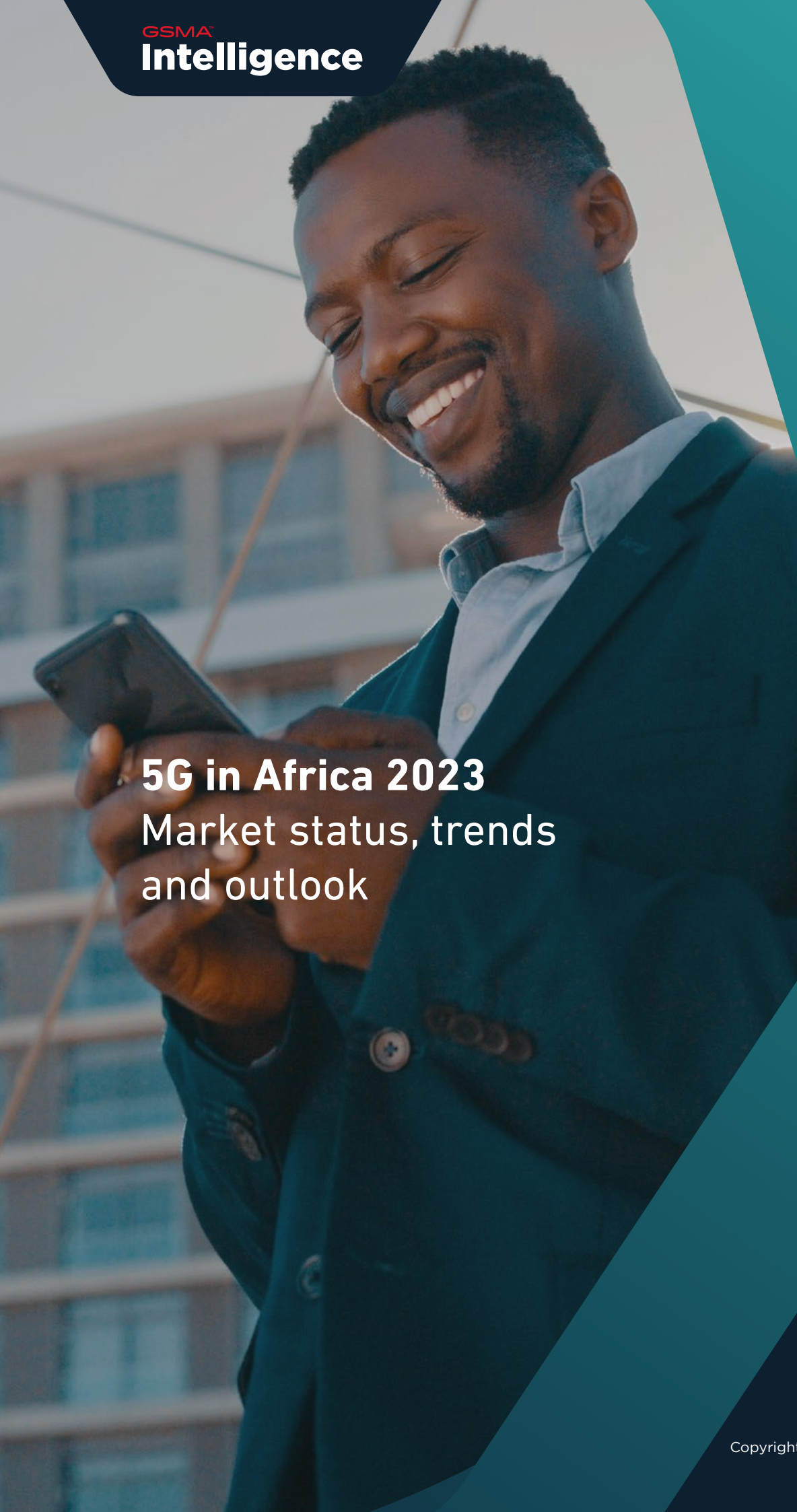
GSMA Intelligence



5G in Africa 2023

Market status, trends and outlook

GSMA

GSMA Intelligence

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

We invite you to find out more at gsma.com

Follow the GSMA on Twitter: @GSMA

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

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

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

www.gsmaintelligence.com

info@gsmaintelligence.com

Published October 2023

Authors
Kenechi Okeleke, Director
James Joiner, Lead Analyst

Contents

Executive summary

5G momentum continues to grow around the world, helped by increasing network rollouts and device availability. 5G is expected to benefit all economic sectors of the global economy, although some industries will benefit more than others due to their ability to incorporate 5G use cases in business. Globally, 5G will overtake 4G this decade in terms of adoption to become the dominant mobile technology, with total 5G connections surpassing the 5 billion mark by 2030.

As of September 2023, 27 operators in 16 markets in Africa had launched commercial 5G services. More markets are expected to follow soon, with operators in an additional 10 countries making a commitment to launch 5G in the coming years. 10 countries in Africa have assigned spectrum for 5G services to operators, at the time of writing. While this represents reasonable progress compared to the situation a year ago, 5G spectrum assignment in Africa is still underdeveloped compared to other regions.

5G monetisation is top of mind for operators around the world. In Africa, 5G fixed wireless access (FWA) has emerged as an important use case for operators looking to address the gap in last-mile fixed broadband (FBB) connectivity. The low level of FBB development in Africa means that operators in the region have the opportunity to deploy 5G FWA as a primary broadband connectivity option for households without access to a fixed alternative; it also gives operators a chance to capture the enterprise opportunity, particularly in the micro-, small and medium-sized enterprises (MSME) segment. To maximise the 5G FWA opportunity, there is a need to address a number of potentially limiting issues, including access to spectrum and affordability of customer-premises equipment (CPE) devices.

The development of 5G enterprise use cases is also gaining momentum, with MTN recently announcing several initiatives in collaboration with Huawei across multiple verticals, including agriculture, healthcare, manufacturing and mining. Several operators and vendors in Africa have invested in programmes dedicated to co-creating consumer and enterprise 5G solutions for Africa. These include Orange, which recently inaugurated its third Orange 5G Lab in Africa, and chipmaker Qualcomm, which launched the 'Make in Africa' initiative in 2022 to support local startups in creating innovative solutions for the region.

Meanwhile, the role of spectrum in the deployment of advanced network infrastructure, particularly 5G, cannot be overemphasised. In Africa, existing bands below 3 GHz remain crucial for mobile network capacity and wide coverage, particularly for 4G and 5G development. While higher mid-bands such as 3.5 and 6 GHz will provide the highest capacity, lower mid-bands (1–3 GHz) and low bands (below 1 GHz) have propagation and capacity characteristics that enhance coverage and, by extension, drive use cases such as IoT and VoLTE/VoNR.

A number of mobile/IMT bands below 3 GHz are being considered today for the further development of 4G and 5G in Africa, such as the following:

- The 700, 800 and 900 MHz bands can improve the 4G/5G coverage layer, while 600 and 1500 MHz may provide capacity in the future.
- The remaining 1800 and 2100 MHz spectrum can increase 4G capacity and ease traffic suppression, supporting the smooth evolution to 5G.
- The 2300 and 2600 MHz bands have the potential to improve the capacity of mobile broadband networks and facilitate the cost-effective deployment of 4G/5G.

1

5G state of play: global

5G becomes mainstream

5G momentum continues to grow around the world, helped by network rollouts and device availability. In some 5G pioneer markets, such as South Korea and the US, 5G has already become mainstream and will account for more than half of total mobile connections by the end of 2023. Globally, 5G will overtake 4G this decade in terms of adoption to become the dominant mobile technology.

5G is expected to benefit the global economy by more than $950 billion in 2030. Much of this will materialise in developed regions, including East Asia and the Pacific, North America and Europe. 5G is expected to benefit all economic sectors of the global economy, although some industries will benefit more than others due to their ability to incorporate 5G use cases in business. Over the next 10 years, 46% of the 5G benefits are expected to be realised in the services sector and 33% in manufacturing, driven by applications such as smart factories, smart cities and smart grids.

Key global 5G growth drivers

Network rollout – As of September 2023, 297 operators in 100 markets had launched 5G mobile services. More than 80 other operators have disclosed plans to launch 5G services, many of them in markets across Africa, Asia and Latin America.

Operator strategies – Operators are increasingly focusing on driving 5G adoption. A GSMA Intelligence survey shows that 5G consumers are more likely than 4G consumers to add services and content – such as video streaming, gaming and wearables – to their contracts.

Spectrum assignments – As of June 2023, 270 individual operators had received spectrum for 5G use across three key frequency band ranges. Mid-band (1–7 GHz) has dominated 5G spectrum assignments to date, but assignments in low bands (<1 GHz) and high bands (>24 GHz) are increasing.

The FWA opportunity – As of September 2023, 116 operators in 57 markets had launched 5G FWA. This indicates that around 40% of 5G commercial networks include an FWA offering – a relatively high proportion at this early point in the generational cycle.

Device availability – To date, nearly 900 5G smartphone models have been launched, with more than 150 having launched so far in 2023. 5G smartphones are expected to account for 62% of all smartphones shipped in 2023.[1]

Legacy networks shutdown – The decline in 2G and 3G connections creates an opportunity for network shutdowns and the transfer of resources to 4G and 5G networks. As of August 2023, a total of 91 networks globally had been shut down, of which 43 were 2G networks and 48 were 3G networks.

Device affordability – Sub-$300 5G smartphones are now available, meaning that 5G devices are approaching a price point that can stimulate mass adoption in middle-income markets.

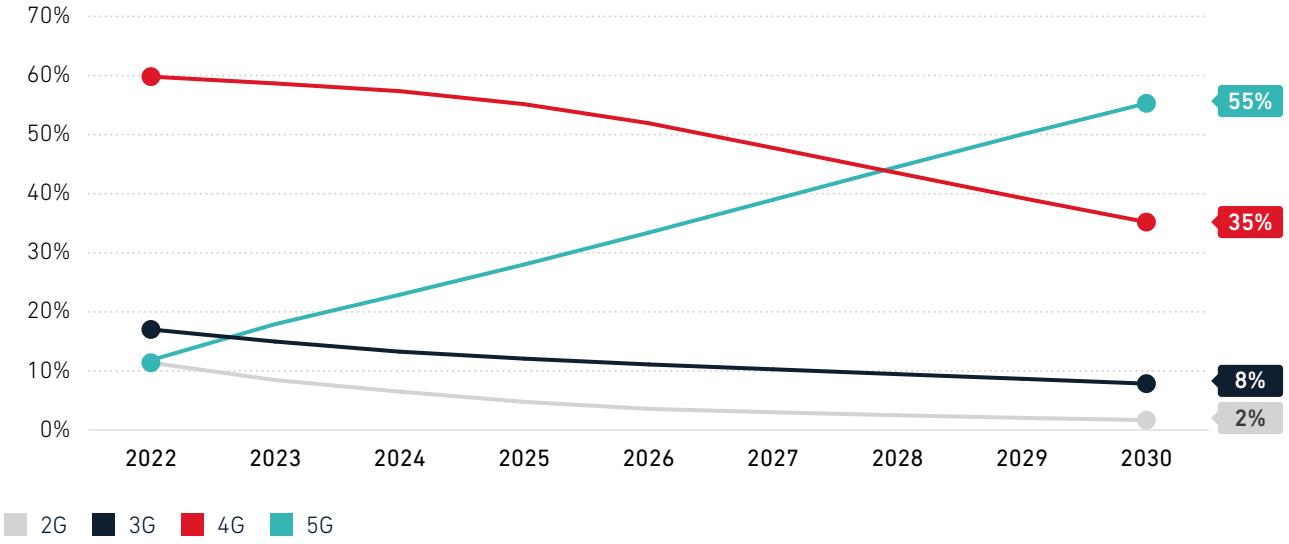
1 IDC

Global 5G connections crossed the 1 billion mark at the end of 2022, just under four years since the launch of the technology. The adoption of 5G has been much faster compared to that of 4G and 3G in the first few years after their respective launches; it took 4G around eight years and 3G nearly 11 years to reach the same 1 billion milestone. 5G connections will continue to grow rapidly over the next few years, reaching 2 billion connections by 2025 and 5 billion connections by the end of this decade.

Figure 1

Global mobile adoption by technology

Percentage of total connections

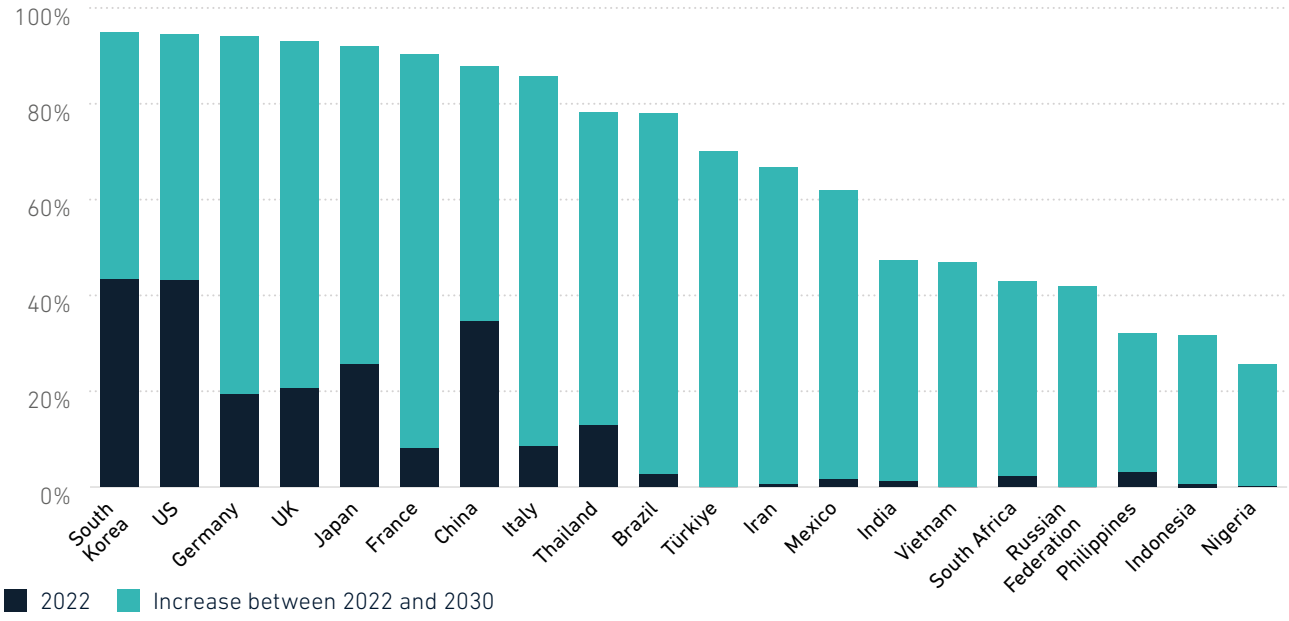


Source: GSMA Intelligence

Figure 2

The top 20 markets by 5G adoption, 2022–2030

Percentage of total connections



Source: GSMA Intelligence

5G monetisation moves up the agenda

As 5G adoption continues to scale up, the monetisation imperative will grow. GSMA Intelligence research shows that the mobile ARPU trend in eight leading markets improved in the 12 months after launching 5G.[2] As multiple drivers affect ARPU, separating the effect of 5G from that of other drivers (e.g. macroeconomic trends and regulation) is difficult. Nevertheless, 5G seems to be one of the main factors behind ARPU growth, which matches what some of the pioneer 5G operators are communicating to investors and the wider ecosystem in their quarterly earnings. While initial 5G deployments have largely focused on faster data speeds, new 5G capabilities will be added in the release of future standards, creating new monetisation opportunities.

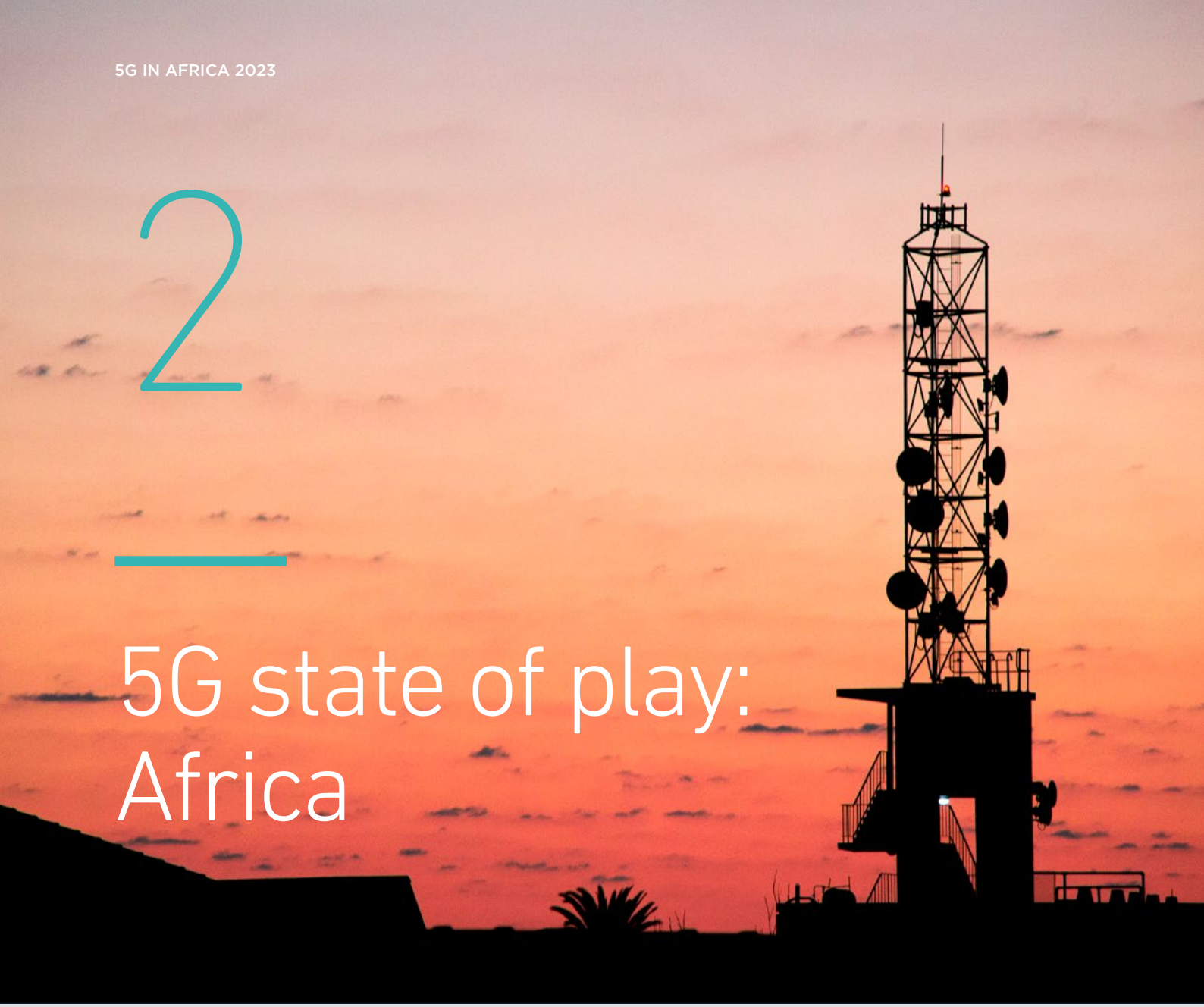
Figure 3

Recent developments for emerging key 5G capabilities

Technology	Recent development	Implication
5G standalone (5G SA)	**July 2023:** Telefónica launched its 5G SA commercial service in Spain, branded 5G+. Over 40 operators have so far launched commercial 5G SA networks, with the number expected to pass 50 by the end of the year.	The transition to 5G SA will help foster a more favourable environment for the adoption of services such as network slicing, edge compute and massive IoT.
5G-Advanced	**September 2023:** In the UAE, the Telecommunications and Digital Government Regulatory Authority and e& completed a 5G-Advanced trial in the 6 GHz band, achieving 10 Gbps throughput.	The use case for 5G-Advanced is straightforward: it enables 5G to support new market demands (e.g. lower cost IoT support, multicast integration) before the arrival of 6G.
5G new calling	**June 2023:** China Mobile announced at MWC Shanghai 2023 that it would launch 5G new calling later in 2023.	5G new calling leverages the IMS data channel to bring ultra-HD, intelligent and interactive capabilities to enhance basic voice and video calls, creating new revenue opportunities for operators.
5G RedCap	**August 2023:** AT&T completed what it claims to be the first 5G RedCap data call in the US. The call was made in both the company's lab and in the field on a live 5G SA network.	5G RedCap opens new opportunities to bring the benefits of 5G to devices beyond smartphones that have a lower cost, smaller form factor and longer battery lives, for both consumer and industrial IoT use cases.
Non-terrestrial networks (NTNs)	**September 2023:** AST SpaceMobile and Vodafone demonstrated a successful 5G voice call via satellite to an off-the-shelf handset on the ground.	5G-Advanced brings enhanced integration with satellite resources. This means that, where commercial partnerships are in place, standard devices will be able to connect seamlessly with traditional cellular base stations and satellite systems.

Source: GSMA Intelligence

2 5G adoption and mobile ARPUs: is there a connection?, GSMA Intelligence, June 2023



2

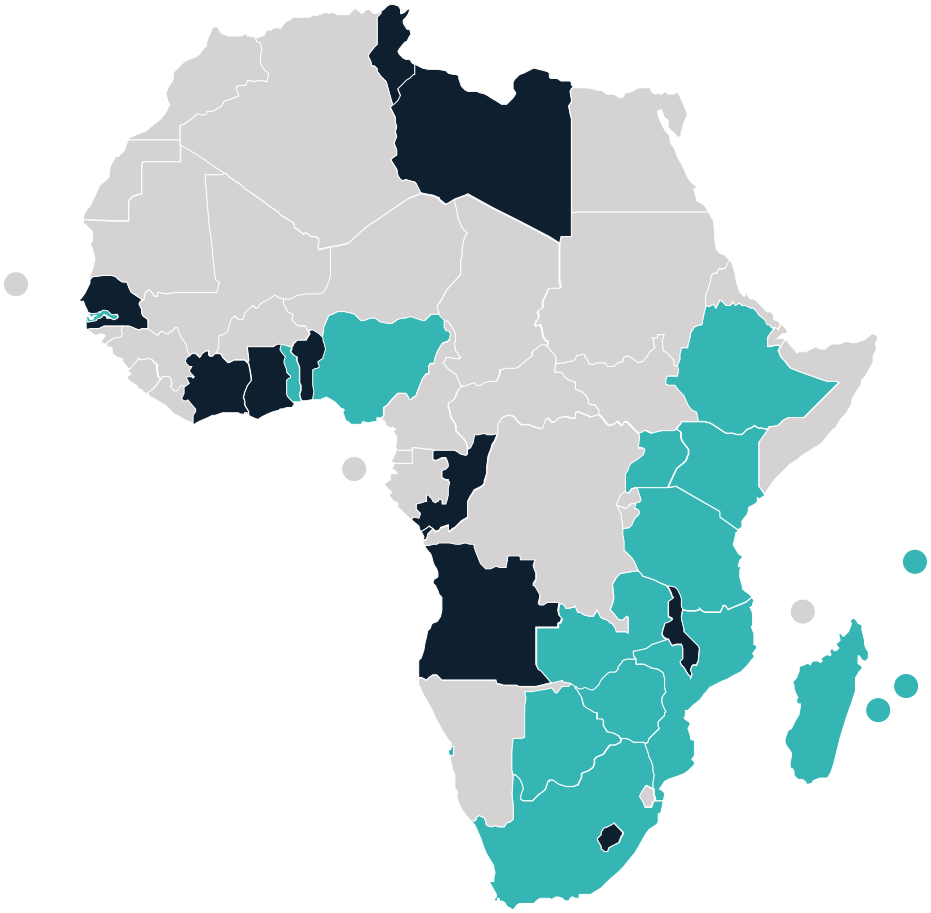
5G state of play: Africa

5G market update

5G continues to make inroads in Africa. As of September 2023, 27 operators in 16 markets across the region had launched commercial 5G services. More markets are expected to follow soon, with operators in an additional 10 countries making a commitment to launch 5G in the coming years. 5G coverage in the region is still mostly limited to major cities, but there is growing evidence that 5G coverage is ramping up in some countries. In South Africa, for example, 5G coverage reached 41% of the population as of September 2023.

Figure 4

5G commercialisation in Africa

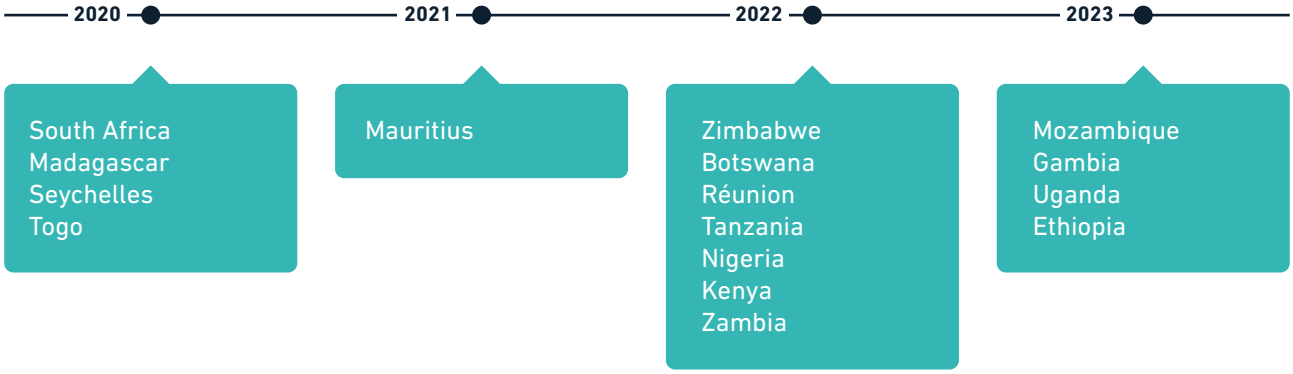


Live commercial 5G networks Planned commercial 5G networks

Note: Data correct to 30 September 2023. Status assigned where an operator has stated a commitment/timeline (planned) or announced a commercial 5G launch (live). Status is defined as live where at least one operator has commercially launched (mobile/fixed) 5G services.
Source: GSMA Intelligence

Figure 5

Commercial 5G launches in Africa by year



Source: GSMA Intelligence

10 countries in Africa have assigned spectrum for 5G services to operators, at the time of writing. While this represents reasonable progress compared to a year ago, 5G spectrum assignment in the region is still underdeveloped when compared to Asia Pacific, Europe and North America. Progress should continue in 2023 and beyond, with several countries set to auction 5G spectrum before the coming years.

Figure 6

Selected 5G spectrum assignments in Africa

Country	Date	Bands	Number of winners
Angola	December 2021	3.5 GHz	3 – Africell (Lintel), Movicel, Unitel
Kenya	May 2022	2600 MHz	2 – Safaricom, Airtel Kenya
Mauritius	June 2021	2600 MHz 3.5 GHz	3 – Emtel (Currimjee), Chili (MTML), my.t (Mauritius Telecom)
Namibia	October 2023	700 MHz 800 MHz	3 – Loc8 Mobile, Telecom Namibia Limited, Mobile Telecommunications Limited (MTC)
Nigeria	December 2021	3.5/3.7 GHz	2 – MTN, Mafab Communications
Nigeria	December 2022	3.5 GHz 2600 MHz	1 – Airtel
Senegal	July 2023	700 MHz 3400 MHz	1 – Sonatel (Orange Senegal)
South Africa	March 2022	700 MHz 800 MHz 2600 MHz 3.5 GHz	6 – Rain, Vodacom, Telkom Mobile, Neotel, Cell C, MTN
Tanzania	October 2022	700 MHz 2300 MHz 2600 MHz 3.5 GHz	4 – Airtel, Millicom, Viettel, Vodacom
Uganda	June 2023	800 MHz 2300 MHz 2600 MHz	2 – Airtel, MTN
Zambia	July 2022	2600 MHz	1 – MTN
Zambia	October 2022	800 MHz 2600 MHz	1 – Airtel

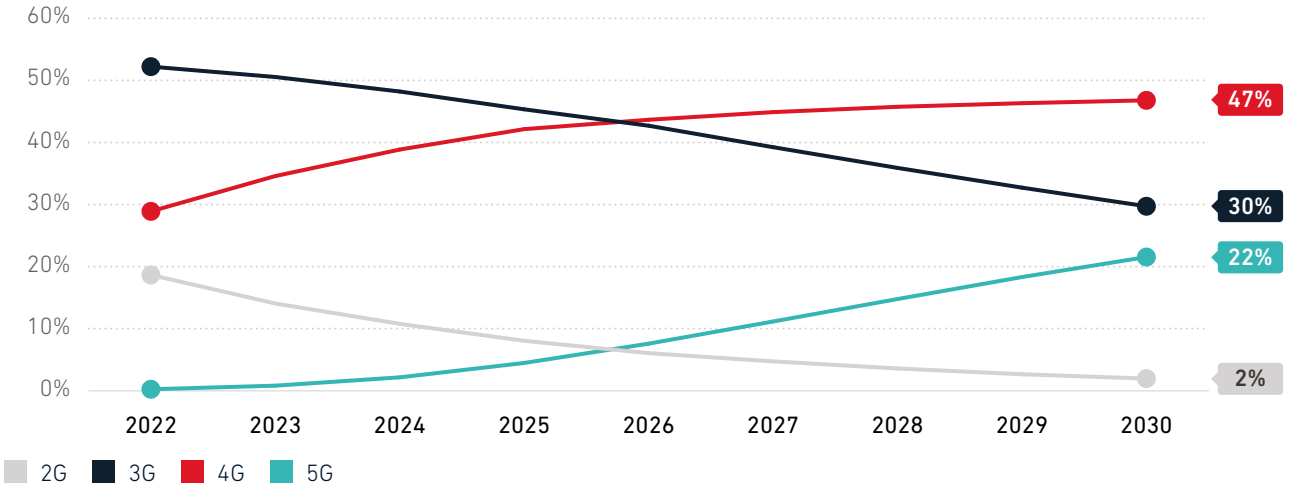
Note: Data correct to 5 October 2023. 5G spectrum auctions have also taken place in Mayotte and Réunion.
Source: GSMA Intelligence

4G adoption in Africa reached 35% of total connections at the end of 2022 (equivalent to 370 million 4G connections). This figure will reach 44% in 2026, overtaking 3G as the most widely adopted mobile network generation in Africa. The increase will be fuelled by growing adoption in Ethiopia and Nigeria, where the number of 4G connections will more than treble between 2022 and 2030.

Figure 7

Mobile adoption by technology in Africa

Percentage of total connections



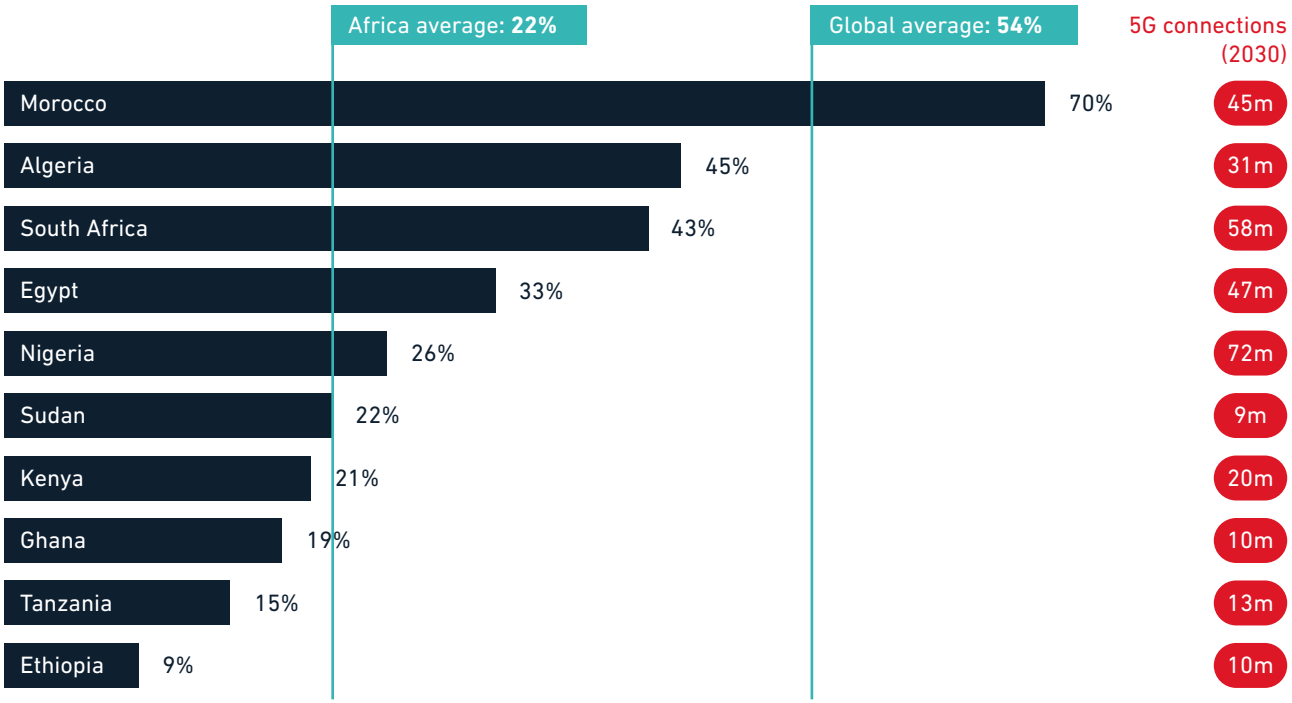
Source: GSMA Intelligence

5G is currently at a nascent stage in Africa, with the adoption rate being around 1% of total connections. This is expected to grow to 8% by 2026. At this point, 5G adoption will have overtaken 2G adoption and gained a double-digit share of total connections in eight countries in the region: South Africa, Morocco, Réunion, Botswana, Zambia, Mauritius, Algeria and Namibia. 5G adoption will continue to ramp up in the following years, accounting for 22% of total connections by the end of the decade.

Figure 8

Top 10 markets in Africa by 5G adoption, 2030

Percentage of total connections



Source: GSMA Intelligence

5G in North Africa

4G adoption in North Africa reached 45% of total connections at the end of 2022 – double the adoption rate in Sub-Saharan Africa. It is therefore unsurprising that North African operators have been trialling 5G networks and announcing new network vendor partnerships in preparation for launching commercial 5G services, such as the following examples:

- **May 2023:** Tunisia's Minister of Communication Technologies announced the country is planning for the commercial launch of 5G services in 2024 and will set out a detailed roadmap for the technology later in 2023.[3] The move follows demonstrations of 5G services carried out by Tunisie Telecom at the International Francophonie Summit in 2022.
- **March 2023:** Nokia was chosen by Ooredoo Group to upgrade its current RAN infrastructure and deploy new sites in Algeria and Tunisia. The partnership aims to improve network performance and help Ooredoo to prepare for a launch of 5G services in the future.[4]
- **November 2022:** Algerian mobile operator Djezzy announced that it has tested 5G services in partnership with Huawei and Nokia. Connection speeds exceeding 1.5 Gbps were demonstrated in Algiers, Oran and Annaba, while Djezzy confirmed it is planning further tests with ZTE in Tlemcen as part of a programme devised by the telecoms regulator.[5]

Despite growing momentum behind 5G in North Africa, commercial 5G services remain absent in the region. This reflects the challenging spectrum situation facing operators. To date, 5G spectrum has not been assigned in any North African country, limiting the scope for operators to deploy commercial 5G services. Improving the availability of spectrum for 5G deployments should be a priority for policymakers in North Africa to unlock the full potential of mobile technology in the region.

3 "Tunisia aiming for 5G launch in 2024", CommsUpdate, May 2023
4 "Nokia selected by Ooredoo Group to deploy 5G-ready network in Algeria and Tunisia", Nokia, March 2023
5 "Djezzy tests 5G with Huawei, Nokia; plans further work with ZTE", CommsUpdate, November 2022

Emerging 5G use cases

5G monetisation is top of mind for operators. Enhanced mobile broadband (eMBB) and FWA connectivity remain the dominant 5G use cases, helped by an ever-growing portfolio of 5G-enabled smartphones across various price points. As 5G users are more likely than 4G users to add content and services to their subscriptions plans,[6] this is something for operators to build on as they design their 5G commercial strategies and offerings.

While video streaming and music streaming remain the most desired bundling options in most markets, there are also opportunities to monetise digital gaming, as cloud-based services require high-speed connectivity and low latencies. Consumers will demand the best possible network experience, thereby providing operators with an opportunity to use online gaming to showcase their 5G investments. For example, in partnership with Huawei, Safaricom has set up three 5G experience centres in Kenya that contain VR gaming zones.

5G also brings new opportunities in the enterprise segment. MTN and Huawei have implemented numerous 5G B2B commercial applications, spanning various industries, such as their partnership with Minetec Smart Mining to establish South Africa's first 5G-connected coal mine. Meanwhile, MTN Uganda has collaborated with Huawei and Hima Cement Company to launch Uganda's first 5G industrial use case at a Hima Cement plant. In these use cases, 5G's enhanced capabilities enable real-time data transmission to improve production efficiency and worker safety. Numerous other use cases are in the pipeline across MTN's operations in Nigeria, Ghana, Uganda, Côte d'Ivoire and Sudan.

To develop further applications that leverage 5G's unique capabilities, operators and equipment vendors in Africa, such as Orange and Qualcomm, have invested in programmes dedicated to co-creating consumer and enterprise solutions.

Orange 5G Labs

In October 2022, Orange inaugurated its third Orange 5G Lab in Africa, and 19th around the world, in Madagascar. This followed the launch of Orange 5G Labs in Senegal and Cote d'Ivoire in 2022. The facilities offer services and support in partnership with tech vendors such as Huawei, Nokia or ZTE, and provide an opportunity for innovators, enterprises and other stakeholders to discover 5G, demonstrate its use cases and assess the potential of 5G in their products and services.

In addition, some Orange units are working with local stakeholders to demonstrate the application of the technology in various scenarios. In Tunisia, for example, Orange Tunisia has partnered with:

- Dräxlmaier Tunisie, Enova Robotics and Novation City to test the uses of 5G in a modern industrial environment
- startup Historiar, the Agency for the Development of Heritage and Cultural Promotion (AMVPPC) and the National Heritage Institute (INP) for a live immersive experience of the Punic Ports of Carthage, which is listed as a UNESCO World Heritage Site
- the city of Kairouan to enable residents to test 5G.

Qualcomm's 'Make in Africa' initiative

In December 2022, Qualcomm launched the 'Make in Africa' initiative, designed to mentor and support African startups in developing innovative tech solutions that address local challenges. The programme received over 550 applications from startups across 34 African countries at the close of applications in March 2023. The 10 selected startups benefit from a masterclass programme in technology areas such as 5G, robotics, IoT and VR. The startups are also supported in terms of gaining knowledge in intellectual property rights, product commercialisation and communication. Solutions being developed cover a wide set of services, including clean energy, agricultural services, computing for education, geospatial predictive analysis, medical technologies and innovations utilising electric vehicles.

6 "5G: user behaviour offers new opportunities, but monetisation at scale is still a work in progress", GSMA Intelligence, June 2023

5G FWA

FWA has emerged as a technology option for operators to extend fixed broadband services to homes and businesses. Previous solutions based on WiMAX and 3G/4G FWA have had limited uptake. However, 5G FWA provides an increase in speeds of over 10× compared to 4G FWA, along with substantial improvements in capacity, due to a range of technological advancements, which enables FWA to target a broader market. With the deployment of 5G networks in Africa, operators have also begun rolling out 5G FWA services to address the gap in last-mile connectivity.

The low level of FBB development in Africa means that operators in the region have the opportunity to deploy 5G FWA as a primary broadband connectivity option for households without access to fixed alternatives. It also gives operators the chance to capture the enterprise opportunity, particularly in the MSME segment, which is responsible for more than 80% of Africa's employment and 50% of the region's GDP, according to the World Economic Forum. In a few cases, such as in urban locations in South Africa, where there is relatively developed fixed infrastructure, 5G FWA is being positioned as a competing broadband service or complementary alternative to other existing FBB services.

Figure 9

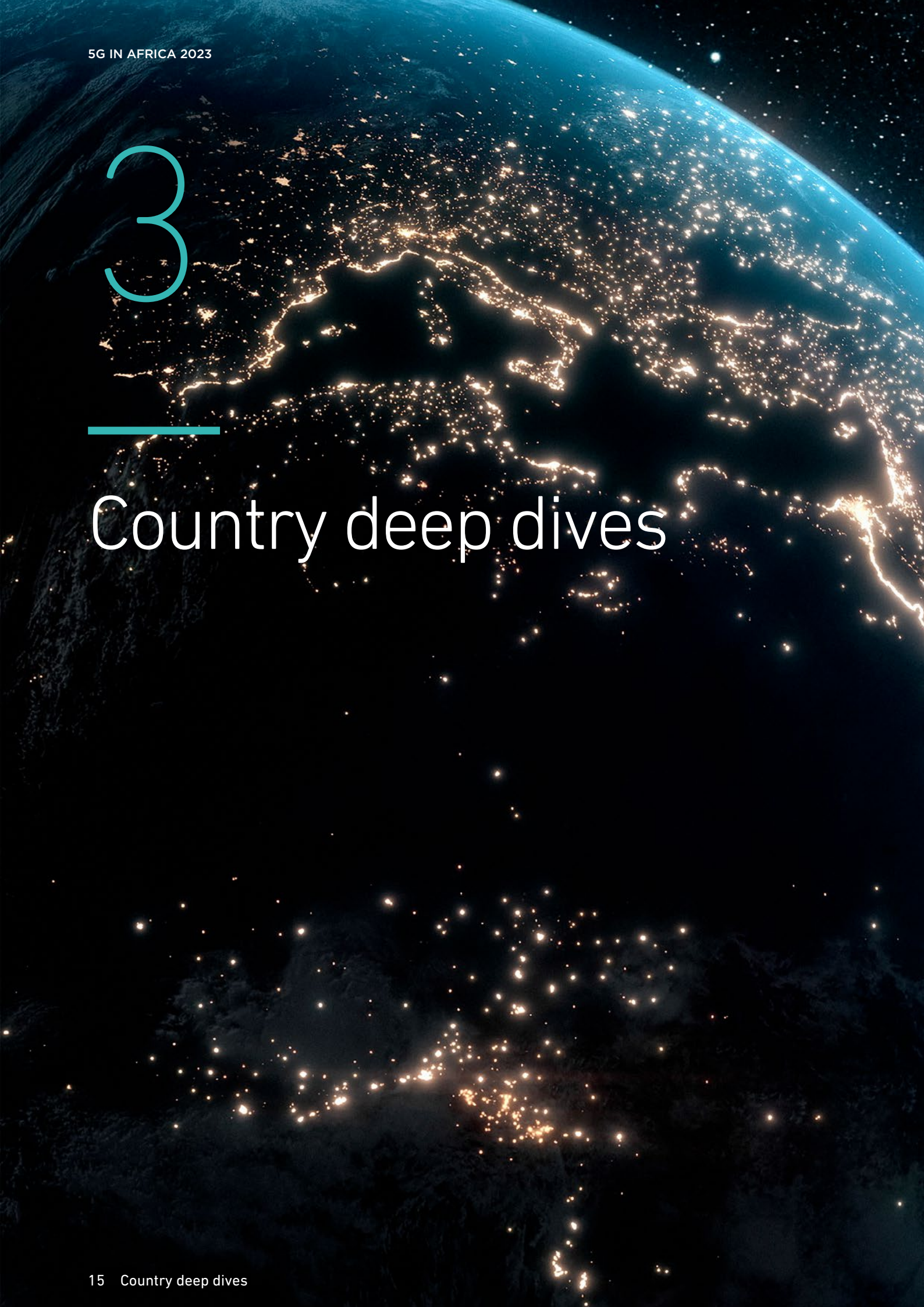
Examples of operator 5G FWA activities in Africa

Operator	FWA service details
Safaricom	In August 2022, Safaricom announced the completion of a 4G and 5G FWA network slicing pilot, which could enable it to support new types of enterprise network services, including fast-lane internet access and application slicing.
MTN	MTN has developed a portfolio of broadband technologies with an aim of connecting 10 million homes by 2025, 75% of which will be in South Africa and Nigeria. This strategy covers mobile broadband modems (top 30% of households), 5G FWA (top 10% of households) and fibre (top 1% of households).
Orange Botswana	In November 2022, Orange Botswana launched commercial 5G services, focusing on 5G FWA as a way to expand broadband services to larger populations. The operator is targeting residential customers and MSMEs for its 5G FWA services.
Rain	In May 2023, Rain unveiled a fixed-mobile convergence (FMC) product, rainOne, following the launch of its 4G mobile network. Media reports have highlighted the growing popularity of the operator's FMC product among users.[7]
Telkom (South Africa)	Telkom SA has put 5G FWA at the heart of its 5G strategy, with the aim of building on the successes of its 4G FWA service. Telkom SA views 5G FWA as a credible alternative to fibre in smaller towns and a complement to fibre in urban areas.
Vodacom Tanzania	Vodacom Tanzania intends to exploit the unique intersection of flexibility and fibre-like performance to deliver enhanced connectivity for fixed and temporary locations, including helping businesses realise faster time-to-value connectivity.

Source: GSMA Intelligence, based on company announcements

While mobile broadband connections have played an important role in connecting people across the region, addressing the gap in last-mile FBB connectivity is necessary to deliver enhanced connectivity services to households and enterprises. 5G FWA is well placed to play this role, offering policymakers and operators the opportunity to overcome many of the limitations of other FBB services, including cost, complexity and time to market. However, to maximise the 5G FWA opportunity, there is a need to address a number of potentially limiting issues, given the low ARPU levels in the region and the challenge this poses to the 5G FWA business case. These issues include access to spectrum, affordability of CPE devices and operators' go-to-market strategies.

7 "Rain says fixed-5G plan with free mobile data and minutes is going strong", MyBroadband, September 2023



3

Country deep dives

Kenya

	2025	2030
5G mobile connections	2.8 million	19.8 million
5G adoption (percentage of total connections)	4%	21%
5G population coverage	21%	99%

Background

Kenya became the fifth country to assign 5G spectrum in Africa when Safaricom was allocated 60 MHz of spectrum in the 2600 MHz band in Q1 2022. In the following quarter, Safaricom launched commercial 5G services in 11 towns across Kenya, increasing to 28 towns by April 2023. The operator has outlined further expansion plans, aiming to increase its number of 5G sites from 205 to 800 by March 2024.

Airtel launched its commercial 5G service in Kenya in July 2023, covering more than 370 sites across various cities. Airtel's deployment focuses on specific areas, such as densely populated residential zones, shopping centres, healthcare facilities and central business districts.

5G in action

To promote its 5G service, Safaricom partnered with Huawei to launch three 5G experience centres in Nairobi to give consumers the opportunity to trial the latest network generation technology. The experience centres feature VR gaming zones, showcases of smart capabilities for homes and enterprises, and speed-testing booths.

Safaricom is also exploring opportunities to use 5G to expand its presence in the home broadband segment. Having piloted 5G FWA since March 2021, Safaricom launched its commercial 5G FWA service in October 2022. It went to market with three 5G FWA tariffs, offering speeds of 10, 40 and 100 Mbps. The 100 Mbps plan offers a data allowance of 1 TB for KES14,900 ($100), highlighting the potential for FWA services to drive incremental revenue growth for mobile operators.

Nevertheless, 5G device affordability remains a challenge. Airtel lists over 30 5G-ready devices on its website. However, the operator noted in August 2023 that 5G-enabled devices accounted for less than 1% of the total number of devices on its network.[8] Device financing schemes and other incentives (e.g. Airtel offered customers a one-time data bonus of 10 GB upon activating a 5G device on the Airtel network) will play a key role in increasing 5G device take-up.

8 "Airtel to invest USD150m in network expansion", CommsUpdate, August 2023

Nigeria

	2025	2030
5G mobile connections	12.3 million	71.5 million
5G adoption (percentage of total connections)	5%	26%
5G population coverage	15%	37%

Background

Nigeria held its first 5G spectrum auction in December 2021, with MTN and Mafab Communications both spending around $270 million to acquire 100 MHz in the 3.5 GHz band. Airtel also acquired 100 MHz in the 3.5 GHz band, along with 2 × 5 MHz in the 2600 MHz band, in a $317 million transaction with the Nigerian Communications Commission (NCC) in January 2023.

MTN was the first Nigerian operator to launch commercial 5G services. It switched on its 5G network in September 2022 in Lagos and other parts of the country, reaching 13 cities across the country by May 2023. Extending 5G coverage to additional sites will be important to enhance capacity, with MTN's data traffic up almost 50% year on year.[9] Mafab and Airtel introduced commercial 5G services in January 2023 and June 2023, respectively. Moreover, Airtel recently announced plans to invest $700 million in its 5G network in Nigeria over the next few years.[10]

5G in action

In September 2023, the NCC reported that the number of 5G mobile subscriptions in Nigeria had surpassed the half-a-million mark.[11] 5G adoption has been underpinned by the growing availability of affordable 5G devices. For example, MTN and Airtel are both selling the Samsung Galaxy A14 5G for N122,000 (around $160). This is a notable development considering the average cost of a 5G smartphone was nearly $900 in 2019. Further demonstrations of 5G's enhanced capabilities at locations such as live events and shopping malls can help convince more customers to pay the premium compared to sub-$100 4G smartphones.

5G FWA is also gaining momentum in Nigeria. Customers now have access to a range of affordable CPE options, such as MTN's 5G broadband router priced at NGN50,000 ($65) and Airtel's equivalent device at N30,000 ($40). With 5G FWA plans starting at N5,000 ($6.5), nearly double the current figure for mobile ARPU in Nigeria, there is an opportunity for operators to generate incremental revenue through FWA. The introduction of speed-based FWA plans, a proven strategy in rapidly expanding 5G FWA markets such as the Middle East, can help operators to realise this potential.

In September 2023, MTN, Huawei and Nigeria's Baze University signed a memorandum of understanding to promote 5G-powered learning and teaching innovations. This followed the launch of MTN-Baze University 5G2Business, which stakeholders say would enable the institution to leverage 5G technology to transform learning and administration.

9 "Slow, steady traction for Nigeria's 5G journey", The Guardian Nigeria, September 2023
10 "Airtel to invest $700 mn annually in Nigeria amid 5G roll out: Mittal", Economic Times, June 2023
11 "Nigeria's 5G subscription hits 500,000 as Broadband", The Guardian Nigeria, September 2023

South Africa

	2025	2030
5G mobile connections	22.1 million	58.2 million
5G adoption (percentage of total connections)	18%	43%
5G population coverage	67%	84%

Background

In 2020, Vodacom and MTN launched the first major 5G networks in Africa, offering 5G mobile and FWA services in South Africa. 5G activities have since gained further momentum, supported by the Independent Communications Authority of South Africa (ICASA) completing the spectrum auction for frequencies in the 700, 800, 2600 and 3500 MHz bands in March 2022. The spectrum was allotted for a 20-year period on a technology-neutral basis, enabling operators to extend 4G and 5G rollouts.

South African operators have subsequently focused on extending the reach of their 5G networks. However, the surge in power outages across South Africa has caused network availability issues and increased costs for operators. For example, MTN unveiled plans to ramp up its 5G coverage in the middle of 2022, with a target to reach 25% of the population by the end of that year. It subsequently announced in March 2023 that it would pause plans to build new infrastructure in order to equip its existing towers with backup power.[12]

5G in action

5G mobile adoption in South Africa reached 4% of total mobile connections in mid-2023, marking the highest share of 5G connections among countries in Africa. South Africa has also experienced steady growth in 5G FWA connections as new operators came to market with 5G FWA offerings. Rain launched its 5G FWA service in 16 towns in 2021 and has since extended this to other parts of the country. Meanwhile, Telkom SA launched a 5G FWA service in Johannesburg, deploying 123 5G base stations. Partnership agreements are also helping 5G FWA reach more customers. In September 2022, fixed broadband provider Axxess launched 5G internet packages via MTN's network.

5G also brings new opportunities to support the digital transformation of enterprises, as highlighted by the rise of private 5G networks. While the private 5G market in Africa is still in its infancy, there are early signs of progress in South Africa. For example, MTN is building private 5G networks for 14 companies in the mining and ports sectors. In addition to traditional mobile operators, new market entrants are pursuing the 5G private networks opportunity. South African company Comsol secured access to 60 MHz of spectrum at 3.7 GHz in 2021 from ICASA, before inking a reseller agreement with Ericsson that will combine the network vendor's private 5G solution and Comsol's expertise in mining and systems integration.

Much of the enterprise opportunity will rely on the deployment of 5G SA networks to benefit from 5G's superior capabilities. In Africa, the vast majority of initial deployments will be non-standalone (NSA) as a way of reducing time to market and ensuring good coverage and mobility. There will, however, eventually be instances of SA deployment, such as with a new mobile market entrant or private 5G network deployments at specific location areas. Early tests and trials are underway among pioneer operators in the region. For example, MTN has conducted a proof of concept for a first-of-its-kind 5G SA core fully deployed in Microsoft Azure.

12 "MTN will hike prices to build more backup power", My Broadband, March 2023

4

Spectrum for 5G: the case for refarming

The transition from legacy (2G and 3G) networks to 4G and 5G is gaining momentum in Africa. 4G/5G networks in the region will account for just over half of total mobile networks by 2026, rising to nearly 70% by the end of the decade. This milestone will be reached in several countries as early as 2024, highlighting the need for enabling policies and other regulatory imperatives to stimulate the required investments in the deployment of advanced network infrastructure in the region.

Emerging 5G spectrum bands

The role of spectrum in the deployment of advanced network infrastructure cannot be overemphasised. Spectrum is a fundamental pillar for driving social and economic development across society. As a scarce resource, governments and policymakers need to ensure the availability of spectrum in prime bands to ensure that the benefits of newer mobile technologies reach everyone.

This is why governments and industries are locked into the final phases of identifying new spectrum for mobile at the World Radiocommunication Conference 2023 (WRC-23). The new mid-band ranges at 3.5 and 6 GHz will provide channel bandwidth and capacity – and with it, download and upload speeds – for a new generation of African mobile broadband. New spectrum in 470–694 MHz will also raise speeds in rural areas and start providing better digital equality between towns and cities. 5G and subsequent network generations will need this new capacity to deliver improved levels of latency, speed and reliability and to deliver on mobile's promise of connecting everyone, no matter where they live.

WRC-23 is an opportunity to increase harmonisation, improve digital equality and provide the capacity to expand 5G up to the end of this decade. This does not mean that current bands do not have a role to play, as spectrum used for previous generations is refarmed and put into use for new technologies.

The role of existing bands in Africa

The interest in the new 5G bands notwithstanding, existing bands below 3 GHz remain crucial for mobile network capacity and wide coverage, particularly for 4G and 5G development. This is especially true in Africa, where 4G and 5G will co-exist for the foreseeable future. GSMA Intelligence data shows that 4G adoption in the region will continue to rise, along with 5G, until 2030. 4G will also provide a coverage layer as 5G connectivity expands and operators will use 4G backhaul for 5G NSA.

This underlines the continued importance of ensuring all bands are made available to support the expected growth in data traffic during this period and beyond.

Figure 10

Characteristics of selected bands below 3 GHz

Band	Characteristics
470–694 MHz	Under discussion at WRC-23. Potential new digital equality spectrum to provide additional capacity for rural areas.
700, 800 and 900 MHz	Ideal for carrying mobile signals into buildings and over long distances, including rural areas. This supports IoT solutions and users travelling at speed (e.g. in cars and trains).
1500 MHz	92 MHz range under consideration for TDD as well as downlink-only.
1800 MHz	Provides a cost-effective solution for boosting mobile broadband capacity. Supported by a large 4G device ecosystem.
2100 MHz	Large bandwidth of 60 MHz, allowing for high data rates and capacity.
2300 MHz	Plays an increasingly important role in the transition from 4G to 5G NR as well as for enterprise use cases.
2600 MHz	Wide availability of spectrum and short range enables deployment in dense areas for maximum capacity.

Source: GSMA Intelligence

While higher mid-bands such as 3.5 and 6 GHz will provide the highest capacity, lower mid-bands (1–3 GHz) and low bands (below 1 GHz) have propagation and capacity characteristics that enhance coverage and, by extension, drive use cases such as IoT and VoLTE/VoNR. Additionally, with increasing data demands and the growing importance of mobile broadband to the way we work and live, there is an urgent need to put all spectrum bands, including those traditionally used for previous generations, to use and transition them to efficient technology generations (4G/5G) over time. It is important to note that both consumers and enterprises stand to benefit from the complementary features of bands below 3 GHz, as highlighted below:

- **Consumers:** Bands below 3 GHz are necessary for operators to deliver cost-effective nationwide coverage of 4G services across rural and urban areas. Despite the rollout of 5G services, operators in Africa also need to drive 4G uptake, given the improving availability and affordability of 4G devices. They need to take advantage of the opportunity that 4G provides to realise financial sustainability and lay the foundation for further evolution to 5G.
- **Enterprises:** Bands below 3 GHz can enable mobile operators to exploit the propagation characteristics of these different bands to support innovative 5G enterprises use cases, enabling operators to support the digital transformation ambitions of businesses across different verticals in the region. In South Africa, for example, MTN has partnered with Huawei to deliver smart mining solutions for several mines, leveraging the capabilities of lower frequencies to enable a range of enterprise solutions. The enterprise segment is important for the 5G business case, providing new 5G monetisation opportunities for operators.

Despite these benefits, refarming ranges originally used for 2G and 3G does not provide enough continuous bandwidth, meaning that operators often lack the recommended[13] 100 MHz contiguous spectrum to support 5G's high bandwidth. Some technical innovations to simplify deployment and address the fragmented nature of operators' access to varying amounts of spectrum across different bands are important to realise their collective potential. For example, multi-antenna solutions have been designed to address these challenges through carrier aggregation.

Spectrum deployments in Africa

The current level of spectrum availability in bands below 3 GHz varies considerably by country. While most countries in Africa have released spectrum in traditional IMT bands – 900, 1800 and 2100 MHz – for 2G and 3G services, the amount of paired spectrum awarded across the region is, in general, substantially less than in other countries worldwide. As 4G and 5G network deployments accelerate, ensuring all IMT bands are brought to market will be important to maintain quality of service and deliver equitable, affordable mobile broadband.

The 700 MHz band remains under development in Africa, even though it has prospects as a 5G coverage band in Europe, the Middle East and Africa. Some countries (e.g. Cameroon and the Democratic Republic of Congo) had previously awarded the 850 MHz band for CDMA 2000 technology, while others (e.g Senegal and Côte d'Ivoire) had awarded the 2300 and 2600 MHz bands for wireless access using technologies such as WiMAX, though these are increasingly being refarmed for 4G and 5G.

More than 200 individual operators in Africa had launched commercial 4G and 5G services as of 30 September 2023. The most common spectrum bands used to support 4G network launches are 1800 and 800 MHz in the region, jointly accounting for more than half of networks launched using bands below 3 GHz (excluding frequencies not reported). Operators are also using additional bands to improve and expand their 4G networks.

13 See European Commission Decision 2019/235, ECC Report 287; 3 GHz in the 5G era, GSMA; 3300–4200 MHz: a key band for 5G, GSA; ATU-R Recommendation 005; and final IMT Roadmap 2019 (Republic of South Africa)

Deep dive on low bands

Operators can achieve the goal of widespread connectivity by leveraging low bands' (below 1 GHz) superior propagation characteristics for coverage in rural and remote areas and advanced in-building penetration for 'deep' indoor coverage and capacity in urban areas. Low bands can also mitigate potential service disruption due to poor handover, which could arise from the use mid- or high-band frequencies.

Providing better rural connectivity requires more low-band spectrum. 800 and 900 MHz will be refarmed in due course, while 700 MHz will be further developed in Africa. New spectrum in 600 MHz will also come online in the region, with Nigeria and Namibia leading the way in the use of this new range. With 5G starting to drive value creation in the enterprise segment, the 600 and 700 MHz bands are set become even more integral in the connectivity landscape. By enabling cost-effective nationwide coverage, these low bands support the needs of various sectors that require reliable connectivity in non-populated areas, such as agriculture, broadcasting, oil and gas, and transportation.

Low bands are also ideal for IoT applications and services that transmit small packets of data to devices located indoors and outdoors over a large area. In Europe, regulators such as Ofcom have released the 700 MHz band to operators in a bid to support the development of IoT applications, while others are now looking at spectrum in the range 470–694 MHz for the same reason

Today, 700 MHz is the key coverage band, accounting for more than 70% of 5G network launches in low-band spectrum globally. For example, TPG Telecom successfully rolled out its 5G SA 700 MHz band services in Australia to provide coverage to 85% of Australia's population, while KDDI in Japan started its 5G 700 MHz rollout in March 2021 to enhance the 5G experience by improving indoor and outdoor coverage. In Africa, the 700 MHz band has only been deployed in five 4G networks and one 5G network to date, although 14 operators across the region have received spectrum assignments in the band.

Call to action: maximising spectrum potential

Accelerating the deployment of 4G and 5G networks requires spectrum in low, mid- and high bands. This is critical to realising the social and economic benefits of mobile broadband and ensuring the financial sustainability of the mobile industry in Africa.

Figure 11

Spectrum options for Africa

Policymakers and regulators	A number of mobile/IMT bands below 3 GHz are being considered today for the further development of 4G and 5G in Africa: • The 700, 800 and 900 MHz bands can improve the 4G/5G coverage layer, while 600 and 1500 MHz may provide capacity in the future. • The remaining 1800 and 2100 MHz spectrum can increase 4G capacity and ease traffic suppression, supporting the smooth evolution to 5G. • The 2300 and 2600 MHz bands have the potential to improve the capacity of mobile broadband networks and facilitate the cost-effective deployment of 4G/5G. Technology neutrality is crucial for all bands.
Mobile operators	Upgrades from legacy networks can improve spectral efficiency and maximise the potential of existing spectrum holdings. At the same time, new technical solutions that improve the performance of networks running on existing spectrum, such as MIMO technology, will enhance quality of service and efficiency.
OEMs	OEMs should collaborate to develop a device ecosystem for the production of affordable end-user devices to support the uptake of services running on bands below 3 GHz.

Source: GSMA

Around the world, various stakeholders in the mobile ecosystem, including policymakers, mobile operators and OEMs, are already taking steps to accelerate the development and deployment of new spectrum while developing existing bands and infrastructure for 5G services. In Africa, there is still potential for growth in the number of 4G network connections, meaning that operators, device manufacturers, and regulators have an opportunity to utilise a blend of new and existing spectrum to drive the transition to 4G and build a foundation for the natural upgrade to 5G in the coming years.

gsmaintelligence.com

GSMA™
Intelligence

gsmaintelligence.com