chapter 6 Broadband

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Supporting Africa's digital future with modern spectrum management frameworks

Across the globe, there remains a number of countries and regions where access to affordable broadband access and devices remain a challenge. Digital inclusion has become more important than ever before, and over the past year we have seen governments and regulators make encouraging strides to bridge the digital divide and deliver reliable, sustainable connectivity to those requiring it most.

Africa continues to hold immense potential for a prosperous digital future, with many countries beginning to establish themselves as major players where digital transformation is concerned. So long as adequate spectrum is provided to a large number of stakeholders on a neutral technology approach and utilized correctly for the benefit of users, the immense youth population found within the region will be empowered to drive significant economic growth and take their place at the forefront of future digital innovations.

Bridging the digital divide

Regulators and governments across Africa are waking up to the benefits that modern spectrum management and reliable access to WiFi can enable. In May 2023, the Independent Communications Authority of South Africa (ICASA) opened the lower part of the 6GHz band for license-exempt access, enabling technologies such as WiFi, Bluetooth or 5G-New Radio Unlicensed (5G NR-U). Actioned through an amendment to Annexure B of ICASA's 'Radio Frequency Spectrum Regulations,' the decision to open up the 5925-6425MHz frequency band will provide a significant boost for the development and implementation of new applications relying on WiFi technologies, such as Augmented, Virtual or Mixed Reality (AR/VR/XR) within the country.

The additional spectrum provided by ICASA will help enable simultaneous connections throughout South Africa, reducing latency and delivering faster data speeds. For people using

WiFi services, this means they will experience less interference, especially in potentially congested and highly populated areas. Furthermore, the introduction of the lower 6GHz frequency band for the deployment of WiFi services will support the growth of the digital economy through the provision of reliable and affordable connectivity to communities and networks located in underserved areas. DSA expects that ICASA will consider outdoor usage of the band in the near future as a complement to the current indoor authorization.

This decision follows on from reports published last year by the Dynamic Spectrum Alliance (DSA), in collaboration with the Wireless Access Providers Association (WAPA). Identifying the economic potential that access to the 6GHz band would enable, the report identified South Africa could benefit by up to $58 billion over the next 10 years - 1.39% of the country's GDP - but only if the full 1200MHz frequency range was authorized. This economic boom associated with the full 6GHz band would enable greater access to remote education, work and commerce, with over 1.25 million of the population benefiting from reliable access to the internet by 2030.

The decision by ICASA is a great first step to sustainable connectivity, but as the economic report indicates, opening the full 6GHz band and enabling outdoors and indoors devices would let South Africa make full use of the latest generation of WiFi and offer its population reliable, multi-bit connections.

In addition to this important decision, the Electronic Communications Amendment Bill, 2022, Government Gazette 48841 of June 2023, introduced the principle of 'Use-it-or-share-it' for radio frequency spectrum use, as well as a recent definition of Community Networks (CN): "Community Networks mean an electronic communications network service and an electronic communications service that are license exempted by the Authority in an under-service area..." It should also be highlighted that in May 2023, ICASA conducted a public consultation on Dynamic Spectrum Access and Opportunistic Spectrum Management and that a group of experts from within the country is leading the effort to modernize spectrum management.

Bringing digital opportunities to underserved areas

Recently, we have also seen the announcement of new and expanded partnerships as part of Microsoft's Airband initiative, with the aim of providing high-speed internet access to nearly 40 million people across Latin America (LATAM) and Africa. With partnerships in Kenya, Nigeria, Tanzania and Uganda, Microsoft show no signs of slowing down in their commitment to deliver reliable internet to 100 million people living in unserved and underserved regions across Africa.

The initiative aims to give greater opportunities to those lacking the digital fluency and skills essential for participation in our digital economy. It is important to note that African countries are increasingly becoming significant economic powers, yet the vast size of the continent means delivering reliable connectivity to all regions has traditionally proven a challenge. Focusing specifically on areas with lower digital connectivity rates, the partnerships put in place is set to improve Africa's 40% internet usage rate.

The relationship between Microsoft Airband and Kenyan service provider Mawingu, initially developed in 2014, now provides high-speed internet access to approximately 4 million Kenyans living in rural areas. Mawingu was

Microsoft's first partner in the initiative and has since blossomed to become the country's leading internet service provider (ISP) dedicated to underserved and peri-urban markets. Now expanding the partnership, Microsoft Airband and Mawingu will bring coverage to around 16 million people in Kenya, Tanzania, and Uganda by the end of 2025. As a result, these countries will have access to meaningful internet access in localized hotspots, vocational schools, and businesses. Over 700 hotspots and 100 primary schools have already benefited from the partnership since its inception, providing essential digital skills training and educational materials to those who had previously been unable to access them.

Another Airband partner, Tizeti, has also brought coverage to more than 900,000 people in Nigeria. An expansion of the current Microsoft partnership will support the ISP as it brings internet access to a further 5 million people found in Cote d'Ivoire, while offering infrastructure support and the deployment of eight solar powered towers to provide connectivity to households, small businesses, and hotspots. This will ensure greater access to education, healthcare, and employment across the country.

Microsoft is a valuable member of the DSA, and we are proud to see organizations in the region benefit from the connectivity support provided through the Airband initiative. Through these partnerships, countries are being given the tools to drive their own self-empowerment and deliver sustainable development and growth.

Making voices heard

In June 2023, we also saw a joint seminar organized by the International Telecommunication Union (ITU) and the Policy and Regulation Initiative for Digital Africa (PRIDA). Hosted in the Congo by the country's regulator, the Agence de Regulation des Postes et des Communications Electroniques (ARPCE), the 'ITU-PRIDA Regional Radiocommunication Seminar for Africa' was made up of several key discussions and workshops relating to a number of spectrum-related issues facing the region.

The seminar covered the current regulatory framework for international frequency management, sharing ITU recommendations and best practices regarding the use of spectrum for terrestrial and space services. Workshops that covered the use of tools designed for terrestrial and space stations gave participants hands-on experience with ITU notification procedures, as well as the software and electronic publications made available by the Radiocommunication Bureau. One of the highlights from a DSA perspective was the session on 'Wireless Broadband' in which we were invited to participate. Giving attendees greater knowledge of what is required to enable greater access to broadband technologies such as WiFi will help African administrations to continue closing the gap on the digital divide.

Concepts related to international spectrum management and the procedures required for recording frequency assignments in the ITU's Master International Frequency Register (MIFR) were also heavily discussed, alongside a review of the agenda for the upcoming World Radiocommunication Conference (WRC-23). As the eyes of the world turn to this event, which will take place in Dubai between November and December 2023, it will be essential that regulators and countries found across Africa have their

voices heard to drive their own digital future, especially when concerning WiFi.

Preparing for WRC-23

This year, the DSA has worked with the regulators in Africa, contributing ideas and discussion points relating to WRC-23 Agenda Item 1.2, which considers the identification of the frequency bands 3 300-3 400MHz, 3 600-3 800MHz, 6 425-7 025MHz, 7025-7125MHz and 10.0-10.5GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution COM6/2 (WRC-19). It is important to note that the 6425-7025MHz is under study for region 1 only.

Focusing mainly on the 6425-7125MHz frequency band, the DSA contributed a paper to some of the regional African groups which highlighted the benefits that arise from usage of the 6GHz band by license-exempt wireless technologies while also highlighting that low-power indoor and very-lower power outdoor WAS/RLAN services such as WiFi can co-exist with incumbent satellite services.

According to the World Bank, the number of fixed broadband connections in sub-Saharan Africa more than doubled between 2015-2021 to more than 7.5 million. Across the continent as a whole, the number of fixed broadband subscriptions is set to climb to 51 million by 2027, and subsequently, WiFi will need access to the full 1200MHz in the 6GHz band if congestion is to be alleviated in areas of high demand. Opening only 480/500MHz of the band would mean WiFi 6E and 7 networks in dense deployments would have to continue employing small channel bandwidths, which will be inefficient as more people become connected.

Furthermore, Wireless Internet Service Providers (WISPs) in different countries of Africa are contributing to closing the digital divide providing affordable fixed wireless access, relying on license-exempt access to spectrum. In this case, the availability of numerous channels in the 6GHz band for outdoor coverage, will facilitate gigabit fixed connectivity across hard-to-reach areas, as well as a growth of local enterprises that are currently responsible for an important part of the broadband connectivity in the continent.

The WiFi ecosystem has grown rapidly in the past three years, with more than 1,200 types of devices currently integrating WiFi 6E.

Making the full 6GHz band license-exempt would provide an efficient way of harnessing the full potential of the available spectrum, while still protecting the existing satellite services and fixed links and giving them scope to expand further. Previous WRC meetings identified specific frequency bands for the deployment of IMT systems, and this spectrum constitutes a good mix of coverage and capacity bands. IMT currently has access to at least 1368MHz of prime spectrum below 6GHz, yet most of this remains unused at present. The last WRC in 2019 also identified more than 17GHz of spectrum for IMT, including millimetre bands, that currently remain idle and are a great opportunity for 5G expansion. Therefore, if Africa is to fulfil its digital potential, then the 6GHz band should be preserved for current incumbent services, with a 'No-Change' outcome at WRC-23. This would give regulators the opportunity to protect incumbents and the flexibility to enable license-exempt access for technologies such as WiFi. ■

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The road to 5G in Africa: navigating investment and value creation

The journey to 5G has started in Africa and is gathering pace across the region. There are now commercial 5G networks in 13 countries, while operators and other ecosystem players in many more countries expect commercial 5G to be available by 2025. Africa's approach to 5G needs to account for the current connectivity landscape and unique market features that could affect 5G rollout and adoption. 5G network ecosystem players in the region must find ways to deliver cost-effective and efficient 5G networks with an implementation strategy that balances investment and value creation.

Any assessment of Africa's readiness for 5G needs to consider various market indicators that could impact rollout and adoption. For example, 4G was already the dominant technology in most other markets by the time 5G arrived.

However, in Africa, legacy networks (2G and 3G) remain dominant, with 4G accounting for less than 25% of total connections in 2022. Spectrum availability is another important factor. As of December 2022, only seven countries (Angola, Kenya, Mauritius, Nigeria, South Africa, Tanzania, and Zambia) had completed 5G spectrum assignments. Slow progress with assignments can delay network rollout, and is particularly the case in North Africa, where countries risk falling behind regional and global peers on 5G development due to the slow pace of 5G spectrum assignment.

The case for 5G in Africa

Despite the challenging scenario in Africa, 5G is set to be a key part of the connectivity landscape, enabling the following benefits:

- Enhanced connectivity in homes and enterprises – 5G FWA will be a leading use case for 5G in Africa; a third of 5G launches include a 5G FWA offering.
- Digital transformation of enterprises – 5G can bring significant improvements to existing and new business operations.
- Access to new services – Around 60% of Africa's population is under the age of 25. For these digital natives, 5G will be key to accessing new digital services, such as metaverse applications.
- Tech innovation – Africa's tech ecosystem will utilise the key attributes of 5G, such as low latency and high device density, to develop new locally relevant solutions.

Preparing for 5G in Africa

The rollout of 5G in Africa will likely take a phased approach, with an initial focus on urban centres, industrial locations, and other areas of high demand.

This allows operators to roll out 5G at a sustainable pace and progressively develop the business case for more widespread rollout. It also allows operators to maintain their focus on increasing 4G adoption over the near term, especially as there are significant returns still to be gained from 4G investments.

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The digital divide in Africa is a complex issue that has been attributed to the lack of access to affordable and reliable Internet connectivity, inadequate infrastructure, and limited digital literacy. To bridge this gap, a mix of different technologies can be used. Leveraging unused TV channels , TV White Space (TVWS) technology can assist in optimizing the available wireless spectrum to reach the underserved communities.

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Operators in Africa have invested nearly $45 billion in capex – mostly on 4G networks – over the last five years. In the coming years, operators will progressively increase investments in 5G as they prepare for rollout.

According to a GSMA Intelligence survey, 87% of operators have started upgrading and preparing their networks for 5G.

As 5G momentum builds across the entire region, the success factors will include a pro-investment, proinnovation environment to support costeffective network rollout, as well as the development of innovative use cases to stimulate demand.

Implications

Mobile operators

- Take a multi-year view – The network transformation required to reap the full benefits of 5G will mean a multi-year journey for operators, but the groundwork needs to be done now. This highlights the need to take a medium- to long-term view when building partnerships with suppliers. For example, MTN Uganda is working with Huawei to integrate core network elements into a single cloud network over the next five years.
- Make network automation a priority – The transition to new architectures (such as cloud-based networks) that often comes with 5G investments presents an opportunity for operators to increase their level of network and service automation and drive opex savings. The need to replace manual network operations will only grow in importance with the added complexity introduced by 5G networks.
- Seize the FWA opportunity – The immediate opportunity for 5G is to use FWA to bridge the gap for enhanced broadband connectivity for homes and enterprises, both large and small. Increased demand for enhanced connectivity or an identified enterprise need in a market are credible triggers for 5G rollout.

Network equipment vendors

- Integrate 5G within single RAN solutions – The slow pace of migration from legacy networks in Africa restricts opportunities to shut down 2G and 3G networks in the near term. Network vendors can provide multi-generational RAN solutions, allowing operators to run 2G, 3G, 4G and 5G on the same radio, helping them balance legacy and future network requirements. This can generate opex savings for operators and reduce energy usage.
- Build sustainability into the technology roadmap – The network accounts for around 90% of electricity use for an average operator (the rest being fleets, property, and travel). To help operators lower energy use, network equipment vendors should use 5G equipment upgrades to deliver greener products for the RAN (e.g. AI-driven sleep state), core and data centres (e.g. liquid cooling).
- Promote E-band benefits – According to a GSMA Intelligence survey, wireless backhaul accounts for nearly 60% of the backhaul mix in Africa. While investments in fibre will increase, wireless backhaul will continue to account for a significant share of backhaul infrastructure by 2030. E-band (71–86GHz) solutions for mobile backhaul will be particularly important, due to the large channel sizes available in the band, making it a cost-effective way to meet the backhaul capacity requirements of cell sites in traffic hotspots.

Regulators

- Provide timely access to the right amount of spectrum – Initially, regulators should aim to make available 100MHz of contiguous spectrum per operator in prime 5G mid-bands (e.g. 3.5GHz). Lower bands (sub-1GHz) are also required to provide wide-area capacity and ensure that 5G reaches everyone. Beyond spectrum availability, the cost of spectrum also has a major impact. Governments and regulators should assign 5G spectrum to support their digital connectivity goals rather than as a means of maximising state revenues.
- Consider 5G backhaul needs – Policymakers should make additional bands available and support wider bandwidths in existing bands. Measures should also be taken to ensure licences are affordable and designed effectively. In the near term, the E-band will be most important, especially to support initial 5G growth, but the W-band (92–114GHz) and D-band (130–175GHz) will be vital to scale capacity in subsequent years.
- Enable quick and cost-effective network rollout – Policymakers are encouraged to simplify planning procedures and regulations for site acquisition, co-location and upgrades to base stations. It is also important to provide operators access and rights of way to public facilities for antenna siting and fibre deployment, according to reasonable terms and conditions. ■

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lead industry analyst, Ookla

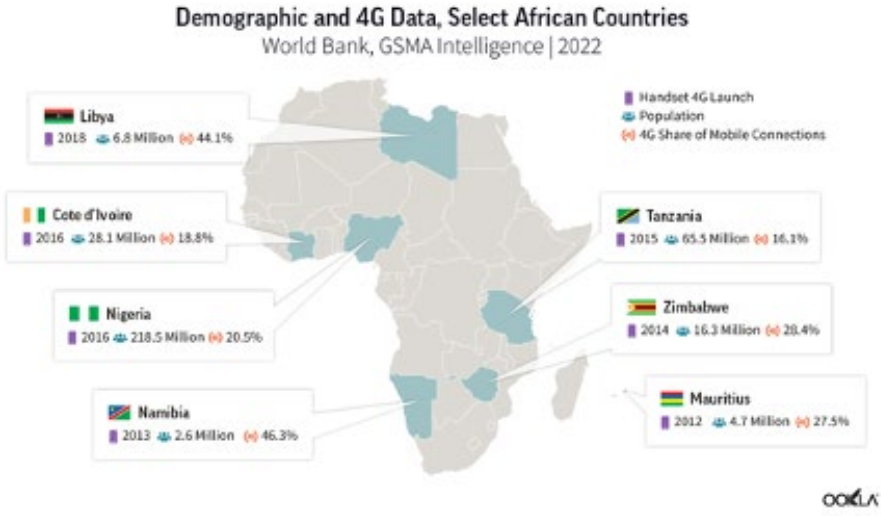
Some African countries have markedly improved in 4G coverage and performance since 2020

Cellular networks are critical to connect individuals and businesses as internet access in Africa is predominantly mobile. The adoption of digital services, spurred by the COVID-19 pandemic, has rapidly increased the demand for data services. Consumer needs and economic growth will increasingly depend on a fast, reliable mobile network.

We used Ookla's Speedtest Global Index™ to identify African countries that have consistently improved their mobile speed ranking between June 2020 and June 2023. We focused on markets that offer strong growth potential for 4G, so we selected countries whose 4G share of connections was lower than 50% at the end of 2022 (based on GSMA Intelligence data).

According to Speedtest Intelligence, Cote d'Ivoire showed impressive improvement in 4G network performance since Q2 2020, reaching a median download speed of 23.8Mbps in Q2 2023, the third highest speed behind only Mauritius with 27.33Mbps and Namibia with 26.92Mbps. Tanzania doubled its 4G download speeds to 20.83Mbps while Libya, Nigeria, and Zimbabwe had download speeds between 15-20Mbps in Q2 2023.

Improvements in upload speeds over the same period and the differences between the countries were less pronounced than download speed results. With a jump of 1.6 times in 4G upload speed between Q2 2020 and Q2 2023, Tanzania moved from fourth to second place, ahead of Cote d'Ivoire and Mauritius and just behind Namibia. Libya lagged other countries in download and upload speeds but improved



markedly over three years, despite being the last one to launch 4G in 2018, and arguably, where operators had the most challenging environment.

Cote d'Ivoire: plenty of room to increase 4G adoption

Mobile penetration in Cote d'Ivoire has increased rapidly since 2020 to reach 142.4% in Q1 2023, according to Autorité de Régulation des Télécommunications (ARTCI).

Orange is the largest mobile operator in terms of subscribers (45.6% in Q1 2023) and 4G network population coverage (90.6% in December 2022). It has expanded its subscriber base rapidly thanks, in part, to a $312 million investment in network deployment and upgrades in 2019-2020. It plans to invest US$120 million between 2020-2025 to upgrade the fibre-optic backbone of its 4G network.

MTN – with just over 33% of mobile subscribers in March 2023 – launched LTE-A in Abidjan in December 2020, the only operator to offer this service to date in the country. In October 2022, it signed a $75 million five-year contract with NuRAN Wireless to expand its network coverage in rural areas. However, this only concerns 2G and 3G services. MTN's 4G coverage reached 57.4% of the population at the end of 2022.

Moov's market share has remained stable at 20% since 2018. It launched 4G services in Q3 2016 over 900 MHz. Its coverage reached just over half of the population at the end of 2022.

According to Speedtest Intelligence, 4G availability grew from 83.5% in 2018 to 94.3% during Q1-Q3 2023, however, 4G share of mobile connections remains low at 18.8% in 2022 (according to GSMA Intelligence). The unaffordability of smartphones, combined with the limited coverage in rural areas and poor network QoS remain obstacles to mobile data adoption.

To address these challenges, Orange and MTN launched financing schemes and introduced affordable handset models; and ARTCI initiated discussions with the operators in 2022 on how to

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implement network improvements and was given additional powers to improve service quality levels. ARTCI also awarded the three operators 2×20MHz in the 2600MHz band for LTE to improve network data capacity and is looking for infrastructure sharing as an option to speed up 5G deployment in time for the African Cup, which will take place at the beginning of 2024.

Libya: government support was pivotal

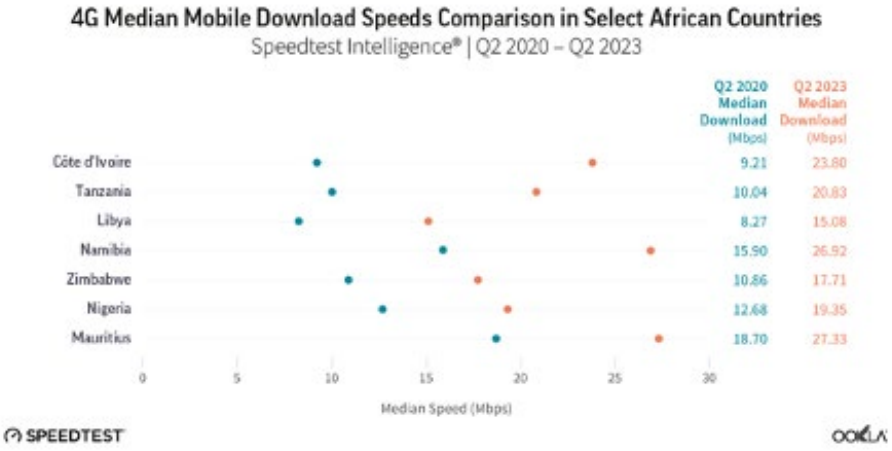
Libya experienced prolonged political unrest and violence since 2011, leading to the destruction of communication networks, equipment theft, and power shortage. The progressive return to stability since 2021 has somewhat enabled the restoration and extension of existing network infrastructure.

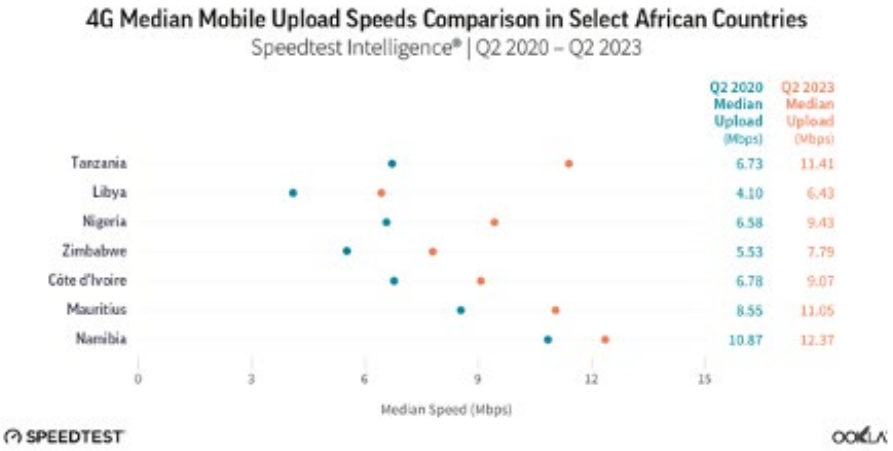
Despite these challenges, Libya has one of the highest mobile penetration rates in Africa (178.5% in June 2023, according to GSMA Intelligence). The market is a duopoly with two subsidiaries of Libyan Post, Telecommunication and Information Technology Company (LPTIC): Al Madar Aljaded and Libyana.

Libyana expanded LTE coverage to more than 49 towns and cities by April 2022, while Almadar Aljaded delivered LTE and LTE-A nationwide, claiming coverage for more than 80% of the population, in 2022.

4G deployment gained momentum and the restoration of telecoms infrastructure resumed thanks to LPTIC's program launched in 2021 to extend LTE coverage to underserved areas, with cooperation agreements with foreign governments and telecoms groups. According to Speedtest Intelligence, access to 4G increased from 11.8% in 2019 to 76.8% during Q1-Q3 2023. Northern regions particularly benefited from coverage enhancements. Coverage expansion was accompanied by a boost to median download and upload speeds reaching 15.08Mbps and 6.43Mbps in Q2 2023, respectively.

Unfortunately, the deadly floods that struck the eastern part of the country in September 2023 are a significant setback. We expect network expansion and upgrade efforts will be delayed as funding will be directed toward relief efforts and the restoration of basic mobile services.





Mauritius: additional spectrum helped to improve 4G coverage and speed

Mauritius, an early adopter of 4G with a saturated mobile market (population penetration reached 160.0% in Q3 2023), has three active mobile network operators: Cellplus Mobile Communications (under my.t mobile), Emtel, and Mahanagar Telephone Mauritius Limited (MTML) (operating under the CHiLi brand).

Cellplus Mobile achieved quasi-nationwide 4G coverage by mid-2019, while Emtel claims its 4G network covered the whole island by end-2022. MTML reached 90% of the population with LTE by end-2022. Operators continue to improve 4G coverage and speed ahead of 5G launches. According to Speedtest Intelligence, access to 4G increased from 64.40% in 2019 to 96.3% during Q1-Q3 2023.

These achievements were partly driven by initiatives by the Information and Communication Technologies Authority (ICTA) which continually encouraged the refarm and release of additional spectrum. The 2100MHz spectrum (1920-1980MHz paired with 2110-2170MHz) was reused for LTE and LTE-A services since 2018, after being used exclusively for 3G. ICTA also assigned 2×10MHz of spectrum in the range 832MHz-862MHz and 791MHz-821MHz for LTE services in 2021, which helped to increase 4G coverage.

Namibia: spectrum and investment boosted 4G

Mobile penetration reached 110.7% in Q3 2023. Like Libya, the market is a duopoly with two mobile operators controlled by state company Namibia Post and Telecommunications Holdings (NPTH): MTC, with an 86% market share, and Telecom Namibia (TN Mobile).

MTC was awarded 2x5MHz lots in the 900MHz spectrum band in August 2021, but that was deemed insufficient to serve its large subscriber base. It initiated the '081EVERY1' project to build additional base stations and upgrade 4G infrastructure in towns to provide 100% population coverage by the end of 2023. However, this objective had not been attained as of October 2023 (LTE coverage expanded to

more than 68% of the population in 2022).

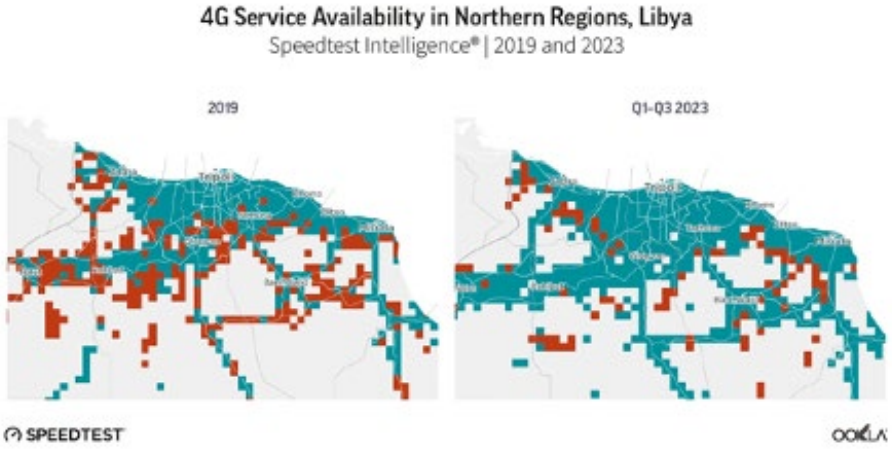
TN Mobile launched LTE in 2023 and LTE-A in late 2019 using only 1800MHz. In July 2022, the operator announced plans to invest more than $124 million over five years to modernize its network. It had been deploying or upgrading mobile sites in selected rural and urban areas since 2019 to achieve 100% population 4G coverage by end-2023; however, the cost of competing with MTC will likely make it difficult to achieve.

According to Speedtest Intelligence, 4G availability in Namibia increased from 24.7% in 2019 to 76.6% over January-October 2023, with the Otjozondjupa region showing substantial improvement (see map below). However, according to the Communications Regulatory Authority of Namibia (CRAN), only seven out of fourteen regions were covered by 4G, calling for more private sector investment. To support these efforts, CRAN kicked off the auction process for 700MHz (703-788MHz) and 800 MHz (790-862MHz) frequency bands in February 2023. The spectrum was awarded in October 2023 to the two mobile operators and local ISP Loc8 Mobile for 4G and 5G services. The three licensees should provide 4G and 5G services with at least 20Mbps download speed and must extend 4G coverage to at least 80% of the population in six out of the 14 regions.

Nigeria: access to multiple spectrum bands helped operators to rapidly expand 4G network coverage

Nigeria is the largest market in Africa with over 220 million mobile subscribers. The market peaked in 2020 and then contracted due to the new SIM registration policy, but started recovering in the second half of 2021 as previously restricted subscribers obtained a new SIM through ID verification. Mobile penetration reached 90.3% in Q3 2023.

The market is highly competitive with three main players: MTN (38.7% share of subscribers in July 2023), Glo (Globacom) (27.82%), and Airtel (27.24%). 4G coverage increased rapidly to reach 80.9% at the end of 2022 though adoption



Green squares show locations where 4G service is available and red squares where 4G service is unavailable.

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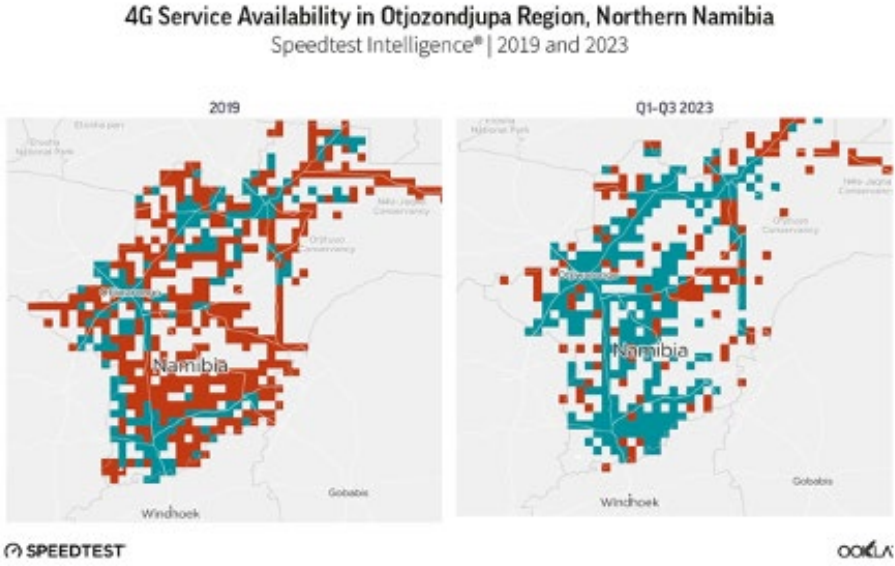


Green squares show locations where 4G service is available and red squares where 4G service is unavailable.

peaked at around 25% before starting to fall as some customers migrate to 5G.

Glo launched LTE-A in 2023 by combining 700MHz, 1800MHz, and 2600MHz, and plans to deploy 4,000 LTE-A mobile sites in major towns and cities. MTN acquired 800MHz spectrum to improve coverage 4G coverage which reached 83% in 2023. In September 2023, it acquired an additional 10MHz of spectrum in the 2600MHz band to improve the capacity of its LTE network. Meanwhile, Airtel incorporated 2600MHz in 2019 and 900MHz in 2022, which helped to expand coverage to more than 463 locations in the country.

Operators faced several technical and operational challenges that impacted the quality of 4G connectivity. This was the result of the network infrastructure not being able to keep up with pent-up demand for mobile device services. Other factors also contributed to the deterioration of network quality including the limited access to continuous power supply, vandalism, and multiple taxes and levies.

The Nigerian Communications Commission (NCC) and the government – which issued significant QoS fines in 2012-2016 – started adopting less punitive measures against operators recently and being more actively engaged, following the South African model. The government also reversed its decision to impose a 5% excise duty on telecom services in 2023. These measures should somewhat help operators weather the current challenging macroeconomic climate.

Tanzania: 4G coverage improved but data services remain unaffordable

Tanzania has a crowded mobile market with seven operators and fierce competition. The introduction of biometric SIM identification slowed market

growth in 2020 (the market contracted by 9.5 million) before recovering in 2021. Mobile penetration reached 93.9% in June 2023.

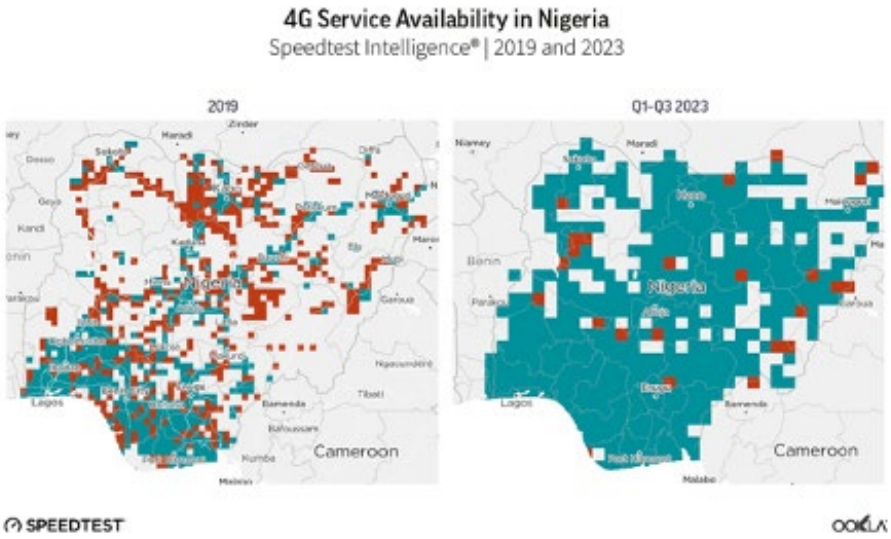
Three operators dominate the market: Vodacom (30% of subscribers in June 2023), Airtel (27%), and Tigo (27%), which was acquired by a consortium led by Axian Telecom in April 2022.

Vodacom reported having deployed 2,315 4G sites by the end of 2022 (up from 1,814 in September 2021) and that broadband coverage reached 93% of the population. Airtel announced the deployment of its 'Supa 4G' LTE-A network in 2021 which uses 700MHz and 2100MHz in 500 cities and villages. It claims to have rolled out LTE-A in 80% of its mobile sites by April 2022. Tigo expanded its network to reach 26 regions by February 2022. In May 2022, Axian Telecom announced plans to invest $500 million in infrastructure over the next five years to improve 4G coverage and QoS, especially in rural areas, and to support the country's digital transformation and bridge the digital divide.

The Tanzania Communications Regulatory Authority (TCRA) has been less punitive than before. In 2019, it fined the six operators $2.6 million for failing to meet QoS standards, but in 2021 ordered them to invest $16.4 million to address network issues rather than issue a new fine.

The government freed up the 700MHz band in 2018 to enable operators to provide 4G data services to more communities. Four years later, another auction was completed for 2300MHz, 2600 MHz, and 3500MHz bands to be used for 4G and 5G. The government launched the 'Digital Tanzania' project in May 2023 in partnership with mobile operators and support from the World Bank to reach 80% broadband population penetration by 2025. Operators will use the universal access fund to deploy 758 mobile towers to provide data services to 1,407 villages and over 8.5 million potential users.

While 4G coverage reached 65%, Tanzania has



Green squares show locations where 4G service is available and red squares where 4G service is unavailable.

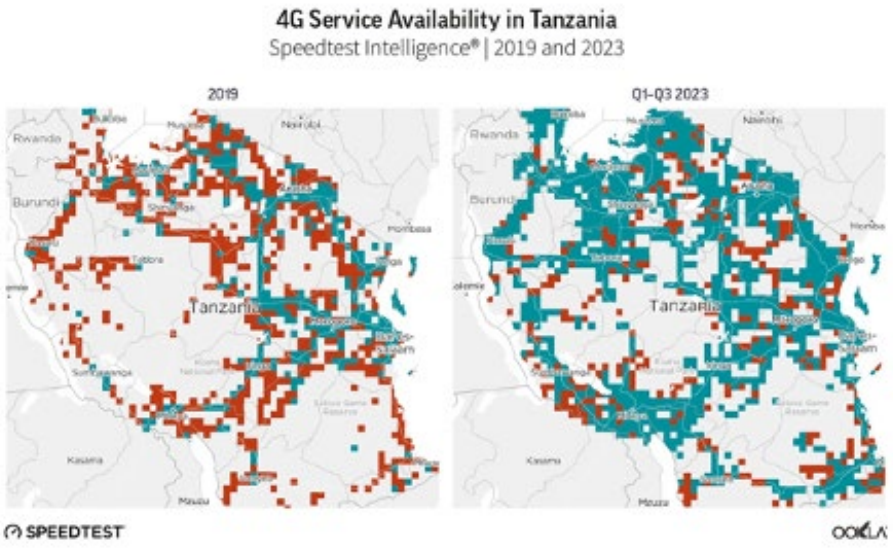
the lowest 4G share of connections among the countries reviewed in this article, at 17.8% in Q2 2023. Furthermore, only 27% of Tanzanians owned smartphones and mobile internet-enabled devices in 2022. This suggests that many consumers still cannot afford data-enabled handsets and that data tariffs remain out of reach for most Tanzanians, given low income levels, since most live in rural areas and work in the agriculture sector.

Zimbabwe: government was crucial in progressing broadband connectivity agenda

According to the Postal and Telecommunications Regulatory Authority (POTRAZ), mobile penetration reached 91.9% at the end of Q2 2023. 3G and 4G services represented more than 98% of data connections in the country, and the main driver for internet penetration.

The market is dominated by Econet which controls 72.3% of subscriptions as of June 2023. As of October 2022, its 4G network reached 39% of the population. Econet has the highest number of LTE base stations (54.3% of the total 1,962) in the country as of June 2023. In September 2023, it announced the deployment of 30 new 4G sites by March 2024 and an upgrade of all existing 2G sites to 4G in the eastern provinces.

State-owned NetOne had a 25.5% market share in June 2023. It resumed deployment of LTE base stations in rural areas in 2021, which helped it to control more than 44.5% of total 4G towers in the country (867 base stations) and grow its data subscribers. Telecel, meanwhile, has been struggling to maintain its market share over the past few years. It initially opted not to launch LTE along with competitors because it believed that the market was not ready and had just 17 LTE base stations by mid-2022.



Green squares show locations where 4G service is available and red squares where 4G service is unavailable.

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The government announced its plan to raise internet penetration to above 75.0% by 2025, up from 65.2% in Q2 2023. It announced the national broadband program covering 2023–2030 to reduce the cost of broadband access to 2% of the average monthly income from 10.1%. The government is committed to raising funds for this plan which includes the deployment of fibre infrastructure for broadband access and backhaul. It also plans to deploy 300 base stations to be shared by the operators to support mobile services in rural areas using the universal services fund.

This is a vital initiative as operators are struggling to finance their network deployment and upgrade their networks due to currency depreciation, and limited access to foreign currency to pay for equipment. Their revenues are also down due to the reduction in consumer spending because of inflation and reduced disposable income, which is impacting their ability to finance their infrastructure development plan.

Strong policy support is vital for Africa's 4G adoption

The role of governments and regulatory authorities is crucial to making mobile data services accessible in Africa. Operators need sufficient spectrum, favourable policies and regulations, and the support they need to expand 4G infrastructure. In light of the current macroeconomic and operational challenges hindering the adoption of 4G, such as spectrum availability, coverage requirements, and handset affordability, overcoming these challenges will help with the next phase of 5G development. ■

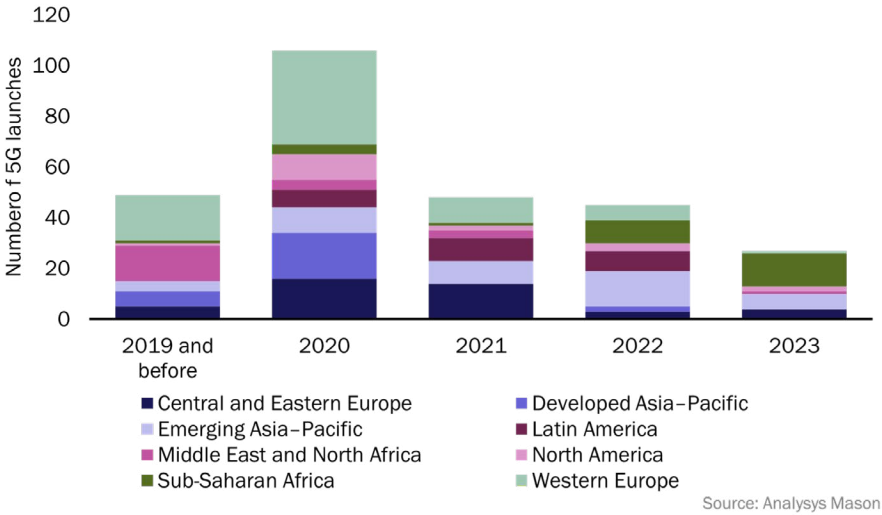
Stephen Burton,
research analyst, Analysys Mason

sub-Saharan Africa leads 5G launches in 2023

According to the latest edition of Analysys Mason's 5G deployment tracker, 26 new 5G networks have been commercially launched across 22 countries so far in 2023, with an additional 55 5G networks either in deployment or scheduled for launch later this year.

Sub-Saharan Africa (SSA) has dominated 5G launch figures in 2023, with 13 new launches across 10 countries, accounting for over 48% of 5G launches during the period. Emerging Asia–Pacific (EMAP) has recorded 6 new 5G launches in 2023 so far, while Central and Eastern Europe (CEE) recorded 4 new 5G launches, respectively. Additionally, North America (NA) recorded 2 new 5G launches, while Western Europe (WE) and the Middle East and North Africa (MENA) each reported one new 5G launch in the same period. 5G standalone (SA) launches for the last 12 months (August 2022–2023) have continued to grow steadily, with 11 new operators commercially launching 5G SA networks. Five of these launches have occurred in 2023, with three operators launching in WE and 2 launching in MENA.

Our 5G deployment tracker includes



5G network launches, worldwide, 2019 and before –2023

338 entries from 2018 to 1H 2023, with 274 confirmed launches of 5G networks and 40 commercial launches of 5G SA networks, worldwide.

sub-Saharan Africa's 5G launch figures continue to surge in 2023

Operators in SSA have long prioritised investment in 4G networks over 5G. This is due to the lower cost of 4G devices and infrastructure, and the high number of users on legacy networks, such as 2G and 3G, across the region. As a result, operators have prioritised the migration of these users to 4G networks over new 5G deployments.

In 2021, 79.8% of all mobile connections in SSA were 2G or 3G connections, and there were only six operational 5G networks in the region. This changed in 2022, with operators launching nine new 5G networks across the region. This number has continued to climb so far in 2023, with a total of 13 new 5G network launches since January.

SSA now accounts for over 48% of all 2023 5G launches, with the region now having more operational 5G networks than MENA, NA, Latin America (LATAM) and developed Asia–Pacific (DVAP). Airtel has launched the most 5G networks in SSA so far in 2023, with the group launching four new 5G networks in four different countries. These include:

- **Kenya:** Airtel became the second operator to launch a 5G network in Kenya, following Safaricom's launch in October 2022. Airtel claims coverage across 370 areas including Mombasa, Nakuru, Nairobi and Kakamega.
- **Nigeria:** Airtel launched its 5G network in June 2023, with coverage in multiple areas including Abuja, Port Harcourt and Lagos. Airtel is the third operator to launch a 5G network in Nigeria, following MTN (2022) and Mafab (January 2023).

- **Uganda:** Airtel launched its 5G services in various areas of Kampala in August 2023, one month after MTN launched the first 5G network in Uganda.
- **Zambia:** Airtel became the second operator to launch a 5G network in Zambia in July 2023, following MT's 5G launch in November 2022.

Other notable launches across SSA include:

- **French Guiana:** Orange Caraibe and SFR Caraibe both launched their 5G networks in 2023 in the 3.5GHz band. These are the first 5G networks in French Guiana.
- **The Gambia:** QCell became the first operator to launch 5G in The Gambia in June 2023, launching in selected areas of the capital city, Banjul.
- **South Africa:** Telkom South Africa launched their 5G network in 2023, becoming the fourth operator to launch 5G in South Africa after Rain, MTN and Vodacom.

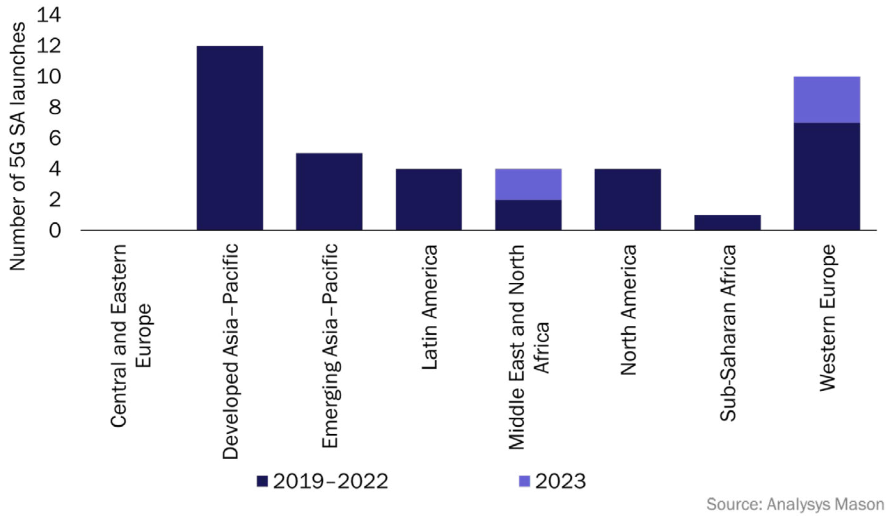
MENA launches two 5G SA networks

There are now 40 operational 5G SA networks worldwide, spanning 24 countries and 34 different operators. In the previous 12 months (from September 2022 to September 2023) there have been 11 new 5G SA launches, with five of these occurring in 2023.

These five launches were spread across WE (three new launches) and MENA (two new launches).

More 5G SA launches are expected in 2023, as launch figures have historically peaked in the second half of a calendar year.

5G SA launch figures are expected to accelerate over the next few years, and operators that have already launched 5G SA networks are likely to continue to expand their standalone coverage. Analysys Mason predicts that by 2024, 5G SA will be the main source of revenue for vendors. ■



5G SA launches, worldwide, 2019–2023

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Abdelkader Najja,
VP Middle East & Africa, BICS

Over the past year, we've seen a growth in opportunities not only within the telecoms sector but also in the enterprise realm. This expansion isn't confined to traditional telecoms entities; smaller businesses are now seeking CPaaS and cloud communication solutions. They desire quick and easily accessible tools, which is what our CPaaS platform delivers.

From a telecoms perspective, voice services remain strong in Africa, maintaining their role as a preferred communication method despite a more global shift away from voice calls.

The African telco market has grappled with issues like infrastructure, affordability, and regulatory challenges. However, it's rich with opportunities stemming from population growth, rising data demand, digital transformation, and emerging technologies. Success hinges on adaptability to local conditions, infrastructure investments, and the exploration of innovative partnerships and services.

Several trends stand out across technology, applications, and the African market. We've observed a rise in mobile-centric work largely due to high unemployment rates. Additionally, there's been an increased focus on digital transformation. This is evident from activities like the move towards mobile solutions after internet restrictions in Senegal and the ECOWAS support for digital projects. The benefits of 5G, including its low latency, have become increasingly recognized, especially when considering the challenges associated with physical infrastructure in Africa.

"From a telecoms perspective, voice services remain strong in Africa, maintaining their role as a preferred communication method despite a more global shift away from voice calls."

"The telecom sector is inherently dynamic. While multiple factors will shape its course, we are confident that the current trends and focal areas in the African telco market will remain relevant in the ensuing years."

Mobile money services such as Kenya's M-Pesa continue to grow in popularity. The African tech startup scene is gaining momentum, smart city initiatives are being embraced by various cities, and there's a push for e-government projects that focus on digital transformations to enhance service delivery and transparency. The Internet of Things (IoT) is also finding applications in various sectors, including agriculture, healthcare, and logistics.

Other significant trends include the initiation of national roaming in Senegal to boost network coverage, growing foreign interest due to detected natural resources which is leading to anticipated technological

investments, and the ongoing expansion of 5G networks with entities like Orange Mali taking significant steps. There's also a visible shift towards renewable energy, with a marked preference for solar power. The COVID-19 pandemic catalysed the growth of the e-learning and health tech sectors.

The African telco market stands out due to its infrastructural challenges, affordability issues, regulatory diversity, unique financial inclusion opportunities, and the demand for tailored solutions that address the continent's varied needs. Success in Africa demands a profound understanding of local conditions coupled with an inclination to invest in infrastructure and foster meaningful partnerships. ■

"The COVID-19 pandemic catalysed the growth of the e-learning and health tech sectors."

Looking ahead: Predicting a single driver for 2024 and 2025 is tricky given the continent's diverse telecoms landscape. Africa's vastness and variance in infrastructure, economy, and regulations mean different regions may prioritize diverse needs. While the previously mentioned trends are pivotal, the definitive drivers will likely differ by region and segment. Keeping abreast of local developments is essential for businesses in the African telecom domain.

Several regions in Africa exhibit remarkable growth and potential:

- East Africa stands out with Kenya's vibrant tech scene and Ethiopia's notable telecom reforms.
- West Africa showcases the dynamism of Nigeria's tech environment alongside Ghana's steadily growing tech hubs.
- In Southern Africa, South Africa's mature telecoms market is complemented by Zambia's burgeoning growth in the ICT sector.
- North Africa, especially Egypt and Morocco, is witnessing a surge in tech startups.
- The Francophone African regions are observing growth, with countries like Senegal, Ivory Coast, and Cameroon leading the charge in digital transformation and tech entrepreneurship.

Not to be left behind, emerging markets like Rwanda and Uganda are making headlines; Rwanda with its aggressive tech investments and Uganda's renewed focus on improving connectivity and internet access. It's essential to consider that the vibrancy of these regions could be influenced by a myriad of factors ranging from political to economic conditions, and thus, staying updated on local developments is imperative for anyone keen on engaging with these regions.

Cross-border cooperation in Africa previously encountered regulatory, infrastructural, and political obstacles. However, ongoing regional integration initiatives, like the AfCFTA, aim to forge a unified African market. The future of cross-border cooperation hinges on factors like political stability, infrastructural investments, regulatory alignment, digital tech adoption, and economic growth.

The telecom sector is inherently dynamic. While multiple factors will shape its course, we are confident that the current trends and focal areas in the African telco market will remain relevant in the ensuing years.

Vaibhav Magow,
vice president, international division, Hughes

Hughes does business all over the world and we are adept at navigating regulatory environments of all kinds. Many countries require that cellular backhaul hubs be in the country of origin. Often, there are various fees and taxes associated with installing satellite ground terminals. Governments are starting to realize how important satellite connectivity is for economic growth and are reducing or eliminating these fees.

However, the African market is very price sensitive. With incomes generally below the global average, the mobile network operators there must consider whether potential customers can afford both the mobile devices and the monthly fees required for internet connectivity. The deployment of low Earth orbit (LEO) satellite constellations, such as OneWeb, is bringing increased capacity into the African market. This will open the door for hybrid services that utilize multiple orbits to deliver services. The combination of GEO and LEO will help operators deliver services that are optimized for the use case. LEO can be used for low-latency traffic while GEO continues to be used for applications that are not latency sensitive and this helps keep the costs down.

"The African market is very price sensitive. With incomes generally below the global average, the mobile network operators there must consider whether potential customers can afford both the mobile devices and the monthly fees required for internet connectivity."

Earlier this year we signed an agreement with Africa Mobile Networks (AMN), which delivers services for some of the biggest mobile network operators in Africa. AMN selected the Hughes JUPITER system ground platform to backhaul 2G, 3G and 4G cellular network traffic in Madagascar and Nigeria. The JUPITER gateways will connect several hundred cell towers via satellite, enabling the network operators to reach more subscribers in remote areas.

The biggest demand for satellite services across Africa continues to come from mobile network operators striving to provide cellular service to more and more of the unserved and underserved population. With fibre and other terrestrial networks not extending far beyond large urban areas, the demand for satellite backhaul for cellular networks will be a key economic driver well into the future. For example, we continue our Yahclick joint venture arrangement with Yahsat. Yahclick provides satellite coverage to areas representing 60% of Africa's population. With our JUPITER ground system, we are providing support to Egypt's National Company for Telecommunications Services (NCTS).

The biggest challenge and opportunity in Africa is providing internet connections through cellular networks to the unconnected. Many areas still only have 2G or 3G service, with select areas being upgraded to 4G. 5G is still years away for most Africans and is available in about a dozen of Africa's 54 countries. Only a small fraction of the mobile devices in Africa

are 5G-enabled. A recent survey by Ericsson Mobility predicted that by 2027, 80 percent of phone users in Europe will have 5G, while in Africa it will only reach 10%.

But as more people are connected and network operators upgrade to 4G, we will see increasing demand for satellite backhaul throughout the region. Customers can have good internet connections and access to cloud-based applications with 4G networks and thus will use mobile devices for more than texting and phone calls. Very gradually, the more remote parts of Africa will have better and better service and start to catch up with the rest of the world.

The move from 2G and 3G to 4G is something we are seeing throughout the continent, including sub-Saharan Africa. A study last year by GSMA reported that while 3G is still the dominant standard, its adoption had started to decline as network operators are able to install and deploy 4G network equipment. The study predicted that by 2025, 4G will account for a third of mobile connections in the region compared to less than 20% last year when the study was published. ■

Looking ahead: We think that in 2024-2025 there will be continued growth in basic cellular service. Network operators are building cell towers as rapidly as they can to provide connectivity to unserved areas. And where there has been service, they are looking to upgrade from 2G and 3G to 4G network services. In smaller communities, we are also seeing the adoption of community WiFi networks that allow residents to use their mobile devices to connect to the internet. These can also be a resource for teachers in schools and for medical practitioners facilitating telehealth services. Any technology that will help expand the reach of the internet at an affordable price is going to be very welcome in the African market.

Egypt will continue to be a strong market for all types of communications and satellite service. We expect continued success in our partnership with that country's telecommunication providers. In sub-Saharan Africa, South Africa and Nigeria will continue to be among the strongest markets. They have strong economies, and their networks use technologies that are quite advanced compared to other countries in the region. They will be among the first to deploy 5G networks on a wide scale.

One market that could start to show more growth is the Democratic Republic of the Congo. It is a large geography, the largest in the sub-Sahara, and its population is well spread out. For the past 10 years, Hughes and Intelsat have worked together to build cell towers in rural areas of the Congo that can provide connectivity for the entire community.

Every country in Africa offers its own set of opportunities and challenges. But what they tend to share is having distributed rural populations disconnected from primary communications networks. The most cost-effective means of connecting them is through satellites connected to multiple ground stations. The satellites are in place, so the challenge for mobile network operators is to build the terrestrial infrastructure to connect to the satellites.

That can take a long time. What could happen more quickly is helping the underserved, or those with only 2G or 3G connections, access 4G service through cellular backhaul. 4G will enable customers to access cloud-based applications like mobile banking, further stimulating local economies.

Africa as a market will continue to grow slowly but steadily. Hughes is committed to bringing as many of our resources as we can to help support this growth.

Hans Boos,
director business development
Africa, Rohde & Schwarz

Over the past year, Rohde & Schwarz has experienced significant milestones in Africa. Most notably, we've established our first subsidiary and R&D lab in Rwanda. This marks our first subsidiary in central Africa as well as our first R&D location on the continent. The lab also received much support, with president Paul Kagame and key minsters attending the opening ceremony. This strategic move aligns with our vision for sustainable growth, making Africa a pivotal focus for our global product development initiatives.

"In navigating the African landscape, Rohde & Schwarz has encountered many challenges, such as the delay and lack of budgets, shortage of qualified workers and security concerns."

In navigating the African landscape, Rohde & Schwarz has encountered many challenges, such as the delay and lack of budgets, shortage of qualified workers and security concerns. Amidst these challenges, however, there are immense opportunities. The continent's young generation is eager to learn and drive economic growth. The rapid adoption of technology and the flourishing tech startup ecosystem offer promising prospects for innovation and entrepreneurship. Investing in education, skills development and healthcare contributes to a more productive and innovative workforce.

We've identified the following key trends shaping the market: mobile technology, internet access, fintech, mobile banking, education technology and AI. Another important point of note is the thriving start-up ecosystem, which reflects the continent's potential for transformative impact.

The African market stands out in its demand for comprehensive solutions tailored specifically for the region, ideally crafted within Africa or by African innovators. This necessitates a more localized and culturally attuned approach. ■

Looking ahead: East Africa is set to be a focal point for positive growth, with an expected economic surge of 5-8%. Within this dynamic landscape, Kenya shines as a prominent tech hub with a flourishing fintech sector. The country's commitment to investing in renewable energy is also a positive indicator for future growth. Ethiopia, fueled by its expanding population, presents significant economic potential, supported by substantial modernization efforts in crucial sectors like infrastructure and energy. Meanwhile, Rwanda is also making significant strides in various sectors, especially technology and education.

We foresee advancements in technology adoption across the continent, particularly in mobile tech, fintech and e-commerce, fostering innovation through increased connectivity. Additionally, Africa's vibrant startup scene is expected to yield innovative solutions to local and global challenges. Rohde & Schwarz is positioned to navigate this dynamic landscape, leveraging these opportunities for sustained growth and impact.

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The New GWS 5500 Delivers more TVWS broadband capacity at greater distances.

6H has just announced its new GWS-5500, the industry's highest performance, furthest distance, PTP/PMP broadband wireless connectivity solution. The lower-priced IP-67 industrial-grade product delivers lower TCO, both onshore and offshore.

6H is also developing an IP-67 Rugged Edge Compute and Communications (RECC), delivering real-time computing for people and things at the very edge of the network.

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IEC Telecom has strong commercial and technical relationships with major satellite operators across the world, including Starlink, Eutelsat, Intelsat, Inmarsat, Iridium, Thuraya, Yahsat and more. With a multi-networks approach, the Group covers requirements across the complete communications lifecycle no matter where customers choose to do business.

IEC Telecom Group has offices across eight countries: France, UAE, Kazakhstan, Norway, Singapore, Sweden, Turkey and Mallorca. For more information, see the website: iec-telecom.com

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Mobile Mark is a leading supplier of innovative, high performance antennas to wireless companies across the globe. We've been in the wireless industry for over 30 years and have our roots in the early Cellular trials. We have grown and evolved over the years, along with the industry. Today, we benefit from enhanced design capabilities and expanded production capacity – along with a greater understanding of new and emerging markets – all of which have allowed us to become one of the best antenna developers in our field. Our customers have been our partners throughout the years. We believe in taking the time to understand our customers' individual needs. Through close consultation with clients, we are able to deliver innovative, tailored solutions that meet specific antenna requirements. Rapid prototyping capabilities allow us to take our designs from concept to reality in an extremely short time span, and to verify the performance of the antenna. Mobile Mark antennas are used in many sectors of the wireless industry. Here are just a few examples:

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Based in the UK's Cambridge technology hub, Sepura provides local support through its global footprint, and is a trusted partner to public safety users and commercial customers in the Professional Mobile Radio (PMR) market.

Sepura's comprehensive solutions for critical communications enable customers to address the demanding operational challenges they face. The company celebrated its 20th anniversary in March 2022.

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Stratosat forms part of the German based SCHAUENBURG International Group, which is a fast-growing family business with more than 30 affiliated companies worldwide. Investments are focused on niche technologies in electronics, plastic processing, engineering, and industrial solutions on a global scale.

Stratosat, established in 2002, provides cost effective tailor-made turnkey satellite and microwave communication solutions in Sub-Sahara Africa. We have rendered products and services to the majority of Telco and Satellite Operators in Africa.
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- Tailor-made Communication Network Solution Design & Project Management.
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