May 2025

Evolution from LTE to 5G

GSA

Introduction

LTE is a global success with over 6.6 billion subscriptions, connecting nearly two-thirds of mobile users worldwide. LTE is specified by 3GPP as a single global standard for paired and unpaired spectrum users. The vast majority of the standard is the same for frequency-division duplex (FDD) and time-division duplex (TDD). LTE has evolved through various 3GPP technology releases, covering the introduction of LTE-Advanced and then LTE-Advanced Pro, which significantly improved the capabilities of LTE networks. From 3GPP Release 15, the community has been defining 5G networks, starting with non-standalone 5G systems that integrate with existing LTE networks and moving onto standalone 5G systems with substantially different network configurations.

Since 2022, GSA has tracked increasing activity by operators investing in 5G technology, specifically mobile, 5G standalone and 5G fixed wireless access. In this edition, we continue to track this trend, as well as the decreasing activity in its predecessor, LTE.

This report provides an independent in-depth status update and analysis of the global 4G/LTE, LTE-Advanced and 5G markets. Information is obtained, analysed and verified by GSA.

Key Market Facts

According to GSA's NTS database, as of May 2025 there were:

- **969** operators in **246** countries and territories that have stated plans to invest or are actively investing in LTE for public networks, including those evaluating, testing and trialling LTE and those paying for suitable spectrum licences. This excludes those using spectrum licences exclusively for 2G or 3G services
- **835** operators running LTE networks providing mobile or fixed wireless access services in **243** countries and territories worldwide
- **375** operators investing in voice-over-LTE (VoLTE) technology in **156** countries and territories, of which **320** have launched or are currently deploying commercial VoLTE networks in **138** countries and territories
- **346** launched LTE-Advanced networks in **155** countries and territories. Overall, **374** operators are investing in LTE-Advanced technology in **161** countries and territories
- **13** launched networks that support user equipment at Cat-18 downlink speeds in limited geographic areas. **Five** of these support Cat-19 in a limited area and one supports Cat-20 in selected locations
- More than **300** operators deploying or operating TDD-based LTE or 5G networks in sub-6 GHz spectrum
- **633** operators in **188** countries and territories investing in 5G mobile or 5G fixed wireless access or home broadband networks
- **354** operators in **133** countries and territories that have announced 3GPP-compatible 5G service launches, either mobile or fixed wireless access
- **163** operators in **66** countries investing in standalone 5G for public networks in the form of trials, plans, paying for licences, deploying or operating networks

Note that all references to countries and territories in this document can be read as also including territories, special administrative regions, disputed territories and dependencies.

LTE Deployments

The drivers of deploying LTE, LTE-Advanced, LTE-Advanced Pro and 5G include more capacity, enhanced performance and improved efficiencies to lower delivery costs. Compared with 3G, LTE offers a big step up in the user experience, enhancing demanding apps such as interactive TV, video blogging, advanced gaming and professional services. Deployment of LTE-Advanced technologies, especially carrier aggregation, took performance to a new level and became a major industry focus.

Interest in LTE-Advanced Pro is high, bringing new, globally standardised low-power wide-area solutions such as LTE Cat-M1 (LTE-M, eMTC) and Cat-NB1 (NB-IoT), along with new business opportunities. Although LTE-Advanced and LTE-Advanced Pro solutions have yet to be deployed by most operators, vendors and network operators are already investing in 5G and its potential to meet future capacity, connectivity and service requirements.

LTE Global Status

LTE has reached almost every country and territory in the world. By May 2025, GSA had identified 835 operators running public LTE networks providing mobile or fixed wireless broadband services in 243 countries and territories worldwide.

However, it is notable that the rate of uptake and investment from operators has decreased significantly, particularly since 2022. Between 2022 and May 2025, GSA tracked only 18 LTE launches. In comparison, there were 93 launches between 2018 and 2021. The peak was 2015, with 122 launches.

This decline since 2022 can be attributed to the already widespread adoption of the technology, increasing uptake of 5G and the shift toward newer, more-efficient and higher-performing technologies such as 5G standalone, 5G-Advanced and 5G RedCap.

Figure 1 shows the net number of mobile operators launching LTE networks each year and cumulative.

With global uptake of LTE now almost complete, there are relatively few LTE not-spots left in the world — countries and territories with no launched LTE network of any kind, whether mobile or broadband fixed wireless access.

Figure 1. Net mobile operators launching LTE networks each year and cumulative (including mobile and fixed wireless access networks)

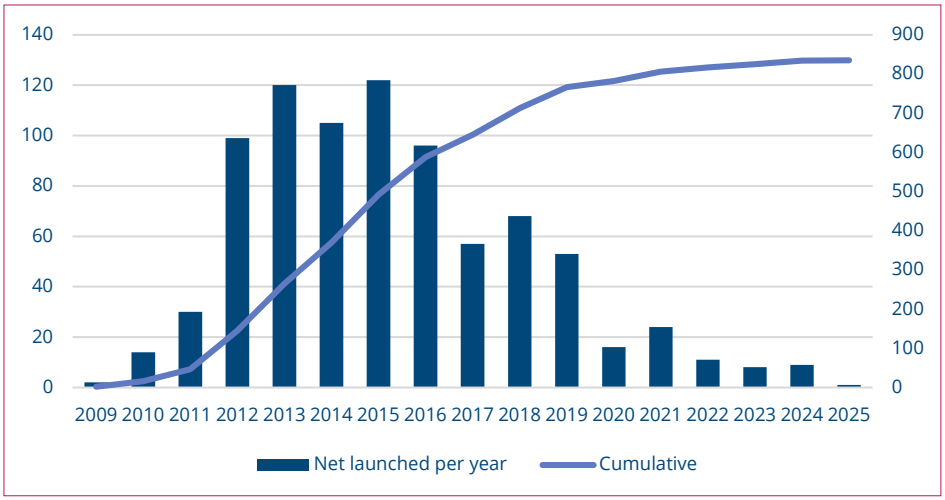
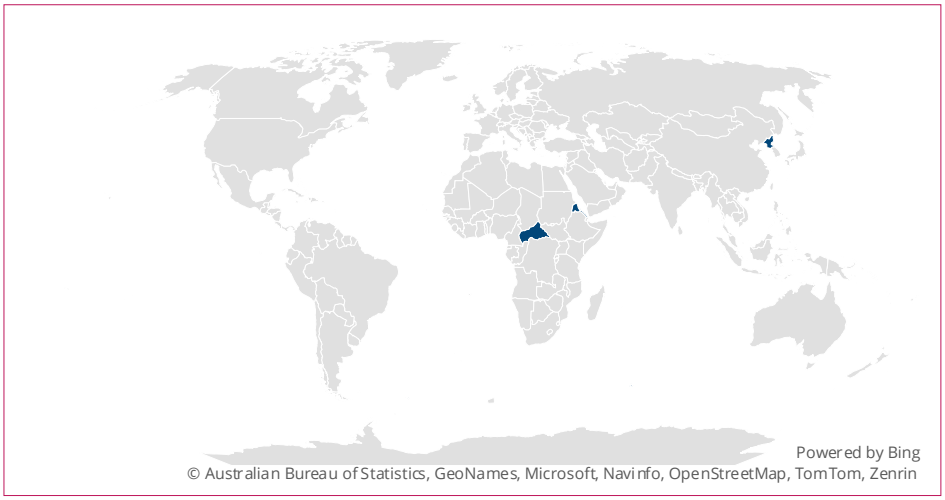


Figure 2. Countries and territories with no identified commercial LTE network for mobile or broadband fixed wireless service



Past not-spots such as Djibouti and Mauritania recently launched LTE services, and most remaining LTE not-spots are remote island territories and states or countries and territories in Africa: Central African Republic and Eritrea. One other notable LTE not-spot is North Korea.

Figure 2 shows the countries and territories with no identified commercial LTE network for mobile or broadband fixed wireless service.

VoLTE Global Status

In total, GSA has identified 375 operators investing in VoLTE in 156 countries and territories, including 320 operators that have launched or are currently deploying VoLTE services in 138 countries and territories. This is highlighted in Figure 3.

At least 26 additional operators are known to be planning VoLTE deployment. The remainder of the identified investors have been testing or trialling the technology, or are to be confirmed.

LTE-Advanced Global Status

Investment in LTE-Advanced networks has largely followed the same path as LTE, with activity slowing since the end of 2022. By May 2025, there were 346 commercially launched LTE-Advanced networks in 155 countries and territories. A further 11 operators are currently deploying networks in 11 countries and territories that do not have a launched LTE-Advanced network.

Overall, 375 operators are investing in LTE-Advanced — in the form of tests, trials, deployments or commercial service provision — in 156 countries and territories.

Figure 4 shows the countries and territories that have deployed LTE-Advanced networks.

Many operators with LTE-Advanced networks have been extending their capabilities by adding LTE-Advanced Pro features that are compatible with 3GPP Release 13 or Release 14. This includes those that make use of carrier aggregation of large numbers of channels, or carriers across TDD and FDD modes, LAA, massive-MIMO, mission-critical push-to-talk, LTE Cat-NB1 or NB-IoT and LTE-M or Cat-M1.

Figure 3. Countries and territories with VoLTE services

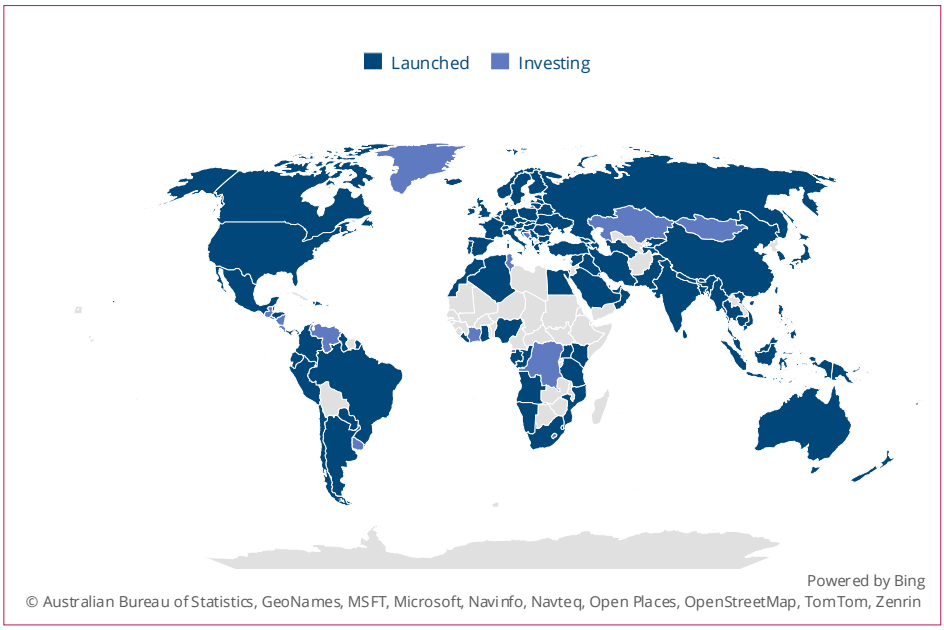
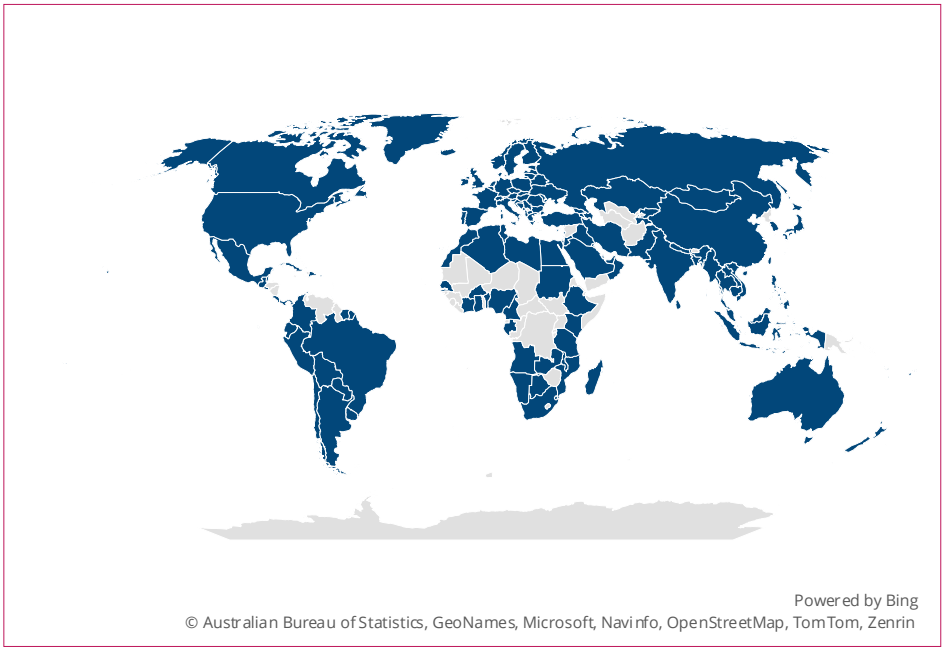
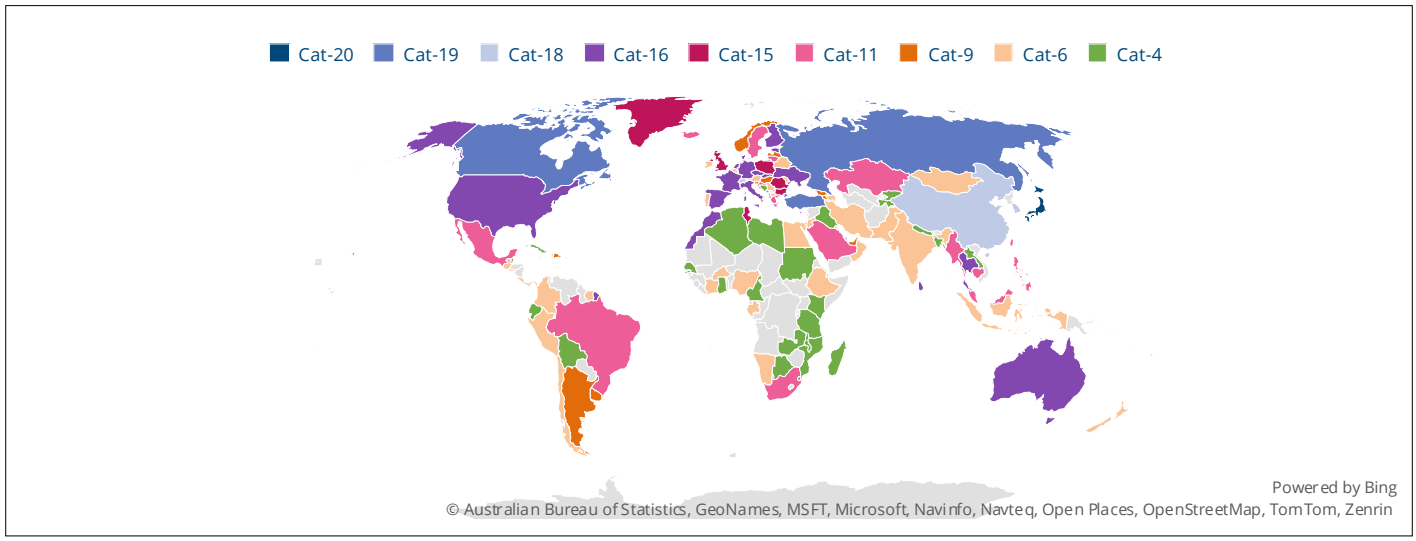


Figure 4. Countries and territories with launched LTE-Advanced networks



GSA has identified 218 operators investing in one or more LTE-Advanced Pro technologies. GSA tracks the reported fastest downlink speeds in commercially launched LTE-Advanced networks. There is wide variation; see Figure 5.

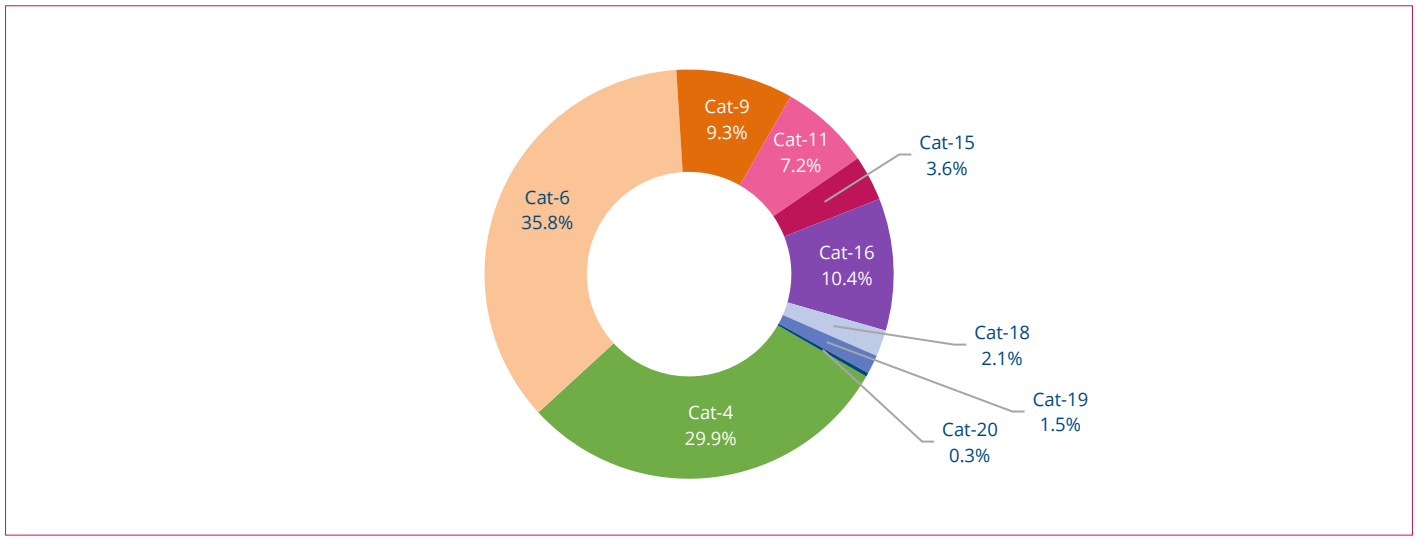
Figure 5. Fastest commercial LTE-Advanced networks per country, expressed in terms of downlink speeds by category of user equipment supported



A total of 48 operators state they can support peak theoretical downlink speeds (beyond 750 Mbps) or above for user equipment in Cat-16. Of those, 46 have announced gigabit — or very near at 998 Mbps — peak theoretical throughput, or better, in the downlink in their deployed or commercial networks. Seven of those operators have pockets of LTE network capable of delivering the maximum downlink speeds supported by Cat-18 devices, for example, peak theoretical throughput of up to 1.2 Gbps. Five of them have announced they can deliver a maximum rate in their commercial LTE network of between 1.2 Gbps and 1.6 Gbps (Cat-19). One has announced maximum peak downlink speeds in its LTE network of just over 1.7 Gbps (Cat-20).

Figure 6 shows the percentages of launched LTE-Advanced networks supporting each category of user equipment. Where GSA has no confirmed speed data, we assume that the network is at least user equipment Cat-4 and is categorised as such.

Figure 6. Distribution of LTE-Advanced networks by category of user equipment

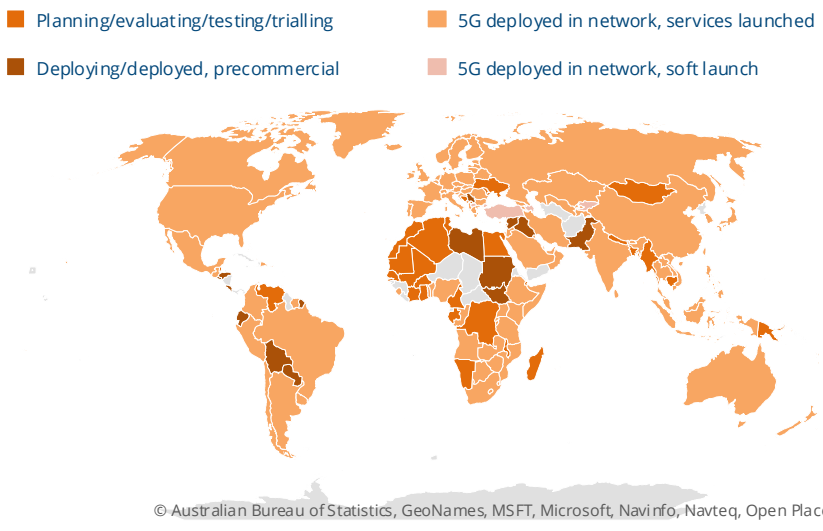


The wide variation in downlink speeds is unsurprising, as operators worldwide have different amounts of spectrum — numbers of carriers and bandwidth of those carriers — that they can aggregate to increase maximum throughput. They also vary in deployment of additional features, such as the use of 256 QAM modulation and 4x4 MIMO and in their use of unlicensed spectrum. Note also that some operators report theoretical downlink speeds, but others report live-network tested speeds.

5G Global Status

GSA has identified 633 operators in 188 countries and territories that have launched, are deploying, have acquired spectrum licences to enable deployment, have demonstrated, are testing or trialling, or have been licensed to conduct field trials of 5G networks. GSA has catalogued 354 operators in 133 countries and territories that have, as of May 2025, announced 3GPP-compatible 5G service launches — mobile or fixed wireless access. GSA has also identified 340 operators providing commercial 5G mobile services and 169 operators with 5G fixed wireless access services. Figure 7 shows the status of 5G networks around the globe.

Figure 7. Global 5G network launches



Low-band LTE is viewed as pivotal to the roll-out of 5G in large geographical areas. This is seen in the continued growth of LTE, as well as the accelerating growth of 5G device models with support for the 700 MHz, 800 MHz and 900 MHz bands. The 900 MHz band is still the most supported, with 14,707 LTE devices and 1,737 5G devices. It is followed by the 800 MHz band, supported by 13,395 LTE devices and 1,293 5G devices. The 700 MHz band is supported by 7,967 LTE devices and 2,063 5G devices and 600 MHz is supported the least, with 1,667 LTE devices and 829 5G devices. We expect these numbers to continue accelerating throughout the rest of 2025 and into 2026. Table 1 shows support from 4G and 5G device models for low-band frequencies.

Table 1. Device support for low-band frequencies

Frequency range	3GPP band	4G devices	5G devices
900 MHz	B8/n8	14,707	1,737
800 MHz	B20/n20	13,395	1,293
700 MHz	B28/n28	7,967	2,063
600 MHz	B71/n71	1,667	829

LTE and 5G Fixed Wireless Access

Fixed wireless access broadband based on LTE is available to most countries worldwide, as shown in Figure 8. GSA has identified 440 operators in 172 countries and territories selling fixed wireless access services based on LTE.

Note that these LTE figures reflect the net growth of the market and disguise the fact that GSA has removed companies from the count as a result of failures or mergers, market withdrawals — owing in some cases to the loss of local spectrum rights because of licence expiry or national spectrum restructuring processes — or the removal of fixed wireless access products from company websites, which are often replaced with MiFi or hot spot products.

In addition, of the 354 operators that had announced 5G launches worldwide as of May 2025, GSA has catalogued 169 operators, forming more than 47%, that have either soft-launched or are marketing residential or business-focused 5G fixed wireless access broadband services.

Figure 8. Countries and territories with commercial 5G fixed wireless networks

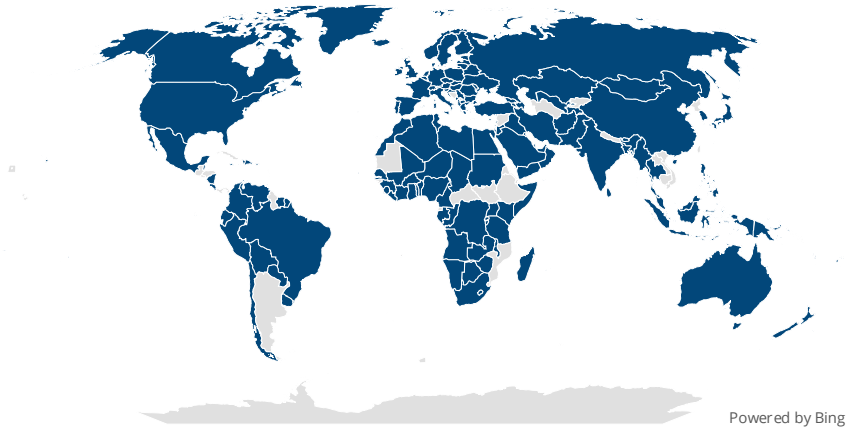
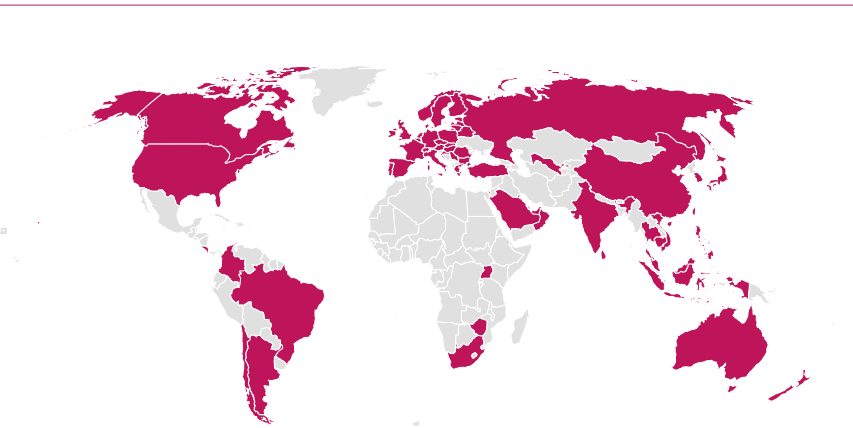


Figure 9. Map of operator investments in 5G standalone for public networks



5G Standalone

A crucial development in the 5G market has been the accelerating launch of 5G standalone networks. Several operators have been running tests or trials of 5G standalone technologies over the past couple of years, with some operators launching networks. As the business case for 5G and user demands increase, operators need to ensure they can provide ample and robust services.

GSA has identified 163 operators in 66 countries and territories investing in 5G standalone for public networks in the form of trials, plans, paying for licences, deploying or operating networks (see Figure 9).

At least 73 operators in 44 countries and territories are now understood to have launched, soft-launched or deployed public 5G standalone networks.

In addition to these, GSA has identified five operators in five countries that are deploying the technology and numerous contracts for the deployment of 5G core systems, sometimes in multiple countries, have been announced.

Spectrum for LTE and 5G Deployments

Pressure for spectrum is high and operators need to deploy the most efficient technologies available. LTE, LTE-Advanced and LTE-Advanced Pro services can be deployed in dozens of licensed spectrum bands starting at 450 MHz and rising to nearly 6 GHz. The LTE standards also enable the possibility to extend the benefits of LTE-Advanced to unlicensed and shared spectrum.

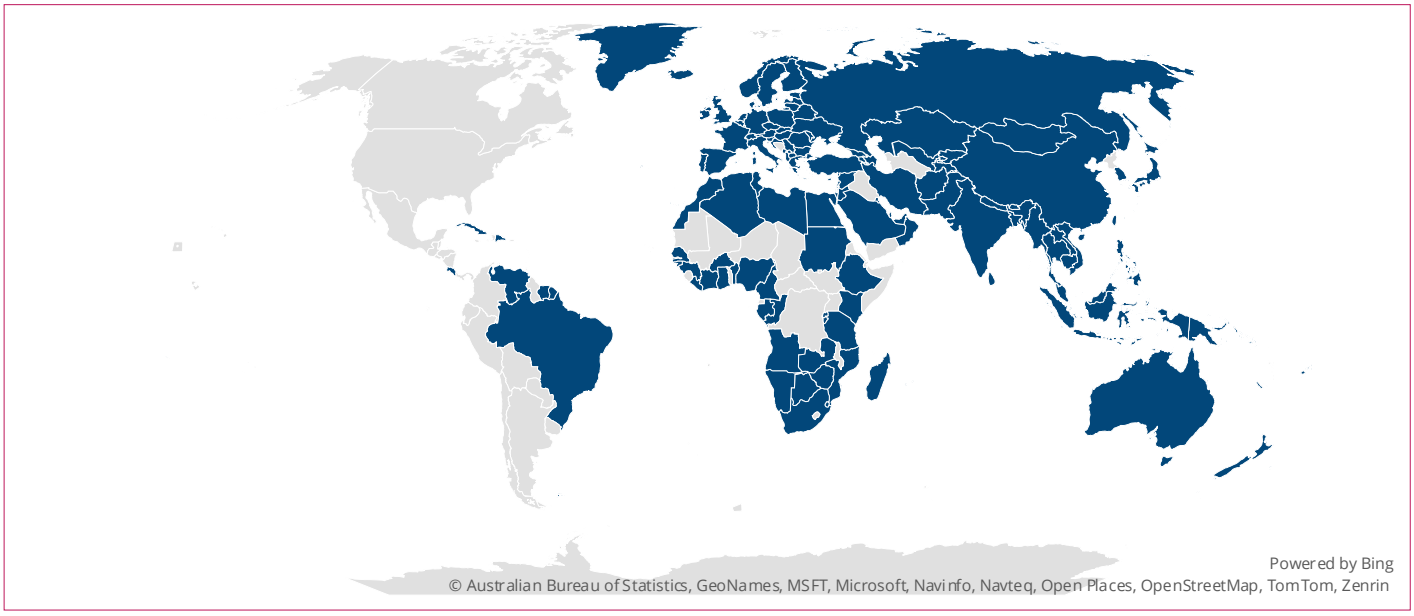
Furthermore, 5G networks can use a much-extended range including all the typical ranges used by LTE networks, plus new millimetre-wave spectrum bands. To date, sub-6 GHz spectrum has been more widely licensed and deployed, with C-band spectrum most widely used. Nonetheless, more and more governments and regulators are looking at the possibilities of using millimetre-wave spectrum to increase capacity in key areas.

Many recent assignments and auctions of spectrum have focused on licensing spectrum for LTE and future 5G services. This spectrum is sometimes dedicated to LTE, sometimes to 5G and sometimes assigned on a technology-neutral basis. GSA tracks spectrum auctions and assignments in a regular report; see the May 2025 edition here.

Band 3 (1800 MHz) Global Status

LTE network deployment in the FDD 1800 MHz band (band 3) is now common in Europe, Asia–Pacific, the Middle East and Africa and regions of South America. In fact, use of 1800 MHz is now almost ubiquitous on a national basis in Europe and Asia–Pacific (see Figure 10).

Figure 10. Countries and territories with deployed or launched LTE band 3 or 5G band n3 networks, including mobile and fixed wireless access networks



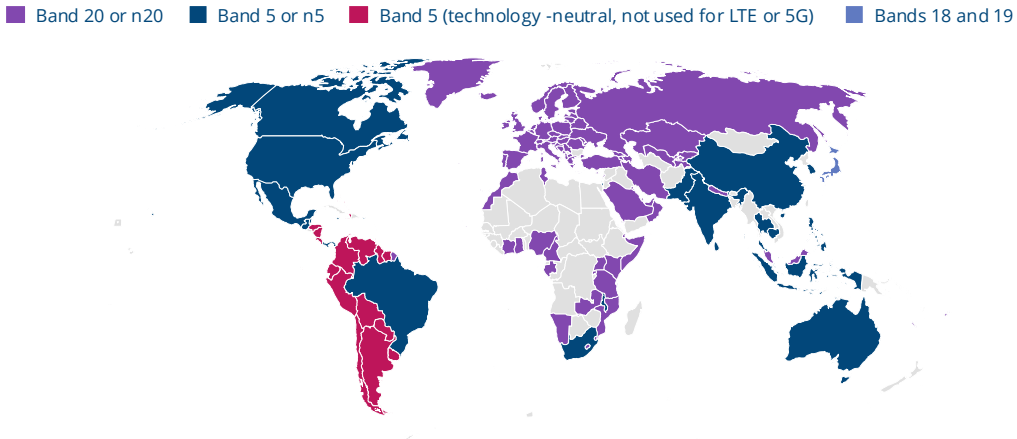
GSA tracks 444 companies in 173 countries and territories with licences enabling them to deploy LTE in band 3, excluding those with technology-neutral licences that have used the spectrum for 2G or 3G networks. At least 398 operators, about 47% of all network operators with launched LTE services, in 165 countries and territories have launched LTE services using spectrum in band 3.

Operators are also starting to use 1800 MHz spectrum for 5G. GSA is aware of nine that have launched using band n3, three that are deploying 5G at 1800 MHz and another six that have been testing, piloting or planning for 5G at 1800 MHz or licensed to launch using band n3.

Bands 5 and 20 (800 MHz and 850 MHz) Global Status

The range of spectrum between 800 MHz and 900 MHz is firmly established as a mainstream frequency range for LTE, using an FDD configuration. GSA has identified 304 operators investing in bands 5 and 20 in this frequency range for LTE, including 243 that are understood to have launched networks. Figure 11 illustrates momentum for these spectrum bands.

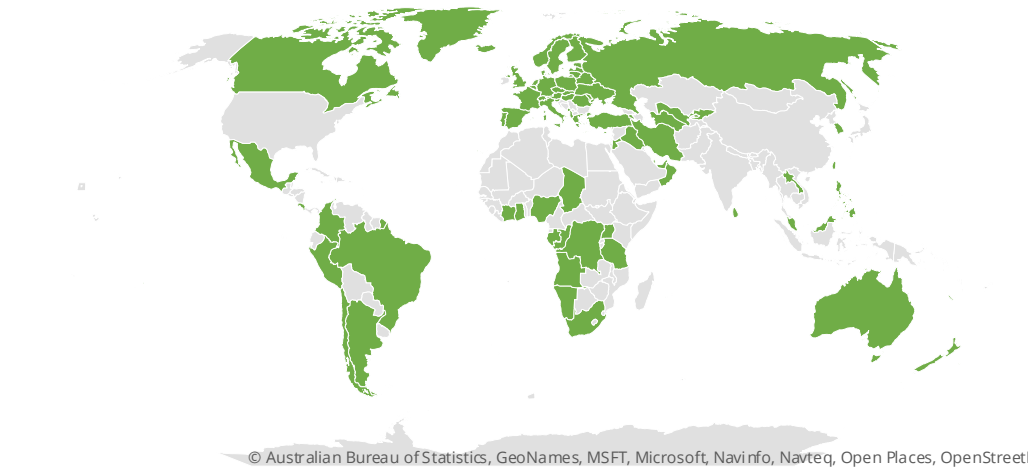
Figure 11. Countries and territories that are known to have licensed operators to use bands 5, 18, 19 or 20 for LTE networks



Band 7 (2.6 GHz) Global Status

The 2.6 GHz FDD band is also very widely licensed and deployed (see Figure 12). There are 249 companies in 99 countries and territories licensed to deploy LTE in band 7, excluding those with technology-neutral licences that have used the spectrum for 2G or 3G networks. Use of band 7 for 5G is less clear; many operators have declared use of the 2.6 GHz range for 5G, but most are thought to use TDD spectrum allocations in this range. Services using spectrum in band n7 have been launched by 11 operators in Canada, Italy, New Zealand, Sweden, Uganda, Vietnam, Trinidad and Tobago and Zambia. In addition, 25 separate operators are licensed for spectrum use in the 2.6 GHz FDD that could be used for 5G.

Figure 12. Countries and territories with operators using band 7 LTE networks (deploying, deployed or launched), including fully mobile and fixed wireless access networks



Bands 12, 13, 14, 17 and 28 (700 MHz) Global Status

After the 2.6 GHz band, the next most widely licensed FDD bands are in the 700 MHz range (see Figure 13), with 222 operators investing in LTE for the key 700 MHz bands:

- 123 operators are investing in LTE in APT 700 MHz spectrum, band 28 (703-748 MHz/758-803 MHz FDD), of which at least 60 hold licences to use spectrum in the band — including technology-neutral assignments — and 60 have launched commercial LTE services.
- 101 operators are investing in LTE in one of the United States' 700 MHz bands — bands 12, 13, 14 or 17, between them covering 75 MHz within 699 MHz and 798 MHz. Of those, 78 are known to have used one of the bands to deploy or launch their LTE network.

In addition to its use for LTE, 700 MHz spectrum is widely being evaluated for 5G: 92 operators have deployed or plan to use 700 MHz. Of these, 38 have either launched or are deploying commercial services and three have planned deployments.

There are other operators holding technology-neutral spectrum at 700 MHz that is currently used for LTE, but which could be repurposed. We expect further licensing activity at 700 MHz, as the EU has identified this spectrum range as a 5G pioneer band.

TDD Global Status

Most LTE deployments use paired spectrum (FDD). The LTE-TDD mode is complementary and the optimal choice for providing high-speed mobile broadband access in unpaired spectrum. Many operators have deployed both FDD and TDD modes in their networks.

Figure 13. Countries and territories known to have licensed operators to use the APT or North American 700 MHz bands for LTE or 5G

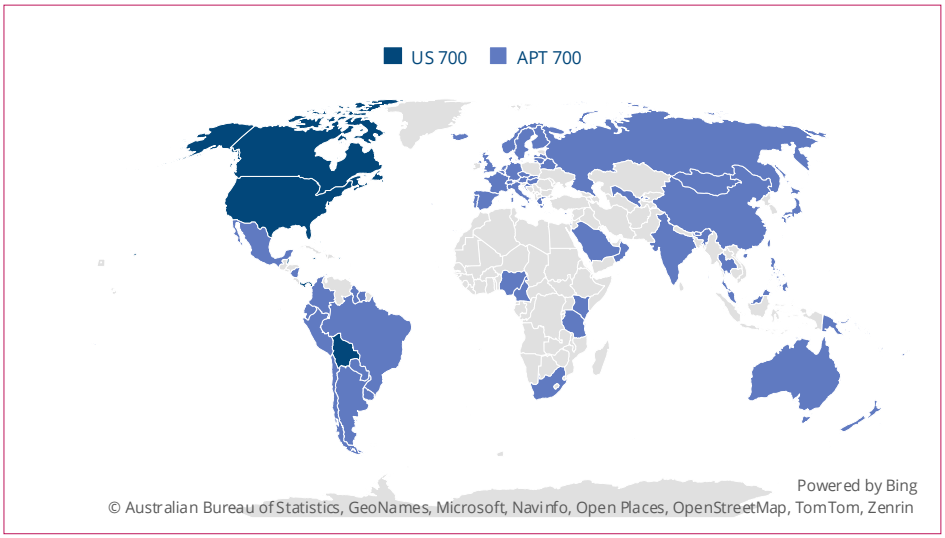
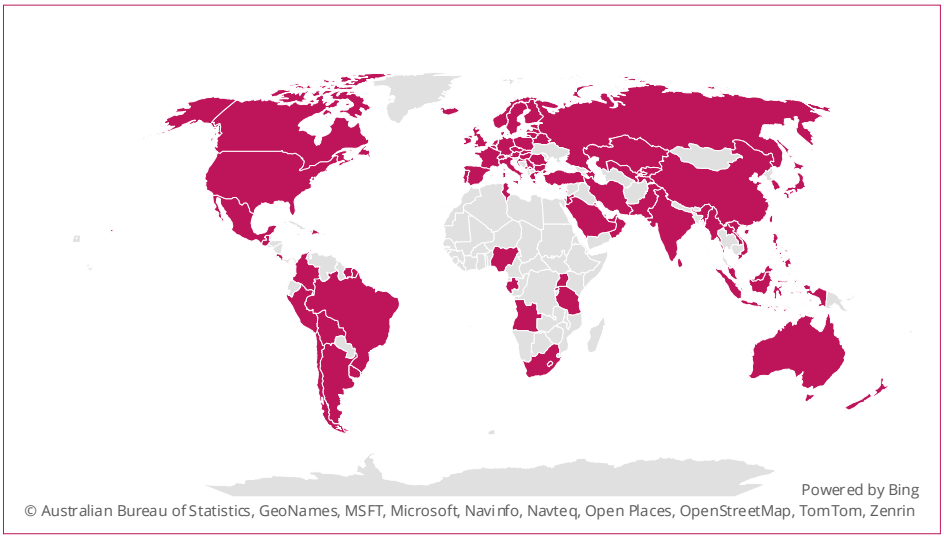


Figure 14. Countries with operators holding licences enabling them to deploy LTE or 5G networks between 3300 MHz and 3800 MHz (bands 42, 43, 48, n48, n77 and n78)



In contrast, the majority of 5G networks are being deployed using TDD C-band spectrum in bands n77 and n78.

GSA has identified over 600 operators that hold spectrum licences enabling them to launch TDD-based LTE or 5G services using sub-6 GHz spectrum, including more than 200 CBRS PAL licensees in the United States (see Figure 14).

Of these, more than 300 operators have been identified as actively deploying or using TDD LTE or TDD 5G networks in sub-6 GHz spectrum.

Excluding the many regional CBRS PAL licences in the United States, TDD spectrum in band 38, with 83 licences, is the most licensed for LTE, followed by spectrum in band 40, with 78 licences, and band 42, with 71 licences. These figures include licences known to be assigned on a technology-neutral basis.

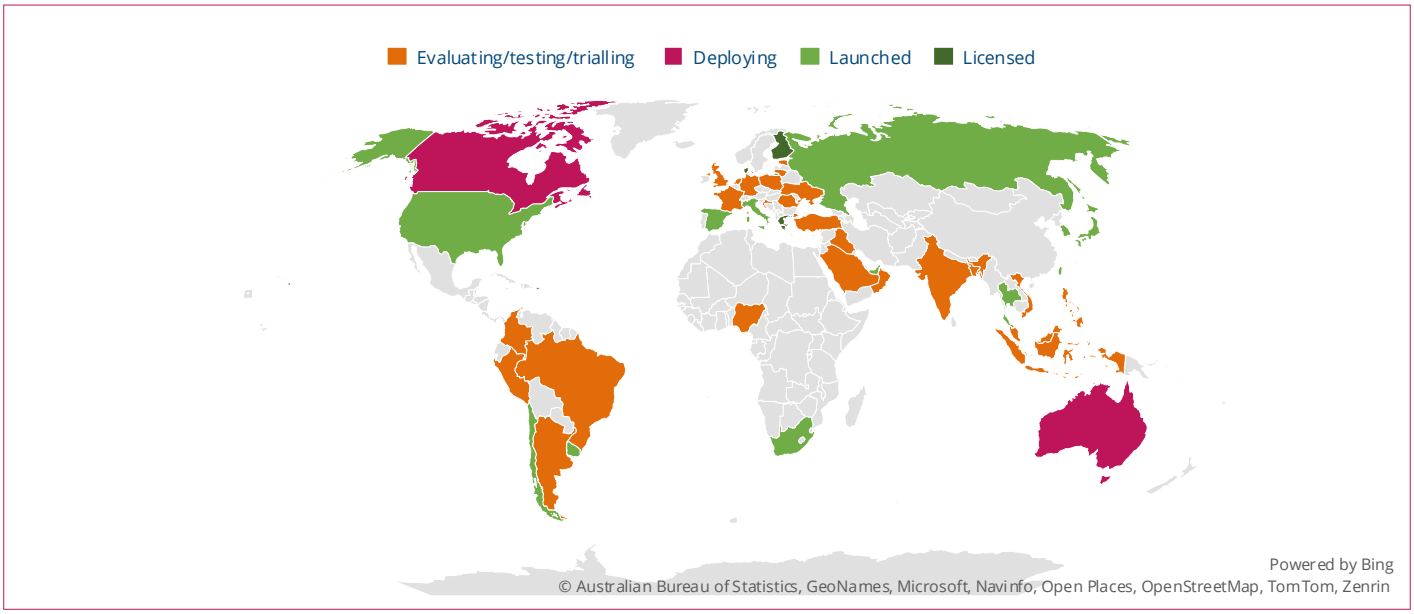
The overlapping TDD bands, band n77 and band n78 (3300-4200 MHz), have emerged as the primary spectrum bands for early 5G deployments. GSA has identified 303 operators that have been investing in 5G in the form of trials, payments for suitable spectrum licences including technology-neutral assignments, deployments or launches using this spectrum. Of those, at least 154 are deploying or have launched 5G in this spectrum range. Other sub-6 GHz TDD bands being used for 5G are bands n38, n40, n41 and n79.

TDD in Millimetre Wavebands

5G networks can use new millimetre-wave spectrum ranges with TDD configurations. These include bands n257, n258, n260 and n261, which are currently the most popular bands for 5G network tests and deployments. The United States has also released spectrum in band n262 on a technology-neutral basis with 5G deployment in mind.

GSA has identified 192 operators in 51 countries and territories that hold public licences — many of them regional — enabling operation of 5G networks using high-band spectrum between 24.25 GHz and 48.2 GHz. There are 27 operators in 17 countries and territories that are known to be already deploying or have launched 5G networks using millimetre-wave spectrum (see Figure 15).

Figure 15. Countries with operators investing in bands n257, n258, n260, n261 and n262 for 5G networks



GSA will continue tracking the global progress of LTE and 5G deployments, spectrum use and features. For more details about planned 5G spectrum allocations, please see GSA's reports here.

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