, the picture in the international comparison markets looks as follows:

- The US reports 3,940 MHz of allocated 5G spectrum, with DSS deployment at 10.0%.
- China increased the allocated spectrum from 887 MHz to 992 MHz, with 14.0% DSS. Compared with the EU27, China appears less dependent on DSS than some European markets.
- India reports 3,480 MHz in both 2024 and 2025, with 5.0% DSS. Relative to the EU27, India combines a very large spectrum portfolio with limited reliance on DSS.
- Japan increased allocated 5G spectrum from 2,160 MHz to 2,890 MHz, with 27.0% DSS.
- South Korea increased allocated spectrum from 400 MHz to 810 MHz, with 4.0% DSS.
- Australia increased allocated spectrum slightly from 3,172 MHz to 3,255.5 MHz, with 40.0% DSS.
- Brazil remained stable at 3,260 MHz in both years 2024 and 2025, with 4.9% DSS.

EU27 consistently leads in spectrum availability across all bands, especially in mid- and high-band, which are critical for 5G performance and future scalability. The US shows strength in high-band spectrum but is markedly behind in the low and mid-band. Japan has relatively balanced allocations but at much lower levels than the EU, particularly in the high band. China and South Korea are strong in mid-band spectrum but lack high-band allocations. Brazil and India have made progress in high-band spectrum but remain limited in low- and mid-band. Finally, Australia is relatively balanced, with allocations in all bands, but still at a much lower level than the EU.

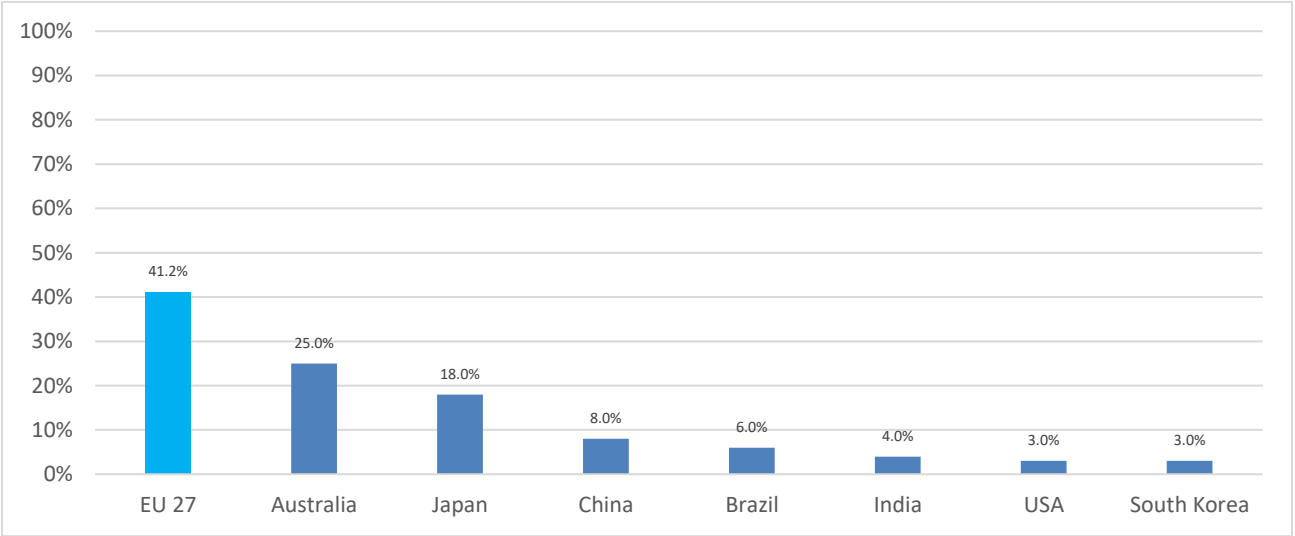
Figure 40: Authorised 5G spectrum per band across international comparison markets



Source: Regulators, Spectrum Tracker

Overall, the mixed picture regarding DSS deployment in the EU is also reflected in international comparison markets, with most of them, however, relying way less on DSS than the EU27 (41.2%) and continuing NSA deployment solely based on 5G-native networks.

Figure 41: Share of DSS in 5G NSA networks across international comparison markets



Source: IDATE estimates.

4.6 Take-up

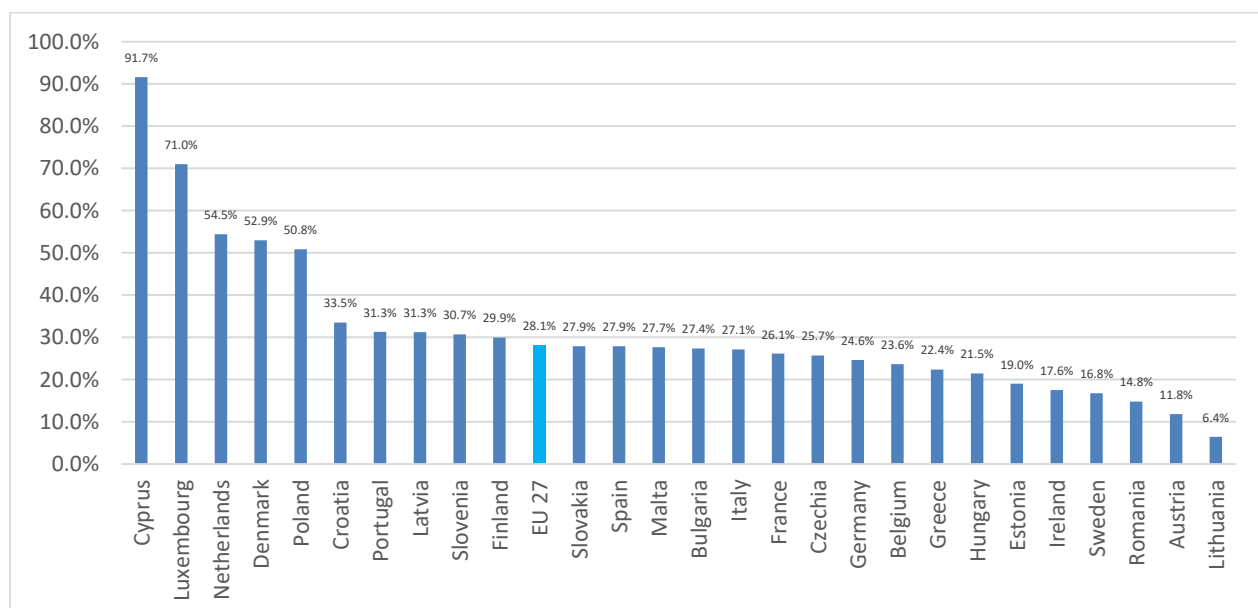
Key findings

- 5G adoption across the EU27 remains highly uneven, with an average of just 28.1% of SIM cards being 5G-enabled. Cyprus leads by a considerable margin at 91.4%, followed by Luxembourg, the Netherlands, Denmark, and Poland, all with over half of SIM cards on 5G. By contrast, Austria and Lithuania lag significantly behind, suggesting slower network roll-out or barriers to adoption.
- Major Member States such as Germany, France, Italy, and Spain are close to the EU average, indicating a more gradual approach to 5G migration in these markets. Several other countries, including Finland, Croatia, Latvia, Portugal, Slovenia, Spain, and Malta, demonstrate steady but unremarkable progress, while Greece, Hungary, Estonia, Sweden, Ireland, and Romania continue to show below-average adoption rates.
- Marked disparities in 5G SIM penetration are evident across the EU, with smaller markets achieving the highest take-up, likely due to targeted regulatory measures or aggressive operator strategies. In contrast, slower progress in certain countries may be attributed to consumer hesitation, market conservatism, or structural constraints.
- Internationally, the EU27 average is outpaced by leading markets such as the US, Australia, Japan, South Korea, and China, highlighting the need for accelerated 5G roll-out and adoption within the EU. Policymakers and operators in lagging countries may need to address structural or regulatory challenges to ensure more consistent 5G take-up across the EU.

4.6.1 In the EU

The adoption of 5G technology across the European Union displays significant variation, as reflected in the share of 5G SIM cards among total SIM cards in each Member State. The EU27 average stands at 28.1%, indicating that just over a quarter of all SIM cards are 5G-enabled.

Figure 42: 5G SIM cards (as a share of total SIM cards) across Member States



Source: IDATE estimates, based on Connectivity Coverage in Europe 2025 Report.

Leaders in 5G take-up: A small number of countries are clear frontrunners. Cyprus stands out with an exceptionally high 5G SIM card share of 91.4%, far surpassing all other Member States and suggesting either a rapid transition to 5G services or unique market dynamics. Luxembourg (71.0%), the Netherlands (54.5%), Denmark (52.9%), and Poland (50.8%) also report notably high take-up rates, each with more than half of their SIM cards being 5G-enabled. These countries demonstrate robust market appetite and/or effective operator strategies for 5G migration.

Above-average adopters: Countries such as Finland (29.9%), Croatia (33.5%), Latvia (31.2%), Portugal (31.3%), Slovenia (30.7%), Spain (27.9%), Malta (27.7%), Bulgaria (27.4%), Italy (27.1%), France (26.0%), Czechia (25.7%), Germany (24.6%), and Belgium (23.7%) cluster around or just above the EU average, signalling steady but not significant progress in 5G adoption.

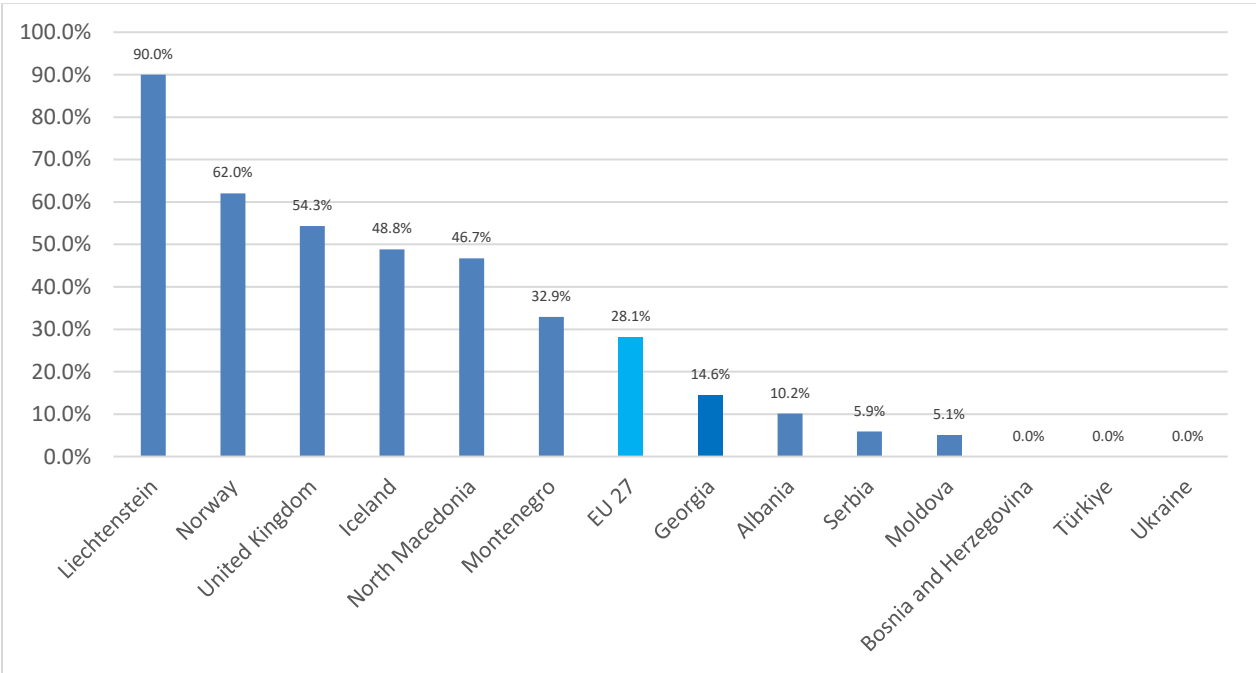
Below average adopters: Greece (22.5%), Hungary (21.5%), Estonia (19.0%), Sweden (16.8%), Ireland (17.6%), and Romania (14.8%) remain below the EU average, highlighting slower migration to 5G, with Lithuania (6.4%) at the bottom of the list. The reasons for these results may be diverse, spanning from market conservatism, slower network roll-out, differing consumer demand, or structural market barriers.

4.6.2 In neighbouring markets

Several neighbouring markets exceed the EU27 average for 5G SIM penetration:

- Liechtenstein demonstrates an exceptionally high take-up at 90.0%, far surpassing both the EU27 and other neighbours.
- Norway also shows strong 5G adoption with 62.0% of SIM cards being 5G-enabled.
- The UK reports a 5G SIM share of 54.3%, and Iceland follows with 48.8%.
- North Macedonia (46.7%) and Montenegro (32.9%) also exceed the EU27 average, indicating robust 5G migration.

Figure 43: 5G SIM cards (as a share of total SIM cards) across neighbouring markets



Source: IDATE estimates. Based on Connectivity Coverage in Europe 2025 Report for EU27.

Bosnia and Herzegovina, Türkiye, and Ukraine have yet to launch 5G.

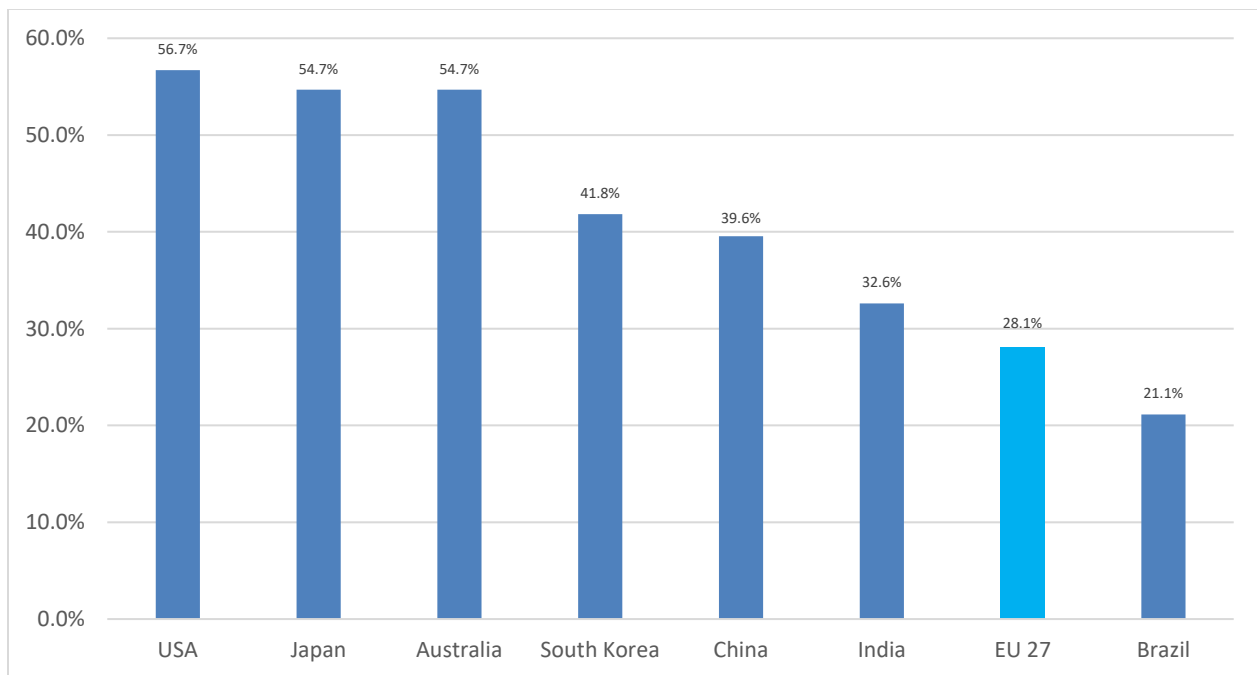
Georgia (14.6%), Albania (10.2%), Serbia (5.9%), and Moldova (5.1%) all fall well below the EU27 average, suggesting slower 5G adoption and possible market or regulatory barriers. It is worth reiterating that Serbia launched 5G (NSA) only in 2025.

4.6.3 In international comparison markets

The EU27 average lags behind most major international comparison markets, underlining the need for further acceleration in 5G deployment and consumer migration within the European Union.

Advanced economies such as the US, Australia, Japan, South Korea, and China have established themselves as leaders in 5G adoption, with shares well above the EU27 average.

Figure 44: 5G SIM cards (as a share of total SIM cards) across international comparison markets



Source: IDATE estimates. Based on Connectivity Coverage in Europe 2025 Report for EU27

The US leads among the selected comparison markets, with 56.7% of SIM cards being 5G-enabled (more than double the EU27 average of 28.1%). Australia (54.7%) and Japan (54.7%) also demonstrate significantly higher adoption rates, reflecting strong consumer take-up.

South Korea and China record similar shares (41.8% and 39.6% respectively), both still well above the EU27 average. India's 5G take-up, while still developing, is marginally higher than the EU27 level, indicating rapid progress in recent months. Brazil is the only country in this international comparison set with a lower 5G SIM penetration (21.1%) than the EU27 average, which corresponds to its slower 5G roll-out figures above.

5. Spectrum-specific analysis

Key findings

- Allocating larger, contiguous blocks of spectrum, especially in the mid-band, directly results in faster and broader 5G deployment. Countries that have awarded more spectrum (e.g. Denmark, Estonia, Finland, Spain) have seen higher and quicker 5G take-up, while those with smaller allocations (e.g. Romania, Lithuania, Cyprus) have experienced slower progress. This trend is mirrored globally, where the US, Australia, and Japan, with extensive allocations, lead in 5G adoption.
- Faster spectrum assignment leads to quicker 5G roll-out and coverage, as seen in several EU countries (e.g. Germany, France, Czechia, Greece, and the Netherlands) and even more so where centralised models are used (e.g. China and South Korea). Slower assignment results in delayed deployment (e.g. Ireland and Finland).
- Dynamic Spectrum Sharing (DSS) enabled early 5G launch in the EU by sharing LTE spectrum, especially in Germany, Greece, and France, but delivers lower performance than dedicated 5G bands. As a result, it is being phased out in favour of higher-capacity standalone 5G networks.
- Regulatory approaches vary internationally. Non-EU countries like China use administrative assignment, accelerating deployment but foregoing auction revenues. The EU and most Western markets favour auctions, which provide transparency and public returns but can delay spectrum release.
- The EU's harmonised approach to spectrum allocation has facilitated cross-border interoperability and economies of scale for device manufacturers. By 2025, most Member States had almost completed assigning harmonised 5G bands, though some faced delays due to auctions. Overall, the coordinated EU framework has enabled wide coverage and spectrum availability, effectively balancing interoperability and timely rollout.

Spectrum policy is a fundamental determinant of the pace and quality of 5G deployment. Efficient assignment of radio spectrum influences not only how quickly networks can be deployed, but also how effectively operators can deliver capacity, coverage and advanced services. The data covering 2024 and 2025 enables a comparison of spectrum assignment practices across EU27 Member States and non-EU markets, using indicators such as:

- total 5G spectrum assigned (MHz),
- share of harmonised spectrum assigned,
- Dynamic Spectrum Sharing (DSS) deployment.

The evidence suggests five principal conclusions concerning the relationship between spectrum policy and deployment outcomes.

5.1 Spectrum availability is a fundamental prerequisite for deployment

The first finding is that the quantity of spectrum assigned to operators strongly influences the scale and capacity of 5G deployment. Markets that allocate large contiguous spectrum blocks, particularly in the mid-band range (3.4–3.8 GHz), generally achieve faster rollout and stronger adoption.

Within the EU27, most Member States have assigned a substantial share of the harmonised 5G spectrum bands. By Q4 2025, the EU aggregate shows 75.3% of harmonised spectrum assigned, compared with 73.4% in 2024. This reflects continued progress in implementing the EU's coordinated spectrum roadmap.

Several Member States have assigned particularly large spectrum resources:

- Denmark increased assigned 5G spectrum from 1450 MHz in 2024 to 4100 MHz in 2025, among the highest in the EU.
- Estonia increased assignments from 1450 MHz to 3387 MHz.
- Finland expanded assignments from 1450 MHz to 3336 MHz.
- Spain increased assignments from 1440 MHz to 2640 MHz.

These countries generally also report strong infrastructure development and high levels of 5G adoption.

In contrast, Member States with more limited allocations often exhibit slower development of mid-band coverage. For example:

- Romania assigned 829 MHz by 2025,
- Lithuania assigned 846 MHz, and
- Cyprus assigned 1022.6 MHz.

These countries also show relatively lower 5G SIM penetration or slower migration to mid-band networks.

The same relationship is visible in several non-EU markets. For example:

- the US has assigned approximately 3940 MHz of spectrum for 5G,
- Australia approximately 3255 MHz,
- Japan approximately 2890 MHz, and
- China approximately 992 MHz.

These markets are also among those with the highest levels of 5G adoption. For instance, in 2025 the data indicates:

- China: 5G SIM penetration of all SIM cards of 39.6%,
- US: 56.7%,
- Japan: 54.1%.

The data therefore supports the conclusion that sufficient spectrum availability is a necessary condition for large-scale deployment, although it does not by itself guarantee rapid adoption.

5.2 Assignment speed influences early network availability

A second finding concerns the speed of spectrum assignment. Markets that assign spectrum quickly tend to achieve earlier commercial deployment and faster coverage expansion.

Within the EU27, most spectrum assignments occurred relatively quickly once regulatory decisions were taken. Several countries report time-to-market figures of around one month, including:

- Germany
- France
- Czechia
- Greece
- Netherlands

These markets are also among the most advanced in terms of network rollout and availability. For example:

- Germany has assigned 2000 MHz of 5G spectrum overall, with very extensive infrastructure and widespread standalone deployment.
- France reports 910 MHz assigned, combined with a declining level of DSS deployment (25.0%) and strong coverage expansion.

By contrast, some Member States experienced longer assignment timelines. For example:

- Ireland required approximately 22 months between regulatory decision and assignment.
- Finland required 9 months.
- Denmark required 5 months.

While these markets have eventually achieved strong rollout outcomes, their early deployment phases progressed more gradually.

Outside the EU, several markets have pursued faster and/or more centralised assignment models. For instance:

- the US typically completes spectrum auctions within a few months, with a five-month allocation delay between auction and commercial launch;
- China uses administrative assignment rather than auctions, enabling coordinated national rollout;
- South Korea and Japan also implemented early spectrum assignments in advance of large-scale commercial launches.

The experience of these countries demonstrates that rapid spectrum assignment can accelerate early deployment, although other factors such as investment capacity and regulatory conditions also play an important role.

5.3 Different assignment models in the world

The fourth finding concerns the regulatory model used for spectrum assignment. Some non-EU markets rely on administrative assignment rather than auctions, which has various impacts on the pace of deployment.

A notable example is China, where the government assigns spectrum directly to operators without auction processes, based on a highly centralised nationwide deployment. By 2025, China had assigned approximately 992 MHz of spectrum for 5G.

Similarly, South Korea and Japan assigned spectrum early and imposed clear rollout obligations on operators. Both countries have since developed some of the most advanced 5G markets globally.

In contrast, the EU and many Western markets rely on auction-based assignment systems, which can introduce delays associated with consultation processes, legal challenges and bidding procedures. While auctions ensure transparent allocation and efficient use of public resources, they may extend the time required to release spectrum.

The data illustrates this difference through auction revenue figures. For example:

- Germany: EUR 7.88 billion
- Italy: approximately EUR 6.55 billion in spectrum auction proceeds
- France: approximately EUR 5.59 billion
- Spain: EUR 1.50 billion
- Netherlands: EUR 1.40 billion
- Sweden: EUR 1.04 billion
- US: EUR 110.12 billion

5.4 EU harmonisation improves interoperability for seamless cross-border services

The EU spectrum framework emphasises harmonisation of frequency bands across Member States, which provides important long-term advantages. Harmonisation ensures that equipment ecosystems develop efficiently and that services operate seamlessly across borders.

By 2025, most EU Member States had assigned nearly all of the harmonised 5G spectrum bands. Several countries report assignment levels close to 100%, including, in alphabetical order:

- Austria
- Croatia
- Denmark
- Estonia
- Finland

- Germany
- Greece

This coordinated approach facilitates economies of scale in device manufacturing and infrastructure deployment. However, some EU markets experienced delays or prolonged auction processes before spectrum became available to operators.

The result is a policy trade-off:

- harmonisation improves long-term interoperability and ecosystem development, but
- centralised administrative assignment can accelerate early deployment.

Despite these differences, the EU has largely succeeded in achieving both high coverage levels and broad spectrum availability by 2025, indicating that the harmonised framework has ultimately supported large-scale deployment. Looking beyond current 5G assignment strategies, spectrum sharing is expected to become a central element for the deployment of 6G, given the increasing pressure on scarce spectrum resources. In this context, more advanced and dynamic sharing mechanisms will be necessary to accommodate diverse and competing users. The DNA is inscribed in this direction, by establishing the principle of “shared use of spectrum”, aiming to maximise the efficiency of large, underused frequency bands, lower barriers to entry for new players such as industrial verticals, and ultimately accelerate investment and deployment across the EU.

6. Policy implications for the Digital Decade review

The European Union's Digital Decade Policy Programme (DDPP) sets out a strategic framework to achieve the EU's digital objectives by 2030, covering areas such as connectivity, digital skills, business transformation, and the digitisation of public services. The Digital Decade Review is currently underway. Its purpose is to update or adjust indicators, governance mechanisms, and monitoring tools to ensure that European policies remain aligned with technological, industrial, and societal developments.

Since 2025, the 5G Observatory has been even more closely integrated within the monitoring of the Digital Decade, and provides structured data and analysis to the European Commission and stakeholders, supporting this review process, notably in the area of advanced mobile connectivity (5G/6G).

As the basic coverage indicators are getting closer to 100%, it could be useful to consider other dimensions that reflect the quality, performance, actual take-up, and technological maturity of networks (for example, 5G standalone, indoor coverage, share of usage, etc.), complemented with international benchmarking of EU with third countries and taking into account the evolution towards 6G.

In that respect, the penetration of 5G SA base stations (as a percentage of total base stations), as used for the first time in this 5G Observatory annual report, could be a relevant indicator to offer a clearer view of the shift towards advanced digital networks compared to initial non-standalone deployments. This new indicator would also serve as a proxy for network modernisation, revealing the extent to which operators are upgrading their infrastructure to support advanced use cases such as ultra-low latency, network slicing, and large-scale IoT connectivity – capabilities that are exclusive to 5G SA.

Other proxy indicators to be considered for monitoring 5G SA deployment and the path to 6G may include for instance:

- mid-band quality,
- rural quality,
- indoor performance,
- edge readiness,
- network programmability or slicing readiness (when data becomes available),
- 6G pilot ecosystem participation.

7. Focus sections

7.1 5G Private Networks

Key findings

State of play in the EU:

- Private 5G deployment is gaining momentum across the EU27, with over 689 operational networks in 2025 (on private, public and hybrid licenses), predominantly based on 5G SA architecture, led by Germany, France, and Spain, while several other Member States have smaller but growing deployments. The sector's financial outlook is strong, with operator-related revenues projected at EUR 611.00 million in 2025 and expected to reach EUR 5.10 billion by 2030, fuelled by enterprise demand and integration with managed services.
- The EU is prioritising mid-band spectrum (notably 3.4–4.2 GHz) for industrial and local private 5G applications. However, regulatory frameworks differ. Some countries offer direct local licensing to enterprises, while others rely on hybrid models, resulting in fragmented market access. The proposed Digital Networks Act (DNA) seeks to harmonise regulation and facilitate deployment, although full alignment across Member States will only materialise in the medium term.

International perspective:

- Private 5G adoption is rapidly increasing worldwide, with a growing focus on high-performance, flexible networks to support enterprise digital transformation. This trend presents significant new revenue opportunities for operators and technology providers.
- The US has seen rapid growth in private 5G through its flexible Citizens Broadband Radio Service (CBRS) model (3.5 GHz band), while China leads globally in private 5G deployments. Japan, South Korea and Australia have each introduced local licensing or supportive policies to encourage enterprise use. The UK has adopted a structured local access regime for 5G private networks in the 3.8–4.2 GHz band, with additional allocations at 1.8 GHz and 2.3 GHz.
- Other regions, such as Brazil and India, are also progressing with private 5G rollouts, particularly in key industrial sectors.

7.1.1 Definition

A 5G Private Network, as defined by 3GPP under the term Non-Public Network (NPN), is a digital communications infrastructure deployed within a specific geographic boundary exclusively for a single organisation. These networks deliver secure, high-performance, and fully controlled connectivity, supporting mission-critical operations in environments where resilience, predictability, and data sovereignty are essential, such as industrial sites, ports, hospitals, or government campuses.

Architecture and operation

A private 5G network integrates multiple functional domains, Radio Access Network (RAN), transport, core network, data centre, and application layers, into a unified, operational environment. Increasingly, these networks are based on virtualised (VNF) and cloud-native (CNF) architectures, aligning with the broader industry shift towards software-defined and programmable infrastructures. This foundation facilitates integration with industrial cloud solutions, edge computing, and AI-driven operations.

Automation and orchestration are central to private 5G, enabling dynamic creation and lifecycle management of network slices, centralised service assurance across multiple domains, and rapid adaptation to evolving business requirements. Alignment with Service Management and Orchestration (SMO) frameworks supports unified governance, minimises fragmentation, and enhances long-term sustainability.

Overview of deployment models

Private 5G networks may be deployed in several models, each offering varying degrees of control, ownership, and integration. The main deployment models are summarised below:

- **Standalone Non-Public Network (SNPN):** Fully private model in which the organisation owns or operates the entire stack (RAN, core, OAM (Operations, Administration, Maintenance), spectrum). It provides maximum control, data sovereignty and predictable performance but requires high CAPEX and in-house expertise. It is commonly adopted in Industry 4.0 environments, port operations, military facilities and other highly sensitive sites⁵⁸.
- **Public Network Integrated NPN (PNI-NPN):** Integrated model using operator spectrum and infrastructure. It may rely on network slicing or shared core with local user-plane functions. This model reduces deployment cost and simplifies operations but creates dependency on the operator and enables seamless mobility outside the organisation's site through native roaming on the public network⁵⁹.
- **Hybrid / Campus Models:** Combination of private and public components (e.g. private RAN with operator core, or local core with shared RAN). These models offer a gradual migration path from Wi-Fi or 4G and balance control with operational simplicity. They are common in industrial campuses, hospitals and logistics hubs⁶⁰.

The selection of a deployment model determines ownership, governance, lifecycle responsibilities, and supplier dependency.

⁵⁸ Examples include [Airbus private 5G network deployment](#) (Germany & France) to support digitalisation in manufacturing, including automation, traceability of parts, simulation tools and real-time data services, or [Frankfurt Airport private 5G campus network](#) (Germany) to support applications such as autonomous ground vehicles, real-time IoT sensor monitoring, and drone surveillance, all operated independently of public mobile networks.

⁵⁹ Examples include [Universidade de Vigo \(Spain\) where a dedicated 5G slice was created](#) on Telefónica's network to support critical services such as remote-controlled robotics for surveillance tasks.

⁶⁰ Examples include the [Oulu University Hospital, 5G campus connectivity](#) has been implemented with Finnish operator Elisa for wireless medical devices, remote diagnosis and monitoring, and augmented reality-assisted procedures, or the [Sandvik test mine in Tampere, Finland, where 5G connectivity](#) has been deployed in cooperation with Finnish operator Telia Finland for autonomous drilling systems, remote-controlled mining equipment and real-time telemetry and predictive maintenance.

Table 4: Description of the different types of 5G Private Networks deployment models

Criteria	SNPN (Fully Private)	Hybrid / Campus	PNI-NPN (Integrated)	Virtual Slice (Fully Managed)
Autonomy level	Maximum	Medium-High	Medium	Low
RAN ownership	Enterprise	Enterprise or Shared	Operator	Operator
Core ownership	Enterprise	Enterprise or Operator	Operator / Shared	Operator
Spectrum	Dedicated	Dedicated or Operator	Operator	Operator
Isolation	Fully isolated	Partial	Logical	Logical only
Data sovereignty	Very high	High	Medium	Low
CAPEX	High	Medium	Low	Very Low
Internal expertise required	High	Medium	Low	Very Low
Supplier dependency	Low	Medium	High	Very High
SLA reliance	Low	Medium	High	Very High
Mobility outside site	No native roaming	Partial	Native roaming	Native roaming
Typical use cases	Mission-critical	Industrial campus	Enterprise integration	Lightweight enterprise services

Security and data privacy

Private 5G networks are engineered for deterministic performance, strong isolation, and enhanced security. They enable guaranteed quality of service (QoS), high data rates, ultra-low latency ($\approx 1\text{ms}$), and reliability (up to 99.99% for URLLC use cases). These attributes are crucial for mission-critical and Industry 4.0 applications. Security mechanisms, as specified in 3GPP Release 16, include SIM-based authentication, end-to-end encryption, Zero Trust architectures, network segmentation, and protection of cryptographic credentials. Organisations may deploy critical functions such as User Plane Function (UPF) and Unified Data Management (UDM) on-premises for maximum confidentiality and segregation from public networks.

7.1.2 Use cases and monetisation

Private 5G networks unlock a diverse range of industrial and enterprise use cases, many of which are associated with direct and indirect monetisation opportunities.

Key use cases

- **Autonomous robotics and vehicles:** Automated Guided Vehicles (AGV/AMR), collaborative robots (cobots⁶¹), and factory automation.
- **Industrial vision and monitoring:** High-resolution video analytics, edge AI for quality control, process optimisation.
- **Mobile IoT sensors and asset tracking:** Real-time monitoring of equipment, predictive maintenance, workforce safety.
- **Enhanced worker connectivity:** Support for AR/VR, wearable devices for remote assistance and training.
- **Tactical and sensitive applications:** Defence, public safety, and critical infrastructure requiring enhanced security and isolation.

Monetisation elements

- **Operational efficiency gains:** Reduced downtime, optimised asset utilisation, and improved production yields translate into measurable cost savings and productivity improvements.
- **New revenue streams:** Enterprises can develop new digital services, such as on-site analytics, predictive maintenance, or premium connectivity packages for tenants and partners.
- **Service differentiation for operators and suppliers:** Telcos and suppliers may bundle private 5G with managed services (e.g., IoT, edge computing, security-as-a-service), capturing additional B2B value.
- **Reduced total cost of ownership:** Consolidation of legacy connectivity (Wi-Fi, wired) into a unified 5G platform can lower total cost of ownership over time.

Examples

Automotive. Automotive companies are leveraging 5G to enhance production efficiency and precision while reducing downtime through real-time monitoring.

- **Volkswagen⁶²** has partnered with Nokia to deploy a private 5G network that enables wireless data download to vehicles and connects assembly robots and tools. This provides high-bandwidth, low-latency connectivity for sensors, machinery, and vehicles, supporting remote monitoring, inspection, and diagnostics.
- **Ford⁶³** is using a private 5G network in partnership with Vodafone to improve laser welding technology for electric vehicle production. The network enhances production tolerances, reduces downtime, and minimises the need for reworking parts. HoloLens devices are employed for real-time troubleshooting.

⁶¹ Collaborative robots are industrial robots specifically designed to operate safely in direct proximity to human workers, without the need for extensive physical safety barriers.

⁶² [Nokia deploys 5G private wireless network for Volkswagen's pilot project in Germany](#)

⁶³ [Ford & 5G | 5G Customer Stories | Vodafone UK](#)

- **Mercedes-Benz**⁶⁴ has implemented a private 5G network at its "Factory 56" in collaboration with Telefónica Deutschland and Ericsson. The network links production data and tracks manufacturing processes, increasing production efficiency and precision while ensuring the security of sensitive production data.

Industrial products. Companies in this sector connect local industrial applications using 5G solutions to achieve faster, more reliable connectivity.

- **Siemens**⁶⁵ transmits the standard Profinet⁶⁶ over a private 5G network for real-time industrial applications using its Scalance 5G routers product. This centralised control system reduces energy and maintenance costs for multiple mobile participants, enabling remote monitoring and diagnostics.
- **ABB**⁶⁷ works with Ericsson to align 5G hardware and software solutions, enabling seamless interactions between robots and factory machines. The deployment provides reliable connectivity for industrial devices, strengthens connected services, enhances workplace safety, and reduces energy consumption.
- **Schneider Electric**⁶⁸ collaborates with NTT to deploy on-site private 5G networks in US factories, leveraging IoT connectivity and predictive analytics. This approach addresses challenges in equipment availability, machine performance, and product quality while achieving energy efficiency goals.

Chemicals and advanced materials. Chemical companies deploy private 5G networks to enhance on-site data transfer, as well as remote monitoring and maintenance activities.

- **Albemarle**⁶⁹ has partnered with NTT to deploy a private 5G/LTE network in a lithium mine in North Carolina. The network supports digital transformation in critical environments, facilitates hybrid work, and reduces travel through remote assistance capabilities.
- **BASF**⁷⁰ worked with Cellnex Telecom, Masmóvil, Nokia, and Lenovo to install the first private 5G network in the Spanish chemical industry. The deployment provides high-bandwidth connectivity for on-site applications such as IoT, big data, virtual and augmented reality, and artificial intelligence.

Transports and logistics. Transport companies exploit 5G's high bandwidth and low latency to improve operational efficiency and enhance customer experience.

- **Lufthansa Technik**⁷¹ implemented, in partnership with Nokia, two private 5G wireless networks to test innovation projects, including collaborative engine part inspections via high-definition video links. This allows customers to participate remotely, eliminating the need for travel.
- **Belfast Harbour**⁷² collaborated with BT to build the first private 5G network for ports in the UK and Ireland, accelerating the port's digital transformation. The network enables real-time virtual presentations and training through 5G-enabled virtual reality.

⁶⁴ [Mercedes-Benz Cars opens "Factory 56": Production facilities are connected in real time via o2 5G campus network](#)

⁶⁵ [Press Release: Real-time communication via 5G with Profinet](#)

⁶⁶ Profinet is an industrial communication standard based on Ethernet that enables real-time data exchange between automation controllers, sensors, actuators, and industrial equipment in manufacturing and process environments.

⁶⁷ [Ericsson and ABB envision intelligent industrial automation](#)

⁶⁸ [NTT DATA and Schneider Electric join forces to drive AI innovation at the edge | NTT DATA](#)

⁶⁹ [NTT DATA partners with Albemarle to deploy a private LTE/5G Network | NTT DATA](#)

⁷⁰ [Cellnex Telecom and Nokia sign an alliance to install the first private network based on Nokia's 5G technology for chemical industry | Nokia.com](#)

⁷¹ [Nokia 5G private wireless networking moves from trial to permanent deployment for Lufthansa Technik](#)

⁷² [BT and Belfast Harbour partner to build the UK and Ireland's first 5G private network for ports - Belfast Harbour](#)

7.1.3 State of 5G Private Networks in the EU

Regulatory and Policy Context

Within the EU-27, the regulatory approach is progressively favouring the reservation of mid-band spectrum (particularly 3.4–4.2 GHz) for industrial and local uses, albeit with nationally differentiated models. Germany, France, the Netherlands, and Sweden have prioritised local licensing. Other Member States use hybrid/operator-mediated models, such as Denmark's requirement for operators to lease spectrum to non-telecoms, and temporary licensing in Belgium.

The lack of full harmonisation has led to varied access conditions and regulatory fragmentation. As discussed above, the proposed Digital Networks Act (DNA) aims to enhance cross-border consistency and reduce deployment complexity but does not yet deliver a fully harmonised regime.

Market development

Across the EU27, over 689 private 5G networks are in operation, with the majority focusing on 5G standalone architecture.

- **Germany:** Leading with 500+ deployments by end-2025, driven by proactive local licensing. Deutsche Telekom holds significant market share.
- **France:** 65 private 5G networks (May 2025, ARCEP).
- **Spain:** 32 networks.
- **Other EU States:** Austria, Belgium, Greece, Finland, and Sweden each have 5–10 networks deployed.

Market Size and Growth

Private 5G in Europe generated EUR 611.00 million⁷³ in operator-related revenues in 2025, up 70% year-on-year. Market value is projected to reach EUR 5.10 billion by 2030 (CAGR: 54%), reflecting both growing enterprise demand and the integration of private 5G into broader managed service offerings.

7.1.4 State of 5G Private Networks outside the EU

United Kingdom

The UK has developed a structured local access regime centred on the 3.8–4.2 GHz band, with additional allocations at 1.8 GHz and 2.3 GHz. Although no longer an EU member, the UK's approach closely mirrors continental models, supporting both industrial and campus deployments. The UK indicates 110 5G private networks at the end of 2025.

United States

The US has over 2,689 private 5G networks in operation. The unique shared spectrum framework (CBRS, 3.5 GHz) enables enterprises to deploy private networks without exclusive licences, fostering rapid market-driven deployment and the emergence of the "neutral host" model.

⁷³ IDATE estimates (provided for the European Commission 5G Smart Communities project)

Asia-Pacific

- **China:** Global leader, with over 67,000 private 5G networks, mainly hybrid models using public spectrum, with some large industrial sites allocated dedicated spectrum.
- **Japan:** Early mover, issuing local 5G licences (including mmWave) since 2019 under favourable terms. Around 130 networks deployed.
- **South Korea:** Over 200 networks, supported by proactive industrial policy.
- **Australia:** Area-wide licences in 3.8 GHz and 26 GHz available for private use.

Other Regions

- **Brazil:** Dozens of licences for private 5G/LTE issued as part of wider 5G spectrum auctions.
- **India:** Commercial private 5G deployments are emerging, typically for enterprise or sector-specific use (e.g., Bharti Airtel at Bosch, BSNL for Numaligarh Refinery).

Global Trends

Worldwide, more than 60,000 organisations have deployed 5G Private Networks, with adoption accelerating and an increasing share of deployments using 5G standalone architectures. Private 5G is becoming a significant, fast-growing segment of the enterprise connectivity market, with substantial new revenue opportunities for both operators and technology providers.

7.2 6G

Key findings

Strategic evolution and technology pillars. 6G aims to unify communications, computing, sensing and AI, supporting advanced real-time applications. It is still in early development, with commercial launch expected after 2030, driven by demand for enhanced digital capabilities.

Standardisation and spectrum challenges. 6G standardisation is advancing internationally, with core specifications expected by 2028. However, unresolved spectrum harmonisation may lead to national and regional differences in spectrum use and radio technology.

Research and innovation initiatives. The EU's principal 6G programme, the SNS Joint Undertaking oversees research and standardisation with over EUR 1.80 billion in public and private funding and a broad focus, including sustainability. Several Member States have also launched major initiatives targeting industrial and ecosystem development (e.g. Finland, Germany, France).

International developments. Major global economies are investing heavily in 6G R&D, aiming for leadership in standards, intellectual property, and future deployments. Initiatives include China's IMT-2030 Group, Japan's Beyond 5G Promotion Consortium, South Korea's K-Network 2030, India's Bharat 6G Mission, Brazil's Brasil6G, and the US-led Next G Alliance.

Policy and regulatory trends. 6G development is shaped by heightened geopolitical competition, with an emphasis on digital sovereignty, security, and supply-chain control. While a global baseline standard is likely, regional variations in spectrum, security, cloud architecture, and sector-specific requirements are expected to grow, driven by divergent policy and industrial strategies.

Outlook for industry. From 2026 to 2030, industry priorities will shift to large-scale trials and integration, especially for industrial and enterprise use. Key technologies such as sub-THz radio and AI-driven networks will mature, with a strong emphasis on sustainability and resilient supply chains. To remain competitive across the entire technology stack, the EU must overcome challenges, notably in cloud computing and semiconductor dependence.

7.2.1 Strategic evolution of 6G

Technology pillars

The transition from 5G to 6G represents a structural transformation of the digital infrastructure underpinning economies and societies, rather than a generational upgrade. While 5G expanded performance parameters in bandwidth, latency and device density, 6G is positioned as a systemic platform integrating communications, computing, sensing and AI into a unified architecture.

6G is expected to redefine the role of mobile networks: from enabling enhanced connectivity to supporting real-time control systems, autonomous operations, immersive environments and large-scale machine interaction. Ultra-high throughput, microsecond-level latency, pervasive connectivity and embedded intelligence are enabling conditions for new industrial and societal models, including autonomous systems,

advanced robotics, digital twins and extended reality environments.

From a technological perspective, 6G development reflects a strategic move toward frontier capabilities. The anticipated expansion into the upper mid-band spectrum (7–15 GHz) and the sub-Terahertz range (100–300 GHz) signals a deliberate shift toward ultra-high-capacity environments. This expansion is about securing early influence over emerging spectrum domains that will shape future industrial ecosystems.

Advances in radio access technologies (including ultra-massive and distributed MIMO, waveform designs optimised for sub-THz operation, and reconfigurable intelligent surfaces) are being explored to manage the propagation constraints of higher frequencies while enabling dense, programmable and energy-efficient deployments. In parallel, the native integration of AI into network functions marks a departure from previous generations. AI is expected to move from optimisation support to structural orchestration, enabling autonomous network management, adaptive resource allocation and convergence between communications and sensing functions.

As of 2025, 6G remains in the pre-commercial and formative phase. No country has launched a public commercial 6G network, and commercial deployment is not expected before the outcomes of WRC-27 clarify spectrum allocations. Current efforts focus on architecture definition, performance benchmarking and early standardisation steps within global bodies. The coming years will be decisive in shaping technical specifications, spectrum frameworks and industrial positioning.

The acceleration of 6G development is driven by three interconnected dynamics:

- **Structural demand evolution.** 6G is expected to accommodate exponential increases in data intensity, ultra-low latency applications, massive machine-type communications and integrated sensing-communication capabilities. Future use cases, including autonomous mobility, smart infrastructure, real-time industrial automation and immersive digital environments, depend on performance levels beyond current 5G capabilities.
- **Geopolitical and industrial positioning.** Leadership in 6G is increasingly framed as a determinant of technological sovereignty, economic competitiveness and influence within global ICT governance structures. Control over intellectual property, standards contributions and semiconductor ecosystems is perceived as strategically critical.
- **Technological capacity building.** 6G development necessitates advances in sub-THz radio systems, non-terrestrial network integration, cloud-edge convergence, AI-native architectures, cybersecurity resilience and semiconductor supply chains. Investment in these domains reflects not only market ambition but long-term industrial policy objectives.

Multiple regions are actively structuring their 6G ecosystems through coordinated public-private initiatives. Research programmes are expanding into early industrial experimentation, with the objective of initiating pilot deployments toward the end of the decade. Commercial roll-out is broadly anticipated around 2030, positioning the 2026–2029 period as strategically decisive for influence over standards, intellectual property and supply chains.

From research to 3GPP standardisation

6G standardisation will enter a decisive phase. The ITU is expected to complete the second stage of the IMT-2030 process by the end of 2026, finalising the technical performance requirements and evaluation methodologies that will serve as the foundation for global standardisation. At the same time, the 3GPP will

move from exploratory studies in Release 20 to the start of technical specification work for Release 21.

Key milestones include:

- Completion of the 6G use-case and service requirement studies in March 2026
- Decision on the duration and scope of Release 21 by the end of 2026
- First normative 6G specifications expected in Release 21 around 2028

In its 6G standardisation timeline report, Ericsson estimates that the core 6G specifications should be ready by the end of 2028⁷⁴. Meanwhile, major regional alliances such as Europe's SNS JU, China's IMT-2030 Promotion Group and the US' Next G Alliance will intensify efforts to shape the direction of Releases 20 and 21, turning this period into a key moment of geopolitical positioning.

Radio spectrum aspects leading to WRC 2027

Spectrum policy represents one of the most structurally sensitive dimensions of 6G development. Unlike technical specifications negotiated within global standardisation bodies, spectrum access is determined through national or regional regulatory decisions. This creates a structural risk of divergence that is largely external to the 3GPP process.

Spectrum harmonisation was largely achieved for 5G. The World Radiocommunication Conferences in 2015 and 2019 enabled broad global alignment on key 5G bands, including 700 MHz, 3.5 GHz, and 26–28 GHz. This global harmonisation facilitated uniform 5G radio interfaces, significantly reducing the risk of divergence across regions.

The landscape for 6G spectrum allocation differs significantly from 5G, with candidate bands spanning upper mid-bands (7–15 GHz), millimetre-wave frequencies above 24 GHz, and notably, sub-Terahertz (sub-THz) ranges between 100 and 300 GHz. Unlike the largely harmonised 5G bands, these higher frequencies remain unaligned globally, with substantial overlap between sub-THz spectrum and incumbent services such as defence, Earth-exploration satellites, and scientific applications. This situation is likely to result in divergent national allocations, potentially leading to regional variations in radio interfaces and device specifications, despite a unified 3GPP standard.

The World Radiocommunication Conference 2027 (WRC-2027) is expected to determine the final IMT-2030 (6G) candidate bands. Even if 3GPP produces a unified 6G baseline, radio interface profiles may vary across regions, reflecting differences in spectrum allocations and regulatory priorities. This creates a higher potential for regional divergence than was experienced with 5G.

⁷⁴ 6G standardization: Technical studies starting - Ericsson

7.2.2 Main R&I initiatives

In the EU

Main 6G Initiative: SNS JU

The Smart Networks and Services Joint Undertaking (SNS JU)⁷⁵ is the European Union's principal vehicle for coordinating 6G research and innovation, established in 2021 under the Horizon Europe framework. As a public–private partnership between the European Commission and the 6G Smart Networks and Services Industry Association (6G-IA), the SNS JU oversees a multiannual programme with a total budget exceeding EUR 1.80 billion. This comprises EUR 900.00 million in EU funding for the period 2021–2027, matched by an equivalent, primarily in-kind, contribution from industry.

The SNS JU's mandate is to ensure European technological sovereignty, strengthen industrial competitiveness, and secure a leading role in global 6G standardisation. Its core functions include structuring the European 6G research ecosystem, bridging research and standardisation, and preparing industrial readiness through testbeds, cross-border experimentation, and pilot projects. By the end of 2025, the SNS JU initiative had delivered a series of measurable achievements across technological, infrastructural, organisational, and strategic dimensions.

Mature and growing portfolio	• As of end-2025, the SNS JU portfolio comprises 79 projects launched under Calls 1, 2 and 3, with additional projects which will be selected under the 2025 Work Programme (Calls 4 and 5). • A broad, pan-European ecosystem including industry leaders, SMEs, research institutes, universities, and cross-sector organisations.
First wave of tangible 6G technological results	• Innovative integrated communication-and-sensing hardware (e.g., time-modulated antenna arrays developed in 6G-REFERENCE). • Breakthrough optical-transport designs for 6G backhaul and fronthaul (SEASON project). • Progress in sub-THz experimentation, AI-driven radio resource management, and energy-efficient hardware and network components.
Establishment of Europe-wide 6G test infrastructures	• Launch of the first European federated 6G experimentation portal, connecting 14 testbeds across multiple Member States. • Deployment of open, reusable facilities enabling cross-sector demonstrations and early prototyping.
Strong acceleration toward vertical integration	Phase-2 projects and the 2025 Work Programme shift the emphasis from foundational research to: • large-scale pilots in manufacturing, mobility, healthcare, media, and public safety; • validation of 6G technologies in realistic industrial environments.

⁷⁵ For further information, please refer to the SNS JU website: <https://smart-networks.europa.eu/>

Strengthened positioning for 6G standardisation	• Development of early technical inputs preparing Europe’s coordinated contributions to forthcoming 6G standardisation cycles in 3GPP and ITU. • Formalised collaboration frameworks aligning research, pre-standardisation, and international engagement.
Increased focus on sustainability, security, and supply-chain resilience	• Integration of green-by-design frameworks and energy-efficiency targets across projects. • Strengthened cooperation with semiconductor initiatives to reinforce European independence in critical components.

6G initiatives per Member-States

At Member State level, several countries have established flagship programmes.

Belgium⁷⁶ is strengthening its position in next-generation mobile connectivity through collaborative 6G research initiatives involving academia, industry and public authorities. Its flagship initiative, BEL6GICA, was launched following a 2023 call for projects by the Belgian regulator IBPT/BIPT and is coordinated by imec. The programme brings together Belgian universities and research centres to build a national 6G research ecosystem and support participation in European initiatives such as the Smart Networks and Services Joint Undertaking. Belgium initially allocated EUR 1.50 million to support this effort, focusing on research coordination, strategic 6G priorities and future standardisation activities. Belgium has since extended this momentum through the “6GBRAINS” alliance for continued inter-university cooperation on 6G research between 2026 and 2030.

In **Finland**, there are two 6G programmes. The first is *6G Bridge*, led through Business Finland. Its main reported results and outputs are the strengthening of ecosystem-driven collaboration in 5G Advanced and 6G, the development of future business ecosystems, the attraction of international investment, the reinforcement of national capabilities, and the fostering of 6G testing and experimentation facilities, with particular relevance for verticals such as health, automotive, manufacturing and energy. The second is the *6G Flagship programme* led by the University of Oulu⁷⁷, which has established global leadership in early 6G research by producing foundational vision documents, test networks and key technology enablers for areas such as AI-driven networks and vertical applications. Its main outputs are the development of essential 6G technological components, tools and equipment for a future 6G test network, together with research organised around four strategic areas: wireless connectivity, devices and circuit technology, distributed intelligence, and human-centric wireless services. In practice, Finland therefore combines an applied commercialisation and ecosystem-building instrument with a globally recognised fundamental research flagship.

⁷⁶ For further details, please consult the official websites of BEL6GICA ([De BEL6GICA à 6GBRAINS. La Belgique s’organise pour la 6G | DigitalWallonia.be](#)) and BIPT ([Call for projects on 6G | BIPT](#)).

⁷⁷ For more information, please consult the official websites of 6G Bridge and the University of Oulu : [6G Flagship – More than wireless](#) and [6G solutions for data-driven society | University of Oulu](#).

France's⁷⁸ main initiative is the *France 2030 acceleration strategy on 5G and future network technologies, including 6G*, a EUR 525.00 million public support framework, complemented by the *France 6G coordination platform* (launched alongside the EUR 65.00 million PEPR “Réseaux du futur” research programme). The main results to date consist of the launch of projects across four strategic axes: development of 5G uses for territories and industry, development of French telecom network solutions, consolidation of R&D capabilities in future networks, and reinforcement of training provision. The initiative has already generated projects across all four axes and is explicitly intended to strengthen French industrial capabilities, standardisation influence, digital sovereignty, cybersecurity and human capital. External official material confirms that *France 6G* is designed to coordinate national actors for forthcoming 6G standardisation and to reinforce European and international cooperation.

In **Germany**⁷⁹, the main initiative is the *German 6G Programme*, coordinated under 6G Platform Germany. Major outputs include: the umbrella platform itself, four 6G research hubs, eighteen industry projects, seven resilience projects, the AI-NET activity, and newer projects on high-speed networks for hyper-connectivity. The four research hubs alone bring together around 160 research groups across 21 universities and 15 research institutes, while the industry projects focus on concrete application domains such as campus networks, medical scenarios, mobility and global coverage. Germany's main results are the creation of a very broad national 6G research-and-innovation architecture with strong links to industrial use cases, resilience, sovereignty and societal concerns. Up to EUR 200.00 million has been allocated to the new 6G Transfer Hubs starting in 2026, funded by the BMFTR together with Länder contributions and infrastructure funds.

Ireland's⁸⁰ main initiative is *CONNECT*, the national research centre for future networks and communications. The principal results and outputs are organised around a set of thematic research areas, including dependable networks, sustainable IoT, link performance, AI-driven network customisation, network ecologies, quantum and satellite communications, cybersecurity, and smart cities and connected autonomous vehicles. There also is a flexible project structure combining platform projects for more fundamental research with targeted projects co-funded with industry, with work spanning mostly TRL 1–4 and in some cases reaching TRL 7. *CONNECT* operates at national scale across multiple higher education institutions and industry partners, with substantial facilities for testing and experimentation. *CONNECT* is supported by approximately EUR 90.00 million in combined funding from Science Foundation Ireland, the European Regional Development Fund and industry partners. In addition, Ireland funds targeted 6G-related projects through national innovation programmes. For example, the ENERGISE Open RAN / sustainable 6G project led by *CONNECT* received a EUR 2.30 million Disruptive Technologies Innovation Fund (DTIF) grant⁸¹.

Italy's⁸² main initiative is *RESTART* (“RESearch and innovation on future Telecommunications systems and networks, to make Italy more smART”). The programme received approximately EUR 116.00 million in public funding from the Italian Ministry of University and Research (MUR) under the EU NextGenerationEU / National Recovery and Resilience Plan framework. The main results highlighted are the creation of a large national research structure with 8 thematic research pillars, 32 research projects, 14 structural projects and additional cascade calls. The programme's outputs extend beyond research alone and include laboratories,

⁷⁸ For more information, please consult the official websites of the French Government: [France 2030 : stratégie d'accélération 5G et futures technologies de réseaux de télécommunications | Direction générale des Entreprises](#), and [France 2030 : Le Gouvernement lance un nouveau dispositif de soutien aux solutions souveraines innovantes pour les réseaux de télécommunications 5G et 6G | info.gouv.fr](#)

⁷⁹ For more information, please consult the Federal Ministry for Research, Technology and Space 6G roadmap portal: [Homepage - Bär: Die 6G-Forschungsroadmap ist unser strategischer Fahrplan zum kommenden 6G-Mobilfunkstandard - BMFTR](#)

⁸⁰ For more information, please consult *CONNECT*'s official website: [CONNECT Centre](#)

⁸¹ Irish Tech News, New €2.30 million project seeks to deliver next-gen, sustainable 6G networks, 15 January 2024, available at : [New €2.3 million project seeks to deliver next-gen, sustainable 6G networks - Irish Tech News](#)

⁸² For more information, please consult the *RESTART* Foundation's official website: [RESTART Foundation](#)

proofs of concept, demonstrators, technology transfer, support for start-ups and spin-offs, education and training, PhD programmes, and work on standardisation and open-source solutions. Taken together, these elements position *RESTART* as Italy's principal mechanism for structuring national 6G-related telecommunications research and industrial valorisation.

The Netherlands⁸³ main Dutch initiative is the *Future Network Services (FNS)* programme, funded through the National Growth Fund (NGF), which supports approximately EUR 203.00 million (EUR 61.00 million for Phase 1 and EUR 142.00 million for Phase 2). Its main results and outputs are structured around four programme lines: intelligent components, intelligent networks, leading applications and ecosystem strengthening. In practice, this includes work on highly efficient transmitters, joint communication and sensing, AI-assisted networking, a 6G DevOps platform and digital twin, demonstrators in sectors such as transport hubs, collaborative surgery, smart grids, 6G factories and XR gaming, as well as the establishment of a national 6G testbed and support for standardisation, SMEs and international collaboration. The programme is also intended to strengthen Dutch capabilities in digital autonomy, trustworthiness and spectrum-related policy development. The FNS programme also established a National 6G Testbed⁸⁴ comprising five regional field labs located in Delft, The Hague, Eindhoven, Groningen and Amersfoort. Each testbed specialises in different future-network domains, including industrial automation, IoT, agritech, immersive applications, digital healthcare, AI and secure digital infrastructure.

In **Spain**⁸⁵, Spain's main initiative is *UNICO I+D 6G*, part of the España Digital 2026 agenda. Several concrete outputs already generated through successive calls: the 2021 call awarded projects to 12 entities for EUR 94.50 million, the 2022 call awarded EUR 49.00 million to 48 projects, and the 2023 call carried an indicative budget of EUR 62.00 million. According to the Spanish government, cumulative public investment through the different UNICO I+D calls exceeded EUR 200.00 million by 2024, supporting more than 200 projects related to 5G and 6G ecosystems. The programme's principal results are therefore the scaling-up of Spain's national 5G/6G R&D base, the support of a large pipeline of research and innovation projects, and the strengthening of Spain's position as a centre of excellence in advanced connectivity. Spain also has strong alignment with the SNS JU, including requirements for substantial beneficiary contribution to the European programme.

In **Sweden**⁸⁶, there are two principal strands: *Advanced Digitalisation* and the *Competence Centres*. The main results of *Advanced Digitalisation* include a large collaborative mobilisation effort, with more than 400 unique organisations participating in 180 projects by the end of 2023 and 12 open calls launched. Its emphasis is on long-term collaboration, digital infrastructure, communication, vertical pilots and competence-building. The *Competence Centres* strand adds a second layer of output through six 6G-related centres starting in 2024, including NextG2Com, WiTech, SEDDIT, ACT, SweWIN and CoDig. These centres are designed to generate demonstrators, proofs of concept, advanced semiconductor and antenna research, sustainable wireless systems, software-intensive industrial digitalisation, and practical validation with strong industry participation. Sweden's national contribution is therefore notable for combining large-scale mobilisation with mission-oriented, industry-linked competence centres. The Advanced Digitalisation programme covers approximately SEK 4.50 billion (EUR 390.00–400.00 million) for 2023–2027, with about half coming from public funding and half from industry co-financing.

⁸³ For more information, please consult FNS' official website: [About 6G Future Network Services - Future Network Services](#) and TNO's website: [Future Network Services | TNO](#)

⁸⁴ Informa, National 6G testbed launches in Holland, 9 October 2025, available at: [National 6G testbed launches in Holland](#).

⁸⁵ For more information, please consult UNICO's official website: [UNICO I+D 6G | España Digital 2026](#) and the Spanish Digital Aid portal: [Portal de Ayudas del Mº de Transformación Digital - Index](#)

⁸⁶ For more information, please consult Advanced Digitalisation's official website : [Advanced digitalisation | Vinnova](#)

Other Member States such as **Poland, Greece and the Czechia** are increasingly contributing through participation in SNS JU projects, which are already delivering concrete results including AI-native network orchestration, energy-efficient IoT platforms and large-scale vertical trials across sectors such as health, logistics and manufacturing.

Outside of the EU

Brazil

Main initiative	Brasil6G⁸⁷ is Brazil’s flagship national platform for preparing the transition to 6G, launched in 2021 with government support. Its objective is to position Brazil as a relevant actor in 6G research, standardisation and future deployment. The initiative brings together academia, research centres and industry to build domestic capabilities across key technological domains. Through the development of integrated testbeds and OpenRAN-based experimental platforms, Brazil is strengthening its readiness for future 6G architectures and international standardisation processes. Brasil6G reflects a capacity-building approach aimed at enhancing technological sovereignty and long-term competitiveness in next-generation telecommunications. In 2026, the Brazilian government approved approximately BRL 104.00 million (EUR 17.00–18.00 million) for projects related to 6G, AI and cloud infrastructure⁸⁸
Main results	• The Brasil6G programme has entered its third phase as of 2025, reflecting sustained governmental and institutional commitment. • It has established a broad network of academic and research collaborators across several Brazilian states and institutions which helps build a diversified 6G ecosystem. • Through the OpenRAN@Brasil testbed project, concrete experimental infrastructure is being developed, combining multiple network domains (radio, optical, edge, orchestration) positioning Brazil to test and validate 6G ready architectures ahead of global standardisation outcomes.

China

Main initiative	China’s⁸⁹ main national 6G initiative is organised around the IMT-2030 (6G) Promotion Group, established as the country’s primary platform to coordinate industry–academia–research efforts on 6G. It operates under the strategic guidance of the Ministry of Industry and Information Technology (MIIT) and the Ministry of Science and Technology (MOST).
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⁸⁷ For more information, please consult Brazil6G’s official website : [Brasil 6G - Inatel](#)

⁸⁸ Dpl news, Brasil | Funttel financiará US\$ 20 millones en investigaciones de 6G e IA, 31 mars 2026, available at: [Brasil | Funttel financiará US\\$ 20 millones en investigaciones de 6G e IA](#)

⁸⁹ For more information, please consult IMT-2030’s official website: [IMT-2030\(6G\)推进组](#)

Main results	The IMT-2030 (6G) Promotion Group: • Defines the national 6G vision, use cases and candidate technologies, set out in its “6G Vision and Candidate Technologies” white paper, covering vision, drivers, use cases and ten candidate technology domains. • Acts as the coordination hub for Chinese operators, suppliers, universities and research institutes on 6G, consolidating research projects funded by MIIT and MOST. • Aligns China’s domestic roadmap with the global 6G/IMT-2030 process, including completion of requirement studies and contribution to ITU-R and 3GPP activities. The timetable presented by Chinese stakeholders foresees completion of 6G requirements research around 2025, with the objective of starting commercial deployment around 2030.
	By end-2025, the IMT-2030 (6G) Promotion Group and associated programmes have: • Published multiple national 6G vision and technology white papers, widely referenced in global 6G discussions. • Coordinated extensive laboratory and field trials, including terahertz (THz) experiments, integrated sensing and communication, and satellite / non-terrestrial components (as reported in public briefings and technical overviews). • Reported key prototype innovations, including a “full-spectrum chip” concept intended to simplify multi-band device design if scaled commercially. • Positioned China to enter the requirement-finalisation and early standardisation phase for 6G/IMT-2030 from 2025 onwards. No commercial 6G services have been launched yet; current work remains at the R&D, trial and pre-standardisation stages.

India

Main initiative	India’s⁹⁰ main national framework for 6G is the Bharat 6G Mission, articulated through Bharat 6G Vision (launched March 2023) and operationalised via the Bharat 6G Alliance (B6GA), established in July 2023. The Bharat 6G Mission is conceived as a nine-year programme (2022–2031), structured in phases to move from foundational research to field trials and standardisation contributions: • Strategic goals include making India a leading supplier of advanced telecoms technologies, targeting 10.0 % of global 6G patents and an estimated USD 1.20 trillion (EUR 1.03 trillion) GDP impact by 2035. • It emphasises affordability, sustainability and ubiquity as core design principles, aligned with the broader “Viksit Bharat” development objectives. The Bharat 6G Alliance brings together government, industry, academia and startups to coordinate R&D, intellectual-property strategy and ecosystem
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⁹⁰ For more information, please consult Bharat 6G alliance’s official website: [Bharat 6G Alliance](#)

Main results	development. ₹240.50 crore ⁹¹ (EUR 26.00-27.00 million) allocated through the Telecom Technology Development Fund (TTDF) for two flagship 6G testbeds: a 6G THz Testbed, and an Advanced Optical Communication Testbed.
	By end-2025, India's 6G initiative has achieved: • Publication and political endorsement of the Bharat 6G Vision and associated manifesto, clearly setting India's 6G targets and policy principles. • Establishment of Bharat 6G Alliance, with an annual report detailing funded projects, patent policy instruments and collaboration with domestic and international stakeholders. • Organisation of the 2nd International Bharat 6G Symposium (2025), which reinforced the roadmap towards 2030 rollout and the ambition to capture a significant share of global 6G intellectual property. • Funding of multiple university and industry pilot projects, including: ○ Beyond-5G/6G system tests by IIT-Hyderabad with Japanese and Indian industrial partners using flexible software-defined radio technology; ○ Development of an indigenous high-speed 6G antenna aiming at 1 TB/s data rates; ○ A cell-free 6G communication prototype for ubiquitous connectivity, funded by the Department of Science and Technology. India's status at end-2025 is that of a rapidly emerging 6G R&D hub with a clear national mission, significant domestic research funding and growing international collaborations (yet still at pre-commercial stages).

Japan

Main initiative	Japan's⁹² principal 6G framework is the "Beyond 5G / 6G Promotion Strategy", accompanied by the Beyond 5G Promotion Consortium, launched to ensure Japan's competitiveness in next-generation communications in the 2030s. Japan created a Beyond 5G Fund managed by NICT worth approximately ¥ 300.00 billion (around EUR 1.80-2.00 billion)⁹³. Key features of Japan's 6G strategy include: • A national roadmap to 6G, published in 2020, calling for early investments to secure leadership in "Beyond 5G" technologies and targeting commercial 6G deployment in the 2030s. • The Beyond 5G Promotion Consortium, which brings together major telecom suppliers, operators, universities and research institutions to coordinate technical R&D, standardisation and international collaboration. • A series of white papers produced by NICT (National Institute of Information and Communications Technology) and partners, updating Japan's Beyond-
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⁹¹ Press Information Bureau Government of India Ministry of Communications, DoT Launches Bharat 6G Alliance to Drive Innovation and Collaboration in Next-Generation Wireless Technology, 3 July 2023, available at: [DoT Launches Bharat 6G Alliance to Drive Innovation and Collaboration in Next-Generation Wireless Technology](#)

⁹² For more information, please consult the Ministry of Internal Affairs and Communications (MIC)'s official website: [総務省 | ご案内ページ - ご利用のページが見つかりません -](#)

⁹³ For more information, please consult : [NICT - National Institute of Information and Communications Technology](#)

Main results	5G/6G vision, requirements, technology roadmaps and testbed concepts (editions in 2021, 2023 and 2024).
	By end-2025, Japan's Beyond-5G/6G activities have: • Delivered mature strategic documents, NICT's Beyond 5G/6G white papers (v3.0 and v4.0), detailing technical directions, key technologies (e.g. advanced radio, network architecture, AI integration) and testbed approaches. • Established collaborative R&D structures across industry and academia under the Beyond 5G Promotion Consortium, including multiple 6G-related projects referenced in the white papers. • Initiated demonstration projects in areas such as ultra-low-latency communications, advanced radio interfaces and network architectures, preparing for larger-scale pilots later in the decade, as reflected in Japanese contributions to international 6G fora. Japan's progress is characterised by strong strategic planning and coordinated R&D, with emphasis on maintaining industrial competitiveness and contributing to global IMT-2030 processes.

South Korea

Main initiative	South Korea's⁹⁴ main national initiative for 6G is articulated through the K-Network 2030 Strategy and the associated 6G R&D Implementation Plan, led by the Ministry of Science and ICT (MSIT) and worth KRW 625.30 billion⁹⁵ (EUR 420.00-430.00 million). The K-Network 2030 Strategy and 6G R&D Implementation Plan: • Set a clear objective for South Korea to launch first 6G commercial services around 2029–2030, following extensive pre-commercial testing. • Outline three main strategic pillars: 1. Securing next-generation key original technologies; 2. Gaining dominance in international standards and patents; 3. Laying the foundation for 6G research and industry through public-private investment and testbeds. Emphasise strong government leadership and close cooperation with national champions (operators, equipment suppliers, semiconductor industry).
Main results	By end-2025, South Korea has: • Deployed a coherent national 6G roadmap and funding scheme, with MSIT committing proactive investment in 6G, open RAN and satellite-based networks. • Initiated multiple 6G R&D projects and testbeds involving major Korean operators and suppliers, focusing on terahertz links, advanced antennas,

⁹⁴ For more information, please consult the Ministry of Science and ICT's official press release : [Press Releases -](#)

[과학기술정보통신부 >](#)

⁹⁵ For more information, please consult the Ministry of Science and ICT's official press release: [20230329110246519.pdf](#)

	network virtualisation and AI-enabled management (as documented in national strategy and international study visit reports). • Positioned itself as a benchmark country for early 6G trials, with planned events such as the “Pre-6G Vision Fest” and a clear trajectory toward standardisation leadership and early commercial offers. South Korea’s distinguishing feature is the strong alignment between government strategy and industrial implementation, aiming to replicate and extend its 5G leadership into 6G.
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United States

Main initiative	The central private-sector-driven framework for 6G in North America (US, Canada and Mexico) is the Next G Alliance (NGA)⁹⁶, established by ATIS and composed of leading operators, suppliers, and technology companies. On the public-sector side, bodies such as the FCC Technological Advisory Council (TAC) and various US government programmes work in coordination with NGA’s efforts. The wider U.S. 6G ecosystem benefits from substantial public and private investment, including the \$1.50 billion (EUR 1.29 billion) Public Wireless Supply Chain Innovation Fund supporting Open RAN and future wireless technologies⁹⁷. The Next G Alliance aims to: • Advance North American wireless leadership over the next decade through a comprehensive approach covering research, development, manufacturing, standardisation, and market readiness. • Develop a National 6G Roadmap, led by the NGA National 6G Roadmap Working Group, which defines vision, timelines, R&D priorities, and recommendations for government actions and incentives. • Address sustainability and societal objectives through a dedicated NGA Sustainability Working Group and a holistic framework for “sustainable 6G”. The FCC TAC 6G Working Group recognises NGA as a key industry forum for North American 6G coordination.
Main results	By end-2025, the US ecosystem has: • Produced and updated a National 6G Roadmap outlining technology priorities, spectrum considerations, R&D directions and timelines, coordinated by the Next G Alliance National 6G Roadmap Working Group. • Established multiple dedicated working groups (technology, applications, sustainability, security, spectrum and manufacturing), generating position papers and technical publications shaping US industry contributions to 6G standardisation discussions. • Advanced federal research and development programmes supporting 6G technologies, including funding initiatives aimed at open RAN, next-generation semiconductor capabilities and experimental platforms.

⁹⁶ For more information, please consult Next G Alliance’s official website : [Home - Next G Alliance](#)

⁹⁷ Next G Alliance’s press release : [Technology Roadmap Working Group: Focus Areas and Priorities - Next G Alliance](#)

- Published the FCC Technological Advisory Council (TAC) 6G Working Group Report (2025), providing recommendations on spectrum strategy, research coordination and US positioning in international standardisation fora.
- Expanded 6G experimental platforms and testbeds across universities, national laboratories and industry consortia, supporting research on sub-THz communications, AI-native networking, sensing integration and advanced semiconductor technologies.

7.2.3 Policy and regulatory trends

The development of 6G is unfolding within a geopolitical context markedly different from that of 5G. Rising international tensions, technology sanctions and heightened concerns over digital sovereignty have repositioned advanced telecommunications infrastructure as a strategic capability. 6G is now explicitly associated with national security, technological autonomy, supply-chain control and influence over global ICT ecosystems.

In this environment, governments are actively seeking to reduce dependence on foreign suppliers and to promote domestic technological capabilities. While a unified global 6G baseline remains formally supported, national policies favour domestic architectures, components and implementation choices, increasing pressure for optional features, regional profiles and custom security layers.

Industrial policy and supply-chain sovereignty further reinforce this dynamic. Government focus on supply-chain autonomy and resilience represents a major driver of potential divergence. All major regions (including the US, the European Union, China, Japan, South Korea and India) are pursuing semiconductor sovereignty and industrial strategies designed to reinforce domestic capabilities. The European Union, notably through the SNS Joint Undertaking, is investing in local manufacturing capacities and critical component supply chains. The US is strengthening local capabilities through programmes such as RINGS and VINES. China continues to pursue a coordinated top-down strategy aligning government, academia and industry.

These sovereignty-oriented strategies contrast sharply with the relatively neutral and globally integrated supply chains that characterised 5G development. During the 5G cycle, although national security frameworks diverged, global equipment supply chains remained largely uniform. In the 6G cycle, industrial policy is directly influencing technical priorities. Investments in domestic chip architectures, radio components, cybersecurity frameworks and cloud-edge infrastructures may shape regional technical specifications, translating into differentiated implementation layers within the global standard.

Divergence is most likely to emerge in specific technical and regulatory domains rather than in the universal core.

Spectrum	6G will rely on upper mid-bands (7–15 GHz) and sub-Terahertz frequencies (100–300 GHz), which are not yet harmonised globally. These bands overlap with defence, Earth-exploration satellite and scientific services, making nationally differentiated allocations likely. Even if 3GPP produces a unified standard, radio interface profiles may vary across regions depending on spectrum availability. This represents a higher fragmentation risk than in 5G, where spectrum harmonisation was largely achieved.
Security, privacy and data governance	Unlike 5G, where security differences remained largely external to the technical core, 6G embeds sensitive capabilities directly into its architecture. IMT-2030 defines security, reliability and trust as fundamental principles, including post-quantum cryptography, AI-driven control systems, integrated sensing and cloud-edge interoperability. Regions maintain fundamentally different regulatory philosophies: • The European Union emphasises security-by-design, certification and technological sovereignty. • The US favours market-driven security standards. • China applies state-controlled network security regimes. Because these features intersect with politically sensitive domains such as privacy and sovereignty, region-specific security layers may be embedded directly into 6G architectures.
Cloud-native and edge architecture	5G maintained architectural uniformity under the service-based architecture model. Edge computing was often an extension rather than a structural component. By contrast, 6G will be cloud-native from the outset, integrating distributed computing, AI processing and multi-orbit satellite systems into the network fabric. Cloud sovereignty regulations differ significantly across regions. Some stakeholders have even proposed fully new 6G core architectures rather than evolutionary upgrades of the 5G core. Implication: regional cloud governance regimes may necessitate distinct 6G architectural profiles.
Vertical-specific requirements	Because 6G will be deeply integrated into manufacturing, healthcare, transportation and other regulated sectors, national regulatory constraints may influence implementation profiles at application level. This scenario mirrors certain aspects of 5G, where differences emerged in standalone versus non-standalone deployment and frequency band usage. However, the regional component is expected to be stronger in 6G.

Despite these pressures, complete fragmentation is considered unlikely. The global mobile ecosystem retains strong structural incentives to preserve interoperability. The most probable outcome is therefore the establishment of a single global 6G baseline defined by ITU IMT-2030 and 3GPP Releases 20 and 21, complemented by stronger regional variations than observed in 5G.

7.2.4 The global race to technological and industrial leadership

The global race to technological and industrial leadership in 6G is unfolding within a more complex and potentially fragmented standardisation environment than in previous generations. While the global mobile ecosystem has historically converged around common standards within 3GPP and the ITU IMT framework, several structural, geopolitical and industrial factors now increase the likelihood of partial divergence.

This strategic framing shapes national positioning in research programmes, industrial policy and standardisation forums. Major regions (including the US, China, the European Union, Japan, South Korea and India) increasingly view leadership in 6G as essential for securing long-term economic and security advantages. As a result, techno-strategic competition is directly influencing technical proposals within international bodies.

Despite the central roles of 3GPP and the ITU, pre-standardisation work is increasingly shaped by coordinated regional alliances that align national positions before entering global forums. The ITU-R defines the high-level vision (completed in 2023) and will finalise the technical performance requirements for IMT-2030 by mid-2026. 3GPP develops the normative technical specifications for the radio interface and core network, notably through Release 20 (study phase) and Release 21 (first normative specifications).

The landscape is structured around powerful regional blocs:

- Europe: SNS JU, 6G-IA
- The US: Next G Alliance
- China: IMT-2030 Promotion Group
- South Korea: K-Network 2030 Strategy
- Japan: Beyond 5G / 6G Promotion Consortium
- India: Bharat 6G Mission and Bharat 6G Alliance

These alliances prepare technical proposals reflecting national industrial and regulatory priorities. If consensus weakens within 3GPP or ITU, standards may incorporate incompatible optional features or region-specific extensions, increasing the risk of implementation divergence. This dynamic contrasts with the 5G cycle, during which close cooperation across major regions ensured the emergence of a single unified standard.

The 6G decade (2020–2030) is characterised by heightened geopolitical tensions, technology-related sanctions and stronger emphasis on digital sovereignty. Regions are pursuing more autonomous R&D trajectories, making global cooperation more fragile and increasing the likelihood of region-specific profiles and implementation differences.

The rivalry between the US and China constitutes a central structural driver of potential fragmentation. Technology transfer restrictions, sanctions and the progressive decoupling of industrial ecosystems complicate cooperation in standardisation forums.

Limited collaboration between major stakeholders increases the risk of incompatible implementations of security protocols, restricted supplier participation and competing architectural approaches. Over time, this dynamic raises the possibility of partially parallel 6G ecosystems aligned with the strategic interests of respective geopolitical blocs.

However, complete fragmentation remains unlikely. A single global market enables economies of scale in equipment manufacturing and R&D; global roaming requires common standards; and shared device supply chains and chipset ecosystems depend on uniform technical specifications. The most probable outcome is therefore a unified global 6G baseline complemented by stronger regional differentiation than observed in 5G.

7.2.5 Industry outlook, from 5G to 6G

State of play in the supplier industry

Short- and Medium-Term Industry Dynamics (2026–2030)

Expansion of testbeds and vertical trials	Between 2026 and 2029, the industry focus will move from exploratory research to large-scale validation and system integration. Trials will expand across manufacturing, mobility, logistics, healthcare, defence and public safety. This phase will include: • Major demonstrators in strategic vertical sectors • Phase 3 of the EU’s SNS JU programme dedicated to Trials and Pilots • Intensive validation of THz links, Integrated Sensing and Communication (ISAC) capabilities and AI-driven orchestration. More than 40.0 % of 6G testbeds already incorporate sensing capabilities, a share that is expected to grow. In the US, programmes such as VINES aim to connect advanced wireless research with practical industrial use cases. Strategic implication: suppliers and operators will refine technology choices and ecosystem partnerships during this phase, shaping early market structures and industrial alliances.
Maturation of key technologies	By the end of the decade, several foundational technologies are expected to reach pre-commercial maturity: • Advanced sub-THz and THz radio systems • Reconfigurable Intelligent Surfaces and advanced waveforms • AI-native networks enabling end-to-end automation

	• Integrated Sensing and Communication, reducing system overhead • Continued evolution of Non-Terrestrial Networks and distributed cloud architectures Quantum communications and immersive interfaces remain at experimental stages. Strategic implication: competitive differentiation will increasingly depend on software capabilities, AI integration and system-level orchestration rather than purely hardware performance.
Sustainability and supply-chain resilience	Sustainability is embedded in the IMT-2030 framework, requiring substantial improvements in end-to-end energy efficiency. Suppliers target reductions in carbon intensity of base stations by 2030. Energy efficiency and supply-chain resilience are becoming structural competitiveness factors, not compliance considerations Short-term priorities include: • Development of standardised sustainability measurement frameworks • Integration of post-quantum cryptography in the 6G core • Reinforcement of supply-chain sovereignty, including local manufacturing of radios, chips and optical components Coordination with semiconductor initiatives such as the EU Chips Act will intensify.

Commercialisation pathway toward 2030

Pre-commercial 6G deployments are expected around 2029–2030, with early launches targeted by South Korea and Japan, with China aiming for commercialisation around 2030. Broader adoption is likely in the early 2030s.

The commercial logic differs from 5G. Rather than focusing on consumer speed improvements, 6G value creation is expected to prioritise industrial and enterprise use cases, based on guaranteed SLAs, embedded AI, edge computing and advanced slicing capabilities.

Convergence is expected around IMT-2030 requirements and 3GPP Release 20/21, which will form the basis of early infrastructure and products.

Strategic implication: first-mover advantage in vertical integration and enterprise solutions may outweigh traditional consumer-market scale advantages.

Strategic outlook for the EU (2026–2030)

The coming period will be transformative. 6G development will move from research-led innovation to system integration and early commercial pilots. Collaboration between telecoms suppliers, operators, cloud providers and vertical industries will intensify.

Geopolitical competition over patents, supply chains and standardisation influence will increase. While a global 6G baseline remains likely, regional positioning will become more assertive.

Maintaining a competitive edge in large-scale commercial deployment around 2030 will depend on:

- Sustained influence in standardisation
- Strengthened semiconductor resilience
- Effective integration of AI and cloud-native capabilities
- Preservation of global interoperability

In strategic terms, Europe's position in 6G will not be determined solely by radio technology leadership, but by its ability to secure influence across the full converged stack, from advanced semiconductors to AI-driven network orchestration and cloud-edge integration.

SWOT perspective for the European supplier industry

Structural strengths	Structural vulnerabilities
Europe retains important industrial assets: • Globally competitive infrastructure suppliers with strong RAN engineering capabilities • Sustained influence in international standardisation processes • Recognised leadership in energy-efficient network solutions • A coordinated research-to-standardisation pipeline through programmes such as SNS JU These elements provide Europe with leverage in shaping technical specifications and maintaining interoperability.	Structural challenges remain: • Relative weakness in hyperscale cloud services • Dependence on external semiconductor supply chains • Risk of reduced value capture as architectures become increasingly software-defined and AI-native • Exposure to geopolitical tensions and potential market divergence As value migrates toward cloud-native control layers and AI orchestration, Europe risks losing share in higher-margin segments if these capabilities remain externally dominated.

8. Annex

8.1. SNS JU

The EU initiated its coordinated transition toward sixth generation (6G) communication systems in 2021, when the European Commission together with the Council and Parliament established the Smart Networks and Services Joint Undertaking (SNS JU) under the Horizon Europe framework. This marked the formal starting point of the EU-27's strategic effort to shape the research, innovation, and early deployment trajectory of advanced 5G evolution and 6G technologies.

The initiative was created to ensure technological sovereignty, secure Europe's leadership in future network infrastructures, and align next-generation connectivity with the EU's broader industrial, digital, and societal objectives. The EU positioned 6G as a core technological enabler for the 2030 digital decade, the green transition, and the competitiveness of European industries.

The SNS JU functions as the central governance, coordination, and funding mechanism for Europe's 6G strategy. It operates as a public-private partnership between the European Union and the 6G Smart Networks and Services Industry Association (6G-IA), and manages a multi-annual research and innovation (R&I) programme with a co-funded budget exceeding EUR 1.80 billion. This comprises EUR 900.00 million in EU funding for the period 2021–2027, matched by an equivalent, primarily in-kind, contribution from industry.

The SNS JU fulfils five critical roles in the EU-27's 6G trajectory:

Strategic leadership and programme implementation: SNS JU designs and implements the EU's multi-annual 5G evolution and 6G research and innovation work programmes, ensuring coherence with Europe's industrial strategy, digital policy objectives, and future standardisation roadmap.

Funding and coordinating 6G Research and Innovation: It funds large-scale R&I projects covering 6G radio technologies, advanced network architectures, AI-native control systems, the edge-cloud continuum, cybersecurity, and integrated communication-and-sensing technologies.

Deployment of European-wide testbeds and experimentation facilities: SNS JU supports the development of federated and large-scale experimental infrastructures and platforms, enabling early experimentation, prototyping, validation, and cross-border trials (essential for technological maturity and future market take-up).

Contribution to global 6G standardisation: The Joint Undertaking acts as Europe's interface between R&I outputs and international standardisation bodies (3GPP, ITU, ETSI). It ensures European research leadership translates into strong European influence in early 6G standardisation phases.

Ensuring sovereignty, sustainability, and security: SNS JU aligns 6G development with EU priorities on technological sovereignty, supply-chain resilience, energy efficiency, secure network architectures, privacy-by-design approaches, and synergies with other EU programmes such as the Chips Joint Undertaking. Through these functions, the SNS JU is the cornerstone of Europe's coordinated 6G strategic effort.

As of end-2025, the SNS JU portfolio comprises 79 projects launched under Calls 1, 2 and 3, with additional projects which will be selected under the 2025 Work Programme (Calls 4 and 5). These programmes cover all major technological and vertical areas required for 6G.

The principal categories and representative projects include:

a) Flagship system-level 6G design

- Hexa-X-II – Developing the holistic end-to-end architecture and foundational building blocks of a European 6G system, including sub-THz communication, joint sensing and communication, cloud-continuum integration, and network automation.

b) Advanced 6G radio, microelectronics, and signal processing

- 6G-REFERENCE – Innovations in sub-6 GHz to THz radio technologies, advanced antenna systems, and joint communication-sensing hardware.
- 6Green, 6G-SHINE, 6G-BRICKS, 6GTandem – Complementary research programmes focusing on sustainable radio systems, intelligent transceivers, and fundamental physical-layer technologies.

c) 6G testbeds, experimentation platforms and open network environments

- 6G-SANDBOX – Providing an open, modular experimentation framework for early network prototypes.
- SUNRISE-6G – Establishing a federated European 6G experimentation portal integrating multiple testbeds across the EU.

d) Vertical-sector trials and cross-domain integration

- Projects under SNS JU Streams focusing on large-scale trials and sectoral validation (including manufacturing, health, mobility, and media), with further expansion expected under the 2025 Work Programme (Stream D).

e) Cloud-continuum, service platforms and network automation

- Projects under Streams B and C addressing intelligent cloud-edge orchestration, AI-native network management, cybersecurity, and open service platforms.

Together, these programmes cover the full value chain from microelectronics and physical layer innovations to applications and vertical deployments, ensuring a comprehensive European approach to 6G development.

8.2. Methodology

Coverage

Indicator	Description	Unit	Source	Reference year
5G household coverage	% of households with coverage by at least one 5G mobile network	%	- Connectivity Coverage in Europe 2025 Report: EU27, and Norway - Interviews: Georgia, Iceland, Liechtenstein, UK - Telecoms operators / official publications: neighbouring markets (Moldova) and international comparison markets (Australia, Brazil, Japan, South Korea, US) - Ericsson Mobility Report: China, India - IDATE estimates: Albania, Montenegro, North Macedonia, Serbia - No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025
5G rural household coverage	% of rural households with coverage by at least one 5G mobile network	%	- Connectivity Coverage in Europe 2025 Report: EU27, Norway - Interviews: Georgia, Iceland, Liechtenstein, UK - Telecoms operators / official publications: Australia, Brazil, Japan, South Korea, US - Ericsson Mobility Report: China, India - IDATE estimates: Albania, Moldova, Montenegro, North Macedonia, Serbia - No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025
5G household coverage in the 3.4-3.8 GHz band	% of households with coverage by 5G using the 3.4-3.8 GHz spectrum band	%	- Connectivity Coverage in Europe 2025 Report: EU27, Norway, UK - Interviews: Georgia, Liechtenstein - Telecoms operators / official publications: Australia, Brazil, Japan, South Korea, US - Ericsson Mobility Report: China, India	2025

			• IDATE estimates: Albania, Montenegro, North Macedonia, Serbia • Not available: Iceland, Moldova • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	
5G rural household coverage in the 3.4-3.8 GHz band	% of rural households with coverage by 5G using the 3.4-3.8 GHz spectrum band	%	• Connectivity Coverage in Europe 2025 Report: EU27, Norway, UK • Interviews: Georgia, Liechtenstein • Telecoms operators / official publications: Australia, Brazil, Japan, South Korea, US • Ericsson Mobility Report: China, India • IDATE estimates: Albania, Montenegro, North Macedonia, Serbia • Not available: Iceland, Moldova • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025

Infrastructure deployment

Indicator	Description	Unit	Source	Reference year
5G base station deployment per 100,000 inhabitants	Number of 5G base stations in the country per 100,000 inhabitants	Amount	• Interviews / official publications: EU27 (Austria, Belgium, Bulgaria, Cyprus, Czechia, Spain, France, Croatia, Ireland, Portugal, Slovakia), neighbouring markets (Georgia, Liechtenstein, Serbia, UK), and international comparison markets (China, India) • IDATE estimates: EU27 (Germany, Denmark, Estonia, Greece, Finland, Hungary, Italy, Lithuania, Latvia, Luxembourg, Malta, Netherlands, Poland, Romania, Sweden, Slovenia), neighbouring markets (Albania, Iceland, Moldova, Montenegro, North Macedonia, Norway), and international comparison markets (Australia, Brazil, Japan, South Korea, US)	2025

			• No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	
5G base station deployment in the lower spectrum bands (<1GHz) per 100,000 inhabitants	Number of 5G base stations in the country in the lower spectrum bands (< 1 GHz) per 100,000 inhabitants	Amount	• Interviews / official publications: EU27 (Austria, Belgium, Bulgaria, Cyprus, Czechia, Spain, France, Croatia, Ireland, Slovakia), neighbouring markets (Georgia, Liechtenstein, Serbia), • IDATE estimates: EU27 (Germany, Denmark, Estonia, Greece, Finland, Hungary, Italy, Lithuania, Latvia, Luxembourg, Malta, Netherlands, Portugal, Poland, Romania, Sweden, Slovenia), neighbouring markets (Albania, Iceland, Moldova, Montenegro, North Macedonia, Norway, UK), and international comparison markets (Australia, Brazil, China, India, Japan, South Korea, US) • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025
5G base station deployment in the mid-band spectrum (1-6GHz) per 100,000 inhabitants	Number of 5G base stations in the country in the mid-band spectrum (1-6 GHz) per 100,000 inhabitants	Amount	• Interviews / official publications: EU27 (Austria, Belgium, Bulgaria, Cyprus, Czechia, Spain, France, Croatia, Ireland, Slovakia), and neighbouring markets (Georgia, Liechtenstein, Serbia) • IDATE estimates: EU27 (Germany, Denmark, Estonia, Greece, Finland, Hungary, Italy, Lithuania, Latvia, Luxembourg, Malta, Netherlands, Portugal, Poland, Romania, Sweden, Slovenia), neighbouring markets (Albania, Iceland, Moldova, Montenegro, North Macedonia, Norway, UK), and international comparison markets (Australia, Brazil, China, India, Japan, South Korea, US) • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025
5G base station deployment in the millimetre-wave spectrum bands (>24GHz) per 100,000 inhabitants	Number of 5G base stations in the country in the millimetre-wave spectrum bands	Amount	• Interviews / official publications: EU27 (Austria, Belgium, Bulgaria, Cyprus, Czechia, Spain, France, Croatia, Ireland, Slovakia), neighbouring markets (Georgia, Liechtenstein, Serbia)	2025

	(>24GHz) per 100,000 inhabitants		• IDATE estimates: EU27 (Germany, Denmark, Estonia, Greece, Finland, Hungary, Italy, Lithuania, Latvia, Luxembourg, Malta, Netherlands, Portugal, Poland, Romania, Sweden, Slovenia), neighbouring markets (Albania, Iceland, Moldova, Montenegro, North Macedonia, Norway, UK), and international comparison markets (Australia, Brazil, China, India, Japan, South Korea, US) • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	
5G standalone (SA) base station deployment	% of base stations that migrated to 5G SA	%	• Regulators' official data: EU27 (Hungary, Spain), UK • Operators' press releases: EU27 (Denmark, Finland, France, Germany, Greece), International comparison countries (China, India) • IDATE estimates based on discussions with regulators (but not official data): Bulgaria, Czechia, Ireland. • IDATE estimates based on media coverage: EU27 (Estonia, Latvia, Lithuania, Portugal, Romania, Slovakia, Slovenia, Sweden), international comparison countries (Australia, Brazil, Japan, South Korea, USA) • No 5G SA launched yet: EU27 (Belgium, Cyprus, Croatia, Italy, Luxembourg, Malta, Netherlands, Poland), neighbouring markets (Albania, Bosnia and Herzegovina, Georgia, Iceland, Liechtenstein, Moldova, Montenegro, North Macedonia, Norway, Serbia, Türkiye, Ukraine)	2025

Standalone and Non-Standalone availability

Indicator	Description	Unit	Source	Reference year
5G non-standalone (launch year)	Year in which 5G services were first introduced using the non-standalone (NSA) deployment model	Year	Regulatory publications or telecoms operator publications for all countries	2025
5G standalone (launch year)	Year in which 5G services were first introduced using the standalone (SA) deployment model	Year	Regulatory publications or telecoms operator publications for all countries	2025
5G non-standalone availability	% of users with 5G-capable devices spending most of their time connected to a 5G NSA network	%	• Ookla: EU27 (Spain, Finland, France, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia), neighbouring markets (Albania, Georgia, Iceland, Liechtenstein, Moldova, Montenegro, North Macedonia, Norway, Serbia, UK), and international comparison countries (Australia, Brazil, China, India, Japan, South Korea, US) • IDATE estimates: Austria, Belgium, Bulgaria, Cyprus, Czechia, Germany, Denmark, Estonia, Greece, • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025
5G standalone availability	% of users with 5G-capable devices spending most of their time connected to a 5G SA network	%	• Ookla: EU7 (Austria, Germany, Greece, Spain, Finland, France, Europe), neighbouring markets (UK), and international comparison countries (Australia, Brazil, China, Japan, US) • IDATE estimates: EU27 (Bulgaria, Czechia, Denmark, Estonia, Hungary, Ireland, Lithuania, Latvia, Portugal, Romania, Sweden, Slovenia, Slovakia), and international comparison markets (India, South Korea)	2025

			• No 5G SA launched yet: EU27 (Belgium, Cyprus, Croatia, Italy, Luxembourg, Malta, Netherlands, Poland), neighbouring markets (Albania, Bosnia and Herzegovina, Georgia, Iceland, Liechtenstein, Moldova, Montenegro, North Macedonia, Norway, Serbia, Türkiye, Ukraine)	
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Investment

Indicator	Description	Unit	Source	Reference year
Total mobile network investments per capita	Total CAPEX allocated to mobile networks per capita	EUR	• Interviews / official publications: EU27 (Belgium, Estonia, Croatia, Ireland, Latvia), neighbouring markets (Liechtenstein), • Estimates from telcos' reports: EU27 5Austria, Bulgaria, Cyprus, Czechia, Germany, Denmark, Greece, Spain, Finland, France, Hungary, Italy, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia), neighbouring markets (Albania, Bosnia and Herzegovina, Georgia, Iceland, Moldova, Montenegro, North Macedonia, Norway, Serbia, Türkiye, Ukraine, UK), and international comparison markets (Australia, Brazil, China, India, Japan, South Korea, US) • Not available: Ukraine	2025
5G investment share	% of total mobile CAPEX specifically directed to 5G technologies, showing the relative priority of 5G within overall network spending	%	• Interviews: Croatia and UK • IDATE estimates for all other countries, based on secondary sources (e.g. GSMA reports), state of 5G coverage in each country, and telecoms stakeholder reports on their 5G initiatives. • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025

5G radio access network (RAN) investments	CAPEX dedicated to 5G radio infrastructure, including base stations, antennas, and associated sites required to deliver 5G coverage and capacity	EUR	• Calculated from IDATE's Telecom Markets and Players database • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025
5G core network investments	CAPEX related to the 5G core network architecture and platforms, including virtualisation, cloud-native components, and functions enabling standalone 5G services and advanced capabilities	EUR	• Calculated from IDATE's Telecom Markets and Players database • Not launched yet: EU27 (Belgium, Cyprus, Croatia, Italy, Luxembourg, Malta, Netherlands, Poland), neighbouring markets (Albania, Bosnia and Herzegovina, Georgia, Iceland, Liechtenstein, Moldova, Montenegro, North Macedonia, Norway, Serbia, Türkiye, Ukraine)	2025

Spectrum assignment

Indicator	Description	Unit	Source	Reference year
Allocated spectrum bands suitable for 5G use	Spectrum bands that have been designated for 5G use under EU-harmonised conditions	MHz	• Telegeography • Spectrum tracker • Regulators • Secondary resources on auctions • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025
5G pioneer bands	% of EU spectrum for 5G that has been formally licensed to operators	%	• Connectivity Coverage in Europe 2025 Report: EU27 • Not available: neighbouring and international comparison markets	2025
Dynamic spectrum sharing	% of base stations that use the same spectrum bands for both 4G and 5G simultaneously	%	• Interviews: EU27 (Belgium, Germany, Spain, Croatia, Latvia, Netherlands, Slovakia), and neighbouring markets (Liechtenstein, North Macedonia, Norway)	2025

			• IDATE estimates: EU27 (Austria, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Greece, Finland, France, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Sweden, Slovenia), neighbouring markets (Albania, Georgia, Iceland, Moldova, Montenegro, Serbia, UK), and international comparison markets (Australia, Brazil, China, India, Japan, South Korea, US) • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	
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Take-up

Indicator	Description	Unit	Source	Reference year
5G SIM cards share	% of 5G SIM cards (of total SIM cards) that generated any internet traffic on a domestic 5G network in the last 90 days	%	• Connectivity Coverage in Europe 2025 Report: EU27 (to calculate total 5G SIM cards per EU27 Member State) • IDATE 5G World Markets database: EU27 (Austria, Belgium, Bulgaria, Cyprus, Czechia, Germany, Denmark, Estonia, Greece, Spain, Finland, France, Croatia, Hungary, Ireland, Italy, Lithuania, Latvia, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, Slovakia), neighbouring markets (UK), and international comparison markets (Australia, Brazil, China, India, Japan, South Korea, US) • Telegeography: Neighbouring markets (Albania, Iceland, Moldova, Montenegro, North Macedonia, Norway, Serbia), and Australia • No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025

5G Private Networks

Indicator	Description	Unit	Source	Reference year
5G Private Networks	Number of digital communications infrastructure deployed within a specific geographic boundary exclusively for a single organisation (definition 3GPP)	Amount	- Interviews / official publications: EU27 (Bulgaria, Cyprus, Czechia, Germany, Denmark, Estonia, Spain, France, Hungary, Lithuania, Latvia, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia), neighbouring markets (Albania, Bosnia and Herzegovina, Georgia, Iceland, Liechtenstein, Moldova, Montenegro, North Macedonia, Serbia, Türkiye, Ukraine, UK), and China - IDATE estimates: EU27 (Austria, Belgium, Greece, Finland, Croatia, Ireland, Italy, Netherlands, Sweden, Slovenia), Norway, and international comparison markets (Australia, Brazil, China, India, Japan, South Korea, US) - No 5G launched yet: Bosnia and Herzegovina, Türkiye, Ukraine	2025

6G

Indicator	Description	Unit	Source	Reference year
Number of EU-based 6G pilot project use cases	Total number of use cases, spanning from proofs of concept and prototypes to demonstrations and trials	Amount	Verticals Cartography 6G SNS Tracker: EU27 - Not available for non-EU27 countries	2025