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Meaningfully connecting Africa

Amy Saunders,
editor, African Wireless Communications Yearbook

It's been a huge year for wireless communications. Investments and partnerships across the continent have been rife, connectivity has become faster and more accessible than ever before, and new technologies are truly shaking up the landscape.

My personal key phrase of the year, and for the year ahead, is 'meaningful connectivity.' For a long time, we've been writing about connecting the unconnected, bridging the digital divide, but achieving truly meaningful connectivity is the name of the game. Providing STEM education, lowering the cost of devices, and expanding coverage is all well and good, but connecting people for connectivity's sake is just one part of the equation. The handsets must be accessible to all, and the connectivity must be broadband speed to enable all Africans to genuinely join the digital era.

To put things into perspective; my smartphone informs me that I've used 110Gb of WiFi data and 6.35Gb of mobile data in the last 30 days. That's a lot of data, considering that my usage is restricted mainly to work, OTT streaming, mobile payments, and the occasional video call. With mobile data the key mode of connectivity on the African continent, and the average price in South Africa pegged at $1.18/Gb in 2023, my usage would cost a hefty $137 – completely out of reach for the average African.

The drive to deliver meaningful connectivity to every African is a marathon, not a sprint.

Advancing standards

Mobile network operators (MNOs) are making significant strides in this area. As per the GSMA's Mobile Economy Sub-Saharan Africa 2023 report, the region has surpassed 25% mobile internet penetration, 574 million 3G connections, and 11 million 5G connections.

By the end of the decade, the GSMA forecasts 17% of all connections to be via 5G – supported by strong uptake of 5G fixed wireless access (FWA) to affordably connect remote and rural consumers - 49% by 4G, and smartphone adoption rates of 88%. Lofty goals indeed: while 'low cost' smartphones are now available at under $100, this remains beyond the reach of the majority, so it'll be interesting to see how such a high adoption rate will be supported.

MNOs have considerably narrowed the coverage gap to 15% for sub-Saharan Africa, however, this far exceeds every other world region. Moreover, a sizeable usage gap remains of 59% due to device affordability and low digital skills. In comparison, the MENA region has a coverage gap of just 4%, although a large usage gap of 44% remains.

3G is considered the bare minimum to achieve meaningful connectivity, with many proponents calling for 4G/LTE and beyond. Some countries are responding accordingly with efforts to

completely shelve the older mobile generations. December 2023 saw Zambia's minister of science and technology announce plans to remove 2G from the equation, and only build new towers with 4G and upwards mobile generations supported, for example.

Doing the maths

With the rise of 4G – which is expected to be the dominant technology throughout Africa by 2030 - mobile data traffic is forecast to skyrocket as data-heavy services like video streaming and online gaming become viable. The GSMA reports that data consumption will increase fourfold in sub-Saharan Africa over 2022-2028, from 4.7Gb to 19Gb per smartphone per month, while in MENA, it will increase by a factor of 3.1, from 12Gb to 37Gb per smartphone per month.

Coming hand-in-hand with the rise of data usage is the drop in cost per bit. Indeed, with each passing year, the value added services (VAS) segment becomes more critical to operators. Interestingly, Juniper Research reports that MNOs stand to lose $3 billion globally in SMS revenues by 2028 as enterprises switch to OTT business messaging services like WhatsApp. Core services are stalling in profitability as connectivity approaches commodity pricing, leaving MNOs seeking new ways to expand their offerings.

Mobile money has, naturally, been key in enabling some operators to drive profit margins. According to GSMA Intelligence, sub-Saharan Africa is now home to 154 live mobile money services and 218 million active (in the last 30 days) accounts, while MENA hosts 31 services and 6 million active (in the last 30 days) accounts.

For the year that ended in March 2023, Safaricom's M-Pesa revenue expanded by 8.8% year on year to KShs 117.19 billion, and remains the company's biggest revenue earner,

accounting for 39.7% of service revenue. This can be expected to expand through 2024 following its Ethiopia launch in August 2023 – within the first three months, m-Pesa had already gained 1.2 million new customers. Similarly, MTN's MoMo service revenue increased by 48.8% year on year to GHS1.3 billion in the first half of 2023, comprising 20% of total service revenues.

And it's not just mobile money. OTT services are gaining traction with MNOs, who are partnering with major international players on innovative new packages. Orange recently teamed up with Spotify to deliver African-language music to mobile customers on the continent, while Digital Afrique Telecom (DAT) has joined forces with Clipfeed to develop Africa Gaming Box, a platform for mobile operators to deliver e-sports services.

Infrastructure abounds

With the boom in data traffic, data centres are proving increasingly vital infrastructure to support the rapidly digitalising continent. Pressure on existing colocation data centres is ramping up, driving demand for new facilities. Moreover, with several nations redressing their data sovereignty laws and increasing security policies, local storage infrastructure requirements will boom. As per African Infrastructure Investment Managers, today's 250MW of installed data centre capacity across the continent is woefully inadequate – 1,200MW will be needed to support the digital economy by 2030.

The move towards meaningful connectivity, and the expansion of communications services into remote and rural regions, necessitates a whole host of new infrastructure investment. Fibre projects have expanded rapidly, bringing high speed connectivity within reach of consumers and businesses in some regions for the very first time. Hamilton Research reports

that the continent's total inbound international internet bandwidth grew by 39% year on year to 36.7Tbps by December 2022, with this growth delivering access to backbone networks to 40 million more people.

Similarly, 2023 has been a vibrant year for towercos as deployments accelerate. The 199,092 African towers in operation in 2023 is forecast by Mordor Intelligence to grow to 249,652 by 2028, driven by the adoption of newer mobile generations and the uptick in mobile subscriptions. Angola is set to benefit from 700 new towers in Huambo, Namibe, Cabinda, and Soyo courtesy of Africell Angola, which is targeting nationwide coverage by 2025. Zambia, too, plans to install 980 towers by 2025 to address communications gaps and meet the Universal Access Master Plan. Telecom Namibia will deploy 500 new towers over the next five years in line with its modernisation strategy, while in Ghana, Telecel Group has some 300 new 4G towers set to be activated.

Critical communications

The devastating floods that have blighted the continent this year – killing more than 2,200 in 15 countries – have once again brought to light the value of critical communications networks.

Low Earth orbit (LEO) satellites are considered key to ongoing humanitarian relief efforts, supporting governments and NGOs in coordinating missions at a time when terrestrial networks have been rendered inoperable. Additionally, with the advent of LEO constellations, capacity has never been more affordable.

Within the satellite sphere, the biggest story of 2023 (surprising nobody) has been the continued evolution of mega-constellations. Local and international media alike has been rife with Starlink stories since it first made its entry to the continent in January, in Nigeria. The 5,000+ strong constellation is now connecting people across Kenya, Malawi, Mozambique, Benin, Rwanda, and Zambia, with a further 25 countries due to come on board in 2024.

However, some reports indicate that the real number of countries where Starlink is active could be higher. Ghana, South Africa, Zimbabwe, and Senegal have all voiced concerns or banned Starlink to operate in their territories. Despite this, the Independent Communications Authority of South Africa (ICASA) reported at November-end that Starlink products were being distributed around the country illegally and without licence…

What's in store for 2024?

The next few years should prove paradigm-altering in the delivery of meaningful connectivity to every African. And with the flurry of activity in modernising networks to 4G/LTE/5G, we can expect to see high capex levels for 2024-2025 before they level somewhat as operators turn their attention to monetisation.

With expanding digital transformation, we can also anticipate a greater focus on securing the networks against cyber-attack. According to Kaspersky, Africa has become the most targeted region in the world, accounting for 28% of global IoT cyber-attacks in Q3 2023. Moreover, in the same quarter, attacks were detected on 32% of industrial control system computers in Africa, including on 22% of machines in South Africa, 28% in Kenya, and 25% in Nigeria. It is imperative that operators take measures to protect their new assets, and their customers.

As for connecting the unconnected – 2024/25 is unlikely to be a major turning point. However, with incremental steps taken in the right direction, continued investment in education, training, and device development, perhaps by the end of the decade, we'll be seeing real, meaningful change. ∎

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chapter
State of
the Market

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Oluwole Babatope,
senior research analyst, data
and analytics, International Data
Corporation (IDC)

African challenges such as limited infrastructure, inflation, illiteracy, and foreign exchange issues, are well-documented. However, it's essential to recognize that these challenges also give rise to growth opportunities.

Take, for instance, the improved access to broadband, which has revolutionized education, extending it beyond the confines of traditional schools. Now, individuals with smart devices and internet connectivity can engage in learning through structured online curricula offered by educational institutions or opt for a more flexible, unstructured approach using platforms like YouTube, Udemy, and Coursera.

Content creators are also being encouraged by these platforms to share their knowledge and insights, making it possible to acquire expertise in nearly any subject without formal education. Thus, broadband connectivity is bridging the illiteracy gap.

Africa represents the next frontier for growth, especially as developed economies slow down. Consequently, significant investments are being made in telecoms and IT services to offer improved experiences to consumers and enterprises. One notable example is the expanding deployment of 5G technology. While initial deployments may have commenced in major markets like Nigeria, South Africa, and Kenya, we are now witnessing 5G deployments in countries like Togo, Ethiopia, Senegal, and beyond.

Broadband infrastructure investment has become a prevailing trend throughout the continent. Simultaneously, consistent investments in 4G and 5G spectrum are shaping the telecommunications landscape across Africa.

Additionally, there has been substantial growth in mobile money adoption, facilitated by partnerships between regulatory bodies, mobile money operators, fintech companies, and financial institutions. These collaborations are driving the expansion of financial inclusion initiatives within their respective markets.

A unique market

The African market possesses distinct characteristics that set it apart from other global markets.

Firstly, Africa is comprised of over 50 diverse markets, each with its unique peculiarities and local nuances. Consequently, attempting to replicate identical strategies across the continent is a formidable challenge. It is crucial to consider the political, economic, and cultural intricacies of each market when pursuing opportunities in the region.

For instance, developing a mobile money product in Nigeria, with a mature banking industry, requires a different approach compared to what it takes to develop same product in Ivory Coast, where the banking sector is not as matured.

Moreover, when it comes to technology adoption, Africa typically lags 3-5 years behind global markets. Therefore, before new technologies become mainstream in Africa, there are often several case studies available that can be harnessed and adapted to ensure successful implementation across the continent. This trend proves advantageous for the entire ecosystem, benefiting end-users, service providers, equipment vendors, and regulatory bodies alike.

Cross-border cooperation

Cross-border cooperation has emerged pivotal in ensuring progress across the African continent, particularly in the realms of financial inclusion and telecommunications adoption.

One of such collaborative efforts is the East Africa One Network Area roaming initiative to facilitate access to cost-effective roaming mobile services. Furthermore, a recent development within the Economic Community of West African States (ECOWAS) highlights the region's commitment to fostering affordability of mobile services. Thirteen ECOWAS member states recently amended their policies to eliminate roaming surcharges within their borders. This policy adjustment is expected to enhance affordability of mobile services across these markets.

Moreover, proactive engagement between telecom regulators and service providers, with shared objective of promoting affordability in telecom services, driving financial inclusion and growth in digital economy, underscores the merits of collaboration.

The regulatory landscape has been notably active, serving as a middleman in executing national development and transformation initiatives. These activities are evident in the allocation of spectrum for 4G and 5G networks, the rollout of fibre broadband infrastructure, and the formulation of policies concerning data sovereignty and privacy. It is evident that regulatory bodies throughout the continent have emerged as agents of change in driving growth across diverse sectors.

Driving growth

I believe mobile data (4G and 5G), fibre-optic services, and initiatives targeted at financial inclusion will propel growth across Africa. Additionally, the momentum behind public cloud adoption is expected to continue, driven by digital transformation efforts aimed at offering improved experiences to employees and customers.

Furthermore, the demand for data center services is expected to grow, particularly as businesses continue to outsource non-core functions, therefore, redirecting focus towards elevating service delivery to customers.

Nigeria, South Africa, Kenya, and Egypt will always be vibrant in the technology landscape. These countries have mature markets, well-established local presences of global original equipment manufacturers (OEMs). Additionally,

they have vibrant startup ecosystems that keeps attracting investments from global markets. Meanwhile, emerging markets like Rwanda, Ethiopia, Senegal, and Ivory Coast are poised for growth.

A common thread among these nations is their governments' keen interest in achieving national development and transformation through technological empowerment. As a result, these countries are actively pursuing a top-down approach to formulate and implement tech policies aimed at fostering growth across all sectors.

The growing enthusiasm for blockchain adoption is particularly intriguing. Although early adoption was predominantly around cryptocurrency and decentralized finance use case, there is now a gradual shift in use case as African governments are now considering the technology to enhance transparency during elections.

I forecast growth across the entire region. Now, African governments are demonstrating commitment to nation-building, and are placing their strategic bets on technology to translate their visions into reality.

Consequently, I expect the formulation of policies aimed at facilitating collaboration with global partners to increase foreign direct investment across the region. Concurrently, I anticipate regulatory focus towards security and data privacy concerns as the adoption of emerging technologies like edge computing and the Internet of Things (IoT) gain momentum. ■

Nsikak Emmanuel Ekere,
research writer consultant with WATRA

Wireless communication in West Africa – expectations for 2024 and beyond

West Africa's telecommunications sector has experienced substantial growth, with increased efforts to enhance connectivity and digital inclusion. The growth is driven by efforts to harmonize regulations, value-added services (VAS), and wireless data. The increase in mobile penetration across developing countries is raising investments, access, and affordability of telecommunication services. Through productivity, the Internet of Things (IoT) has boosted new changes with digitisation and

Major socioeconomic growth and trends.

In 2023, West Africa has shown great potential in adopting emerging technologies, high-speed spectrum, and improving its wireless policy roadmap. Contributing an estimated $70 billion to the GDP of West Africa in 2023, the number of mobile internet users is 184 million. The transformation is driven by the 17% growth rate of the total 4G network connections. However, investment from the government in wireless communication has been relatively low when compared to private and foreign investments.

A thriving economy

West Africa's digital economy is thriving with increased usage of WiFi routers, 4G/LTE services, and the low latency benefit of 5G networks in major cities.

There's a clear trend towards broadband connectivity, WiFi-enabled laptops and phones, wireless LAN, wireless wide area network,

cloud computing, and augmented, mixed, and virtual reality (AR/MR/VR) technology for user experience, including virtual reality gaming. Also, startups are thriving because of data obtained from mobile apps, social media, and website traffic.

Efforts in the sub-region from the private sector focused on expanding high-speed internet access and AI technology integration, which is crucial for cellular phones and various sectors like education, health, and small businesses in the informal sector. This trend is likely to continue as wireless communication penetration and the spectrum quality of WiFi 6 and WiFi 5 are becoming increasingly used by corporate businesses.

Driven by the COVID-19 pandemic, working-from-home router connections for businesses, podcasts, online learning, software apps, and e-commerce have sped up internet use, digital solutions, and device upgrades to smartphones and gadgets.

A new market for smartphone IT companies

According to the West Africa Telecommunications Regulators Assembly (WATRA), increased investment in the region will rise proportionally with new integrated policies to reduce operational costs and multi-taxing systems.

By the third quarter of 2024, wireless communication through SIM card registration will surge owing to the global rise in internet penetration, IoT, and online banking, prioritising the adoption and roll-out of 4G, 5G, and 5.5G services.

According to the Global System for Mobile Communications Association (GSMA), the 5G network will provide $11 billion to sub-Saharan Africa by 2030, having a 6% impact

on the economic value of mobile technology. In 2024-2025, a new market will open up for smartphone IT companies with heavy traffic in the broadcasting industry in West Africa fuelled by the foregoing market of advertisement, urbanisation, and remote and virtual working. Localised innovation in West Africa and the government digital plan framework in Ghana, Cape Verde, Nigeria, Togo, Cote d'Ivoire, and Burkina Faso, among others, encourage over 200,000 direct jobs.

Global investors' interest in wireless infrastructure companies will bolster sub-contracts and revenue, while the growing demand for wireless products and services in West Africa will influence big data for the industry. Market share rose for major telecom companies like MTN (38.70%), Glo, Airtel (27.24%), Orange, and Sonatel, which are still experiencing great results on the stock exchange.

Regulatory bottlenecks

West Africa's wireless communication faces regulatory bottlenecks at the sub-state levels, affected by administrative priorities and little budgeting for the industry. Others include the digital divide, quality of experience (QoE), particularly between underserved urban and rural areas, and poor big data management and storage.

However, these challenges present opportunities to innovate and tailor solutions specific to the West African context, such as increasing rural internet coverage and encouraging the sharing of wireless infrastructure to reduce capital expenditure (CapEx) and government-partnered infrastructure development to lower operating expenses (OpEx).

IT operators and consumers face challenges

in operations like power supply, signal strength, interference, local currency weakness, inflation rate, and service cost while setting up business WiFi. Meanwhile, the presence of 2G/3G services is large in West Africa when compared to 4G and 5G services. This affects the quality of data, spectrum speed, and digital key performance index of multiple sectors. In 2024, there will be over 40% 4G presence in the sub-region; however, the infrastructure quality may suffer from inadequate substantial funding, a shortage of advanced software and IT professionals, and the cost of maintaining and upgrading to 5G and 6G.

According to the Internet Society, West Africa's enabling technology networks are Https (80%), IPv6 (10%), and DNSSEC TLDs (above 40%). In a 2021-2023 report by the Internet World Statistics, the sub-region has a 43.2% internet penetration rate, the lowest among the six regions.

Reforming policy

The 2023 Africa Internet Governance Forum (AFIGF) in Nigeria left a lot to ponder about local content development, cybersecurity, internet governance and enabling regulatory terms at the national level on the continent. The widespread wireless communication industry towards the 4IR is triggering more multi-stakeholder collaboration and policies by national regulators to strengthen a unilateral market for affordability and access. The internet in rural communities is unreliable; however, non-extra taxation on country-to-country roaming data and the rollout of 5G services are encouraging. Countries like Nigeria, Ghana, and Senegal demonstrate high demand and potential for further broadband penetration, market return on investments, and digital services.

Through an interview with the executive secretary of WATRA, Aliyu Yusuf Aboki emphasized that collective efforts to reduce roaming charges can improve connectivity across Africa, especially in the recent case of the Ghana-Cote d'Ivoire roaming partnership. With the indicators experienced in 2021-2023, he said that "lowering tariffs with a reformed policy regulation can quickly attract foreign investments in the industry and further make the sector have broader inter-country partnerships." Another is the African Union roaming through the African Internet Exchange System (AXIS), which was launched in Kenya in 2016 and has 32 country signatories.

Broadband connectivity for sharing and using online technology services is driving growth across various sectors like online banking, the transport sector, health tech, and startups to perform economically well, reach more customers, transform work culture and transition to various digital services. Cross-border cooperation and promoting regional regulatory knowledge sharing have yielded results. This has evolved with a better commitment to creating affordable telecommunications services, improved quality of service (QoS) policies, and integrated digital economic frameworks.

Thoughts for the future

There'll be an alternative impact of the telecommunications industry on the environment and economy and potentially on climate-resilient products like Ethernet switches, modernized 5G cellular networks, wireless LANs, and wireless wide area networks for video conferencing.

By video streaming COP28, telecommunications effects on the green

economy will provide in-depth data insights on climate change, awareness, knowledge sharing, and capacity development to foster innovations and fact-based decision-making. There's a need to integrate AI chatbots and underscore operators' licensing.

WATRA secretariat forecasts that broadband connectivity will remain the key driver for the African telecommunications market. High-quality, reliable internet access is crucial for the burgeoning digital economy and is expected to catalyze growth and quality job creation across various sectors with a view to the 5.5G network. There is the potential for enablers to minimise data costs for video conferencing, AI messaging and call interpretation, and money services connectivity for cross-sector growth and opportunities. Positive interest will attract WiFi 7 in 2024, which will enable strong throughput, connect more devices, enhance stable transmission, and enhance network security.

According to WATRA's expectations, the sub-region can propel its economy's $3 billion export value through the export of wireless communication to an annual contribution of $20 billion, if local tech is produced in large quantities and incorporated with emerging global standards and the expansion of services to other regions in the world. ∎

Dario Betti,
CEO, Mobile Ecosystem Forum

Unveiling the dynamic landscape of mobile operators across the continent

In the heart of the African continent, where vibrant cultures, diverse landscapes, and a tapestry of histories intersect, another remarkable tapestry is being woven – that of the telecommunications industry. This network of networks reflects the political, economic, and even social evolutions in the continent. 2023 brought with it five big themes.

Big telco in Africa – and big growth

Just like the continent, the African telecom industry is big, very big – yet showing potential for considerable growth. According to MEF Data, in 2023 there are 1.82 billion people in Middle East and Africa (a 2% year on year increase) and for the first time, the continent will see 1 billion users of mobile phones (+4% year on year).

Phones are emerging as broadband and fixed line replacement and demand is growing. More users now own a smartphone: 770 million users in the region, a healthy 6% increase from 2022. Among the surprises from this is seeing the number of Apple users growing to 109 million – a sign that new affluent users are emerging as well.

Telecom deals: Africa is opening up and connecting

Ethiopia is the country that has once again attracted lots of attention in terms of telecom deals. As a later market to be fully liberalised, it has seen some important changes in in 2023. The Ethiopian state has put 45% of the incumbent Ethio Telecom up for sale. The sale has generated interest from the e& group and Orange as well as other groups. The country

has also invited bids for a third mobile operator licence in the country. The newcomer would join Safaricom Ethiopia and Ethio Telecom.

African operations continue to show growth signs and are in fact some of the highlights for international groups. Orange reported growth in its operation in Africa and the Middle East, posting revenues increasing by 12% year-on-year to €1.77 billion in Q2 2023 due to the rapid development of retail services. The region continued to demonstrate its agility, and resilience to the currency instability. Mobile subscribers for the African base of the French group grew by 5% year-on-year to 146.2 million, and average revenue per order grew 4.3%.

The race to 5G is on in the continent too. South African operators can claim big results, but many more countries are joining. The Uganda Communications Commission (UCC) announced its first 5G spectrum awards in July with MTN and Airtel communicating their first 5G transmission in the year.

There has been good news with new announcements for subsea cable connection to Africa, from Equiano, ECOWAS, PEACE, Amilcar Cabral, Medusa and Angola. Cables are only some of the extensions discussed for Africa. In addition, the profile of satellite solutions is rising. For instance, Orange announced a partnership with LEO satellite broadband network operator OneWeb for rural coverage.

Towers and financing

As the world hurtles into the 5G era and beyond, Africa stands on the cusp of another technological leap while upgrading its infrastructure. In a world of low ARPUs funding, telecom revolutions can be a challenging task for mobile operators. The increasing cost of capital is putting funding at the top of the agenda for many operators and groups.

In August 2023, the Qatari telecoms company Ooredoo, Kuwait's Zain Group and Dubai-based TASC Towers Holding announced the creation of the Middle East and North Africa's largest cell-phone tower company. The companies intend to combine their 30,000 telecommunications 'towers' in Qatar, Kuwait, Algeria, Tunisia, Iraq, and Jordan. Divesting from tower assets is a common route globally for mobile telecoms to increase efficiencies in the infrastructure and release capital to fund information and communications technology projects. The CEO of MTN Ralph Mupita also reported in August that he will be selling minorities participation including fibre, tower and fintech to access more capital.

The importance of fintech

Africa has developed some of the most innovative approaches taken by mobile operators to cater to their diverse customer base. In particular, the region has created some of the most ground-breaking financial services. Mobile fintech is showing a strong performance.

Airtel Africa's mobile money business continues to grow at nearly 30% year on year, in constant currency terms. The mobile operator generates more than 13% of the group's total revenues, an increase from 12% from the year before, and its EBITDA margins stand at about 50%. The Orange Money service in Africa surged 25.5% across the territories of the French telecom group during 2023.

Mastercard has agreed to take a minority stake in the fintech subsidiary of MTN, Africa's biggest mobile company by subscribers. The deal values the unit that includes payments and remittances at more than $5 billion. Mastercard had already invested $100 million in the mobile

money business of Airtel Africa in 2021. Airtel is a competitor of MTN in multiple markets, the unit was valued about $2.6 billion at the time.

MTN's unit MoMo showed strong performance, with mobile money transactions up 61% in the six months to June 2023 to $135 billion and 60 million users. Mobile money is a major driver for a telco on a financial level too. MoMo helped MTN Uganda to achieve an impressive set of results during 2023. MTN Uganda is the country's largest telecom company with 17.2 million users. It announced a 20% rise in pre-tax profit for the full year 2022 ending in March 2023. The numbers were boosted by fintech and data service sales – accounting for a rise in pre-tax profit to $160 million. The impact of the digital transformation triggered by COVID-19 is now showing in East Africa. Mobile payments have grown in Uganda as businesses have embraced cashless payments and e-commerce.

Nigeria is the fintech centre of Africa, stealing the title after Safaricom in Kenya first opened the market. Local start-ups including PalmPay are growing fast. PalmPay has increased its users by 500% in the last two years to 25 million. The other main rival is OPay, backed by Softbank and valued at $2 billion. Both have got the support of local smartphone brands that carry the apps as preloads. Chinese giants' super-apps are now active, increasing competition further for mobile operators. Alipay and Wechat Pay have offices in Lagos.

Geopolitical impact: foreign investments and oil are important elements of telecom

The change in the global political balance is now mirrored in the region. The increased competition for influence in the region between China and the United States is potentially good news for

> "Africa has developed some of the most innovative approaches taken by mobile operators to cater to their diverse customer base."

the states looking for aid. The EU and US have re-initiated new digital infrastructure projects in the region, in response to growing influence of Chinese telecom players. For instance, during 2023 the EU and US have agreed a joint plan to upgrade the country's telecoms infrastructure in Kenya. Kenya is the continent's seventh-largest economy by purchasing power parity, according to the World Bank – a large market that will see new growth. British support has been critical in the creation of local digital champions such as Liquid Telecom in the past. The UK development agency CDC Group sponsored the African fibre company Liquid Telecom for $230 million in 2020-2021 to expand its fibre network further into central and western Africa. Africa currently has the lowest rates of fixed and mobile broadband subscription penetration in the world according to the ITU.

Oil prices seems to have also had an impact in the telecom region. It might not sound surprising, but the continent includes oil rich economies that had to adjust its macroeconomic profile. For Airtel Africa, Nigeria accounts for 40% of revenue of the group, and Nigeria is an oil rich country that suffered from the drop of oil value of near 30% during the year. The Nigerian naira has devalued by roughly half at one point in the year. Falling oil prices should decrease the cost of running generators to power cell towers on diesel. Airtel Africa's foreign exchange losses reported in 2023 summed to $178 million, almost half of which came from Nigeria, despite a good underlying performance. ∎

Telecommunications in Africa

An exert from EMIS' Africa Telecommunications Sector 2023/2024

In recent years, Africa's telecommunications industry has expanded rapidly, driven primarily by the mobile services segment. According to the International Telecommunications Union (ITU), mobile telephone subscriptions grew at a compound annual growth rate (CAGR) of 7.5% between 2011-2021, the fastest rate in the world, allowing Africa to account for 11% of all mobile users worldwide in 2021.

However, the number of active users is significantly lower than the number of subscriptions due to the widespread ownership of multiple SIM cards, a result of the inadequate quality of mobile services in terms of both coverage and customer rights. Prepaid subscriptions continue to dominate on every continent. The mobile segment is currently driven primarily by mobile data and the mobile money service in terms of both users and revenue. The penetration of mobile phone services, however, is low by global standards, with only 0.6 users per 100 inhabitants in 2021, versus a global average of 17.7%.

While 60% of Africa's population accesses the internet via mobile device, most mobile connections are 2G, primarily due to their affordability. Even though the average selling price of smartphones has decreased substantially over the past few years, particularly with the influx of Chinese brands with prices below US$100, many Africans are unable to afford the one-time upfront cost of purchasing a device.

GSMA Intelligence predicts that by 2025, 58% and 28% of all connections in sub-Saharan Africa will be 3G and 4G broadband connections, respectively. 52% of all connections at the end of 2020 were 3G, followed by 36% for 2G and 12% for 4G. In 2025, the proportion of 5G connections is p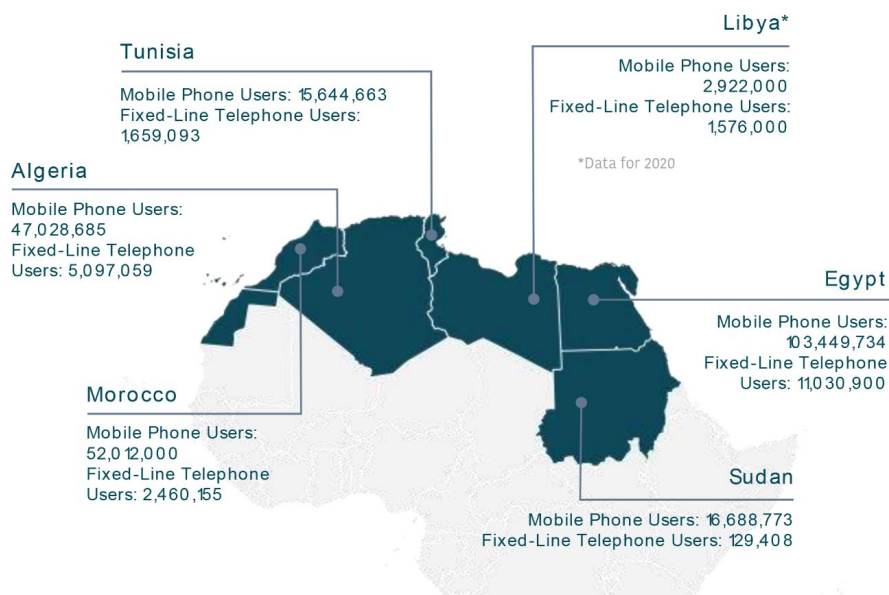rojected to reach only 3%. A quarter of the 500 million new mobile phone subscribers expected to join the global market by 2025 will be from sub-Saharan Africa.

In line with global trends, fixed telephony on the continent has declined over the past decade, with the number of subscriptions declining at a CAGR of 5.9% between 2011-2021. In 2021 alone, subscriptions fell by 16.9% y/y to 6.4 million, comprising only 0.7% of the global total.

Africa's internet access has improved significantly in recent years, but still lags far behind the rest of the world. According to ITU data, by the end of 2021, 392 million Africans were using the internet, double the number in 2016, but accounting for only 8% of the world's total users. Strong mobile service penetration has significantly contributed to enhanced internet access. During 2011–2021, the number of active mobile broadband users in Africa grew at a CAGR of 34%, nearly double the 18.8% growth rate of global subscriptions during the same period. The number of active mobile-broadband subscriptions in Africa increased by 4.2% y/y to 430 million in 2021. While the share of population covered by at least a 3G mobile network is high at 78.4% in 2021, the LTE/WiMAX mobile network is accessible to only 47% of the African population.

During 2011–2021, fixed broadband usage increased at a much slower CAGR of 16.2% to reach 7.2 million users. Its high price and digital illiteracy continue to limit usage. In addition, only 22.7% of households possess a personal computer.

50 of the 54 African countries had adopted a national broadband strategy as part of efforts to support investments in telecom infrastructure by the end of 2020. The African Union Commission's adoption of the Digital Transformation Strategy

Tunisia
Mobile Phone Users: 15,644,663
Fixed-Line Telephone Users:
1,659,093

Libya*
Mobile Phone Users:
2,922,000
Fixed-Line Telephone Users:
1,576,000

*Data for 2020

Algeria
Mobile Phone Users:
47,028,685
Fixed-Line Telephone
Users: 5,097,059

Egypt
Mobile Phone Users:
103,449,734
Fixed-Line Telephone
Users: 11,030,900

Morocco
Mobile Phone Users:
52,012,000
Fixed-Line Telephone
Users: 2,460,155

Sudan
Mobile Phone Users: 16,688,773
Fixed-Line Telephone Users: 129,408

for Africa in February 2020 was also a significant achievement. Under these strategies, investments are directed toward, among other things, terrestrial backbone fibre and undersea fibre-optic cable projects. 25 backbone fibre projects were announced in 2020. Among these, the One Africa fibre-optic network project stands out, as it aims to connect Cape Town, South Africa, and Cairo, Egypt. Undersea fibre-optic cable projects also advanced, with the most notable being the launch of the South Atlantic Cable System, which offers alternative lower-latency routes to the Americas via a direct connection between Africa and South America (Angola and Brazil).

Africa's expanding digital economy is key for the expansion of the telecommunications industry. The digital market has attracted more venture capital and fostered the expansion of numerous industries, including mature ones such as the mobile money market in Kenya. Additionally, the digital economy has fostered new talent among the continent's young population.

COVID-19 has highlighted how digital platforms that target the informal sector can contribute to societal resilience. In several markets, digital platforms played a crucial role in supporting government responses to the outbreak, particularly in reaching the underserved, due to their ability to rapidly reengineer their platforms.

Twiga Foods has partnered with Jumia to deliver agricultural products to consumers, for instance. The Nigerian government relies on payment service providers to distribute cash to impoverished households. Digital platforms have enabled the rapid deployment of social protection programs and the continued operation of some essential government services.

Northern Africa

In terms of ICT development, Northern Africa is the most developed region in Africa. It has the highest number of fixed-line telephony and broadband users and the second highest number of mobile phone users in Africa. Egypt,

Algeria, and Morocco are the three largest African markets by number of subscribers in this region. In contrast to most of sub-Saharan Africa, the fixed telephony market is relatively mature and accounted for 71.8% or 20.2 million of Africa's subscriptions in 2020.

According to ITU data, despite the region's well-developed fixed-line broadband segment, the penetration rate is low, with Tunisia having the highest rate of 12.2% fixed broadband users per 100 inhabitants in 2021, followed by Egypt and Algeria with 9.94 and 9.46, respectively. The least-developed Sudan had a rate of just 0.07. 3G technology is the most advanced, accounting for 51% of all mobile subscriptions in 2020, while only 14% of subscriptions were 4G.
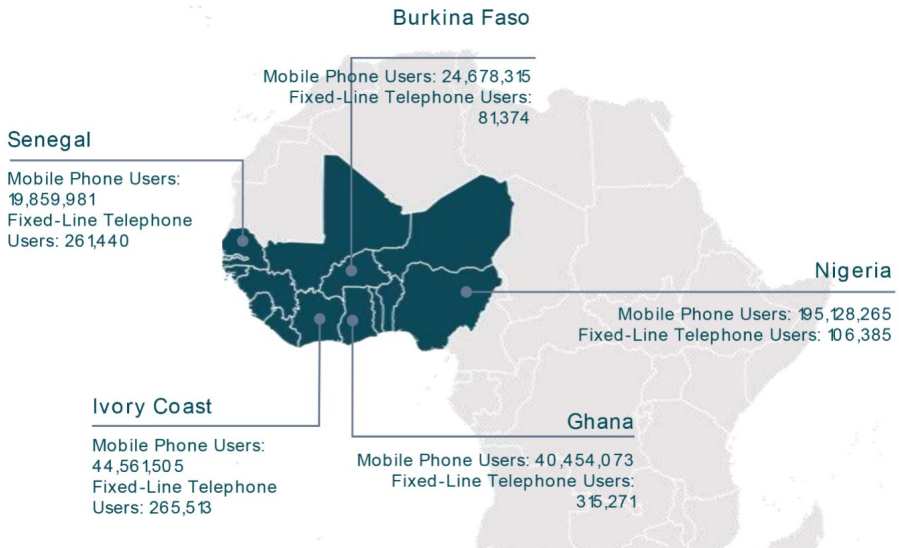
In terms of mobile broadband penetration, the northern African region has one of the highest rates on the continent, in as much as most countries having an internet access rate exceeding 70%. Algeria is the leader with 97.58 mobile data subscriptions per 100 inhabitants in 2021. Even Sudan is faring considerably with a rate of 40.66.
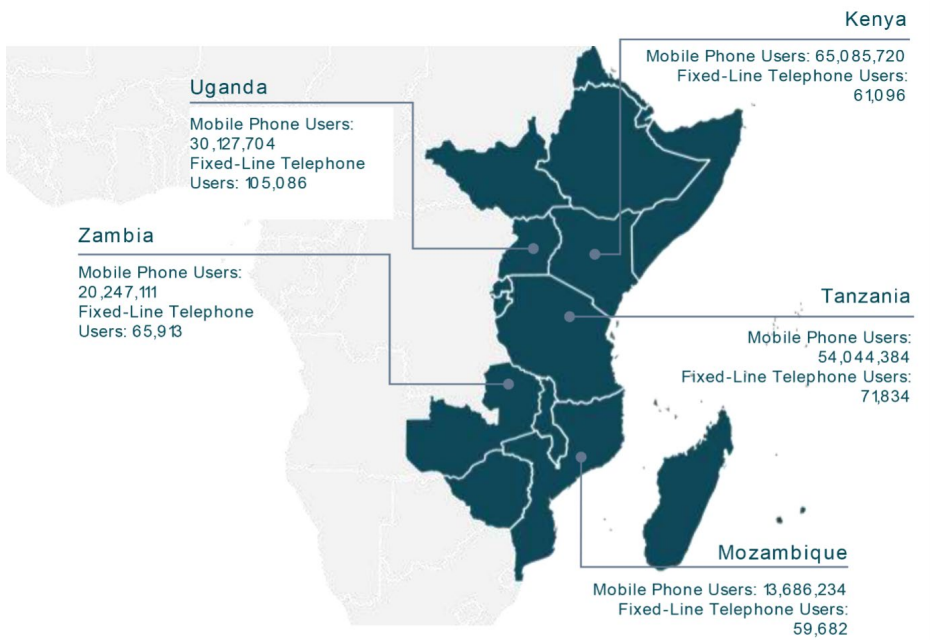
Western Africa

Western Africa is Africa's largest mobile market, with 452 million users in 2020, or 37.8% of the continent's total. Nigeria is by far the largest market, with 195.1 million subscribers in 2021, a decrease of 4.5% y/y. Ivory Coast and Ghana follow, each with users exceeding 40 million.

The region's 3G connection has expanded because of increased infrastructure investments and falling mobile device prices. The large young population also contributes to growth. Over 40% of the region's population under the age of eighteen will be first-time mobile phone owners.

Investments in submarine fibre optic cables have resulted in significantly increased mobile broadband usage, expanding access to more advanced network connections. Even though more than four international submarine cables traverse the region, no other country in Western Africa has an internet penetration rate exceeding 50%. As landlocked nations continue to be constrained by infrastructure shortages, only coastal regions have a chance to profit.

Burkina Faso
Mobile Phone Users: 24,678,315
Fixed-Line Telephone Users: 81,374

Senegal
Mobile Phone Users: 19,859,981
Fixed-Line Telephone Users: 261,440

Nigeria
Mobile Phone Users: 195,128,265
Fixed-Line Telephone Users: 106,385

Ivory Coast
Mobile Phone Users: 44,561,505
Fixed-Line Telephone Users: 265,513

Ghana
Mobile Phone Users: 40,454,073
Fixed-Line Telephone Users: 315,271

Uganda
Mobile Phone Users:
30,127,704
Fixed-Line Telephone
Users: 105,086

Kenya
Mobile Phone Users: 65,085,720
Fixed-Line Telephone Users:
61,096

Zambia
Mobile Phone Users:
20,247,111
Fixed-Line Telephone
Users: 65,913

Tanzania
Mobile Phone Users:
54,044,384
Fixed-Line Telephone Users:
71,834

Mozambique
Mobile Phone Users: 13,686,234
Fixed-Line Telephone Users:
59,682

Nigeria is the largest market in terms of the number of mobile users, primarily because it is the most populous nation in the region. In addition to a lack of infrastructure, lack of access to electricity is a major impediment to Internet access. As a result, the problem of consumers possessing multiple SIM cards persists, particularly in the country's rural areas, as a means of avoiding coverage gaps.
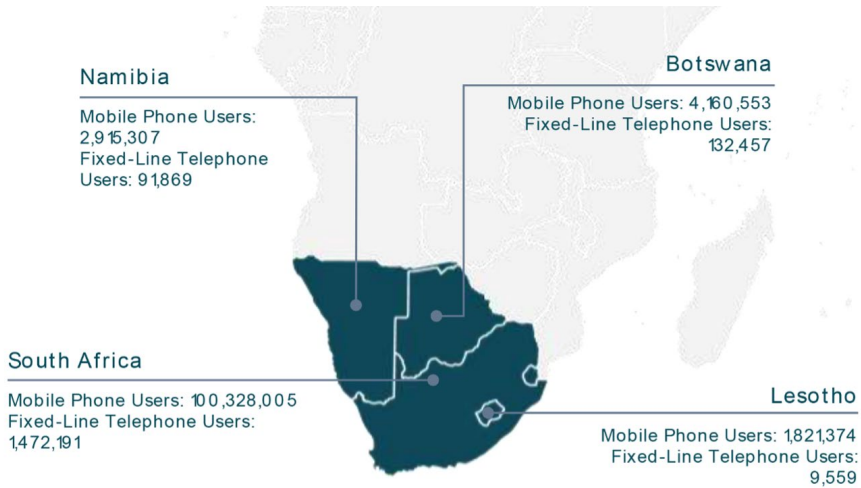
Eastern Africa

In 2020, Eastern Africa ranked third on the continent in terms of mobile phone subscriptions, although the number of users increased by 4.8% y/y to 230.4 million. The mobile penetration rate in the region is also high, with most countries exceeding 100. Ivory Coast had the highest mobile penetration rate with 162.17 users per 100 inhabitants in 2021, followed by Ghana and Senegal with a rate of 123.21 and 117.68, respectively.

Due to a lack of infrastructure development,

access to the region's fixed telephone lines remained prohibitively expensive, and there were no incentives for investors to enter the market. Low levels of electrification and legacy fixed-line infrastructure shortages have resulted in Eastern Africa having one of the lowest fixed-line broadband penetration rates on the continent.

Eastern Africa is one of the continent's most unexplored regions due to the dominance of governments in markets such as Eritrea, Ethiopia, Sudan, and Somalia. Tanzania, Sudan, and Uganda, on the other hand, enjoy the presence of international MNOs, but there is no incentive to invest in rural network expansion because most of the population in these regions has low purchasing power. Ethiopia is the most lucrative of the unliberalised markets due to its large population and expanding middle class.

Several countries in the region have implemented national programs for the development of their broadband networks. The National ICT Broadband Backbone of Tanzania

Namibia

Mobile Phone Users:
2,915,307
Fixed-Line Telephone
Users: 91,869

Botswana

Mobile Phone Users: 4,160,553
Fixed-Line Telephone Users:
132,457

South Africa

Mobile Phone Users: 100,328,005
Fixed-Line Telephone Users:
1,472,191

Lesotho

Mobile Phone Users: 1,821,374
Fixed-Line Telephone Users:
9,559

aims to increase the availability of fibre networks for urban consumers and businesses.

Southern Africa

Southern Africa ranks third in mobile subscriptions and second in fixed-line telephone users. In 2020, the region's 191.4 million mobile subscribers represented 16% of Africa's total users. In the segment of fixed-line telephony, the region accounted for 12.5% of the continent's total users. South Africa is the dominant player in the region, accounting for most of the users in both segments.

The region stands out for its high rate of penetration. South Africa (168.9%), Botswana (160.7%) and Namibia (115.2%) all have mobile phone penetration rates greater than 100%. According to DataReportal, South Africa and Namibia had internet penetration rates of 68.2% and 51%, respectively, at the start of 2022, which is high by continental standards.

Central Africa

Central Africa is the least developed region in Africa in terms of ICT, primarily due to its ongoing political instability, which frequently leads to infrastructure destruction and market disruption.

In the Economic Community of Central African States, only 11.4% of households have access to a computer and the internet, while approximately 1 in 100 residents subscribe to fixed-line telephone service, compared to 46 in 100 for mobile telephone service. Moreover, only 46% of the population is connected to the 3G mobile network. With 99.9 million users in 2020, Central Africa accounted for only 8.4% of the continent's mobile subscriptions and 0.8% of its fixed broadband subscriptions (823,613). Except for Gabon and the Republic of Congo (134% and 95%, respectively in 2021), mobile phone penetration rates are low. In all countries except Gabon (62%), internet access is low, at or below 30%. ■

Chad*

Mobile Phone Users: 8,687,151
Fixed-Line Telephone Users: 5,340

Cameroon

Mobile Phone Users:
22,442,440
739,572

DR Congo*

Mobile Phone Users: 40,798,396
Fixed-Line Telephone Users: n/a

Gabon

Mobile Phone Users:
3,144,609
Fixed-Line Telephone Users:
31,708

Angola

Mobile Phone Users: 15,327,864
Fixed-Line Telephone Users: 119,826
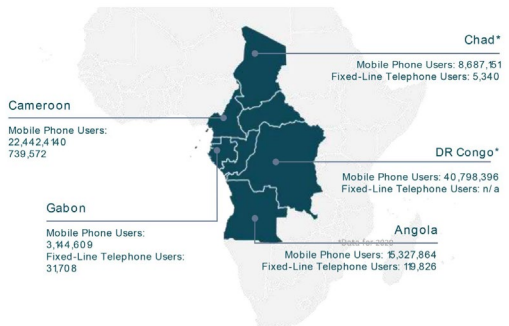
The mobile landscape in sub-Saharan Africa

An exert from The GSMA's Mobile Economy sub-Saharan Africa 2023

There has been a steady growth of unique mobile subscribers in sub-Saharan Africa. This will continue over the next seven years, taking the total to nearly 700 million by the end of 2030. Nigeria and Ethiopia will account for almost a third of total subscribers.

Mobile penetration will reach 50%, much lower than the global average of 73%. Within the region, penetration will be highest in Mauritius at 93% of the population.

In 2022, sub-Saharan Africa had around 287 million mobile internet subscribers. The mobile internet usage gap in the region remains significant, highlighting the impact of the barriers to mobile internet adoption, including lack of affordability and low levels of digital skills. The mobile internet landscape in the region varies significantly: mobile internet penetration levels are over 50% in Mauritius, South Africa, and the Seychelles, but still below 15% in Benin, Chad, and the Democratic Republic of Congo.

4G connections will almost double by 2030, increasing the 4G adoption rate, as a percentage of total connections, to 49%. This will be driven by continued network upgrades and efforts to make 4G devices more affordable. The number of connections on legacy networks will decline steadily.

In July 2023, MTN and Airtel launched 4G LTE services in Rwanda after the government amended their operating licences. They were previously only able to offer 4G services using the infrastructure of wholesale provider KT Rwanda Networks (KTRN), highlighting the importance of competition at the infrastructure level.
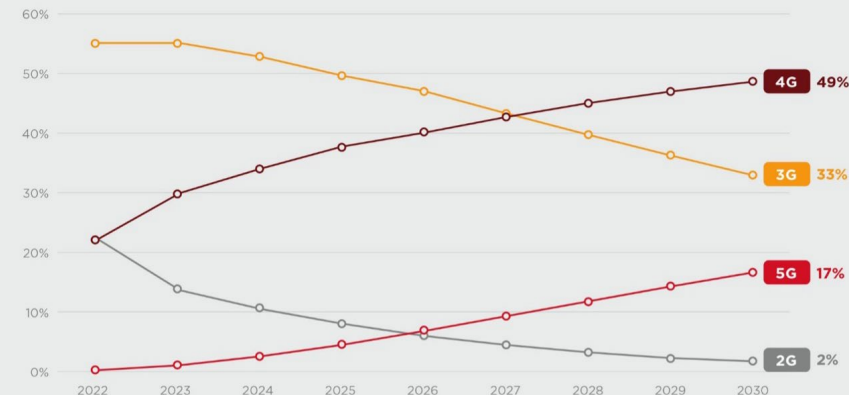
Growing 5G momentum

In 2022, there was an uptick in 5G-related activities, including 5G commercial launches in 15 countries and a growing number of spectrum allocations.

sub-Saharan Africa will have 226 million 5G

Sub-Saharan Africa: mobile adoption by technology

Percentage of total connections

Source: GSMA Intelligence

connections in 2030, equivalent to an adoption rate of 17%. Nigeria and South Africa will account for almost half of these connections. 5G growth in the region will be slow but steady, as a larger share of the customer base will continue to migrate to 4G.

The approach to 5G must consider the current connectivity landscape and unique market features that could affect its rollout and adoption. 5G network ecosystem players in the region must also find ways to deliver cost-effective and efficient 5G networks, balancing investment and value creation.

FWA boosts 5G adoption

FWA provides an opportunity to enhance last-mile connectivity for home broadband services. Although it is already frequently used as a substitute for fixed broadband, new global standards and 4G have improved the economics and performance of FWA in recent years.

Looking ahead, 5G will further catalyse the growth of FWA in sub-Saharan Africa, making it a primary broadband option. Along with providing basic connectivity, FWA will help operators reach unconnected areas.

As of September 2023, 12 operators in the region provide 5G FWA services across 7 countries, including Botswana, Kenya, South Africa, and Tanzania. These include MTN Nigeria, which launched commercial 5G services in September 2022, Orange Botswana, and Telkom South Africa.

The number of FWA services will continue to rise as more operator networks are upgraded, more 5G networks are built out and more customer-premises equipment (CPE) devices (particularly 5G ones) are commercialised.

Operators are also leveraging FWA to improve other areas, such as education. Free and Ericsson will provide FWA connectivity to schools in Senegal, demonstrating how FWA can utilise existing mobile radio networks to effectively bridge the educational divide.

While FWA has a lot of potential, practical limitations and regulatory considerations are holding back large-scale deployment. These include the high cost of CPE devices, low household incomes and the lack of sufficient spectrum for network deployment. That said, some operators are implementing measures, such as subsidies and payment in instalments, to make CPE devices more affordable for users.

Addressing smartphone affordability

60% of the population does not use mobile internet despite living in an area with coverage. Smartphone affordability is a key barrier to using mobile internet. This is an area of growing concern, as reducing the internet usage gap is critical to closing the digital divide. In Senegal, 61% of women and 46% of men who do not own a mobile phone reported that the lack of an affordable handset was the top reason.

To help address the issue, operators and manufacturers have devised solutions targeting the cost of devices. The average selling price of smartphones has reduced significantly in recent years, with an influx of devices priced at under $100.

The challenge for manufacturers in sub-Saharan Africa is to produce devices at a low enough price point to gain market share, particularly in the 5G and 4G markets, where devices remain prohibitively expensive. Along with the manufacturing costs, other costs such as fees and taxation directly impact the final selling price. Taxation and duty fees add 10–30% to smartphone costs, depending on the country. To improve affordability, governments should reconsider these fees by offering tax exemptions on low-cost handsets, as is available in Rwanda.

IoT and smart cities

There will be around 53 million licensed cellular IoT connections in sub-Saharan Africa by 2030. South Africa is the leading contributor of IoT connections and will cover almost half of the total connections in 2030.

Sub-Saharan Africa: smartphone adoption

Percentage of connections (excluding licensed cellular IoT)

Global average (2030): 92%

● 2022 ● 2030
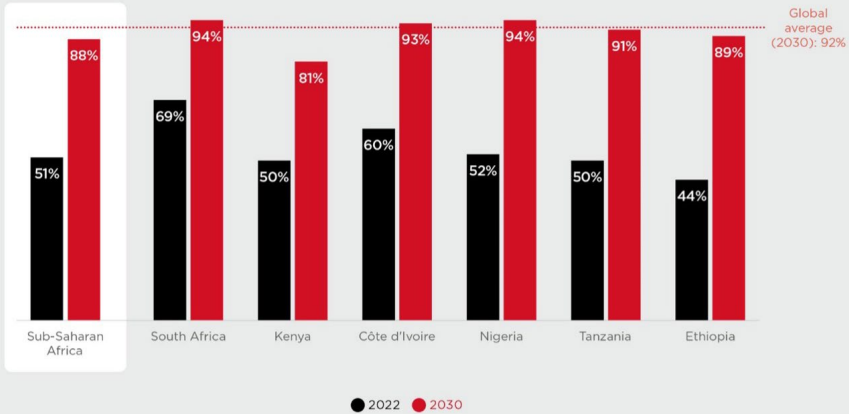
Source: GSMA Intelligence

Government initiatives to use innovative solutions as part of smart city programmes are also boosting IoT deployment. IoT devices have reached households and businesses, helping streamline processes and increase efficiency in the utilities sector, including through smart sensors for waste management in Kenya. Operators are increasing IoT coverage by targeting a range of vertical use cases, including digital payments, smart metering and smart utilities, digital agriculture, digital health, telematics, and fleet management.

Ethio Telecom, in partnership with the Addis Ababa city administration in Ethiopia, will install a wide area network (SD-WAN network) to interconnect different bureaus and service-rendering institutions of the city with the main data centre. The project will address the growing technology demands of digital transformation and data security concerns of the city administration, interconnecting the sub-cities and woredas (administrative divisions of Ethiopia) with higher-speed and greater-bandwidth optical services.

Mobile operators have been playing a pivotal role within the IoT ecosystem, contributing significantly to various applications in the utility sectors, including digital meters and monitoring and managing resources such as water and treatment plants. In sub-Saharan Africa, smart utility IoT connections will increase almost sixfold over 2021-2030. By 2030, utility solutions will account for nearly 30% of IoT connections in the region.

Operators have been collaborating in trials using IoT solutions, with many leveraging the available low-power wide-area network (LPWA) networks. In Kenya, Safaricom's NB-IoT network has been used for smart meter pilots in Kisumu, Embu and Eldoret, among other cities, and has led to an IoT product line for water. In addition, Safaricom has partnered with Kenya Water Institute to deploy a smart water system that uses IoT to manage production, distribution, and consumption at the institute's campuses. The smart water system will be used to facilitate practical training and to co-create and run a smart water management curriculum for students at the institution.

Tapping into AI

There has been a wave of growing momentum behind AI in the last few years, with increasing investments into new AI capabilities and applications as well as debates on the responsible use of the technology.

Mobile operators have employed AI at different levels, from improving network operations and customer services to achieving efficiencies and cost savings. Several network infrastructure vendors are creating new AI-enabled products to make the technology more accessible and to drive larger-scale deployments. MTN will migrate to Microsoft's Azure's cloud computing platform to tap into machine learning and AI to deliver operational efficiency across its footprint, starting with Nigeria and South Africa. Further, MTN Benin and Ericsson have entered a partnership to deploy AI and machine-learning solutions to address throughput degradation and, ultimately, provide improved customer satisfaction.

Connecting the unconnected

As of 2022, around 15% of the population in sub-Saharan Africa is not covered by mobile broadband networks. The coverage gap remains significant, especially in rural and remote areas.

The lack of mobile broadband coverage in rural areas is primarily an economic challenge: costs can be prohibitive; revenues are lower; and logistics are more complex. This has led operators to explore new infrastructure models through collaborations, such as MTN Uganda's turnkey solution with iSAT Africa under the GSMA Innovation Fund for Rural Connectivity. As part of the partnership, iSAT deployed five mobile network sites in rural areas of Uganda using concrete-less towers, solar power, and an open radio access network (RAN) to provide 2G and 3G connectivity.

Such initiatives offer operators an opportunity to expand into uncovered areas while sharing the cost of infrastructure development, and the related responsibilities, and to utilise available resources.

Operators and infrastructure companies have also announced renewed commitments to improving connectivity in sub-Saharan Africa. Vodacom plans to invest $3.3 billion to upgrade network resilience, maintain connectivity and boost rural coverage in South Africa over the next five years, while Africa Mobile Networks has secured a $20 million loan package to build new base stations in rural areas.

Mobile operators have been innovating business models and improving coverage; however, the usage gap remains sizeable. More than half of the population do not utilise mobile internet despite living in an area with mobile internet coverage. The mobile industry has been taking steps to tackle the key issues restricting usage.

Opportunities for operators

Mobile operators have ventured into the fintech space with mobile money services, along with an increase in collaborations with fintech companies and financial institutions.

In early 2023, MTN and Mastercard announced a partnership to enable Mastercard's virtual cards to be linked with MTN's MoMo wallets. The partnership allows the expansion of their services by leveraging the networks of both companies.

Similarly, in August 2023, Airtel Africa and Mastercard announced the launch of a new cross-border remittance service, which will enable subscribers across 14 African markets to send and receive money safely and securely.

The growing role of mobile financial services in sub-Saharan Africa has been supported by an improved regulatory outlook, which is allowing further innovations. These regulatory developments have opened new avenues of growth for the fintech sector and present opportunities for mobile operators to expand services and generate additional revenue streams. By leveraging their existing infrastructure and customer data, operators can continue to create new value-added services for customers. ∎

Mobile trends across Africa

An exert from the Ericsson Mobility Report November 2023

## sub-Saharan Africa - catalysing connectivity

The telecom sector in sub-Saharan Africa remains resilient despite funding challenges and high inflation. However, in the face of a global economic slowdown, the economies of sub-Saharan Africa are set for a period of robust 4% short-term growth.

Connectivity has become a basic need for voice and data communications, as well as for enabling services such as banking, which have traditionally had low penetration. Service providers are also exploring additional offerings on mobile platforms, such as health, education, and e-commerce.

Total mobile subscriptions are projected to rise 3% year-on-year for the next six years. 2G subscriptions will maintain a significant share of total subscriptions at 27%, mainly due to the region's largely rural population, for whom broadband coverage is limited and smartphone affordability is a challenge. However, a 9% increase in 4G subscriptions will bring the total to 49% by 2029, as access to lower-priced smartphones and data services increases. While 5G will be the fastest-growing subscription type over 2023-2029 at 60% annually, it will account for 16% · 180 million – of mobile subscriptions at the end of this period.

sub-Saharan Africa is poised to remain the region with the highest growth in total mobile data traffic, with a compound annual growth rate (CAGR) of 33% anticipated over
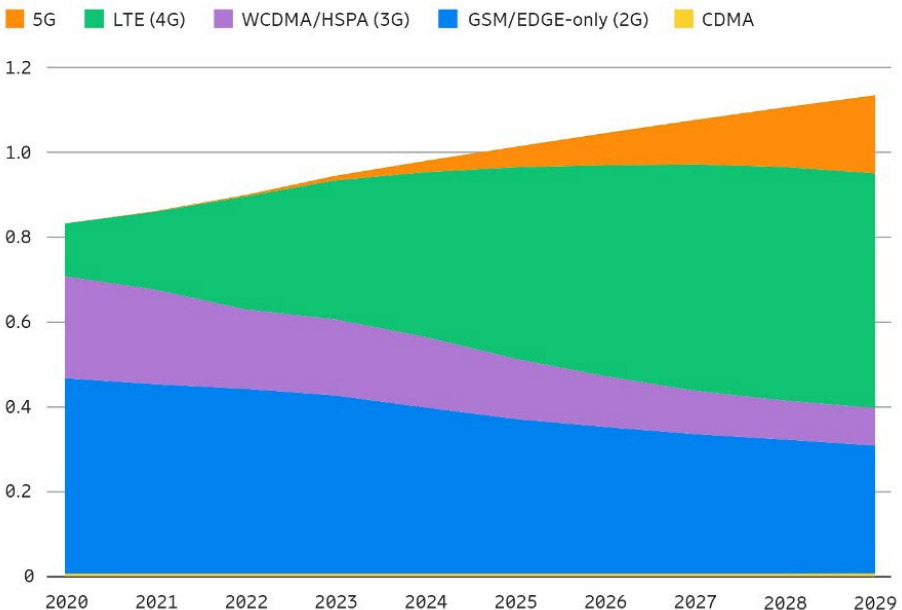
sub-Saharan Africa mobile subscriptions by technology (billion)
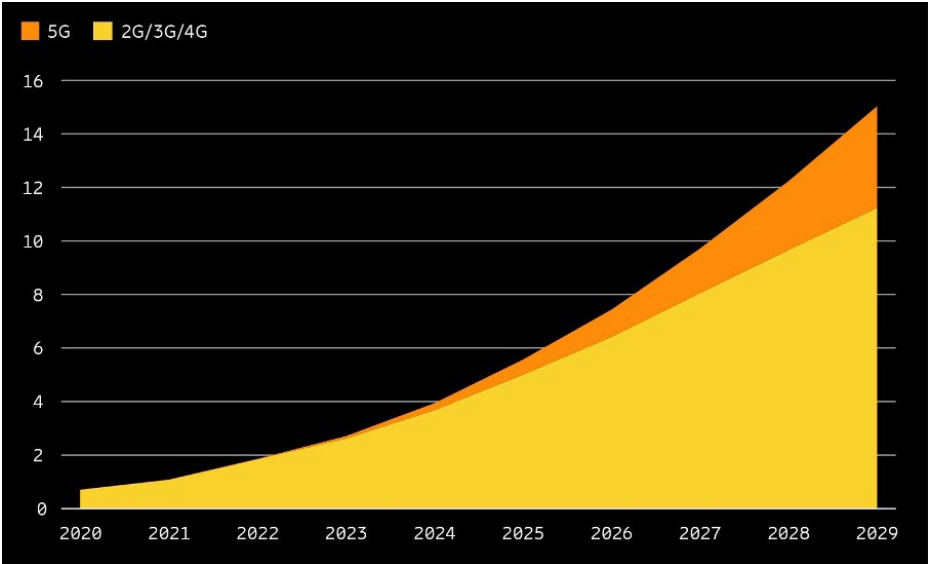
sub-Saharan Africa mobile data traffic (EB per month)

2023-2029. This growth will be driven by the expansion of 4G network coverage across the continent and the increasing affordability of data and smartphones. Smartphone traffic is expected to be the primary contributor to total mobile traffic, with average data usage per smartphone reaching 23Gb by 2029.

This technological shift underscores a pivotal moment in the region's telecom landscape. 4G's prevalence is poised to redefine the way communities engage with digital services. Service providers are evolving into technology companies, integrating mobile money services into their digital portfolios. This shift not only enhances financial inclusion in society but also significantly boosts revenue for service providers, complementing traditional voice and data services.

sub-Saharan Africa's strategic network infrastructure investment ICT can play a pivotal role in enabling critical climate action, steering industries toward a low-carbon economic model.

Several countries in the region are demonstrating a strong commitment to making substantial investments in their network infrastructure, driven by the region's demographic advantage of a largely youthful population, alongside a marked surge in demand for enhanced connectivity solutions.

Forward-looking 5G investments in sub-Saharan Africa are supported by spectrum releases in low- and mid-bands. The bulk of mobile subscribers will remain on 4G networks for several years, and it will be some time before subscribers who have migrated to 5G reach a more considerable proportion. Many African governments and service providers have nonetheless made measurable progress over the past year when it comes to releasing the relevant spectrum resources for launching 5G and activating them on compatible network equipment. More than a dozen countries – which, with the exception of Nigeria, are mostly

in Eastern and Southern Africa – now have 5G services available. Urban areas are increasingly reaching maximum capacity, given the site density and available spectrum, leading to service disruption.

Many governments, including Kenya and Tanzania, have allowed service providers to reuse existing spectrum assets, enabling frequency refarming in line with technology neutrality principles. Most also granted access to additional frequencies, especially in the mid-band, in sizable amounts to allow 5G to fully deliver on its promises of higher download speeds. As these frequencies have a limited reach, releasing some low-band frequencies alongside them offers a strategic combination of 5G resources to simultaneously expand capacity and extend coverage. Only a few countries have released frequencies higher than 6GHz, which are needed for ultra-high performance 5G services. This includes around 80GHz in the E-band for high-capacity microwave links to connect towers, which is especially effective in suburban settings where fibre may not yet be available.

The Middle East and North Africa – 5G adoption on the up

Telecom industry growth remains strong in the Middle East and North Africa (MENA), despite economic uncertainty in some countries, with 2.4% overall subscription growth forecast over 2023-2029.

Smartphone subscriptions will experience strong growth through 2029, rising at 5% annually, second only to sub-Saharan Africa. While 4G subscriptions will account for the bulk at 54% by 2029, 5G subscriptions are projected to register the strongest growth in the period, at 41% compounded annually, to account for around 40% of total subscriptions by 2029.

Service providers are expected to increasingly push solutions such as mobile financial services – especially in parts of North Africa, where financial inclusion remains a priority – and fixed wireless access (FWA), which shows a discernible growth trend in the region.

The Middle East and North Africa region is also expected to experience significant mobile data traffic growth, with a CAGR of 23% forecast over 2023-2029. This growth will be fuelled by the transition of more subscribers to 4G, the increasing uptake of 5G, and attractive variable data service offerings. Monthly data usage per smartphone is expected to reach 45Gb by 2029, rising 17% annually.

FWA takes centre stage

In the quest to meet Africa's increasing broadband demands, FWA emerges as a pivotal technology.

sub-Saharan Africa has many unconnected households, especially in rural areas, and this digital divide can be effectively and quickly addressed by FWA. It is also a cost-effective solution for bringing digital connectivity to other segments, such as schools, opening a world of access to information and learning.

While 4G FWA is an initial stepping stone, 5G's potential is increasingly coming to the forefront due to its capability to deliver fibre-like speeds. This advancement complements traditional fixed broadband infrastructure within the region.

Several key African markets, including Angola, South Africa, Nigeria, Kenya, Zambia, and Zimbabwe, have already launched 5G FWA services. This shift can be attributed to its cost effectiveness, rapid deployment capabilities and inherent flexibility. ∎

chapter
Cellular
Networks
2

Cina Lawson,
minister of digital economy
and digital transformation –
government of Togo

Closing the gender gap through digital and social inclusion

Over the past decade in Togo, the mobile penetration rate has nearly doubled - from 40% in 2011 to 78% in 2021; the internet penetration rate, while below 5% in 2011 reached 75% in 2021 — a fifteenfold increase; and the mobile money penetration rate grew rapidly from 0% in 2011 to 58% in 2021.

These statistics show that Togo has made a significant leap in digital infrastructure. Yet, more than 40% of the country's telephone base is made up of 2G mobile phones, which are not suitable for exploiting the full potential of digitized public and social services, as well as the universe of possibilities offered by the internet.

If we have learned anything from the COVID-19 pandemic, it is that digital transformation can be a powerful tool to ease inequalities in society, by providing essential services to those

in remote and hard-to-reach areas, as well as to those most in need. Regrettably, however, in low- and middle-income countries, women are 7% less likely than men to own a mobile phone and are 16% less likely to use mobile internet.

During the pandemic, Togo launched 'NOVISSI,' a digital cash transfer program that distributed $34 million in financial aid to 25% of all its adults. The program aimed to help people in the informal sector impacted by the mobility restriction and social distancing measures was adopted by the government in the context of the state of health emergency. NOVISSI revealed the importance of having a national ID, registered SIM, and mobile phone to easily enrol in, and directly benefit from, the program. Globally, and beyond Togo, it demonstrated that widespread access to mobile devices could enable shock-responsive, and contactless delivery systems, to expand the reach of social protection.

As part of the cash transfer program, Togo decided to give more money to women than men, because of the key role women and girls played in supporting households (e.g., in homecare for the sick and performing daily housekeeping type functions including — but not limited to — childcare, cooking and shopping).

GENDER GAPS IN QUANTITY AND QUALITY OF MOBILE PHONE OWNERSHIP

A 2021 GSMA survey of 10 countries revealed significant disparities in mobile phone ownership between men and women. Although the four African economies surveyed (Egypt, Kenya, Nigeria, and Senegal) have comparatively small mobile phone ownership gaps, there exist large differences in phone quality capabilities between men and women. In Nigeria, for instance, more than half of men 18+ have smart phones, while less than a third of women 18+ do.
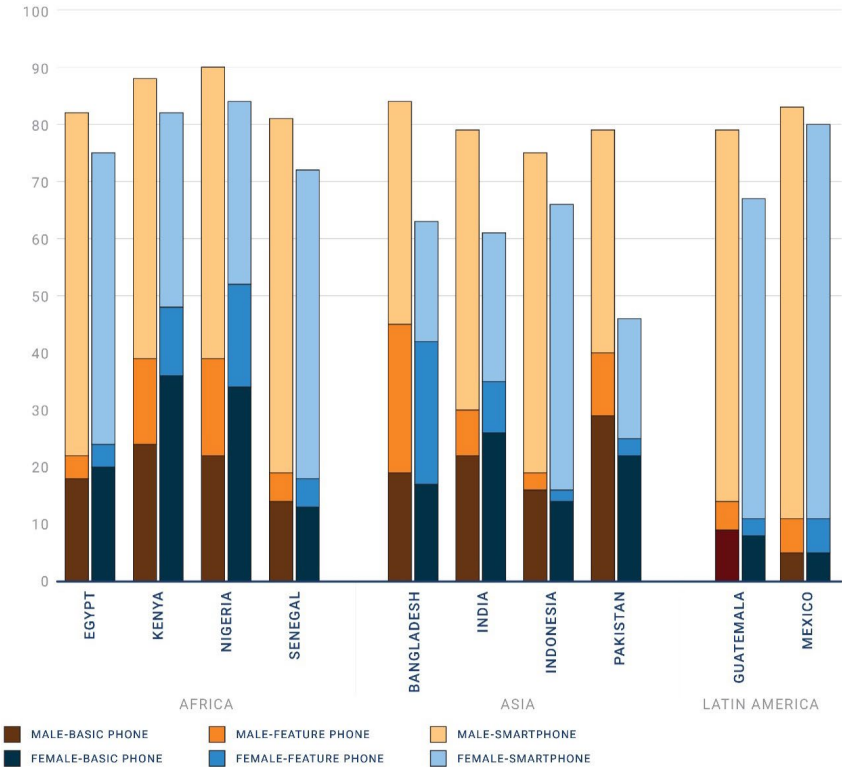
Source: GSMA. 2021. GSMA Consumer Survey 2021. Global System for Mobile Communications.

B | Africa Growth Initiative at BROOKINGS

While women constituted 61.4% of the total beneficiaries of the program, learnings from monitoring done throughout the scheme revealed that women (mostly in rural areas), had lower access to digital terminals than men. Moreover, in many households, the only existing phone belonged to men, making it difficult or almost impossible for women to have direct access to the social assistance funds allocated to them. Closing the gender gap in mobile phone access and use would therefore directly contribute to the economic

empowerment of women and girls, and to achieving equal opportunity.

Several barriers hinder women's ownership and use of mobile phones, such as affordability of mobile devices and lack of proof of identification required to register SIM cards and take loans. The lessons learned in Togo throughout the pandemic have inspired our new 2025 digital transformation strategy. One of the key initiatives of this strategy is to build a universal, foundational ID system to boost citizens' inclusion in the economy by providing each person with a biometric ID and a unique identification number. Once citizens have a unique biometric and digital ID, well thought-out partnerships with the private sector and innovative pay-as-you-go business models or micro loans could popularize access to mobile devices (especially smartphones) for everyone—and at subsidized rates for women. The ID system will also underpin the dynamic and unique social registry Togo is looking to set up to support all its social protection programs. Coupling the government-led unique electronic identifiers with a mobile phone and a mobile wallet could help to systematically close digital, social, and financial inclusion gaps for women, the poor, and vulnerable. The Togolese ID system will also underpin the dynamic unique social registry Togo is looking at setting up to support all its social protection programs.

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AFRICAN COUNTRIES LEAD THE WORLD IN FEMALE LABOR FORCE PARTICIPATION

Countries like Rwanda (83 percent), Madagascar (82 percent), and Tanzania (80 percent) have among the highest rates of female representation in the workforce. Their female labor force participation rates are higher than comparable countries in Eastern Europe, the Middle East, and South America.

FEMALE LABOR FORCE PARTICIPATION (%)

83

6
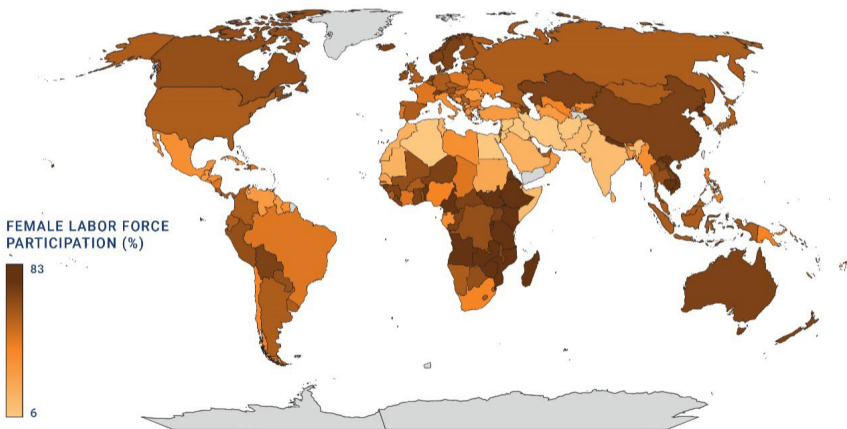
Source: World Bank. 2022. World Development Indicators. World Bank Group.

B | Africa Growth Initiative at BROOKINGS

Jordan Cox,
research manager, GSA

Africa's lack of infrastructure and communication coverage, and its issues with older network infrastructure, are well-documented. But there is real potential for new-generation technologies to connect the continent to the rest of the world. Indeed, many operators and countries are now investing in and launching 5G networks across Africa.

Globally, there are 983 operators investing in LTE networks, with 825 now having launched public LTE networks in 243 countries and territories. In North Africa, 19 operators have rolled out LTE mobile services, of which ten have launched LTE-Advanced in Algeria, Libya, Morocco, Sudan, and Tunisia, with one other operator currently in a testing phase.

Of these 19 telecom providers in North Africa, 16 have also launched LTE fixed wireless access (FWA) services. In the larger sub-Saharan Africa region, 182 operators are investing in LTE, with 151 networks launched and a further nine operators actively deploying LTE. Furthermore, 37 operators in this region have deployed LTEAdvanced, and a further four are deploying, plan to deploy or are testing the technology. There are also 87 operators in this area that have deployed or launched LTE FWA networks, with four more currently in the process or planning to deploy.

As a result, Africa now makes up 20.8% of the total number of operators investing in LTE and 20.9% of all commercially deployed networks, a steady increase of 0.4% and 1.3% respectively since last year. Although the continent still

accounts for many places without LTE access, it has seen a dramatic drop in the number of not-spots. The only African countries and territories with no LTE network known to GSA are Central African Republic and Eritrea.

In terms of LTE and 5G subscribers, however, the continent is further behind. Mobile subscriptions in Africa stood at 1.2 billion by the end of December 2021, according to data supplied by OMDIA. In absolute terms, LTE was the fastest-growing mobile technology in Africa in the 12 months to the end of 2021, gaining 57.3 million subscribers to reach a total of 247.9 million, although this pales in comparison with WCDMA networks, which reached 646.6 million subscribers by December 2021. GSM continued to decline, falling from 393.6 million to 337.9 million subscribers.

LTE is now gaining a foothold in Africa. It was the fastest-growing technology in percentage terms and just above WCDMA in absolute terms. LTE subscriptions hit 247.9 million by the end of 2021, up more than 30% over 12 months, accounting for slightly more than 20% of all mobile subscribers on the continent. In comparison, globally, LTE represents over 67%. As LTE gains ground, eventually delivering gigabit speeds, GSA expects a migration from 3G to 4G or LTE and later 5G. But for now, Africa represents only 3.6% of the world's LTE subscribers. It is important to note that LTE population penetration in Africa was still only about 18% in March 2021.

5G is on the horizon

Network suppliers and operators worldwide are currently testing and deploying 5G networks — in fact, 292 commercial 5G networks have now been launched worldwide. The pace of evaluation and deployment has been

accelerating in Africa too. GSA is aware of 70 African operators from 38 countries that have been investing in 5G networks, including pre-commitment evaluation, testing, and trialling, all the way to service launch.

Southern African operators are at the vanguard of the region's 5G development efforts, with 5G network launches by MTN, Rain and Vodacom. GSA has also recorded 5G launches in Angola, Botswana, Burundi, Ethiopia, Gambia, Kenya Madagascar, Mauritius, Reunion, Seychelles, South Africa, Togo, and Zimbabwe, among others. There has been a soft launch in Lesotho, precommercial deployments in Ethiopia, Kenya, Libya and Mozambique and further active deployments underway in Angola and South Africa.

Furthermore, GSA has identified other operators with plans to deploy in Cape Verde, Cameroon, Ghana, Kenya, Mauritius, Namibia, Nigeria, Republic of the Congo, Seychelles, South Africa, and Tunisia.

New generation technologies

We are starting to see more and more LTE solutions for voice and IoT services in Africa. VoLTE is now commercially available in at least 22 African networks, with three other operators known to be actively deploying the technology and two planning to do so.

Narrowband IoT, meanwhile, has been launched in Kenya, South Africa, and Tunisia, with further investments in Liberia and Nigeria. MTN has been involved in trials of LTE-M in South Africa.

The year ahead

GSA expects LTE to continue its rise in Africa during 2024. With at least nine operators

known to be deploying new LTE networks as of November 2023, we might expect to reach nearly 170 LTE networks providing either FWA or full mobile services in Africa by the end of the year, which is slightly down from our prediction of 170 in 2022.

It will be a few years before the technology is as widely used as 3G. But given the recent rise in commercially launched networks, the expected launch of more LTE services in 2024 and the fact that it will be available to many more people as network coverage widens, LTE will attract more and more users.

In addition to the growth in use of LTE, GSA expects the quality of the LTE infrastructure to improve. We forecast that the number of networks being upgraded from LTE to LTEAdvanced and LTE Advanced Pro will increase — predominantly through the introduction of carrier aggregation to improve speeds, and the launch of 3GPP IoT technologies. Currently, few networks in Africa can boast maximum (peak theoretical) download speeds of much more than LTE Category 4. GSA has identified 20 operators offering Category 6 or better.

Beyond LTE-Advanced and LTE Advanced Pro services, the launch of 5G networks will help to deliver higher speeds for end-users and will additionally open new opportunities for industry.

With more than 10 operators having launched or currently deploying 5G networks, rollout of 5G will continue to gather pace across the African continent over the next few years, supported by more governments and regulators making spectrum available — a critical enabler for 5G deployment.

At the same time, new technologies designed to improve rural coverage, coupled with wider availability of lower-cost mobile devices, will bring LTE and 5G within reach of more households. ∎

James Williams,
director of programmes, Mobile
Ecosystem Forum

Control through data abstinence
MEF 9th Annual Trust study

The 9th Mobile Ecosystem Forum's benchmark on consumer trust highlights the concept of 'data abstinence,' a triangulation from users' desire to participate in mobile services, the appeal of free services, and concerns around privacy and security.

MEF's 9th Annual Global Trust Study was carried out in January and February 2023. On Device Research surveyed 8,450 smartphone users, 650 in each of 13 markets, including South Africa.

Trust in data sharing is weak, with the report finding an average Trust Index of 54% across the 13 markets – although this value is notably higher
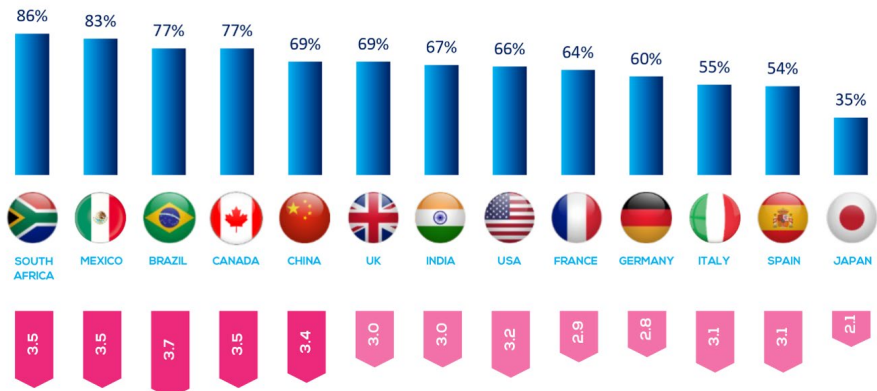
in South Africa, at 64%. The mobile economy is growing fast and is central to the lives of many, and so is the sharing of information in the data economy. Users are reluctant to share data, but are embracing mobile services, and data powered ones, at a consistent rate. The uneasiness of data sharing is well established though.

The 54% Trust Index shows work is still needed to build awareness, control, and defence tools. Many commentators might reflect positively that the model 'free services in exchange for data' is still working. However, there is a form of decay in the system that is not easy to view from a distance – data abstinence. The quantity and quality of information that is shared in the system is deteriorating.

The study shows that 67% of global users avoid sharing their personal data, and only 12% of users say that they do not worry about control of their data. Deleting accounts and sharing as little as possible is impacting on social media. Users are increasingly passive, lowering their

AGREEMENT WITH 'I LIKE THE IDEA OF CONTROLLING WHO HAS ACCCESS TO MY DATA, USING A SINGLE TOOL'

AVERAGE NUMBER OF DATA HARMS EXPERIENCED

SOUTH AFRICA	MEXICO	BRAZIL	CANADA	CHINA	UK	INDIA	USA	FRANCE	GERMANY	ITALY	SPAIN	JAPAN
86%	83%	77%	77%	69%	69%	67%	66%	64%	60%	55%	54%	35%
3.5	3.5	3.7	3.5	3.4	3.0	3.0	3.2	2.9	2.8	3.1	3.1	2.1

engagement and eventually the richness of the data profiles available.

Indeed, the industry is challenged by robots creating fake accounts and users limiting their data - this could be a real challenge over the next years. The industry must respond to these perceptions: data sharing can still represent a valid and thriving market in the future, but only if long-term buy-in from users is reinforced. The entire industry needs to address and show care for end users' concerns.
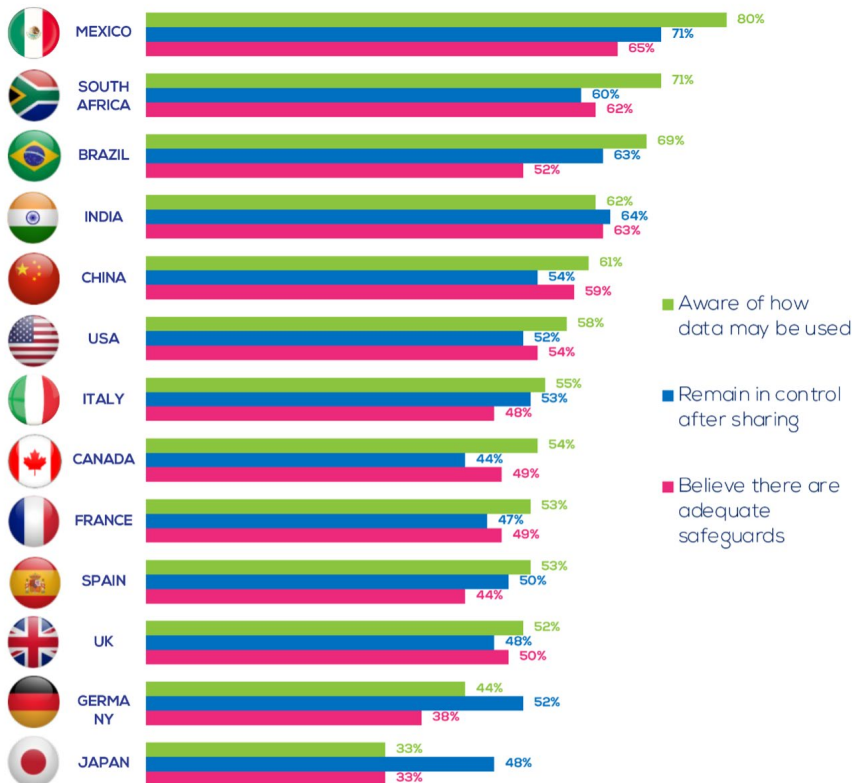
Diving deeper

Awareness of how personal data may be used is the strongest perception in most markets and is driving the high Trust Index in South Africa, Mexico, and Brazil. In South Africa, 71% are aware of how data may be used; 60% remain in control after sharing; and 62% believe there are adequate safeguards. It is important to note that the awareness measure reflects how users feel rather than any factual assessment and will be influenced by any past exposure to data harm.

There are widely varying levels of trust in different types of organisation when it comes to using and looking after personal data. Medical and banking institutions tend to be most trusted in all countries including South Africa, while social media companies and government (excluding China) tend to be least trusted.

TRUST INDEX COMPONENT PERCEPTIONS – BY MARKET

Market	Aware of how data may be used	Remain in control after sharing	Believe there are adequate safeguards
MEXICO	80%	71%	65%
SOUTH AFRICA	71%	60%	62%
BRAZIL	69%	63%	52%
INDIA	62%	64%	63%
CHINA	61%	54%	59%
USA	58%	52%	54%
ITALY	55%	53%	48%
CANADA	54%	44%	49%
FRANCE	53%	47%	49%
SPAIN	53%	50%	44%
UK	52%	48%	50%
GERMANY	44%	52%	38%
JAPAN	33%	48%	33%

In the past three years there has been an upward trend in unsolicited calls and messages, the most prevalent concern among mobile users. There were notable increases between 2020-2022 for fraudulent texts and emails, which have been maintained in 2023. This is key because the most common data 'harms' are unsolicited messages and calls, experienced by half of users globally. Two in five reported having received fraudulent emails or texts aiming to collect sensitive data. There are also above-average levels in South Africa, Brazil, Canada, Mexico, and China.

This year's study explored the appeal of personal information management systems (PIMS). The majority like the idea of controlling who accesses their data and claim they would check their data frequently. However, there is great inertia – over half state that organisations should look after their data without them needing to be involved in this way, and most also claim they would only use it if it was free. This kind of service will need to expound on a wider range of user benefits to appeal to more users. Unsurprisingly, there is a correlation between those markets indicating most interest for PIMS and those reporting the highest level of data harms: South Africa (86% interested), Mexico, Brazil, Canada, and China.

Lessons for industry

According to the reports findings, the global mobile industry should note the following lessons:

Social media giants must show care for users, not just data: as social media strengthens its position as the most prevalent and frequent mobile activity, increasing numbers of users feel their security and privacy are exposed. It is incumbent upon social media companies to adopt a leadership role in addressing perceived shortcomings on data transparency and trustworthiness.
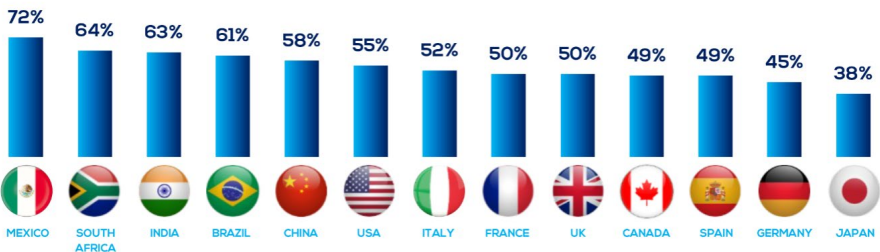
Don't be complacent: despite increased usage of mobile apps and services, there remains a great deal of user concern about sharing personal data. It should not be forgotten that users would engage more fully in mobile life if their concerns were addressed.

Systems built on data are at risk of underperforming or failing: user reticence to share data poses a risk to any organisation seeking to leverage AI or build systems on data such as recommendation engines, advertising or mobile intelligence. All will be less powerful unless users share their data freely and willingly.

Users must take more active control: Users still tend to manage risk by abstaining from data sharing, with few exercising true 'control' over their data.

Dramatise benefits beyond addressing risk: few users currently appreciate the benefits of empowerment solutions such as PIMS, beyond preventing harm, and as a result these tools garner muted interest. ◼

TRUST INDEX BY MARKET

MEXICO	SOUTH AFRICA	INDIA	BRAZIL	CHINA	USA	ITALY	FRANCE	UK	CANADA	SPAIN	GERMANY	JAPAN
72%	64%	63%	61%	58%	55%	52%	50%	50%	49%	49%	45%	38%

Pete Bell,
research analyst, Telegeography

All change in Ethiopia

Until recently, Ethiopia was one of the few telecom markets in the world that was still a monopoly, with no competition to state-owned firm Ethio Telecom.

The situation changed with the award of a new communications license in the first half of 2021. Market liberalization had been a long time coming; the government pledged to open the market up to competition as far back as 1999, when it outlined plans to authorize a new GSM operator, but it took years for this plan to come to fruition.

It was not until 2019, under a revised proposal published in July that year, that the government revealed it was looking to award a new full-service Unified Telecommunications Service License to Ethio Telecom and similar concessions to a pair of new players.

While 12 groups expressed an interest in the new licenses, only two bids were submitted. One from South Africa-based MTN Group and another from Global Partnership for Ethiopia (GPE), a consortium comprising Kenya's Safaricom, Vodafone Group, Vodacom Group, CDC Group, and Sumitomo Corporation.

In May 2021, it was confirmed that GPE would be awarded one of the licenses for $850 million, but MTN's offer of $600 million was too low and had been rejected.

Arrival of Safaricom

The winning consortium subsequently unveiled plans to launch commercially in April 2022 under the name Safaricom Telecommunications Ethiopia.

It said it would invest around $590 million in the initial start-up phase, with between $1.5-2 billion to be spent over its first five years of operation.

Although unable to meet this launch target — in part due to delays finalizing a roaming agreement with Ethio Telecom — Safaricom Ethiopia eventually announced the start of a network pilot in August 2022, before confirming its commercial launch in 11 locations in October that year.

It was an instant hit. By the end of October 2022, it claimed 740,000 subscriptions and hit 1 million less than a month later. It also had a staggering 5 million subscriptions by August 2023. Market leader Ethio Telecom had an estimated 70 million mobile subscriptions at the same date.

Safaricom has also been busy expanding its network reach. It covered 21 cities by early 2023 and was active in 22 cities and 49 towns by the middle of the year, covering approximately 25% of the country's 105 million population.

In June 2023, World Bank Group members

Year	Revenue	ARPU
2013	10,426	46.7
2014	12,490	50.0
2015	16,082	54.1
2016	21,280	60.4
2017	24,174	61.3
2018	26,122	58.5
2019	27,951	55.7
2020	38,494	69.0
2021	44,861	69.5
2022	49,539	64.3

Table: Ethiopia Mobile Market Revenue and ARPU

the International Finance Corporation and the Multilateral Investment Guarantee Agency announced plans to make an equity investment in Safaricom Ethiopia, as well as providing loans for the cellco. Under the deal, the World Bank Group is providing equity, debt, and insurance facilities to support the construction and operation of Safaricom Ethiopia's 4G and 5G mobile networks.

Third license award restarted

Meanwhile, the process to award the third new full-service license was re-launched in September 2021, but then postponed three months later. The regulator, the Ethiopian Communications Authority (ECA), said that it had "received concerns and requests from several prospective bidders to delay the process and issue the RFP at a convenient time in the future."

Applications were eventually invited once again at the end of June 2023. Announcing the development, the ECA said it was inviting "world-class" telecommunications operators to take part in what it called an "exciting opportunity to operate within Ethiopia's rapidly growing economy." The deadline for submissions was October 2023.

Editor's note: Recent news reports indicate that the search for a third MNO has been put on hold indefinitely after a lack of interest due to the conflict in parts of the country.

Ethio Telecom privatization

While the search for a third mobile operator continues, the government's been looking to sell off a stake in Ethio Telecom. Like the licensing process, however, things have not always gone smoothly.

While it published the RFP for the sale of a 40% stake in the telco in September 2021, the following March the sale was postponed.

The country's Ministry of Finance (MoF) said that the decision to press pause on the process had been taken "given the recent developments and fast-moving macroeconomic changes both globally and from a country perspective."

The tender was restarted in February 2023, with the stake on offer having been increased to 45%. The government's interested in receiving "proposals from interested parties who can add value to the company by bringing in best practices in terms of operations, infrastructure management, and next-generation technological capabilities."

No further developments have so far been reported.

Mobile market growth

Meanwhile, the Ethiopian mobile market has continued to grow.

At the end of June 2023 there were an estimated 72.2 million mobile subscriptions, up from 64.5 million a year earlier and 54.3 million in mid-2021.

Ethio Telecom isn't taking the arrival of competition lying down. In September 2023 it launched the country's first 5G network at 145 sites in the capital, Addis Ababa. Later that month it teamed up with Gilat to modernize its portfolio of satellite-based business services and improve satellite backhaul for its mobile networks.

While the search for a third mobile operator continues, the government has been looking to sell off a stake in Ethio Telecom. Like the licensing process, however, things have not always gone smoothly. ■

Kees Snijders,
managing director, SIMcontrol

We have been actively expanding our business into the continent from a South African (SA) base since 2016. The common prerequisite to success is lots of patience and investment in local partnerships and relationships. We offer a cloud-based B2B SaaS solution, but we have had to invest in local people, infrastructure, and relationships to gain traction.

Opportunities abound, especially since Africa isn't necessarily a focus area for first world competitors. There has been significant investment in network infrastructure, enabling OTT solution providers like us to offer our services in more markets.

In SA, NB-IoT based solutions, at least on the Vodacom network, have become viable for the first time. Improvements in coverage and the underlying commercials on offer have enabled this. Roaming providers have started investing in local packet gateways to improve quality of service. Consumer app-based eSIM solutions have seen adoption, and there has been movement on the GSMA standards to enable MNOs to offer eSIM solutions for IoT.

The 'leapfrog' effect is a recurring theme. From a connectivity perspective, this happens when quality, relatively affordable, broadband connectivity becomes available to a market that has effectively been cut off from the internet.

There is no gradual migration from previous connectivity technology as was typically the case in the first world. This can lead to exciting innovations and rapid adoption without parallel.

In 2023, the coupling of mobile money and renewable energy has enabled a few businesses to rapidly scale their customer bases. M-Kopa is the most prominent example of this; they distribute subsidized off-grid solar-powered kits to consumers who pay these off over time using M-Pesa. Ubiquitous reliable connectivity and large-scale mobile money adoption were the enabling factors - and lots of sunshine.

This year, some markets opened to external service providers for the first time, Ethiopia for example has licensed Safaricom as a second operator. They have rapidly rolled out a quality network with Vodacom, and they have seen excellent uptake because of pent-up demand for affordable and reliable broadband connectivity. The key question for anyone doing business in Africa is how easy it is to repatriate earnings; we try to steer clear of markets with volatile currencies and cumbersome tax regimes and exchange control restrictions.

We mostly rely on deploying white-label versions of our software in partnership with MNOs. We do so in a telco-agnostic fashion. As we have gained traction in markets and proven the business model, it has become easier to sell the concept. The use cases that require scaling of connectivity management solutions are gaining traction. Tracking and asset management is at the forefront, but other verticals are following suit. ∎

Looking ahead: We expect to see continued rapid growth in most African markets - we are still a long way from saturation.

The most important market need is the insatiable demand for reliable, affordable, and ubiquitous connectivity; this is true in Africa and the developing world in general. In the B2B world where it's necessary to manage connectivity at scale, OTT software tools providing real-time management and cost-control are key.

Jerusha Rooplall,
managing director for sub-Saharan Africa, G+D Mobile Security

Connectivity in sub-Saharan Africa is still very hardware-based with physical pluggable SIMs being the overwhelming standard. This is partly led by the fact that very few African MNOs have adopted eSIM technology. As this changes and more original equipment manufacturers (OEMs) include eSIMs in lower cost and entry-level devices, it will become a great opportunity.

The availability of 4G services has been steadily increasing – with 5G to come – which in theory is giving people more access to wireless networks. But in general, there is still the barrier of the price of even entry level smartphones which, according to the GSMA, exceeds 60% of the average monthly income. This remains one of the greatest challenges.

Above all, however, the African Union's 'Digital Transformation Strategy for Africa' opens up new exciting opportunities with its potential in the digital economy space and the increased collaboration and harmonization between countries. Under the motto of 'digital economy, collaborative

"In general, there is still the barrier of the price of even entry level smartphones which, according to the GSMA, exceeds 60% of the average monthly income. This remains one of the greatest challenges."

"eSIMs have a lot of potential. Usage will grow and deliver more flexibility to end users. Beyond that, an increasing number of connected IoT devices can be foreseen due to the logistic needs of the African continent. Things that are on the move need to be tracked, things that are sensitive to environmental conditions need to be monitored."

economy,' more governments are looking at harmonizing policies, legislation, and regulations. This allows them to strengthen intra-Africa trade, investment and socio-economic integration while also maintaining a balance regarding other continents. These strategies and developments are extremely positive. In addition, a key step in South Africa is that the telecommunications regulator is requiring MNOs to support and onboard MVNOs. This market will see a boom in MVNOs in 2024 and 2025.

Consumer use cases are expected to drive growth in the eSIM market in Africa in the short term. The central feature of the eSIM is that the SIM module is permanently installed in the device as a chip. The arrival of eSIMs gives the mobile ecosystem a new tool to help reduce Africa's digital divide. They offer OEMs the potential to reduce costs by creating devices that do not require space for a physical SIM and, therefore, make it possible to cut the price

"For many years, South Africa and Nigeria have competed to become the best and most advanced economies in Africa. Both countries will continue to lead the pack into 2024 and 2025."

of smartphones. They also enable consumers to store multiple numbers or contracts on a single device. Moreover, they give MNOs the opportunity to speed up onboarding, eliminate distribution costs, and create new sales channels. Beyond mobile-telephony-related solutions, eSIMs can be used in wearable devices to improve healthcare outcomes, or in a wide-range of smart home products and services, such as security offerings. ∎

Looking ahead: As 5G networks begin to replace 4G and 3G networks and data speeds increase, there are several exciting possibilities that eSIMs can enable in the IoT field. Examples of this include connected vehicles, remote farming monitoring or the tracking of assets such as containers and livestock.

Overall, however, the dominant number of connections is still in the mobile consumer space. Other cellular connected solutions are becoming increasingly visible, but still on a much smaller scale. Nevertheless, cellular communication has massive advantages over wired communication due to the vastness of the African continent and therefore offers much more capabilities to also connect rural areas. For even remoter areas, a smart interconnection between various types of connectivity can play a crucial role, such as WiFi, LPWA, satellite, private network, and cellular interaction.

Small, even micro businesses drive a lot of innovation on the African continent compared with the rest of the world. For example, delivery-people on their bikes, scooters and vehicles for tracking or following orders power demand for connectivity. One common challenge in Africa is the lower access to reliable mobile connectivity. 3G still remains the dominant connectivity technology with over half of all connections still expected to be 3G even by 2025. But 2022 marked the first time that this number

declined in favour of the introduction of 4G and 5G.

eSIMs have a lot of potential for the future. Usage will grow and deliver more flexibility to end users. Beyond that, an increasing number of connected IoT devices can be foreseen due to the logistic needs of the African continent. Things that are on the move need to be tracked, things that are sensitive to environmental conditions need to be monitored, smart farming for example. And the increasing population in the urban areas demands efficient connectivity solutions for the promotion of smart cities and smart health.

For many years, South Africa and Nigeria have competed to become the best and most advanced economies in Africa. Both countries will continue to lead the pack into 2024 and 2025. Early adoptions of eSIMs was seen in South Africa and Nigeria, with Nigeria dominating the number of active eSIMs.

Africa remains very hardware-based. Therefore, our SIM cards will remain the front runner of our business. The eSIM is of course top of mind for many of the bigger MNOs and we will see adoption of eSIM grow in parts of Africa that have not yet adopted the technology. As soon as the lower cost phones introduce eSIM, the adoption rate will increase exponentially. In addition, there is a big transport industry in Africa and our Track and Trace solution will be of great benefit in this field. We plan to explore this opportunity further.

Bonface Ndawala,
founder, CEO and deputy executive chairman, Malcel PLC

The past year has been an eventful one and one of lots of promise but of course also beset by challenges. We managed to win a mobile license in Malawi and set out on the process engaging various partners to work alongside us to achieve our rollout plan so that we can enter the market at the end of 2024.

The major challenges have been due to the impact of the global economy which has seen central banks try to curb inflation by increasing their base lending rates by some really unprecedented rates. For instance, the Federal Reserve in the US at the time we were applying for our license had their base rate at 0.25% - but by the time we got to Q3 2023, this had gone up to 5.5% in just a space of 18 months!! That's the steepest interest rate hike in over half a century and the highest rate in 40 years. This means that while we had a lot of potential investors looking

"We have noted the growing 5G deployments in Africa, starting from South Africa and moving to other parts of the continent and we have also seen the explosion of mobile money and fintech solutions that are changing the mobile landscape and bringing the much-needed solutions to the continent."

at Africa which would give them a return of 40% plus when the base rate was at 0.25%, they would reconsider such an investment decision with a base rate of 5.5%, as they consider investments in their own countries in the West risk-free.

In terms of opportunities, we have the most underserved populations in the world, with the world bank estimating that up to 45% of the population in sub-Saharan Africa is unbanked. There then lies the opportunity. In Malawi in particular, the real mobile penetration is under 40% - although the stats from MACRA show that it's 60%, if you take the impact of the multi-SIMmers (people with more than one active SIM card) you will arrive at less than 40%. Real internet penetration is less than 18% (officially 24% including the multi-SIMmers explained above) and financial inclusion versus population at around 22%. This is a virgin market, one that we intend to serve well.

We have noted the growing 5G deployments in Africa, starting from South Africa and moving to other parts of the continent and we have also seen the explosion of mobile money and fintech solutions that are changing the mobile landscape and bringing the much-needed solutions to the continent. With players like Cassava and Safaricom driving such change and bringing such solutions, it's an exciting marketplace that is fertile for exponential growth going into the future.

Africa is only now beginning to meaningfully develop. It has some unique requirements which require innovation. For instance, while western and other global economies have an integrated ID system which can track people that have borrowed money from the bank, in Africa we do not have such infrastructure. Thus, there is always a need to craft and develop smart solutions which will allow the disbursement of credit without running the risk of the lenders completely losing their money. There will be some smart solutions required to address such challenges.

"There is a move to have some sort of a 'one network area,' whereby Malawi, Zambia, Botswana, Zimbabwe, and Lesotho will have subscribers within their areas travel to each other's countries without paying roaming fees."

Fintech is the technology that will drive the African market into 2024 and 2025 - and at the heart of this will be providing reliable mobile broadband connectivity to as many subscribers as possible. The enablers of such fintech platforms are 5G, fibre and even satellite broadband, which is making a comeback through Space X getting licenses across the continent.

I foresee Southern and Eastern Africa will be the most vibrant in 2024 and 2025, mainly because there is still scope for growth. There are many natural resources that have yet to be exploited, like the gas deposits discovered on the coast of Northern Mozambique; the emphasis taken by the Malawi government to exploit mining resources; and the massive opportunities that have been unlocked by the Dar es Salaam Port Authority, which will increase trade into the east and central Africa.

For me, the success story of Safaricom in Ethiopia is the standout story of the year. When you see the growth that has been unlocked there, Safaricom M-Pesa has shown that with the right approach and solutions, exponential growth like we saw in the early 2000s in most of Africa is very possible - and that's what we would like to do with Malcel Plc in Malawi.

The regulatory environment has contributed mostly positively. In Malawi for instance, MACRA has brought in more changes in the market in 2023 than in the past 20 years. This is what happens when you put in place young and able management to lead such critical organizations. MACRA has acted swiftly to bring Malawi to par with her neighbours by implementing mobile number portability, a Central Equipment Identification Register to curb fraud, scrapping unnecessary levies on international termination rates, and introducing national roaming - all long overdue.

Prior to 2023, cross boarder cooperation was mostly non-existent, with each country focusing on its own territories but led by the heads of state for SADC (Southern Africa Development Community), which has advocated regional integration and cooperation we are seeing positive moves going into 2024/2025. There is a move to have some sort of a 'one network area,' whereby Malawi, Zambia, Botswana, Zimbabwe, and Lesotho will have subscribers within their areas travel to each other's countries without paying roaming fees. This will promote integration and enhance trade, and grow the industry faster than before. ∎

Looking ahead: The outlook of next year and beyond is exciting. I see lots of growth and the uplifting of lives through technology. ICT will contribute even more to the region's GDPs, and I see investors from the West and East scrambling for the opportunities that we see today that they haven't seen yet.

With the heavy mining that's about to be unleashed, the explosion of fintech solutions, and a very young population (Malawi's median age is 17) who are tech savvy, I foresee Africa growing exponentially over the next ten years before stabilising. Anyone paying attention understands that this is the market to be in - it will be the new China, experiencing growth of at least 6% on a year-on-year basis into the foreseeable future. It's an exciting time to be an Africa.

Soenke Peters,
head of technology and strategy,
Nokia, MEA

Ever since 1860 Nokia has been a partner for communication service providers (CSP) in Africa in providing reliable and performant communication networks to people and companies across the region.

Winning the 5G contract from MTN South Africa and being selected by Ooredoo to deploy 5G ready networks in Algeria and Tunisia are some of the many advances we made together with our customers in 2023. Our motto is to create the technology that helps the world act together, and to fulfil the mission we gained the opportunity to partner with UNICEF in Senegal. The partnership is to bridge the digital divide by providing digital education, benefiting more than 100 teachers and 10,000 schools in underserved areas is of particular importance, and in line with our ESG strategy.

One of the biggest challenges and conversely opportunities remain that more than 500 million people in Africa are not connected. As if connecting hundreds of millions of people and providing better broadband networks is not challenging enough, we as an industry will have to do it while reducing energy consumption and CO_2 emissions. Depending on the country, we expect 3x to 9x traffic growth (according to the Nokia MEA Broadband Index) from 2023-2027 in Africa – and many countries have set targets to reduce CO_2 emissions drastically; for example, Morocco 45% by 2030, Egypt 10% by 2023, Kenya 32% by 2050.

There is no 'one size fits all' solution to provide access to connectivity for more communities. Depending on population density and geographic distribution, we are working with our CSP partners to design the most optimal solution for coverage, often using a mix of complementing technologies. Our long-standing presence on the continent gives us the ability to combine leading technology and global best practices with a sound understanding of the local culture and requirements to deliver tailor-made solutions for each of our customers and partners.

While many new subscribers will be connected via wireless technologies, we see an increasing investment in fibre optic core and access networks, utilizing and distributing the massive new subsea cable capacities. Meanwhile, fixed wireless access (FWA), initially via 4G, later using 5G, has been proven to be an efficient way to provide broadband services to around 12 million subscribers in 2022, and is expected to grow to 19 million subscribers by 2027, almost half of it in South Africa.

African market characteristics are diverse across the countries, as are the requirements. One common denominator is the need to provide connectivity to rural areas, which poses a dilemma for CSPs as providing services using the regular models is often not commercially viable in sparsely populated areas. Meeting this demand requires a creative and innovative mix of technologies, like mobile, fixed and satellite.

From a consumer perspective, we see only a small number of early adopters of new technologies and handsets, and a long tail of consumers slow to adopt new technologies – mainly due to affordability limitations. Operators must balance the level of technology deployed in their networks to cater for the wide variety of customer needs. In remote areas the slow adoption of new handsets is also limited by unavailability, or limitation of electricity, so users prefer feature phones with better battery life.

While there is no single technology driving the market in Africa, there are four trends that will influence many of the African markets during the next two years:

1. The landing of several high capacity subsea optical cables in many African countries, which will provide unprecedented levels of connectivity. Terrestrial operators will invest to establish and upgrade optical backbone transport capacity, utilising 400GE/800GE technologies, to connect data centres, businesses, and end users. From 2025 onwards we expect to see an increase of edge data centres, catering for the increasing demand for compute, both for consumer and enterprise.

2. 5G will enable CPSs to provide advanced services to enterprises and mobile subscribers, initially in cities and densely populated areas. FWA via 4G is already a key use case and is expected to remain so going forward for wireless broadband services, using both 4G and 5G in the future.

3. Sharing passive and active infrastructure by neutral host companies will aid to address the dilemma of providing broadband access to more people, including those living in sparsely populated areas.

4. Satellite connectivity, either direct to device or as backhauling medium, will help to fill the remaining coverage gaps.

It remains of the utmost importance to develop and adhere to global standards, which allow for global scale in the telecommunication industry that in turn enabled economy of scale benefits. Fragmentation and techno-nationalism will lead to an increase of product variants to be produced in smaller quantities, which will increase cost positions. Especially in the very low ARPU market of Africa, any cost increase will further challenge the ambition of digital inclusion.

Given the ever-increasing need for spectrum, we believe that governments and regulators are well advised to consider new concepts, like spectrum for private networks, spectrum sharing, spectrum leasing and spectrum trading. Also, technology neutrality can ease the transition to new 3GPP generation by reusing existing spectrum assets. We see that the countries embracing these new concepts are benefiting from more digital inclusion. ◼

Looking ahead: With the worldwide economic pressure, high inflation, currency devaluation and pressure on their profitability of operators in the markets, more cross border cooperation is expected. Easing of cross border projects and digital transport routes can lower required CAPEX and OPEX to provide connectivity across the continent, helping to close the digital divide and accelerate digital transformation.

Africa hosts a growing and young population, eager to join the digital economy, get access to better education, and healthcare.

This represents a huge opportunity.

The economic challenges in some African countries might temporarily slow down the speed of development, which can be at least partly mitigated by some of the actions and concepts mentioned above. Despite this short-term potential slowdown, we believe in the mid-term potential and remain fully committed to our customers, our partners, and our purpose to create technologies to help Africa act together.

Salman Tariq,
VP, Europe, Middle East & Africa,
Optiva

The African telecommunications landscape is poised for transformative growth, and mobile virtual network operators (MVNOs) stand at the forefront of this evolution. The unique market dynamics of Africa, characterized by a predominant reliance on mobile communications over traditional landline infrastructure, create a fertile ground for MVNOs to flourish. This is particularly true as different communities, demographics, and use cases across the continent demand specialized mobile services.

Governments in key markets like Nigeria and South Africa have recognized this potential and are actively fostering a conducive environment for MVNOs. Recent policy initiatives, including the generation of new MVNO licenses, signal a strong governmental commitment to diversifying the telecommunications sector. This 'proactive stance' is a strategic move that serves multiple objectives. First and foremost, it fosters a competitive landscape, which is essential for driving innovation and efficiency within the telecommunications sector. Competition ensures that MVNOs are continually striving to differentiate themselves, be it through pricing, service quality, or unique value-added services. This not only benefits consumers by providing them with a broader range of choices but also pushes the industry as a whole towards higher standards of service delivery. Moreover, increased competition often leads to more affordable pricing models, making essential communication services more accessible to the general population. In a continent where mobile communication serves as a lifeline for many, especially in remote or underserved areas, this increased consumer choice and affordability have far-reaching social and economic implications.

However, the success of MVNOs is not merely a function of market demand or regulatory support; it is intrinsically tied to technological innovation. Specifically, the adoption of modern, cloud-native billing and charging software solutions is crucial. Traditional MVNOs, often launched by incumbent network operators, have been hampered by outdated BSS technology. As noted by Omdia analyst James Crawshaw, the evolution from "clunky systems'' to flexible, cloud-based solutions with open APIs has been a game-changer.

The case of Salam Mobile in Saudi Arabia exemplifies the transformative power of modern BSS platforms. Within just four months of receiving its MVNO license, Salam Mobile navigated complex regulatory landscapes to launch its service successfully. Their rapid time-to-market and focus on digital customer experience have resulted in over 1 million subscribers within a year, with an ARPU exceeding industry norms. Similarly, Nova Energy in New Zealand has leveraged a modern BSS platform to offer bundled services, enhancing customer loyalty and generating additional revenue streams.

Financial constraints often limit MVNOs, leading them to rely on the incumbent operator's billing and charging systems. However, cloud-native software-as-a-service (SaaS) BSS platforms eliminate the need for large upfront capital investments. Moreover, these platforms are continually updated by the service provider, reducing operational overhead for the MVNO, and allowing them to focus on market strategies and customer engagement.

For MVNOs aiming to capitalize on the burgeoning African telecommunications market, adopting a modern, cloud-native BSS platform is not just an option but a strategic imperative.

The future of the MVNO market in Africa is intrinsically linked to the broader telecommunications landscape, which is

undergoing a transformative shift. One of the most significant drivers of this transformation is the advent and proliferation of 5G technology. The promise of 5G is not merely about faster internet speeds; it's about enabling a new range of services and applications that could revolutionize sectors ranging from healthcare and education to agriculture and manufacturing. The low latency, high reliability, and increased capacity of 5G networks are expected to unlock countless use cases for IoT applications, real-time analytics, and even remote healthcare.

The momentum behind the rollout of 5G services in Africa is high, and it's being fuelled by a combination of market demand and governmental initiatives. Governments across the continent are aligning their digital strategies to leverage 5G as a catalyst for socio-economic development. This involves not just the rollout of 5G networks but also the creation of regulatory environments that encourage innovation and competition. The objective is twofold: to make high-speed, reliable internet access more widely available and to attract investment into a range of 5G-enabled services and technologies.

In this context, South Africa, Namibia, Kenya, and Nigeria stand out as particularly vibrant markets for MVNOs and broader telecommunications growth. Each country offers a unique blend of market potential and regulatory support, making them fertile grounds for innovation and investment. For instance, the Nigerian Communications Commission (NCC) recently took a monumental step by granting licenses to 25 companies, thereby opening up a plethora of opportunities in rural connectivity, Machine-to-Machine (M2M), and Business-to-Business (B2B) markets. This move is not just about expanding network coverage; it's about creating an ecosystem where digital inclusivity is the rule rather than the exception. Moreover, the licensing process has become a revenue-generating mechanism for the government, creating a sustainable digital transformation model.

The concept of a 'sustainable model for digital transformation' is particularly crucial for these African nations, given their broader socio-economic challenges including limited access to quality education and healthcare. A sustainable digital transformation model ensures that the benefits of technological advancements are not just short-lived or confined to urban centres but are widespread and long-lasting. It creates a virtuous cycle where increased connectivity leads to greater digital literacy, which in turn fosters innovation and entrepreneurship. This not only attracts further investment into the telecommunications sector but also spills over into other areas of the economy, thereby accelerating overall economic growth and improving quality of life. In essence, a sustainable digital transformation model serves as a cornerstone for achieving broader developmental goals, making it an imperative for governments and industry stakeholders alike. ■

Looking ahead: The combination of progressive regulatory frameworks, robust governmental support, and the burgeoning momentum for 5G services makes South Africa, Namibia, Kenya, and Nigeria the most promising landscapes for MVNO growth in 2024 and beyond.

These countries are not merely opening doors for business opportunities; they are laying the groundwork for a more inclusive, connected, and digitally empowered Africa. By aligning with these macro trends and leveraging the capabilities of 5G, MVNOs have a golden opportunity to play a pivotal role in shaping Africa's digital future.

Simon Yomtov,
general manager – Africa, Upstream

This year, Upstream achieved technological and product growth in Africa, being able to advance despite a clearly unfavorable external environment.

What do I mean by the latter? Slowdown of the economic growth in the continent, inflation peaking to very high levels and local currencies being vastly depreciated over currencies such as the Euro. In some countries, political and fiscal limitations made the transfer of money to other countries either too costly or even unfeasible. Such conditions were certainly obstacles to the progress of international companies operating in Africa.

Our belief is that when the conditions get more difficult, rather than halting your efforts, you should only push harder. This way you will emerge from challenging periods stronger and ready to reap the rewards. The World Bank predicts that inflation rates in most African countries have already peaked. So, we can be optimistic that it won't be long before the conditions normalize again. We have already seen this normalization take place in other markets where we operate,

> "Our belief is that when the conditions get more difficult, rather than halting your efforts, you should only push harder. This way you will emerge from challenging periods stronger and ready to reap the rewards."

> "While we are already talking about 'mobile first' in most of the world, with 53% of the internet traffic worldwide coming from mobile phones, in Africa this percentage rises to 74%."

such as Brazil, where inflation decreased threefold after peaking about a year ago.

The African market is like no other and it has been a key market for Upstream over the years. One thing that makes it unique is that Africans must rely on their mobile phones to access the internet more than people on any other continent. While we are already talking about 'mobile first' in most of the world, with 53% of the internet traffic worldwide coming from mobile phones, in Africa this percentage rises to 74%. This means that when brands need to reach their customers online, mobile channels are pretty much their only option.

We must keep in mind that most of the people in Africa aren't always connected to the internet in the way people in the most developed markets are. WiFi connections are quite scarce, and most users rely on their mobile data, which isn't always affordable. What's more, over half of the users still use feature phones rather than smartphones. Given this context, channels such as SMS, which don't rely on an internet connection and are usable even on feature phones, are the most effective in engaging wide audiences in Africa.

For Upstream, the highlight of 2023 in Africa is the launch of our martech platform, Grow, with one of the largest mobile operators of the continent. The platform had already been launched with two mobile operators in Brazil, but this new development showcases the potential

for marketing technology in Africa as well. I would like to highlight especially the potential it holds for mobile operators in Africa, because on this continent more than anywhere else, they are the ones holding the keys to the interaction between brands and consumers on the mobile. Platforms like ours could prove to be the much-needed equipment for operators to realize their potential in the digital advertising landscape.

Grow is a mobile marketing platform that combines a series of different features to drive effective customer engagement. It allows for the creation of campaigns through a simple drag and drop user interface. These campaigns can run across a series of different mobile and digital channels, depending on the campaign's purpose and target audience. The various channels are centrally orchestrated through a single UI, which enables better collaboration between different individuals within the MNO, who manage different channels. In addition, marketers can set-up automated, event triggered messaging according to the end users' behavior. Platform users constantly have access to insights and analytics to check what works and what doesn't, while AI enabled optimization ensures

> "Despite the overall economic climate, in 2023 we have seen telcos willing to invest in innovation to tap into new revenue sources. After all, their traditional core revenues can only get them so far, as at one point, if not already, they'll hit a ceiling."

that customers receive the best performing messages via the best performing channels at the optimal moment. Last but not least, an ad fraud prevention feature ensures that all interactions are genuine, protecting both a brand's budget and reputation.

Despite the overall economic climate, in 2023 we have seen telcos willing to invest in innovation to tap into new revenue sources. After all, their traditional core revenues can only get them so far, as at one point, if not already, they'll hit a ceiling. ■

Looking ahead: We expect that in 2024, those that have already invested will reap the benefits and this will lead to more players trying to follow the same path.

Especially in the digital advertising industry, mobile operators in Africa have the potential to lead the game. We have already seen telcos in Europe acknowledging that they can and should play a bigger role in digital advertising by launching the TrustPid initiative. With the latter, they aim to use mobile numbers as unique user identifiers online to address a significant market need, particularly considering the impending demise of third-party cookies.

Telcos in Africa have an even stronger position and they should capitalize on it. Upstream has developed a user identification technology over the mobile network, called Mobile Identity and it has already been deployed by one of the biggest names in the African telco space. This tech enables approaching users with personalized and unified communications across different channels, streamlines user journeys and makes building CRM bases easier than ever.

Deploying the right tech will help telcos secure a leading position in digital marketing and much-needed additional revenue sources.

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As a leading international communications enabler, BICS is at the heart of the communications ecosystem. We enable people, applications and things to connect, wherever they are. We are a global provider of international voice, messaging, mobile data, cloud communications and IoT services. Our solutions, delivered seamlessly and securely, are essential for supporting today's data-hungry consumers and digitally driven enterprises. Headquartered in Brussels, with a strong presence in Africa, Americas, Asia, Europe and Middle East, BICS powers the global communications that connect the world.

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Cerillion is a leading provider of billing, charging and customer management systems with more than 20 years' experience delivering its solutions to mobile, fixed, cable and multi-service communications providers worldwide. These are used to price and bill subscriptions and variable usage for wholesale, retail and white label services; B2B and B2C offerings and multi-country service provider portfolios.

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About us

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Solutions

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chapter
Data centres
3

Ayotunde Coker,
chairman of the board, Africa Data Center Association

The African data centre market is being promoted as the next frontier in the globe. The fundamentals of the continent indicate this should be the case for a variety of reasons.

Africa has been relatively well served with subsea cable capacity on the West Atlantic coast to Europe and on the East Pacific coast. To date, a key issue has been broadband and fibre infrastructure from the coastal subsea landing points in land, in particular for landlocked countries. This has been improving significantly given the investments of companies such as WIOCC, Liquid Telecoms, Paratus and CMC.

The recent GSMA sub-Saharan Africa Economy report indicates a significant increase in SIM connections growing from 980 million in 2022 to 1.36 billion in 2030, reflecting a penetration rate of 86% in 2022 to 99% in 2030. Significant is the growth in 4G connections from 22% in 2020 to 49% in 2030 in tandem with dramatic drops in 2G and 3G connections. Although the percentages may look low, the absolute numbers are significant indeed.

Information by Telegeography indicates significant increases in data flows from Africa to Europe with increasing equity between Nigeria, Kenya, and South Africa in data volume flows, and significantly, increasing intra-Africa data flows. Googles Equiano cable on the west coast of Africa is live with more capacity than the aggregate of all cables previously available. This will be complemented by Meta's 2Africa West and East coast cable going live later in 2024. Smartphones are getting more affordable and now typically less than $100.

So, the demand drivers and growth indicators are substantial and have become more pervasive across the continent, with significant absolute numbers. For data centre capacity to grow, the right scale, architecture and quality of data centres must be available. According to Xalam Analytics, South Africa has been leading the way with over 50% of the Africa installed base in South Africa. Over 200MW of installed capacity by companies such as Teraco and Vantage. New entrants include Open Access Data Centres with its core to edge strategy with over 30 data centres across the country. New capacity growth has been announced by Teraco, OADC, ADC and Vantage with expandable capacity progressing beyond 300MW. The availability of the right architecture

and scale creates a virtuous circle of growth.

Other Tier 1 locations are emerging in Nairobi Kenya, and Lagos Nigeria. IX-Africa has announced the launch of its hyperscale data centre in Nairobi. Other multiple launches are occurring in Lagos with OADC where the Equiano cable lands announcing growth to 24MW, Rack Centre building 12MW hyperscale and DRT indicating the build of further 12 MW and Kasi Cloud 4MW with growth potential. In the next 12 months, a hyperscale architecture data centre will be launching every quarter for the next few years. Tier II markets include Kinshasa with OADC launching imminently and Raxio announcing its intent. Multi-country providers are emerging with Raxio, Wingu and Paratus building across Tier II markets. Africa Data Centres has announced growth in multiple countries.

Other growth drivers include the growth of cloud and the natural buying pattern in Africa. The pay as you use model has propelled the growth of GSM adoption. The Africa 'sachet' economy where people buy in small quantities as needed and pay as used lends itself to the growth of cloud with the primary delivery and consumption channel being the mobile phone. The emergence of capacity demand for AI in Europe where power availability for data centres is limited will cause a capacity substitution to Africa hyperscale data centres.

The growth of broadband penetration, in tandem with GSM 4G/5G growth and hyperscale growth in Tier 1 locations will spurn the consequential growth in Tier II countries and should result in significant economic and social impact and positively impacting multiple SDGs. WIOCC Group, the owner of OADC Converged Open Digital Infrastructure value proposition and core to edge strategy plays to driving this grow and social impact. Challenges such as access to power, skills and capital for expansion are typical industry challenges to be overcome, and with the growth potential will occur in time. Indeed, most countries in Africa have access to green hydro and gas power and new hyperscale data centre technologies will cause a leap in energy efficiency over the established and older facilities in Europe. ■

Boniface Abudho,
research analyst ,
Knight Frank

Stephen Beard,
head of data centres,
Knight Frank

The African opportunity

In many parts of the world, extensive urbanisation has already taken place, and Africa is at the cusp of starting this journey.

Cities like Cairo, Lagos, Luanda, Dar es Salaam, Nairobi, and Addis Ababa are together home to over 65 million people. By 2030, the combined population of these African activity hives will expand to 100 million, according to United Nations estimates.

Overall, sub-Saharan Africa's population is growing at a rate of 2.7% per annum (p.a.), more than twice as fast as South Asia (1.2%) and Latin America (0.9%) (World Economic Forum). Indeed, according to the Word Bank, by 2050, Africa's population is forecast to rise to 2.4 billion and will continue to grow to 4.2 billion in the next

100 years, four times its current size.

The projected population boom is set to unleash a wealth of real estate investment opportunities as Africa's mega-cities enter their next phase of growth.

Multi-dimensional partnerships key to unlocking investment

A significant hurdle to overcome will be securing funding to drive the expansion of Africa's cities.

The continent faces significant challenges in attracting private-sector investments. Long-standing investment barriers include political instability, corruption, and inadequate road and energy infrastructure. However, there are also numerous opportunities for investment, particularly in data centres, agriculture, and manufacturing.

In our view, multi-dimensional partnerships can play a significant role in addressing some of the challenges faced by investors eyeing opportunities on the continent, particularly those with little or no experience in Africa. Public-private partnerships are a case in point, exemplifying collaborations that embrace diverse areas of interest, including financial, operational, technological, social, and environmental. Their overarching objective is to foster a mutually advantageous alliance aiming to address a wide range of issues or challenges.

Consequently, public-private partnerships have the potential to yield positive outcomes for local communities, such as augmenting employment opportunities and developing critical infrastructure. Dubai's DP World, for instance, strives for partnerships that enhance employment, local infrastructure, and national GDP. One such example is the new Road Transport Centre for delivery trucks in Kigali, Rwanda, which has reduced waiting times for land transport from weeks to days. It has also lowered storage costs, helping to position Kigali as a significant logistics hub in East Africa and facilitating connections between regional businesses and global markets. Over the last 10 years, DP World has invested over US$1.8 billion in Africa and plans to invest a further US$3 billion over the coming years.

Data centres: the new asset class of choice

With the rise in online retailing, catalysed largely by the pandemic and the subsequent boom in demand for storage, distribution and last-mile logistics facilities, requirements for data centres too have flourished across the continent.

Data centres provide a cheaper and more efficient IT capability than inbuilt servers, which is aiding their popularity. They also offer cloud services and allow organisations to focus on their core functions.

Investors have already recognised the growing demand for additional data centres in Africa. Investment into the market is projected to have a compound annual growth rate (CAGR) of approximately 15% from 2020-2026. In 2020, the data centre market size in terms of investment was valued at US$2 billion, and it is anticipated to reach US$5 billion by 2026 (Source: Africa Data Centres).

Earlier in 2023, global real estate industrial and logistics developer, Agility Logistics Park (ALP), launched masterplans for four new data centre campuses in Egypt, Ghana, Saudi Arabia, and Kuwait, one of the largest investments to date. The completion of these campuses will contribute a total of approximately 275,000 sqm of cutting-edge data centre capacity to ALP's existing infrastructure in the Middle East and Africa. In addition, ALP also announced plans to open more data centres in other rapidly growing

markets, including Nairobi, Casablanca, and Lagos. Currently, the industrial developer has a presence in the Middle East, South Asia, and Africa, with a total of approximately 140,000 sqm of warehousing facilities and 12 million sqm of industrial land spread across twelve countries.

Across Africa, there is also increasing demand for high-quality data centres that are both ESG-compliant and cost-effective.

Investor interest

Unsurprisingly, Africa's data centre market is also attracting interest from institutional investors.

Over the last twelve months, multiple transactions have been registered across the continent, including the $3.5 billion acquisition of Terraco by Digital Realty. The acquisition follows Digital Realty's acquisition of iColo, a leading Kenyan-based platform with facilities in Nairobi and Mombasa (a central subsea cable Africa access point).

Equinix entered the Africa market by acquiring MainOne data centres, which has a presence in Ghana, Côte d'Ivoire, and Nigeria, for $320 million. In addition, NTT and Vantage Data Centres have together committed in excess of US$500 million to new data centres in Johannesburg and its environs. Africa Data Centres, Raxio, PAIX, and other pan-African players also continue to enter new markets, including the Democratic Republic of Congo (DRC), Congo, Ghana, and Côte d'Ivoire. WINGU also continues to make great strides through the Horn of Africa in countries such as Somaliland. It's a market that is often regarded as challenging. These operators typically lead with c.2- 5MW developments, allowing them to illustrate proof of concept in anticipation of further foreign investment.

Chinese 'cloud players' are also increasingly active in the market, targeting South Africa as a gateway to the continent. China Mobile and Alibaba, for instance, are both already operational here.

South Africa, and specifically Johannesburg, has dominated the African data centre landscape for many years due to its geographical location, the abundance of sub-sea cable landing stations (connecting Africa to the rest of the world), political stability, mature enterprise, and corporate markets. However, other hubs are emerging:

Nigeria: Demand from the financial services sector is underpinning and driving expansion of data centre capacity. Several local and pan-Africa data centre operators have and continue to announce new projects, such as the recently unveiled Tier IV Data Centre, designed and built to support private businesses and public sector organisations. The new digital infrastructure in Kano will serve as a first-level backup to the Tier III data centre in Abuja.

Egypt: In North Africa, a number of mature Middle East-based colocation platforms, such as Khazna and GDH, are gearing up to enter Cairo. The significant undersupply here - just c.20MW serving in excess of 22 million people, is a clear draw. Historically the Egyptian market has been challenging to enter, given the monopoly held by the incumbent telecoms company, Telecom Egypt.

Kenya: Nairobi still attracts significant investor attention, and we anticipate fresh development announcements by new colocation operator entrants to the market. However, the government or other significant public sector bodies are yet to declare any intention to migrate IT infrastructure onto the public cloud (Google, AWS & Microsoft), which is ultimately the catalyst for data centre growth. Separately, Kenya's access to renewable transmission power, which represents at least 80% of total power production, is another

DATA CENTRES: INTRODUCTION

significant pull factor. With environmental, social and governance considerations (ESG) at the forefront of stakeholders' minds, Kenya's focus on sustainability should safeguard its position as Africa's next hyperscale market.

Morocco: Our team is working with two international data centre operators on land acquisition projects in Casablanca, where the proximity to continental Europe and the presence of an open terrestrial fibre market offers significant benefits to both the developers and end users. Unlike other parts of Africa, Morocco's economy and general GDP have performed relatively well in recent years. Furthermore, the underlying power infrastructure is reliable, unlike many other locations in Africa. The next twelve months look extremely promising for the African data centre landscape as the social, political, and economic landscapes mature. We anticipate that 2023/24 will see more M&A activity, led predominately by the US data centre Opco, with all stakeholders seeking viable (power, fibre, and permit potential) brownfield and greenfield development sites throughout the continent.

Kenya: Kenya's data centre capability is expanding at a rapid pace, with projected growth from US$190 million in 2021 to US$434 million by 2027, representing nearly a 15% increase (Kenya Data Centre Report). Inland connectivity is also improving, and the country has made strides in deploying a 5G network. However, high land prices have been a challenge for some investors. Nairobi is the primary location for data centres due to its strategic position as the country's capital city.

Mobile banking and electronic financial services have been significant drivers for the country's data centre market, with Safaricom's M-Pesa emerging as one of the primary catalysts for the increase in requirements. Furthermore, the growth of fintech companies and partnerships between banks and mobile network operators has also underpinned demand for data storage facilities.

The Kenyan government is quickly moving to nurture the data centre sector and has plans to increase infrastructure growth and improve nationwide internet connectivity by laying 100,000km of fibre optic cable by 2027. Additionally, 1,450 digital hubs and 25,000 free hotspots will be established to boost e-commerce. This will undoubtedly create more opportunities for data centre operators and other digital service providers to expand their services.

Election uncertainties

The outcome of any African election can often have significant implications for the real estate sector. With 13 countries scheduled to hold the head of state (presidential or prime ministerial) or national legislature elections in 2024, a lot is at stake.

Any political instability has a direct and almost immediate impact. A decline in foreign investments, falling values, and lower transaction volumes often ensue, as has been the case in the Democratic Republic of Congo (DRC).

Conversely, newly elected governments can also be positive for the property industry. New policies stimulating the real estate sector to attract foreign investors have become a hallmark of some of the continent's new leaders. Zambia is an example. The country's recently elected administration has garnered significant attention from international investors with its economic policies, stable political infrastructure, and robust currency that has bolstered business confidence. According to International Monetary Fund (IMF) data, the Zambian kwacha witnessed an impressive appreciation of 33% over the 12 months to June 2022. ■

Moritz Breickmann, investment director at African Infrastructure Investment Managers (a version of this article first appeared on IJGlobal)

Africa is amid a rapid digital transformation, creating attractive opportunities for investors looking to generate significant economic returns and investment impact.

New ways of doing business digitally, a rapid acceleration in mobile data consumption, and a booming tech sector across the continent's major industrial hubs is putting strain on Africa's digital infrastructure. Data centres, fibre-optic broadband expansion, and telecom towers are set to become the new backbone of Africa's economic growth.

More businesses and households are connecting to the internet for the first time, and the continent is experiencing the fastest increase in internet penetration worldwide. Mobile data consumption across Africa is expected to increase by 40% annually until 2025. This is nearly double the global average growth rate.

Meeting this new demand is an opportunity for the continent to leapfrog outmoded technologies like the copper cables still spanning many developed countries and create a new generation of high-tech African jobs.

Growth in data generation and demand

Africa's data demand boom is partly fuelled by an increase in connections and partly by the way we use the internet. Urbanisation and population growth paired with a continuous expansion of 3G, 4G and – more recently – 5G networks allows more and more Africans to connect to the internet.

African consumer behaviour already mirrors a global move towards people spending more of their lives online; connected South Africans are now the world's most online people, and Nigerians and Kenyans are among the top five nations for time spent using social media. The smartphone is how most Africans connect to the internet.

At the same time, sub-Saharan Africa's 64% smartphone adoption rate in 2021 was the lowest of any global region. It is expected that by 2025 the rate for sub-Saharan Africa will increase to 75% while other global regions will be above 80%. This suggests there is still tremendous potential for growth in internet usage. But the expected growth in data transfer and storage is also driven by the way the internet is accessed and used across the continent.

As mobile customers shift from GSM to 3G and 4G and from feature phones to smart phones, there is an exponential increase in data traffic. For example, a low-resolution picture takes up about 0.3Mb, whereas a video will take up a staggering 10-50Mb per minute, depending on the resolution.

Beyond personal usage, digital-enabled businesses and corporations drive data generation and consumption in Africa. 2021 was record-breaking for Africa's technology sector, with more tech start-ups completing $100 million investment rounds than ever before.

Digital technologies are also transforming every sector of the economy, from manufacturing and sales to communications and talent management. According to the World Economic Forum, 60% of global GDP is expected to be digitised by 2022. Digitisation has become not just an enabler, but a necessity for economic activity. And just like for personal usage, change in technology is a key driver for data growth. For

example, video conferencing, cloud computing, data mining and artificial intelligence, as well as the Internet of Things (IoT), are all producing and using vast amounts of data.

Identifying infra gap/opportunity for data centres

Despite the importance of a growing digital economy to Africa's growth aspirations, there is still a lack of digital infrastructure across the continent. Investment in new submarine fibre-optic cables continues to boost intra-continental connectivity, but further investment is needed to extend this connectivity inland.

Broadband cellular network technology – from 3G to 5G – is expected to connect most of Africa's devices to the internet, but this technology requires telecommunication and data centre infrastructure to operate.

The potential rewards for providing the infrastructure necessary to enable the continued growth of the digital economy are substantial. The IFC has identified that increased online activity will add an extra $180 billion to Africa's economy by 2025.

The vast amount of data produced and consumed on the continent will support data centre investments in the region. Consumers expect – and modern applications require – faster connectivity, greater stability, and lower latency. These trends, paired with new data sovereignty laws and higher security requirements, will further promote the onshoring of data.

There is 250MW of installed data centre capacity across Africa, forcing people to rely on data centres thousands of miles away, in South Africa or outside Africa. Demand for data centres across Africa is expected to exceed supply by 300% in the coming years. A rapid increase in capacity to 1,200MW by 2030 is needed to support the growth potential of the continent's digital economy.

Recent acquisitions of African data centre providers by the world's major data centre operators show that this attractive investment opportunity is recognised beyond the continent's borders. But despite these significant investments, with a market experiencing an annual compound growth rate of 12%, ample opportunities remain across Africa to develop and expand data centre capacity.

A digital, impact-driven investment approach

New data centre infrastructure should be state-of-the-art, high-capacity, power-efficient and climate-resilient. Aspects like design, efficiency and energy sources should be top priorities for investors to consider when planning a digital infrastructure investment strategy capable of capitalising on Africa's emerging digital economy.

Greenfield locations and expansions across sub-Saharan Africa provide significant opportunities for returns on data centre projects. Strategies that focus on building platforms to foster organic growth and that pursue economies of scale, thereby offering competitive solutions for customers, also align strongly with impact investment models.

Impact-driven strategies also have the added benefit of supporting the UN's Sustainable Development Goals, particularly economic growth, and climate action.

By supporting the development of critical digital infrastructure, including data centres, there is an opportunity for investors to encourage job creation and new growth opportunities across the continent while achieving attractive investment returns. ◾

Africa's data centre estate

An exert from Mordor Intelligence's Africa data centre market size & share analysis – growth trends & forecasts up to 2029

The Africa data centre market is fairly consolidated, with the top five companies occupying 67.54%. The major players in this market are Africa Data Centres (Cassava Technologies), Open Access, Rack Centre Limited, Teraco Data Environments (Digital Realty) and WIOCC's OADC.

The market is projected to register a compound annual growth rate (CAGR) of 15.41% over 2023-2029. IT load capacity will have steady growth and is expected to reach 1,226.8MW by 2029. The total raised floor area of the country is expected to increase to 5.2 million sq. ft by 2029. The number of installed racks is expected to reach 260,783 units by 2029. South Africa is expected to house the maximum number of racks.

There are 37 colocation data centre facilities in Africa. South Africa holds the highest share in the region. Growing connectivity, increasing demand for cloud services, and rising government incentives for land and tax are a few factors that have accelerated the growth of data centre facilities in Africa.

Teraco Data Environment led the market in 2022, with a share of 35.65% and an operational capacity of 150MW. The company has announced plans to launch a 30MW hyperscale facility in Ekurhuleni, South Africa, east of Johannesburg.

Tier 3 leads the way

According to our research experts, Tier 3 is the largest Tier type of data centre on the continent.

Increasing developments in artificial intelligence (AI), IoT, and blockchain technology across varying sectors, including telecom, cloud, and government, have contributed to the growing data consumption in Africa.

Africa has more than 400 technology hubs across 93 cities in 42 countries. In 2022, the African start-ups raised about US$4.8 billion through 1,000 deals, compared to about US$4.33 billion raised across 820 rounds in 2021. These technology start-ups may require low latency and high-speed, uninterrupted internet and cloud facilities to ensure continuous customer service. The increasing demand for better infrastructure may fuel the demand for more IT load capacity and more Tier 3 and 4-certified

Africa Data Center Market, CAGR, %, By Country, 2023 - 2029
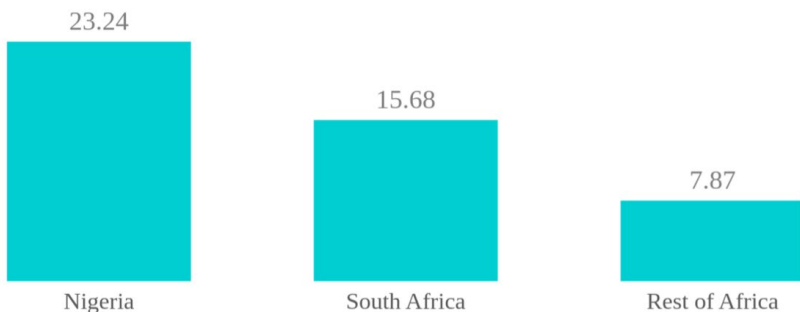
Source : Mordor Intelligence

data centre facilities.

The long-term growth vision is better suited to set up at least Tier 3-certified data centres to cover the initial high cost of establishing the facilities. However, Tier 1 & 2 facilities were losing traction, given the limited power availability. Hence, to ensure the longevity of investments and tackle the increasing demand for faster and more reliable data storage and processing facilities, companies are focusing on constructing Tier 3 and 4 facilities.

Tier 4 data centres offer higher bandwidth speed, low latency, better connectivity, and disaster recovery options. Thus, during the forecast period, the Tier 4 segment is expected to record a CAGR of 18.02%, compared to the Tier 3 segment at 14.40% and the Tier 1 & 2 segment at 3.26%.

South Africa is the largest Country

South Africa is the most prominent country for data centres in Africa since the country comprises about 42 million internet users. It also has internet penetration rates closer to 70%, and its adaptation to e-commerce and other demand-generating aspects is growing. This, in turn, has led data centre operators to set up their data centre facilities in the region to leverage the increasing demand for the facilities.

South Africa held a market share of around 63.1%, followed by the rest of African countries at 24.4%, and Nigeria accounted for 12.4% in 2021. The company that has strengthened its market share in South Africa is Teraco Data Environments (acquired by Digital Realty), which currently has a market share of 36.72% and operates at an IT load capacity of 150MW. Through its subsidiaries, Medallion Communication Ltd and Teraco Data Environments, companies such as Digital Realty have announced plans to develop mega and massive data centres with IT load capacities of 160MW and 110MW during the forecast period.

Cape Town has been ranked among the top smart cities worldwide for its IoT and real-time data analysis through sensor implementation. Smart cities create huge amounts of data owing to the varying smart services imparted to the citizens. The country is expected to witness more such smart cities as operators plan to extend the deployment of IoT-based devices. The rest of Africa also comprises smart cities like Kigali, Rwanda, which have sensors to measure air quality, monitor the power grid's safety, and detect water leakages. Due to all the above factors, the South African data centre market is expected to grow and register a CAGR of 15.68% over the forecast period. ■

Africa Data Center Market, CAGR, %, By Tier Type, 2023 - 2029

Tier 1 and 2	Tier 3	Tier 4
3.26	14.4	18.02
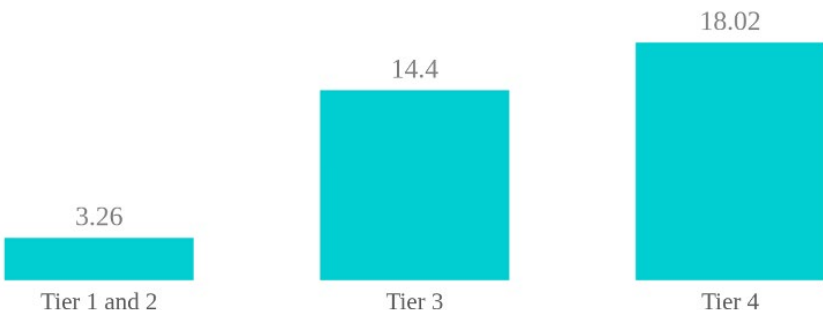
Source : Mordor Intelligence

Wojtek Piorko,
managing director Africa, Vertiv

As a global provider of critical digital infrastructure and continuity solutions, Vertiv is increasing its presence across the African continent with a particular focus on the connection and protection of networks with core-to-edge solutions. In the Europe, Middle East and Africa (EMEA) region, there are 10 manufacturing and assembly locations, more than 65 service centres, around 650 service field engineers, more than 100 technical support and response resources, and five customer experience centres.

With our new 'Africa for Africa' project, we're strengthening our position even further. The initiative is aimed at addressing our local clients' needs and we're doing this by creating a new internal structure that focuses strongly on leveraging local skills and knowledge within our team. I see exciting times ahead for Vertiv in Africa, as we now have more independence and focus within the company's EMEA regional division. We have been gearing up for growth this past year and will continue to do so moving forward.

General telecoms trends seen across the continent include ongoing digitalisation, the need to reduce carbon footprint, and the decentralisation of networks. The telecommunications industry across Africa occupies a complex yet active space, with significant investment in subsea connectivity cables, increasing demand for data centres, and the rollout of terrestrial fibre broadband infrastructure gaining increasing prominence.

Challenges include high costs of connectivity in some countries, together with the average speed of available internet; as well as limited access within rural areas, and general infrastructure issues. Other complications include potential issues around currencies, including availabilities, exchange rates and devaluations, as well as pockets of political instability in certain regions. Local skills shortages can also present challenges with regards to projects. The cost of implementing 5G networks and de-commissioning 3G and 4G networks comes under the spotlight, as does the need to be efficient with energy and water sustainability requirements.

Trends in Africa today include issues such as efficiency/sustainability; increasing demand for complete solutions that are easy to implement; and increasing demand for the provision of micro and small data centres.

There are several principal expectations from almost all customers in Africa, with the following topping the list: understanding the local environment and specific customer needs; providing quality technical advice across the whole timeline of the project; and delivering reliable after-sales support.

Currency devaluation, limited availability, unpredictable challenges related to lead times, and a shortage of local skills can impact on each project. Africa is a particularly dynamic region, with huge growth potential; however, there are areas where the region is more unstable than other parts of the globe. ■

Looking ahead: Business in Nigeria, South Africa and Kenya will continue to dominate Vertiv's activity within the continent, but noting that we regard northern Africa as being a 'sleeping giant.' Here I am referring specifically to possibilities within Morocco regarding hybrid, renewable or alternative energy solutions, as well as in Egypt and Libya, where we see opportunities for governmental investments as well as foreign investment from existing multi-nationals situated in those countries.

At the same time, the DRC offers opportunities for many telco- and digitalisation-based projects. Long-term internal reforms in some of the main players such as South Africa and Nigeria will continue to bring positive regulatory change.

Dr Ayotunde Coker,
CEO, Open Access Data Centres

This year has been excellent - both challenging and rewarding, among sometimes trying conditions.

We have worked hard to develop the OADC brand and much progress has been made to date. We have changed the narrative in the market with our Converged Open Digital Infrastructure value proposition and the innovative core to EDGE strategy, right sizing data centres from our core DC, right-sized data centres for the locations we operate in, and distributed EDGE data centres to the point of use. We've been very busy.

The Equiano cable landed into the OADC Lagos facility in Nigeria went live in 2023; meanwhile, the Meta-backed 2Africa East

"If there was a single technology that could drive the African market in 2024-2025, I would say that it would be cloud and content. Consumption in Africa is what I call the 'sachet economy:' people and small businesses earn today to consume tomorrow in sachet quantities, and cloud is a way to consume technology with this model."

"We currently have only 1% of global data centre capacity in Africa, but with 17% of the global population and the rising mobile smartphone penetration, the opportunities for growth on the continent are extremely significant."

cable was landed into our OADC Durban site in Amanzimtoti, South Africa, in early 2023.

The challenges we've experienced this year have included building a range of data centres in parallel, in multiple countries, and launching and growing the OADC brand rapidly to strengthen our position.

The opportunities on the African continent are vast. We have been redefining the narrative of open access connectivity in tandem with an open access carrier neutral data centre company to create our Converged Open digital Infrastructure proposition to meet the opportunities available.

Africa is at the cusp of significant data centre expansion in order to deliver fibre penetration underpinned by data centre infrastructure. We currently have only 1% of global data centre capacity in Africa, but with 17% of the global population and the rising mobile smartphone penetration, the opportunities for growth on the continent are extremely significant.

Much is happening at the point of use, be it the phone, tablet, or PC, with social media and other business applications. This is growing and the remarkable expansion in

"The innovation and success of pay-as-you-use with mobile telephony has shown its potential for a continent where the mobile device is dominant for access to content."

content throughput in the largest Internet Exchanges in Johannesburg and Lagos is just one of the indicators that we're seeing.

Broadband penetration and adoption, access to content and a whole wide range of services such as Facebook, Tik Tok, Fintech, are all growing in popularity and driving data consumption. Given the scale of Africa, latency is an issue that must be overcome by hosting content closer to the point of use.

If there was a single technology that could drive the African market in 2024-2025, I would say that it would be cloud and content. Consumption in Africa is what I call the 'sachet economy:' people and small businesses earn today to consume tomorrow in sachet quantities, and cloud is a way to consume technology with this model.∎

Looking ahead: What else should we watch out for going forwards? The innovation and success of pay-as-you-use with mobile telephony has shown its potential for a continent where the mobile device is dominant for access to content.

The emergence and proliferation of generative AI in Europe will demand more data centre capacity, which is scarce due to power and planning constraints in Europe. I see capacity substitution occurring and Africa content and cloud compute, currently in Europe, will be transferred to Africa as the hyperscale facilities are brought on stream, in particular Lagos and Nairobi. This is now happening with the emergence of OADC in Lagos and IX-Africa in Nairobi.

Nigeria and Kenya will be the most vibrant countries for wireless communications over the course of the next year. Given the scale of subsea cables connected to Nigeria, the scale of the population and economy, I expect the trajectory of growth in the Lagos locale to rise significantly and the emergence of a range of hyperscale data centres will enable that growth.

My assertion and projection is that Lagos will have as much expandable capacity as Johannesburg in the next three years.

The implementation of Cypherwave at our Isando core data centre campus is our standout success story from 2023. That was an excellent anchor client kick start to the facility, and we have a great and growing strategic relationship with Cypherwave.

Data centres continue to be regulated - as any business would - for required standards of business governance and due diligence. Globally, typically data centres are not uniquely regulated beyond normal business regulation.

Cross border cooperation has been dynamic this year, and there is competitive cooperation in the industry. The success and growth of the Africa Data Centres Association is a testament to this, where competitors and key industry actors come together to build holistic industry across Africa, for the benefit of all.

We expect continued growth in the key anchor Tier 1 countries; Egypt, Kenya, Morocco, Nigeria and South Africa. Other Tier 2 countries, such as DR Congo, Ethiopia, Ghana, Ivory Coast and Zambia, will emerge, with increasing growth of Internet Exchange platforms in those markets.

Robert Mullins,
CEO, Raxio Group

Over the past year, Raxio Data Centres in Africa has experienced substantial growth and success. We take pride in maintaining an uninterrupted 100% uptime in our facility in Uganda, demonstrating our unwavering commitment to delivering reliable and uninterrupted data centre services.

Additionally, we've achieved a significant milestone by successfully getting to the end of the construction process of our state-of-the-art data centre facility in Ethiopia, a strategic market for us. We've also made substantial progress in constructing facilities in Mozambique, Ivory Coast, and the Democratic Republic of Congo (DRC), setting the stage for our continued expansion across the continent. Furthermore, we've broken ground on a new data centre facility in Angola, marking our entry into this promising market and further solidifying our position as a leading data centre provider in Africa.

In line with our growth ambitions, we have raised a debt facility of up to $170 million, a testament to our investors' confidence in our vision and capabilities. This capital infusion will play a pivotal role in fuelling our expansion initiatives and the rollout of cutting-edge data centres in key African markets.

Our growing customer base reflects the increasing recognition of the value of our secure and reliable infrastructure solutions across various industries. Additionally, we've invested in the development of our team, fostering a culture of excellence and innovation that drives our continued success.

The African continent offers significant opportunities, including growing demand for cloud services in both enterprise and public sectors, catering to the evolving needs of mobile network operators (MNOs) for latency-sensitive applications, and contributing to the development of digital hubs in countries with world-class data centres. This positions Raxio Data Centres as a crucial player in Africa's digital transformation, fostering innovation, job creation, and investment.

However, challenges do exist, primarily stemming from the diverse regulatory frameworks across African markets. Adhering to various rules and regulations necessitates a tailored approach in each country, demanding time and resources. Additionally, the reach of connectivity across markets remains a substantial challenge, requiring collaboration with telecommunications providers and governments to improve overall infrastructure. Despite these challenges, Raxio Data Centres remains committed to leveraging the opportunities presented by Africa's evolving digital landscape while addressing regulatory complexities and connectivity limitations to provide secure and reliable data centre solutions across the continent.

In the evolving technology landscape, three key trends have emerged: a growing migration to the cloud for scalable and cost-effective

"Many countries are proactively implementing measures to support data centre development, streamline licensing processes, and enhance data protection regulations, which bodes well for our industry's growth."

infrastructure; a surge in digital content consumption necessitating localised data delivery; and a decreasing cost of connectivity enabling broader digital participation. These trends underline the vital role of data centres. They serve as the backbone for cloud computing, accommodating the remote hosting of data and applications, while also acting as the linchpin of content delivery networks to reduce latency. Furthermore, as connectivity becomes more accessible, data centres are essential for businesses and individuals to harness the benefits of digital services, making them a fundamental cornerstone in our increasingly interconnected world.

Agility, local expertise and deep understanding of the market dynamics are critical for success in Africa. The African market is distinct in its rapid technological leapfrogging and its vast untapped potential. However, each country within Africa comes with unique requirements, such as the need to adapt our solutions to varying levels of (power, connectivity, and road) infrastructure maturity across regions.

One user success story that stands out for us from 2023 is our collaboration with a leading financial services institution in Uganda. By providing them with scalable and secure data centre services, we played a pivotal role in improving the uptime of their digital systems and reducing the overall cost associated with managing their infrastructure in-house. As a result, they were able to improve customer satisfaction by providing a higher quality of service to their customers and redirect capital towards their core business.

Regulatory environments have generally evolved positively in 2023 to accommodate the growing digital economy. Many countries are proactively implementing measures to support data centre development, streamline licensing processes, and enhance data protection regulations, which bodes well for our industry's growth.

Cross-border cooperation in 2023 has been promising, particularly within the West Africa Economic and Monetary Union (UEMOA) with increasing collaboration among neighbouring countries to enhance data connectivity and infrastructure. We expect this trend to continue and strengthen in 2024 and 2025 as African nations recognize the benefits of regional data integration and cooperation. ∎

Looking ahead: Our vision for Raxio Data Centres in Africa is one of continued growth and innovation. In the coming year and beyond, we plan to further consolidate our position as a leading provider of digital infrastructure on the continent. This includes, commissioning five new facilities over the course of the next 16 months, and beyond that, the expansion of our data centre footprint into new regions.

Additionally, we aim to enhance our services by continuing to invest in cutting-edge technologies, including green and sustainable data centre solutions, to align with our environmental sustainability goals. We remain committed to nurturing local talent and fostering partnerships that support Africa's digital transformation journey.

As we navigate the evolving technology landscape, we see immense potential in emerging areas such as content, cloud, and edge compute. We will continue to adapt our offerings to meet the evolving needs of our customers, ensuring that Raxio Data Centres remains at the forefront of innovation in Africa's digital infrastructure space.

We are excited about the prospects that lie ahead, and we are dedicated to playing a central role in shaping the future of Africa's digital economy by providing secure, scalable, and sustainable data centre solutions.

Sibongile Thobakgale,
project sales manager (data centre)
for Southern Africa, Aggreko

Africa is growing in the data centre space. However, the region faces many challenges. Data centres are power hungry and, and keeping the equipment cool, especially in Africa, requires a lot of energy. Reliable power is a challenge in most African countries. In South Africa, Eskom is experiencing infrastructure challenges, causing loadshedding.

The second challenge is that currently, much of Africa's data is stored in Europe. This has prompted many African nations to reassess data regulations, especially when it comes to storing sensitive information.

Challenges like these are going to hinder the growth in the African data centre market.

It is projected that there will be 525 million people in Africa accessing the internet. It's a fast-growing market, with everything being done online. This is a great opportunity as demand for digital infrastructure continues to grow.

In terms of trends, we are seeing increased adoption of high fibre. The compact cable construction plays a different role in Africa, and communication services providers are rethinking their fibre packages.

Data centres are evolving in a 5G-enabled world, and with the evolution of AI, comes the intelligent data centre.

Of course, there is also now the focus on ESG - everybody's going green. We know that renewable is hard in Africa, however, Eskom is investing to build renewables over the coming years.

Hyperscalers like Amazon are planning to expand. Teraco's 186MW JB5 is expected to be completed in 2024, which is the biggest co-locator in Africa.

On 5 October, BCX launched the Alibaba cloud region in South Africa. I think that is one of the biggest success stories, because Google and AWS are international. When they come here, they're still international. But BCX is a local company which can compete with the hyperscalers with a local cloud data centre. This will enable it to offer cloud services closer to customers, decreasing the latency while meeting data sovereignty requirements. ∎

"It's a fast-growing market, with everything being done online. This is a great opportunity as demand for digital infrastructure continues to grow."

Looking ahead: Subsea and fibre connectivity growth, currently rampant across the continent, will have a major impact on driving the market.

There are five countries in Africa that are going to be vibrant for the next two years: South Africa, Nigeria, Egypt, Morocco, and Kenya.

When you look at the growth trends in South Africa, we have a total capacity of 408MW, but the live power is just 106MW. Some are under construction, and some are new builds that are envisioned in the next two years. Likewise, Nigeria has got 100MW total capacity, with live power of 21MW.

When you look at South African projects, there's a phase two that is coming for Vantage Data Centres, Teraco is building the 180MW JB5 in Isando right now, as well as SPT2 in Cape Town, and Africa Data Centres is upgrading most of its facilities. Vantage Data Centres is also building another 30-40MW data centre, and is currently on construction of phase two.

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Website

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Colocation

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WIOCC Group company Open Access Data Centres (OADC) is Africa's fastest-growing data centre company and was established to transform the provision of data centre services for Africa.

OADC is deploying its open-access, Tier-III hyperscale data centres at major cable landing locations and in key business hubs throughout Africa. In parallel, it is rolling out OADC EDGE data centres to support service providers in cost-effectively extending network reach and to meet rapidly growing demand for content storage, processing and delivery at the network edge.

OADC prides itself on delivering an unparalleled client experience, offering expert assistance and tailoring bespoke solutions to client needs.

OADC is an environmentally responsible company and as such is pursuing a wide range of environmental and sustainability management accreditations.

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Going further in critical communications

chapter
Critical
Communications

4

Ildefonso de la Cruz Morales,
principal analyst, government
& manufacturing critical
communications, OMDIA

A trajectory of growth and innovation

Africa, a continent of kaleidoscopic diversity, covers a very dynamic mix of countries with their unique geographical traits, political climates, and infrastructural disparities. This diversity intrinsically shapes the critical communications market, fostering a complex landscape. Across the region, nations with strong economies and highly developed urban hubs that have invested heavily in technologically advanced public safety solutions can be found alongside countries that are only beginning to lay the groundwork for basic critical networks to address emergency response infrastructure requirements for the protection of their increasing population.

The African market is still facing huge macroeconomic challenges fuelled by the aftermath of the COVID-19 pandemic, the impact of the global chipset shortages as well

as the recent political unrest in the Middle East. These hurdles for the regional market have consequently translated into high inflation and sharp depreciation of some local currencies, forcing many governments to reassess their technology investments. However, it should be noted that the focus on critical communications, especially for public protection and disaster relief, has remained resilient and continues to record growing volume of radio shipments and infrastructure rollouts for almost all digital technologies on the back of the increasing demand both in urban and rural regions.

In developing countries and rural areas that lack emergency response infrastructure, OMDIA has observed a trend for initial investment efforts to prioritize law enforcement agencies. Generally, Fire & Rescue and Emergency Medical Services (EMS) technical capabilities lag somewhat behind, and the focus is placed on bolstering the technical capabilities of law enforcement agencies and the establishment of basic emergency response provisions. For these developing regions in Africa, the replacement of worn-out equipment remains relatively slow due to conservative decisions from governments with limited budgets. As a result, a preference for off-

the-shelf technology has been observed and high demand for cost-optimized digital technology (CODT) solutions and services.

High power analogue radio systems have traditionally provided reliable lifelines in these challenging landscapes, especially for rural areas. But even those agencies that once considered analogue radios, like VHF technology unchallenged, are being persuaded towards the digitalization of their critical communications equipment driven by the appealing cost of technologies like DMR and PDT, and in some cases a direct shift towards push-to-talk (PTT) over cellular solutions. This market represents a considerable opportunity for digital migration thanks to the availability of multi-tiered cost optimized digital devices. Omdia projects that, by the end of 2027, less than 4% of the active critical communications connections will be analogue, making this market one of the most digitized regions in the world.

On the other hand, higher-end customers have typically migrated to technologies such as TETRA and P25. Some examples of local governments enhancing their public safety and security agencies with these critical communications technologies are Kenya, Nigeria, and Angola. In this last one, the innovative decision to adopt a hybrid TETRA network enhanced with LTE capabilities has been made futureproofing the national public safety network with narrowband and broadband convergence.

Additionally, there are safe city projects in the works in South Africa, Mauritius, Congo, Kenya, Sudan, and Tanzania as well as plans for multiple programs in sub-Saharan Africa. Other nations, like Libya and Nigeria have already adopted TETRA technologies as a high-end digital critical communication solution for their public safety agencies. TETRA solutions are also particularly prominent in transportation critical infrastructure

enhancements. The political unrest and security requirements in the regions are one of the main drivers spurring the decision of governments to secure their communications.

Similarly, some topologies in the region particularly suit the deployment of high-powered P25 equipment. North African countries are using P25 in desert areas benefiting from the P25 technology support of larger cell size coverage. Omdia has observed an uptake in the demand of countries including Algeria, Angola, Kenya, and Nigeria.

But, without a doubt, cost-optimized digital technologies dominate the African critical communications market, representing close to 60% of the entire installed base. Additionally, these technologies that offer sensibly priced digital communications remain the fastest growing technology group in the region. This growth will be seen in transportation, industrial and utility sectors for the next five years.

Omdia also forecasts that countries with limited budgets will opt for the adoption of CODT solutions even for their public safety and security user groups, rather than building expensive nationwide networks supported by high-end standards. Countries like Uganda, Ethiopia and Tanzania are the perfect example since they have chosen DMR technology solutions to provide critical communications to their police forces. Other countries like Kenya and Tanzania have also enabled other organizations like their port authorities with DMR solutions.

DMR tier-II is very well-suited to open geographic regions, resulting in many countries in Africa looking to adopt these solutions. It is also worth noting the potential for an increase in demand of DMR tier-III and dPMR model 3 networks in the region. Similarly, as a direct consequence of foreign investment, PDT technology is experiencing a growth surge. It is

still being used sporadically across the region, but OMDIA expects its growth to continue.

Looking at the African public broadband mobile market, OMDIA has observed that LTE networks currently represent more than 20% of the mobile subscriptions. This a low number when compared with other regions in the world but major efforts from service providers and government have been put in place resulting in a major push of 4G technology. OMDIA expects 4G LTE technology to dominate public communications by 2027 with more than half of the total mobile subscription market. Some African countries have been early adopters of critical LTE technology. OMDIA has observed major efforts and relevant deployments in Nigeria, Kenya, and Ghana. As a consequence of these advances from 2G to 4G and 5G on the horizon, over-the-top PTT technologies leveraging broadband are becoming increasingly popular. Multiple industry sectors are attracted to the advantages of PTT offerings and the possibility of being connected by radio over long distances without additional dedicated infrastructure.

In Africa, the adoption of 5G technology has remained low to date. This is mainly due to the delays in spectrum allocation and the barrier of entry from high prices for end-users 5G devices. However, multiple governments have initiated active programs and Omdia projects 5G adoption to increase significantly over the next five years. One of the main drivers for this growth is the launch of 5G services by major service providers in Nigeria, Angola, Botswana, Kenya, and Tanzania in late 2022 and several North African markets are expected to launch their 5G offerings by the end of 2024.

Despite some of the ongoing challenges faced in the region, Africa's critical communications market continues to chart a trajectory of growth and innovation. The pursuit of resilient secure and efficient critical communications is propelling Africa towards high digitalization fuelled by the availability of cost-optimized digital communication solutions. ∎

Ken Rehbehn,
principal analyst, CritComm Insights

Public safety, wireless and the road to prosperity

Africa is massive, with its 30 million square kilometer landmass surpassed only by Asia. Technology progress in this diverse region varies widely, from urban centers humming with LTE airwaves to rural villages with limited connection to the outside world. Advancing progress in society and industry demands investment to broadly spread technology benefits across the land. While the challenges remain complex, the elusive goal is a vital step toward boosting public safety and economic prosperity.

A diverse continent benefits from diverse wireless strategies

Africa is no stranger to advanced 4G LTE services. Mobile network operators have built out networks in urban centers and other major population areas. The resulting high-performance coverage has transformed banking and brought new educational resources to areas that lack wired communications access.

However, vast swaths of rural regions still need robust data communications that can enable security, education, health, and industrial

growth. With little to no prospect for fibre expansion, these regions remain constrained. The need for more fibre resources leaves wireless support dependent upon capacity-constrained microwave transport.

This patchwork of connectivity options for public safety operations means that long-range analog or DMR networks must remain the foundation for rural coverage. Advanced LTE services, where available, offer powerful capabilities that can improve public safety responses. But with access to these networks limited, investment in cost-effective narrowband radio technologies remains an essential communications necessity.

Leapfrog technologies

Establishing a dense grid of high-capacity cellular base stations operating LTE or 5G across the African landscape remains a tall order. Beyond the daunting geographic scope, basic infrastructure is a challenge. Power infrastructure is spotty and unreliable. Fibre access is rare. And vandals frequently target infrastructure for personal gain.

Against this backdrop, new satellite services offered by low Earth orbit (LEO) systems may provide modest relief. With 100-300Mbps speeds, LEO data services can quickly establish advanced communications technology in areas facing infrastructure challenges. These investments can light up remote regions and foster improvements in education and healthcare. Access to better data services can translate to economic growth for local businesses.

Expanding opportunities with direct-to-satellite mobile communications may benefit rural Africa, though the cost of these subscriptions will likely be beyond what individual users can afford. For public safety organizations, however, these new capabilities may deliver a big impact at an affordable price point.

5G drivers limited

Industrialized cities across Europe, Asia, and the Americas embraced 5G to contend with rapidly growing cellular data loads. The 5G New Radio (NR) air interface opens up new spectrum ranges unavailable with LTE. And the flexibility of the air interface sets the stage for precision wireless systems serving industrial use cases.

However, the African landscape and infrastructure constraints limit the requirement for 5G deployment in the region. Following years of LTE enhancements that added flexible combinations of spectrum bands, the 4G technology remains sufficient for most mobile network operators.

One thrust of 5G progress addresses improvements in non-terrestrial networks (NTN) or satellite-based services. As with early LTE-focused efforts for direct-to-satellite, 5G NTN progress coupled with LEO constellation expansion may set the stage for broader 5G impact across the region.

A role for policy makers and international efforts

Economic growth in the region depends on progress in education, healthcare, safety, security, energy, and other foundational elements of society. Ubiquitous access to high-performance data services remains a key enable in each element. Government policymakers must take steps to strip away barriers to fibre and wireless deployment.

The international community can assist, as well. Financial contributions and business expansion that bring wireless access into communities help expand markets. The vitality and success of the African continent are essential for a healthy and prosperous world. ■

Robert Bell,
executive director, World Teleport Association

Growing connectivity options boost the prospects of African mining

The abundant mineral resources of Africa have made it significant contributor to exports, revenue, and gross domestic product (GDP). Before the pandemic, minerals and fossil fuels accounted for over a third of exports from nearly two-thirds of African countries. In any discussion of Africa's economic future, mining must be on the table.

The modern mine has come to rely heavily on automation, from self-driving loaders and trucks to automated drills and AI-driven video surveillance. Those systems, in turn, rely on connectivity across the mining operation, to regional offices, headquarters locations and the worldwide web. The good news for mining companies and their investments is that connectivity has become less expensive, more powerful, and more flexible over the past few years than anyone could have anticipated.

Why connectivity matters

Robust, reliable, and widespread connectivity contributes to mining operations in many ways.

Health and safety. Mining has long been one of the most dangerous jobs in the world. With competition for qualified talent at an all-time high, automating work site surveillance with video analytics can produce sizable improvements in worker safety. Unlike supervisors, cameras and data processing systems never sleep or get distracted, and they can play a key role in making sure employees comply with rules designed to protect them. The health of people living near the mine is equally important to progressive operators. The same surveillance and analytic capabilities enable mines to monitor their environmental impact and take preemptive action to prevent harm.

Productivity of people and machines. The systems put in place to protect health and safety can be leveraged to significantly boost the productivity of resources and workers. As sensors on mining equipment and systems collect massive amounts of data, it creates an opportunity for sophisticated analysis that reveals bottlenecks and cost-inefficiencies in operations.

Autonomous haulage and drilling systems have an immediate impact. According to Nokia, haul trucks in an open pit mine are scheduled for an average of 5,500-6,000 engine hours per year. Autonomous trucks achieve significantly higher utilization, resulting in higher annual engine hours and more tons of material moved per day. Tire life is also significantly longer because trucks operate only on a programmed basis and avoid vehicle collisions and sidewall punctures.

Analytics can also generate predictive maintenance schedules based on operating data, so that equipment can be quickly taken offline and serviced before a major breakdown can bring operations to a halt. On a higher level, real-time analysis of data from operations, drilling reports and geological surveys can generate recommendations on exploration and improve metals processing methods to do less environmental damage.

Digital twins. For the most advanced operations, the 'digital twin' is transforming how companies manage complex systems and infrastructure in the field. Using data from construction and operation, analysts create a digital replica of the complete mine, which is maintained up to date from the data flowing in real time from the field. As additions and changes to the facility are proposed, they can be tested with great accuracy on the digital twin before fabrication and installation. Digital twin technology is being adopted at a record pace because, by eliminating errors, it can save millions of dollars on field implementation.

New options in the sky

Despite the spread of optical fibre, satellite remains the core option for connectivity from the mine to the world, because most mining operations are located far from urban areas. For decades, all satellite services were provided from geostationary orbit or GEO, at an altitude of 36,000km. GEO satellites are powerful and offer highly reliable service, but the distance from satellites to the ground introduces transmission delay called latency. For most applications, this is not a problem – but enterprise resource planning systems and cloud services from Microsoft Office to mining applications such as EarthCache and Lightship are highly interactive and operate poorly over high latency connections.

Massive investment over a decade has created satellite constellations operating in medium Earth orbit or MEO and low Earth orbit or LEO. At these lower altitudes, latency ceases to be a barrier, and the new generations of spacecraft being launched are making available massive amounts of new bandwidth at much lower prices.

In Papua New Guinea, K92 Mining has contracted for a combination of GEO and MEO connectivity from SES O3b to improve cost and resilience. The O3b service is primary and GEO service backs it up, with a technology called SD-WAN used to automate seamless hand-offs from one platform to another. In Western Australia, Atlas Iron has contracted for a combination of GEO and Starlink LEO service, with the GEO VSAT supporting mission-critical operations and Starlink providing crew welfare connectivity. An advanced network management platform called SIGMA from the service provider Speedcast blends these paths into a single wide-area network and provides robust cybersecurity.

Compared with the 'single thread' connectivity traditional for mining, these hybrid satellite solutions increase the reliability of service, expand the range of applications it can support and give crew members an internet connection that can support all their needs.

New options on the ground

WiFi has been the staple of onsite connectivity for years, but private LTE is rapidly emerging as a preferred technology for onsite connectivity at mines.

The technology leader in this space is Nokia, which offers a Digital Automation Cloud that delivers significant improvements in range, performance, and cost. Private LTE has 4-100 times the range of WiFi, depending on conditions, and offers more predictable performance for multiple users. While WiFi security is based on passwords, LTE uses military-grade security with SIM authentication and end-to-end encryption. It also provides simplicity of operation, because it integrates LPWAN technology for Internet of Things applications on the same radio network.

Mines are using private LTE for group communications, push-to-talk radios, and push-to-video, which can speed collaboration and problem solving. More sophisticated applications include high-accuracy positioning of their automated vehicles to prevent accidents, control of drone networks and video analytics.

A partnership among Huawei, MTN and Mintec introduced a 5G private network at South African mines operated by Canyon Coal and Zijin Mining Group in 2022. The high bandwidth and low latency of 5G enabled real-time communications among mine workers, with planned applications including proximity detection, vehicle detection, asset tracking and wireless video surveillance.

For Africa to benefit fully from its mineral abundance, policy leaders need to understand the requirements of modern mining companies for productivity, connectivity, and process automation. According to McKinsey & Company, worldwide mining operations were as much as 28% less productive in 2015 than they were a decade before. In coming years, it will be the most productive mines, not the ones with the biggest deposits that will win the competitive battle to supply mineral wealth to the world. ■

Louis Lambert,
chief revenue officer, 6Harmonics

We've sold products in Africa for years, but with less focus than in other regions. Our main challenge in Africa this year was the lack of product certification for some markets - but we are changing this for 2024 and in the future.

We have developed an upgraded product and are securing the FCC, ISED, and the required ETSI certifications. We expect the ETSI certifications in December 2023 and the first production shipment to be ready at the end of January 2024.

We're seeing an increased dependency on people and things to be constantly connected. Although there is an appetite for higher connectivity speed, the basic requirement is to be connected. More and more application developers assume that the devices are always connected, hence the need for real-time connectivity. On-prem computing alone is not enough; edge computing in edge devices needs to be married to edge computing.

From a technological viewpoint, we've seen new connectivity options in Africa that were unavailable just a few years ago. However, some of these, like LEO satellite connectivity, are still too expensive for many use cases. We also see tremendous energy and investment in edge computing to enable people and machines to process data locally and reduce reliance on high-capacity network connections. A high-capacity network connection is always desirable but often unrealistic due to location, coverage, and cost. Edge computing can function even when the communications path is marginal or interrupted, delivering more reliable OT operations and a safer work environment with reduced reliance on high-capacity network connection. With edge computing becoming available, containerized applications and micro-services are now possible. We are also seeing a push by OT to migrate from x86 to ARM-based. OT drives this push in the industrial markets, where footprint, resources, power consumption, reliability, and security are needed.

Africa is well poised to benefit from experiences and learnings from other markets and to adopt new applications and technologies fitting for digitization, as it does not have as much legacy infrastructure to deal with. Unlike most of the world, African mobile operators are not racing to build ubiquitous 5G coverage only to realize that users do not want to pay for it. ■

Looking ahead: Telecommunications is one of the most critical technology sectors to drive the African market in the future. The people of Africa need to reduce their dependency on commuting for education, work, health services and leverage communication. Moving from commuting to communicating is an essential milestone in Africa's growth.

The continent has diverse small markets with individual needs and requirements, from the regulatory, geo-political, economic, business processes and local customs. Doing business in Africa is not as easy as in North America, but the market entry barrier may discourage competitors.

We are still researching and working closely with the Canadian embassy to determine our best focus areas by considering mining output, security, financing, regulatory, and political landscapes. We are excited about Africa as a mining market and the significant opportunity to help with the digital divide. Africa is part of the focus from now on.

Nimrod Kapon,
founder and CEO, Oasis Networks

The dynamic within Africa has been characterised by both growth and instability. In the last year we have seen large scale projects mature within the region and we are witnessing significant developments within African communication networks.

In terms of new technology, we are taking an interest as to how LEO and the rollout of Ka-band small terminals will have an impact. The continuous penetration of Ka-band is an interesting advancement within the satcom industry in Africa. LEO, and especially Starlink, has become something that people are asking about. Additionally, the VSAT market is mature and proven within Africa and, without the same level of reliability, it will be interesting to see how LEO technology competes. There are operators which offer dedicated capacity however it remains to be seen as to how it will be received.

As the market matures and the demand for development within Africa continues to gain pace, we are seeing significant opportunities within connectivity. As the national infrastructure becomes more established, it can support

"People in Africa are more connected than ever and are well aware of what is going on worldwide. They own devices and their hunger to be connected affects the VSAT market."

more initiatives. Oasis Networks is currently involved in two national projects, in two different countries, which can flourish due to this growth, paired with political stability.

The largest challenge within the region is related to political instability. It affects our customers' activities in the continent by delaying projects and developments. Unfortunately, we have seen political instability have a negative impact on the business environment within Mali, Niger, Burkina, Gabon, and Sudan.

We are seeing an increased need for better communication networks from our private sector customers. As their businesses grow alongside the African market, they require better connectivity, and therefore they need more support on the ground.

We're also seeing growth in terrestrial technologies across the region, including 5G and fibre. People in Africa are more connected than ever and are well aware of what is going on worldwide. They own devices and their hunger to be connected affects the VSAT market. It has increased both consumer and market demand. For example, the mining industry needs communication systems for operational reasons as well as welfare connectivity (providing video conferencing, emails, internet browsing, streaming for mining teams). The African market needs more of everything. Competition is growing significantly, especially within the VSAT sector.

Compared with the rest of the world, conditions in Africa are certainly different. Infrastructure can be poor in remote areas and the weather often poses problems. This must be factored in and respected by those doing business on the continent. There is a need to be familiar with what is going on at the ground, with it being very important to consider local populations. A flexible approach

is essential. You may need to wait for equipment to be released and this can take time. You must consider weather conditions. Has this affected your planning? Are the roads you need to use blocked? Things can take longer and so you must be able to adapt. You must understand both the unique culture and conditions.

Working within the region requires us to balance both the opportunities from the market's continuous growth with the challenges presented by political instability. Our success derives from our open-minded approach in which we employ adaptable, flexible models of operation. Despite meticulous planning, there are instances when you will have to readjust your strategy in-field to ensure success in delivery. We know that adjusting operations to suit the situation in front of you leads to the best success.

Angola now has two of its own satellites, Angolasat-1 and 2 which can be utilised to boost local projects. Angolasat-2 is a high throughput satellite (HTS) that will deliver services to the entire African continent and some of Europe. On the other hand, there is a possibility that the 'instability belt' from Mali to Sudan, will lead to more governmental, military and security projects in the neighbouring countries. I think that east Africa is likely to receive more support from the West which will go towards easing instability.

The regulatory environment continues to be a complicated issue in Africa. Political

> **"Working within the region requires us to balance both the opportunities from the market's continuous growth with the challenges presented by political instability."**

instabilities could result in governments paying more attention to communication markets and I am concerned that any changes in regulation could have negative effects. It has been reported that five people were arrested for selling Starlink service in Senegal. My fear is that it could lead to censorship of the internet as we saw in DRC a few years ago. There tends to be a heightening of regulations when political situations are unstable.

Border crossings can be dependent on infrastructure in some parts of the continent. For example, it is easier to access Gao in East Mali from Niamey, Niger, than from Bamako. Or it is easier to access some areas in North DRC from Bangui, CAR, than from DRC itself. However, instability in both Niger and CAR can affect cross-borders cooperation. It is hard to predict what will happen in 2024/2025, however it will align with political challenges. It is constantly evolving, and we monitor it closely. ∎

Looking ahead: I think that Africa will become more and more connected, and satellite will be one piece of this puzzle. The potential of this continues to be immense, with many sectors requiring good connectivity, including mining, lodging, construction, agriculture, offshore, NGOs and remote community connectivity.

Africa is so vast and there is no doubt that satellite has a lot to offer for the development of the continent, and satcom has a key role to play. I can't speculate now whether VSAT or LEO services will be most popular, as this is all still very much unfolding. There is still a huge demand for VSAT; look at the mature market of Europe where VSAT continues to be popular. Both people and industry are demanding more and more bandwidth, and I expect this trend to continue.

Danny Duan,
GM for MEA, Baicells

2023 has been a successful year for Baicells, particularly within the African market. We have signed up several new customers across South Africa, Kenya, Somalia, Mauritania, Nigeria and Zambia – helping facilitate the rollout of 4G and 5G in the region. In addition, we have deployed a 2G radio solution to provide connectivity to those who still rely on this legacy generation.

Despite the hype around 5G, 2G devices remain widespread in Africa due to their broad availability and low cost. Recognising the need to support critical legacy connectivity services until the network is upgraded to the next generation, Baicells deployed a high-power outdoor radio solution in November 2023, which will now offer cellular connectivity to 2G user devices.

Global economic volatility has left no industry untouched, including telecoms. Committed to enhancing connectivity, we saw this as an opportunity to support our customers through financially tough times. Thanks to our financing plans with a 0% interest rate (with the option to defer payment over several years), our customers have been able to continue to grow their networks.

In line with previous years, we have observed an increased focus on digital transformation and progressing to the next generation

> "Global economic volatility has left no industry untouched, including telecoms. Committed to enhancing connectivity, we saw this as an opportunity to support our customers."

of mobile technology. As a consequence, urban areas have seen a huge uptick in high-speed network coverage. A lot of handsets have evolved towards 4G, sending 3G into diminution. In suburban and rural areas, while 4G and 5G are on the rise, 2G is still heavily relied on to stay connected. For example, MTN plans to keep 2G active in South Africa until at least mid-2024 and through 2025 in Nigeria.

There are also a couple of global telecom trends, that we have seen reflected in Africa. In response to economic challenges, MNOs and ISPs are prioritising reducing their CAPEX investments. Given the climate emergency, there has also been a focus on how to reduce power consumption in the network.

We are particularly proud of our 2G radio that was announced at AfricaCom this year. Baicells' compact, low-cost and easy-to-deploy Nebula246 radio supports 40W total power for an extended coverage range. It offers an attractive platform for African mobile operators to continue supporting their 2G customer base while offering them an attractive software upgrade path to 4G/LTE. ∎

Looking ahead: Africa is rich with opportunity with a rising demand for digital.

Given the race for digital transformation, we expect to see the emergence of new telco players, as well as an expansion and upgrading of existing customer networks.

While 3G will be phased out as 4G and 5G subscribers continue to grow, 2G will remain relevant – particularly in rural areas.

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6Harmonics, a Canadian Company, has its roots in developing long-range broadband. In late 2021, the company assembled a new management team to develop a new product strategy.

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.

The new 6H edge intelligent systems comprise H/W with edge S/W, either on-prem or cloud-based 6Harmonics controller S/W. Communication port options will include 4G/5G, WIFI6, TVWS, LORA, Etc. The new platform offers high value to digital divide solution providers and resource extraction operators such as: O&G, mining, forestry, fisheries, farming, and utility companies.

6Harmonics

6H New GSW-5500

6H Rugged Edge Compute & Communications

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Sepura is a recognised global leader in the development and supply of radio terminals, accessories and applications for mission critical and business critical communications.

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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Full Rack

chapter
Satcoms 5

Daniel Batty,
space and spectrum policy analyst,
Access Partnership

Satellite in Africa

Satellite networks have undergone significant innovation and advancement in recent years. While all the traditional services remain core components of satellites services, such as geostationary orbit (GSO) broadcasting, internet, and communications, as well as navigation and maritime distress communications, new services have emerged which present exciting opportunities and benefits for users, governments, and industry. These include Direct-to-Device satellite communications, non-geostationary satellite orbit (NGSO) broadband internet, and narrowband Internet of Things (IoT).

The number of satellites launched into orbit has dramatically increased over the past few years. This statistic is easily addressed by the emergence of the large NGSO constellation operators, such as Kuiper and SpaceX – each intending to operate constellations of thousands of satellites – but it does not paint the whole picture. Alongside the emergence of the large NGSO constellations, there has been a renewed interest in space and a revitalisation of national space programmes and international cooperation in space activities. With this renewed interest in space, we are witnessing the birth of new space powers in India, China, and Japan.

Africa has not bucked this trend. It is also investing in domestic and regional space programmes, with the local market expected to exceed US$10 billion by the end of 2024. The Africa Space Industry Annual Report from 2021 paints an impressive image of the future of African space missions, with 125 new satellites on backlog to be launched by 2025 spread across 23 different African countries.

By the close of 2022, Africa had collectively launched 52 satellites, contributing to the continents' growing space expertise. South Africa has been the largest contributor to the launches with 12 satellites, followed by Egypt's 10 launches.

African satellites are providing a range of services including communications, broadcasting, weather monitoring, and a suite of Earth observation services, which I will discuss in more detail.

Partnerships and investment

To set the scene, however, we first need to outline the international investment and cooperation picture.

It is no secret that the growth of the African space sector has attracted the attention of the international community looking to expand investment opportunities on the continent. China remains the largest investor in African space missions and has expanded beyond monetary and infrastructure investment to offer upskilling through engagements between African youths and Chinese astronauts.

The European Union has also not missed the opportunity presented by a growing Africa space economy and has invested US$29 million into the development of satellite technology in Africa.

While the national budgets of African space programmes do not match those of larger economies like the USA, India, and the European Union, they have steadily increased as more African states seek to stake their claim beyond our atmosphere. The largest African space budget is South Africa's at US$154 million. The South African National Space Agency has an established history in operating satellites, conducting radio astronomy and monitoring space weather. Nigeria is Africa's second largest space budget at US$68 million while Egypt comes in third with US$40 million.

Space services in Africa

The typology of space activities in Africa illustrates the needs of developing nations and the key role satellites play in achieving the sustainable development goals and maximising the impact of investment. The most significant ones are Earth observation and remote sensing, and satcoms.

Earth observation and remote sensing

Earth observation and remote sensing are a group of technologies that integrate successfully into many African economies, as they address important needs. From management of vast coastlines to tracking deforestation, monitoring soil quality, erosion, and agriculture efficiency, Earth observation is most effective in providing actionable insights to developing countries. As such, it is little surprise that Earth observation and remote sensing remain the largest market for space services on the continent.

The African Earth Observation Challenge is a unique example of a programme targeted at developing the private African Earth observation market, which is currently dominated by State players. The challenge focuses on innovative solutions which either provide or make use of Earth observation data to develop a strong business case.

Digital Earth Africa (DEA) is another example within the African Earth observation sector. DEA provides an open-source platform on which Earth observation data is hosted, processed, and shared together with key insight reports. Digital Earth South Africa is an offshoot programme focused on Southern Africa and integrated with the South African National Space Agency's (SANSA) ARD data.

As the continent's oldest space agency, SANSA alone has 30 years of experience in Earth observation and makes use of the data generated to provide a suite of services in South Africa, including crop yield monitoring, settlement expansion monitoring, water quality and vegetation status monitoring, along with coastal monitoring.

Finally, as one of Africa's fastest growing economies, Kenya has seen the potential and launched their first '3U' Earth observation satellite in April this year. 3U provides data to

support policy development and decision making on food security, natural resource management, climate change, and disaster management.

Satellite communications

Of course, one of the most vital uses of satellite services on the continent is to aid communications, be it direct satellite links or backhaul for IMT. With the emergence of Direct-to-Device technology, satellite looks to be one of the key technologies for plugging the coverage gap. Satellite networks' service operates at a relatively low cost-per-user, thanks to their large coverage area, meaning the usage gap may in part also be addressed by the continued development of satellite communications networks.

The emergence of large constellations capable of providing high-speed broadband Internet across the globe present an additional important development for African communications. The deployment of high-speed stable fibreoptic networks on the continent is limited to large cities and is particularly lacking in inland countries, owing to the cost of deployment.

The Regional African Satellite Communication Organization (RASCOM) is a prime example of a home-grown African satellite communications company providing communications and broadcasting services across the continent. RASCOM's objective is to limit Africa's dependency on international networks and serves as a prime example of an African solution.

In conclusion, the overarching trend is clear: space is a vital staging ground for further development on Earth. Through the continued development of new technologies and increasingly extreme weather caused by climate change, satellites provide essential services in a robust and secure way. These services have proven themselves vital to all regions of the world, including Africa, and their importance is only set to increase. With the emergence of Direct-to-Device, high-speed satellite broadband, and the endless use cases made possible by narrowband IoT, it is no surprise that African countries are moving to capitalise on them and the opportunities they present to increase the rate of development. ■

Ayooluwa Adetola,
editor, Space in Africa

Africa's space industry

The African space economy showed remarkable growth in 2022, reinforcing the possibility of achieving the projected valuation of US$22.6 billion by 2026. The industry is firmly on track to reach this target and is supported by the substantial progress witnessed across various segments. These individual segments have contributed to the overall growth of the space economy, showcasing promising advancements and opportunities.

Many African nations actively invest in their space programmes to support their growing space aspirations. In 2023, African countries allocated US$425.01 million to fund space activities, representing a 14.96% and 18.77% decrease compared to the revised budgets of US$499.76 million in 2022 and US$523.3 million in 2021, respectively. Africa's space budget witnessed a notable decline in 2023, which can be attributed to various factors, including
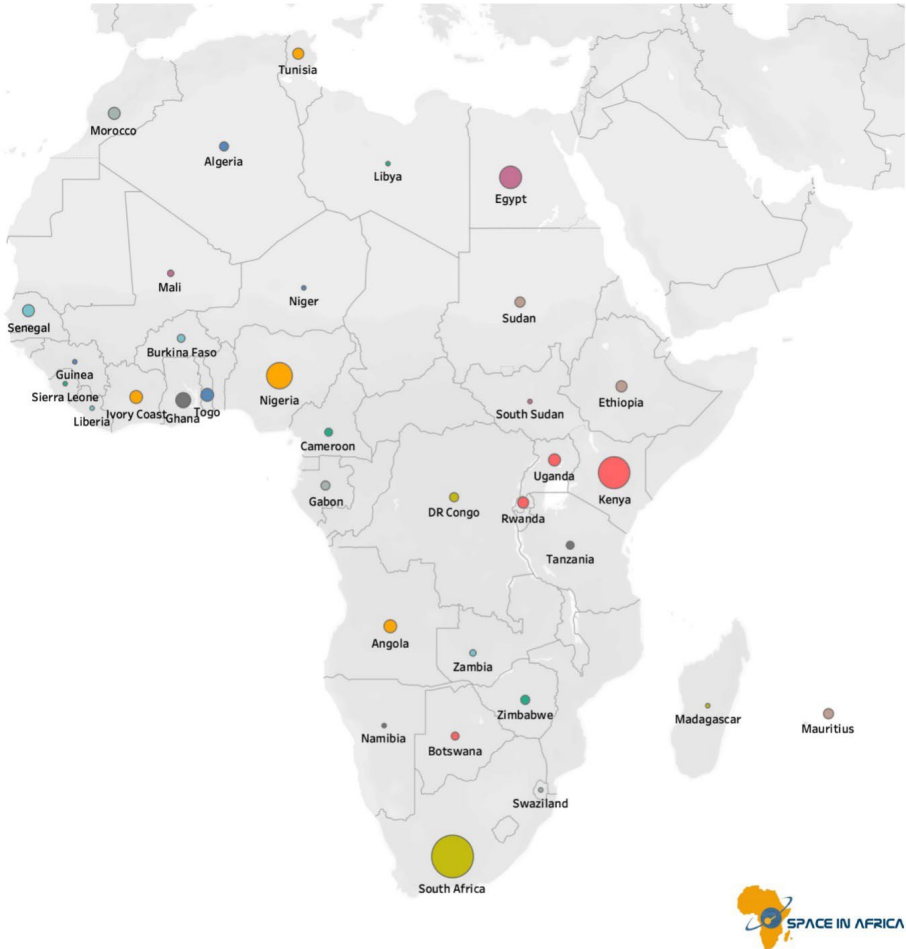
31 African countries have entered the NewSpace sector, encompassing a variety of origins, including university research spin-offs, government-backed startups, and commercial ventures

fluctuation in foreign exchange rates and the completion of national space projects. This decline reflects a shift in government priorities, economic constraints, reallocation of funds to address pressing national issues and the evolving nature of space programmes as they move into different stages of development.

As of June 2023, 15 African nations (including three multilateral satellites) have invested over US$4.71 billion in 58 satellite projects. The launch of an additional 105 satellites by 2026 is anticipated. Africa's space assets and infrastructure are expanding significantly, including launch facilities, ground stations, teleports, and astronomy infrastructure. Presently, the continent hosts 355 ground stations, 60 telescopes, 22 planetariums and over 11 renowned observatories. Of the 11 African launch

facilities, which include previously used rocket launch sites, only three are currently operational, three are proposed, and five are inactive.

As space technologies become more crucial for achieving sustainable development in Africa, more countries are establishing or strengthening their space programmes to realise the benefits of space technologies in their national goals. Moreover, space is directly linked to the 17 United Nations Sustainable Development Goals and the 20 goals of AU's Agenda 2063 (Africa We Want), a strategic framework for the continent's socio-economic transformation over the next 50 years. Since African participation in space is geared towards sustainable development, it is natural that each country's priorities are in tandem with its current and future needs, some of which include Earth observation applications and digital inclusion.

318 NewSpace companies are charting the course of space democratisation on the continent. These companies are involved in emerging technologies such as AI/ML, robotics, big data analytics, small satellite constellations, and spacecraft propulsion. Since 2022, at least two NewSpace start-ups have secured pre-seed funding to support their research and development efforts and initial entry into the market. Furthermore, an increasing number of companies are well-positioned to take advantage of monetary and non-monetary resources from foreign sources, enabling them to scale up their businesses and gain greater visibility. This progress has allowed many African NewSpace companies to transform their business models significantly, expand their market reach and capitalise on emerging opportunities. This has also influenced the creation of an inclusive and supportive environment for African NewSpace founders. These companies are involved in emerging technologies such as artificial intelligence/machine learning, robotics, big data analytics, small satellite constellations, and spacecraft propulsion. As the continent embraces

AFRICA'S LAUNCHED SATELLITES

African countries have launched 58 satellites from 1998 until June 2023. 55 of these satellites were launched by 15 African countries, while the remaining 3 involved several African countries in a multilateral project.

MOROCCO 3
TUNISIA 1
ALGERIA 6
EGYPT 12
SUDAN 1
NIGERIA 7
ETHIOPIA 2
KENYA 2
GHANA 1
RWANDA 2
UGANDA 1
ANGOLA 2
MAURITIUS 1
SOUTH AFRICA 13
ZIMBABWE 1

ALGERIA
ALCOMSAT-1
ALSAT-1
ALSAT-1B
ALSAT-1N
ALSAT-2A
ALSAT-2B

EGYPT
TIBA-1
EGYPTSAT-1
EGYPTSAT-2
EGYPTSAT-A
NARSSCUBE-1
NARSSCUBE-2
NILESAT 101
NILESAT 102
NILESAT 201
Nilesat-301
HORUS-1
HORUS-2

SOUTH AFRICA
ZACUBE-1
ZACUBE-2
NSIGHT-1
KONDOR-E
SUNMBANDILA
SUNSAT
ZA-AEROSAT
THINSAT
MDASat-1a
MDASat-1b
MDASat-1c
EOS-SAT 1 (EOS Agrisat-1)
PLATFORM-2

ANGOLA
ANGOSAT-1
ANGOSAT-2

NIGERIA
NIGERIAEDUSAT-1
NIGERIASAT-1
NIGERIASAT-2
NIGERIASAT-X
NIGCOMSAT 1
NIGCOMSAT 1R
DELSAT-1

ETHIOPIA
ET-SMART-RSS
ETRSS-1

MOROCCO
MAROC-TUBSAT
MOHAMMED VI-A
MOHAMMED VI-B

TUNISIA
CHALLENGE ONE

MULTILATERAL
NEWDAWN
RASCOMSTAR QAF-1
RASCOMSTAR QAF-1R

MAURITIUS
MIR-SAT1

RWANDA
RWASAT-1
ICYEREKEZO

KENYA
1KUNS-PF
TAIFA-1

UGANDA
PEARLAFRICASAT-1

SUDAN
SRSS-1

ZIMBABWE
ZIMSAT-1

GHANA
GHANASAT-1

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space technologies and harnesses their potential across various sectors, it also opens numerous avenues for investors to explore and consider.

Over the past few years, several new as-a-service providers in different industry segments have emerged. Most of these service providers operate proprietary ground stations and satellite constellations, enabling them to cover various infrastructure services using the same model. Although some of these companies have partners in Africa, they are all non-African organisations serving the global market. The as-a-service business model has emerged as a transformative approach in the African space industry, offering flexible and cost-effective access to space-related services, resources, and technologies. With its numerous advantages and the involvement of diverse stakeholders, this model is revolutionising how organisations engage with space capabilities.

Between 2000-2023, African nations have engaged in over 166 bilateral space agreements involving more than 100 institutions from 32 countries worldwide, 90% of which are international agreements with non-African stakeholders. 89 of these agreements were signed over the last three years. Africa offers a promising investment landscape, with more than 45 ongoing research and development projects across 10 African countries, focusing on various Sustainable Development Goals. The bilateral agreements between African countries, foreign nations, and organisations have proven mutually beneficial. Some countries have secured contracts that exceed their investment in the continent, while others invested more than they have received. ■

Martin Coleman,
COLEM Engineering

Alex More,
Trust CPD Lead Sherborne Area Schools Trust, teacher, trainer and consultant

The talent acquisition and skills gap facing space & aerospace Industries

This year, there has been a focus on the shortage of satcom engineers and the discussions within the satellite communications industry got me thinking about my involvement with a local school here in the UK. Shaftesbury School is taking a different approach through the innovative 'Future Classroom' project.

Launched after the COVID-19 pandemic, this project has been a revelation from the get-go. Each year, the school has a steady stream of students opting to study maths, engineering and scientific subjects, with a view to a career in the space and aerospace industries. Encouraging school students to take an interest in these key subjects is a passion for me, and that's why I have been working to take action to help fill the skills gap in our space communications industry.

What does this have to do with Africa?

One teacher had a dream about what a transformed classroom could offer to his students and then dared to make that dream a reality. That teacher is Alex More, who has been instrumental in pioneering the 'Future Classroom' concept at Shaftesbury School. This has led to an expansion of the school's horizons. Lessons now include exciting and innovative elements such as TEDx talks and the

school is engaging with great organisations for educators such as HundrEDorg.

Alex is now linking up with a school in Ghana that has taken an interest in the Future Classroom and this has resulted in shared learning between pupils and teachers. Here is a snippet from a recent Sub Stack blog post Alex shared on the progress of the project.

It is Wednesday, 2pm. The classroom is quiet as the students selected for this project are yet to arrive. The screen above me crackles and within seconds fifteen sets of eyes are looking directly at me. The smiles follow. 'Hello, Alex - can you hear me?' I see Daniel (the teacher) on the screen and the class behind him, sat patiently. This is the highlight of my week...

Despite being divided by 8,000km, an ocean and a continent - there is only an hours' time difference between the UK and Ghana. With a little imagination, the world has become our classroom, and it is a fascinating place to learn.

Why Ghana?

Africa is a place of huge contrasts and easy headlines. A few years ago, a teacher in Ghana reached out to me via the HundrEDorg. Daniel had seen our Future Classroom and was intrigued about the technology and how we organised the learning. After a few initial Zoom calls, we decided to try a live lesson. Post-COVID-19, live lessons, or 'hybrid' as they are now known, were not uncommon. However, connecting learners between countries is rare - but, it doesn't have to be.

The first live lesson was a failure. I quickly learned that Daniel was working with limited resources (he joined the lesson via a single cell phone). The class were huddled around a device and the sound was poor. Every now and then the connection would drop and we would lose the flow of the lesson. Regular storms make internet accessibility hard in the Battor

Dugame region of Ghana where is the school is based. Daniel was relying on a generator to power connection. Despite this, his class were attentive and keen to learn.

Lessons were organic, we kind of made up the objectives based on what interested the students. One week we would be focusing on climate change, the next automation. Everything was led by the students. Lesson lasted approximately 30 minutes. I would start with some content to shape the discussions, then students on both sides of the screen would work on solutions in teams. Most lessons ended with some interactions between learners in the form of presentations, questions or competitions. This was the most powerful part. As relationships formed, the young people drove this project with an infectious energy, keen to learn from each other.

I had underestimated the raw power of this project. The cultural richness such learning provides is hard to find elsewhere within our curriculums. Students were fascinated by each other - from home life to hobbies. Despite being worlds apart, kids are kids and they connected on many levels. For the children in Ghana, the lure technology was irresistible and at the time, out of reach. They wanted to know about virtual reality (VR), artificial intelligence (AI) and robotics. Lessons started to focus more on technological solutions and the science of the future. One lesson on the topic of VR and immersive technologies stands out as it changed everything. A young lady called Brightness said 'Hey, Mr Alex - we want to try VR in Ghana, that is my dream.'

That comment alone lit a fire. Shaftesbury School students started to fundraise. We started a Crowd Funding page and reached out to our Future Classroom sponsors. Within months we had raised enough funds to create a Future Classroom in Team, just outside of Accra in Ghana. One of our students was born in Ghana and travelled there every summer with her family. They kindly offered to transport all the technology to save on huge import taxes. It worked. Daniel found a suitable space and Future Classroom Ghana was born.

The lessons continued and the impact was immediate. The connection speed improved, as did the sound and visuals. Daniel was able to use the new technology to inspire other children in the region.

This got me thinking about how a project like this essentially relies on communication links.

So, how does this all relate to communication in Africa?

We have come full circle and are back to the topic of "can we connect a continent?"

The talent pool in Africa is huge but largely untapped because it is not as well connected as we would like. Education is key everywhere in Africa and now is the time for our industries and nation schools to pull together and make it happen. If a school in the UK can make a massive difference to a school in Ghana then we have a working model already in place.

Connecting the African continent is fundamental to its success in a digital world. This can only be achieved by connecting Africa's Education and Health systems through schools, universities, colleges, hospitals, surgeries, health authorities and associated professionals. It is so doable. It's ambitious, but not out of reach. The benefits to all globally are huge.

Alex once said: "now a teacher myself, I have a chance to disrupt and make good trouble. I use the curious phrase 'good trouble' often to describe how innovation can be used as a transformative force, one that improves the learning for everyone involved. The Future Classroom is my attempt to disrupt the stagnant nature of learning and it is working!"

If one man can achieve this amount of success, then connecting Africa's education and health systems is simple.

One of the easiest ways to connect quickly is via satellite. And, right now this easier than ever with addition of LEO constellations available and with many more to come. Satellite provides that vital layer of communications that provide us all with safety, disaster recovery, medical/healthcare, education and, of course, navigation and tracking through the various GPS services available. Satellite delivers effective broadband and fast, thus it's ideal for connecting education and health within the African continent and globally.

Governments and their regulatory departments need to make it possible by allowing satellite infrastructure, especially LEO, landing rights in each country. In major towns and cities, fibre and 4G/5G are likely candidates for fast connection. If governments take that first step to concentrate on education and health, this alone would allow immediate and cost-effective connection. As more communication infrastructure becomes available it will simply add to the connection possibilities and increase speed, capacity and use cases.

Making education and health the priority will lead to a connected African continent. My hope for 2024 is that African countries, governments, schools and health authorities will start to develop better connectivity and connect as soon as possible. Global reach is simply a byproduct. Job done!

The outlook for the mobile, broadband (terrestrial and satellite) and wireless markets remains bright for the coming years. The continued expansion of 5G and satellite networks, the adoption of fibre and other high-speed broadband technologies, will make connectivity in all sectors much easier.

However, challenges related to spectrum allocation, infrastructure costs and cybersecurity will require ongoing attention to ensure the sustainable growth and resilience of these markets. The governments and their regulators must take charge now and open the doors to allow communications technology to flourish.

Africa is an incredible continent, with such rich diversity, culture, spirit and talent. That's why it's so important that connectivity enables the African people to take part on the world stage in terms of education, health, commercial ventures and global politics. Satellite technology can enable this with a cost-effective and efficient means of eliminating the digital gap that still exists across so much of the region. Through initiatives like the Future Classroom and encouraging dialogue and sharing of ideas and information, the future prospects for young Africans can be limitless. ■

Victor Meadeb,
SVP global partnerships, Africa Development, Commercis (formerly Talia Communications)

Africa has been a land of ample opportunity for Commercis.

Since we started offering services across the continent, we have been extremely blessed with the trust of our customers and partners.

We have been serving customers in more than a handful of countries, namely Chad, Cameroon, DRC, Nigeria, Ghana, Equatorial Guinea, Uganda, Sudan, and South Sudan. We serve a variety of market verticals through local partners, including the energy sector, mining, enterprise, government, and NGOs.

There are many opportunities across the continent due to the rapid digitalisation of society in general. Africa has the youngest population in

"Africa has remained in the 'long' time - Africans by and large are in no rush to make decisions. Therefore, it is counterproductive to try to be pushy to get certain things done quicker The two main requirements to operate in the continent are patience and adaptability. The two main requirements to operate in the continent are patience and adaptability."

"There are many opportunities across the continent due to the rapid digitalisation of society in general. Africa has the youngest population in the world – this will be the generation that will build the continent using digital tools that are becoming accessible to all."

the world – this will be the generation that will build the continent using digital tools that are becoming accessible to all.

In terms of trends, we see the growth of bandwidth usage across the population and the increased coverage supported by governments efforts from the private sector.

We are also seeing new investments coming from traditional industries like banking, energy and mining, and the arrival of retail, which is starting to invest seriously in the African market.

In order to support this effort and transformation, Commercis is partnering with major technology providers to bring the solutions to where they are needed most.

Of course, there are also challenges operating on the continent - the main one been the stability of certain countries, mainly in West Africa.

For these unstable countries, priorities are elsewhere and the only opportunity we have is to provide support through our governmental and NGO customers.

The regulatory environment is always changing and constantly adapting to new trends and solutions as and when they're deployed.

> **"We are working with our Ghana partner to provide connectivity for schools so that they can implement this tutoring platform across Ghana (for now) and potentially other countries after the initial rollout."**

I'd say that one of the biggest obstacles to the deployment of new technology is the regulatory component. Each country is different and will have its own way to adopt new solutions. Some will be faster, and others will be cautious.

In general, we are confident and see a bright future for all Africa thanks to the empowerment through technology.

Each African country has its own unique requirements; there are huge differences between each country.

In my experience, the major difference is the approach to time. Africa has remained in the 'long' time - Africans by and large are in no rush to make decisions. Therefore, it is counterproductive to try to be pushy to get certain things done quicker.

The two main requirements to operate in the continent are patience and adaptability.

The main trend we see across Africa is the development of low Earth orbit (LEO) constellations that will bring fibre like connectivity at a competitive price with complete coverage across the continent. This will certainly change the consumer internet market in the next few years.

It will also impact the enterprise world, allowing fast forward digitalisation independently of the development of local infrastructure. This will make solutions like AI, AR/VR, cloud computing to be accessible to anyone who needs them. That is a huge revolution.

We are investing a lot of time and resources in future proof solutions that will democratise these new technologies.

Thanks to the new LEO constellations we will see connectivity moving from a luxury to a commodity for most of the population and its organisations.

We believe in the amazing social impact of this new type of connectivity; it will allow better economy, better institution, better healthcare, and better education for populations that so far have been left behind.

In 2023, we completed a very interesting project in Ghana. We have connected two of our partners - one is doing IT solutions in Ghana, and another is providing a mathematics tutoring platform to help children develop their skills through a tailor-made online course. We are working with our Ghana partner to provide connectivity for schools so that they can implement this tutoring platform across Ghana (for now) and potentially other countries after the initial rollout. ∎

Looking ahead: Africa is the youngest continent in the world, and we have a strong belief that a lot of innovation will come from the continent now that we are all working on making available the tools to help empower population development. We also foresee acceleration in the digitalisation of African society. We hope for political stability that will allow economic growth, to ensure that all African nations benefit from recent technical developments.

We believe that a Pan-African success is the way to a bright future for all Africans.

Doreet Oren,
senior director, solutions marketing & product marketing, Gilat

Africa is a mosaic of diverse cultures, languages, and landscapes. However, it is also a continent marked by disparities in infrastructure, connectivity, and access to essential services. Addressing these disparities has become crucial for the continent's growth and development. Satellite communications is a powerful tool to bridge these gaps and unlock a world of opportunities for Africa.

Gilat Satellite Networks is a vital partner in Africa, driving forward multiple social inclusion projects across the continent, and ensuring connectivity in the most remote areas. These initiatives span various domains, each contributing significantly to Africa's development.

Education is the cornerstone of development. Yet the challenges of providing education in remote regions of Africa are immense. These areas often lack reliable internet connectivity, leaving students and teachers isolated from the wealth of information available online. Additionally, the absence of modern IT infrastructure compounds the problem, limiting the potential for interactive and engaging learning experiences. As such, one of the most pressing applications of satellite communications in Africa is in the field of education.

Satellite connectivity connects these underserved areas to the internet and much more. By enabling e-learning platforms in rural areas, Ministries of Education (MoEs) are breaking down barriers to education by ensuring that all teachers, regardless of where they are located, have access to the same materials, knowledge, and training. Teachers in local villages can provide the same level of education as their counterparts in main towns and cities.

E-learning in Africa has also unleashed the power of self-learning. Instead of students just internet surfing on their own, they now have access to specially curated digital resources like videos, tutorials, and interactive quizzes to explore subjects and interests autonomously.

Gilat Satellite Networks is playing a pivotal role in transforming education in remote areas where traditional infrastructure falls short. Solutions include the implementation of a Learning Management System (LMS) and the development of essential IT infrastructure. The LMS, hosted on the cloud, effectively manages students' academic achievements and requirements. It is complemented by a suite of applications designed for both students and teachers. These applications facilitate seamless communication, assignment submissions, and access to a wealth of educational content. Cloud-based storage contains lesson plans aligned with the MoE's curriculum, ensuring that the educational material is both relevant and effective. This digital interface empowers both students and educators by providing a centralized hub for learning resources, communication, and progress tracking.

This holistic approach, including laptops, desktops, tablets, WiFi, power boards, printers, servers, etc. ensures that not only do students gain access to information, but they also have the tools and resources to make the most of it. Moreover, Gilat also helps local authorities receive the funding they need to deploy these critical projects via multi-year financing through loans from banks and other financing resources. By combining connectivity, infrastructure, and financial strategies, Gilat is actively participating in Africa's journey towards a more inclusive and educated society.

Access to quality healthcare is a fundamental human right, yet it remains a challenge for many

"Satellite communications are transforming the African continent by advancing social inclusion, improving education and healthcare, streamlining governance, and bolstering security."

in remote areas of Africa. Limited access to medical facilities and specialists often results in inadequate healthcare, leaving communities vulnerable to preventable diseases and health crises. In remote areas with limited access to medical facilities, telemedicine enables remote consultations, allowing patients in rural areas to connect with healthcare professionals located in urban centers.

In regions where connectivity is limited, establishing a government-owned satellite communication solution at rural schools, which often serve as polling sites, offers substantial advantages. During elections, this infrastructure can be repurposed for secure and reliable data transmission, supporting automated election systems. This not only ensures the integrity of the electoral process but also reduces the need for costly dedicated election networks.

Furthermore, the same satellite network that facilitates education can be harnessed for broader e-government initiatives. Digital platforms enable citizens to access government services, pay taxes, and participate in administrative processes online, reducing the bureaucracy and corruption often associated with traditional paper-based systems.

The security landscape in Africa demands modernization and efficiency in homeland security and defence solutions. Satellite connectivity is a powerful tool that can significantly enhance both national and local security. Establishing a robust communication network that links village police stations with the country's ministry of interior or other security agencies opens the door to a comprehensive approach to addressing crime. This empowers law enforcement agencies to respond swiftly and effectively to local incidents, ultimately leading to an improved security landscape. Real-time access to critical information, seamless coordination of resources, and efficient communication facilitate more thorough prosecution. Satellite connectivity creates safer and more secure environments, instilling confidence in the capacity of local law enforcement and national defense to safeguard their communities and their country. ∎

Looking ahead: Satellite communications are transforming the African continent by advancing social inclusion, improving education and healthcare, streamlining governance, and bolstering security. Gilat's integrated approach to these initiatives holds the promise of long-term sustainability and growth for Africa. And we have a long history of successful projects in the region; most recently, we were selected by Ethio Telecom of Ethiopia to enable enhanced satellite-based 4G cellular backhaul capabilities and enterprise communications for remote regions of the country. This project, as well as many others on the African continent, exemplifies Gilat's dedication to extending the benefits of satellite communications to the farthest reaches of Africa, bringing connectivity, economic opportunities, and progress to underserved communities.

The impact of satellite communications extends beyond immediate connectivity; it touches the lives of millions in profound ways.

Nabil Ben Soussia,
group CCO, IEC Telecom

Valued at $19.49 billion, the African space economy employs a workforce of 19,000+ with the government sector leading tremendous growth opportunities in the industry. Projected to grow by 16.16% by 2026, the rate at which the African space economy is flourishing is beyond even Africa's GDP growth. Moreover, the industry is well aligned with the Sustainable Development Goals (SDGs) and thriving in an environment that hosts well over 400 technology hubs, quite a few of which have gained international recognition.

IEC Telecom has been steadily expanding its presence in Africa. We have been actively growing our distribution network across the continent, building fruitful relationships with regional service providers, and have opened a new service hub in Tunisia. With a 24/7 operating center, it is home to our technical development and customer support. Today, our network engineers, IT specialists, and diverse support team operate under one roof to fuel innovation and digital transformation in Africa and across the globe.

IEC Telecom believes in deeply immersing itself in the communities that it operates in. We believe that connectivity serves a greater social cause and paves the way towards prosperity. We are committed to supporting e-learning opportunities, e-medicine, and food security in Africa. With our satellite communications portfolio, we have been able to empower women's education in the Maasai community and remote settlements in Kajiado Central Constituency. In a region where less than 20% of girls enroll in school, IEC Telecom saw an opportunity to provide connectivity services to enable Memusi Hope Foundation's education programme, which saw 21 students graduate in November 2022. From a lack of infrastructure in an isolated community to being able to access digital libraries and communicate with educators over videoconferences, it is heartwarming to build an avenue for more girls to access basic education over satcom solutions.

In the healthcare sector, our satellite-based connectivity solutions can enable governments, NGOs, and private healthcare institutions to extend their medical programmes to remote communities. This is a fantastic prospect in sub-Saharan Africa, which constitutes 13% of the world's population yet consists of merely 2% of its doctors. This skewed ratio can start to be balanced out with digital services – whether it is equipping field teams with telemedicine kits, creating access for consultations in real-

"Approximately 45% of Africa's population lives more than 10km away from any fibre optic network infrastructure. 16 countries, including Chad, Ethiopia, and Botswana, are landlocked. This is where satellite communications can offer a reliable connectivity experience and complement existing terrestrial and sub-marine networks."

time, or setting up health hubs and remote clinics in underserved areas.

IEC Telecom is also dedicated to delivering IoT solutions to the government sector for crop monitoring and predictive analysis. This is a great means to increase agricultural yields in a region that is facing a long-standing drought and has been severely affected by geopolitical circumstances. Compounded by the possibility that sub-Saharan Africa's population can double by 2050 and already 85% of the current population cannot afford a nutrient-rich diet, food insecurity is a matter of critical concern. According to the World Food Programme (WFP), there has been a 60% rise in acute food insecurity in East Africa and a nearly 40% rise in West Africa – meaning that a lack of food is putting lives in immediate danger.

Approximately 45% of Africa's population lives more than 10km away from any fibre optic network infrastructure. 16 countries, including Chad, Ethiopia, and Botswana, are landlocked. This is where satellite communications can offer a reliable connectivity experience and complement existing terrestrial and sub-marine networks.

Presently, satellite services are indispensable in rural and remote areas, where 30% of households rely on them. Moreover, 20% of households across Africa depend on satellite services for telephone and internet access.

According to the African Space Industry Annual Report 2019, satcom generates $6.5 billion in Africa annually. Besides bridging the connectivity gap, satellite communications deliver opportunities for digitalisation – and, therefore, increasing levels of economic and social development.

Mobile missions for humanitarian operations and government programmes are the norm in Africa. This necessitates a multi-channel approach for connectivity services. As such, seamless network switches and hybrid systems are gaining popularity – from GSM to satellite communications in areas where coverage is limited or unavailable. Network management solutions, such as OneGate by IEC Telecom, blend a few networks under one umbrella, automatically routing traffic over the most cost-effective link. This enables continuous connectivity while saving costs.

Business continuity is a key priority for the satcom sector. Besides communications, it is also about the ability to run digital processes no matter where operations take place. MSS terminals that are commonly used for mobile missions operate on L-band (up to 700Kbps) and will not be able to support applications designed for GSM networks. Recognising this trend, IEC Telecom delivers a whole portfolio of optimised applications that can be used under 90Kbps – from videoconferencing for e-learning and public service delivery to remote CCTV surveillance and telemedicine. ∎

Looking ahead: With increasing LEO technology adoption, the market dynamics of Africa will change significantly. Presently, Starlink is available in five countries and more roll-outs are expected soon; OneWeb offers services above 25' N and below 25' S and the coverage is expected to span the whole continent by the end of the year.

At $7.3 billion value, the satellite ecosystem in Africa is geared towards increasing its own satcom capacity. It is expected that Africa will have launched at least 110 satellites by 2024. As of 2022, 13 African countries have manufactured 48 satellites.

Rhys Morgan,
VP and general manager, EMEA
media and networks, Intelsat

Africa contains some of the most important growth markets globally embracing digital transformation. As the first satellite operator to provide satellite communications services on the continent, we've been leading the development of a reliable and widely available communications network in Africa. We have relationships in Africa that go back to 1965, enabling critical communications infrastructure.

Africa's connectivity requirements are unique and we are continually integrating innovative new technologies into our advanced global network to make it as easy and affordable as possible to seamlessly connect people, businesses, and communities when and where they need it.

There is no single business solution that overcomes all the barriers to connectivity, but we're committed to solving the problem. That's why we strive to pair our technology innovations with creative ways to economically expand broadband and WiFi networks.

Thanks to our managed-services approach, we are making it as easy as possible for mobile network operators (MNOs) to incorporate disaster-proof satellite communications into an integrated network of networks, as either a primary or redundant communications option. This relieves operators of the burden of managing the nuts and bolts of the network, for which many lack the resources. For instance, we have been working with the largest operators in the DRC to deliver a wide range of applications including trunking, cellular backhaul, and enterprise services. We've also helped a leading

MNO in West Africa build a new network that can serve both consumer and enterprise users in the market.

We believe in a connected Africa where rural Africans will have access to healthcare, education, and financial services, for an improved quality of life; that's why we're working on the infrastructure of the future. This communications infrastructure will be fuelled by our investments in standards-based design and integrated, high-throughput and software-defined architecture, which will help us respond to the booming connectivity needs, more easily and at an accessible cost.

Ensuring underserved populations have access to broadband is critical. Without access, millions of people risk falling irretrievably behind the rest of the connected world. Governments across the continent have understood this challenge as they try to deploy their digital strategy and significant government investment in fibre networks has already been made, enabling to successfully establish broadband connectivity.

However, the digital divide persists because there are many barriers to expanding coverage and encouraging usage. In regions where there is little or no mobile broadband infrastructure, the challenges are mainly economic. Satellite backhaul is often the only practical and cost-efficient means for providing life-changing connectivity in such areas. A key benefit of satellite backhaul is the ability to right-size connectivity for individual sites and avoid costly overbuilding of fibre or microwave capacity that could go largely unused. Helping to close the business case are standardised tower/RAN platforms that make installations quicker and easier. Increasingly, this includes using solar-powered components to support off-grid regions.

Combining different technologies into

hybrid solutions can offer the best of all worlds. Building out the continent's network infrastructure requires a fresh approach, fully integrated hybrid networks, new business models and creative partnerships. The development of standards will be essential.

We believe hybrid networks are the future. That's why we've invested upwards of US$2 billion to refresh our network, both terrestrially and in space. The new network will be software based, rather than hardware, and will be built on a 5G core. Our open architecture design which integrates multiple orbits supports virtually any access technology, while the multi-layer approach ensures no single point of failure in the system by creating redundancy - the assurance of continuous high-level service. The construct of our network - cloud-based, fully virtualised, and software-defined - enables ground and space systems to interact seamlessly, no matter the orbit or band. Software-defined satellites provide 'follow me' capacity that dynamically allocates based on prevailing and predicted demand. The network enables frictionless connectivity with global roaming and easy integration with the growing 5G networks of the world, including common hardware platforms. ∎

Looking ahead: Africa is among the most complex environments for any communications service provider seeking to deliver high-quality and consistently available connectivity to the people who need it. While 3G remains the most dominant technology in the region, the adoption of 4G has accelerated and should more than double to 45% over the next five years. 5G momentum is also growing with Burundi, Tunisia and Cote d'Ivoire planning commercial launch of 5G services in 2024 and GSMA expects that 5G will contribute in 2030 $11 billion to the sub-Saharan African economy, accounting for more than 6% of the overall economic impact of mobile. The success of these deployments will, however, depend on their geographical reach, as it is important that everyone, even those in the most remote areas, benefits from the 5G revolution.

Countries like Nigeria and the DRC have really accelerated their development with many more sites connected, while Rwanda is planning to connect all villages by 2024. Countries might evolve differently but connectivity has become a priority for governments and the next couple of years should be crucial in that development.

One success story from 2023 is the partnership between Intelsat and Africa Mobile Networks (AMN).

This long-time strategic partnership that started in 2018 has enabled to connect more than ten million people in rural Africa. The past year has been significant with AMN expanding the number of sites connected to Intelsat's network, enabling citizens and businesses in any community to have access to the education, social, and economic benefits of telecommunication services. AMN's business model based on Network-as-a-Service solutions and revenue-share model, combined with Intelsat's multi-satellite African coverage, means that MNOs can grow their subscriber base and expand their network coverage deep into rural and remote areas without having to invest in their own tower facilities and operations staff.

It was great to see recently the industry at MWC Africa discussing the continent's challenges and we hope to see increased cooperation over the next few years. A governmental drive for digitisation, innovative business models and solutions making satellite easier to access and more affordable are the perfect combination to accelerate access to connectivity over the next few years. Our goal is to continue to enhance day-to-day network quality and help deliver secure and affordable connectivity across the continent.

Ziga Kvas,
regional account manager, STN

Over the past year, STN has seen promising growth in the African market. Our fortunes have been positive, with an increase in demand for our services across the broadcast industry. We've established strong partnerships and expanded our presence in the key region of Ethiopia, contributing to our overall success.

Challenges we've experienced include navigating complex regulatory environments, infrastructural limitations, and competition. On the flip side, we saw significant opportunities in the growing tech-savvy population, increasing digitalization, and a hunger for innovative solutions across sectors such as TV in particular religious channels.

We've observed the rise of mobile, the adoption of digital payment solutions, and the emergence of e-commerce platforms. There is a growing interest in renewable energy solutions, advancements in telemedicine, and an increased focus on data analytics to drive business decisions.

The African market is unique in its diversity and complexity. It varies significantly from region to region, with varying economic conditions, languages, and regulatory frameworks. Understanding these differences and tailoring solutions to local needs is crucial. Africa also presents unique growth opportunities due to its youthful population and untapped potential.

Connectivity and digital infrastructure are expected to continue driving the African market in the coming years. Expanding access to the internet and improving digital literacy will open up opportunities across sectors, enabling innovation and economic growth.

In 2023, a standout success story was our partnership with a bundle of Ethiopian television networks. Through this collaboration, we extended their channel viewership on our MENAFLIX OTT platform and added our STN Live cloud-based service. These cutting-edge solutions have enabled them to connect with the younger demographic and offer convenient access to their content on smart TVs, mobile devices, and tablets, catering to the tech-enthusiastic youth residing in major cities and less populated regions.

Regulatory environments in Africa have been evolving, with some countries making positive strides to facilitate business growth. However, challenges related to inconsistent regulations and lengthy approval processes still exist. The regulatory landscape varies by country, requiring a tailored approach to compliance in each market.

Cross-border cooperation has been a mixed experience, with some regions embracing it more than others. We expect this cooperation to continue improving, driven by regional economic blocs and a growing recognition of the benefits of collaboration. Strengthened partnerships will facilitate market expansion and regional integration. ∎

Looking ahead: We anticipate continued growth in East Africa, particularly countries like Kenya and Ethiopia, which have been investing in technology and infrastructure. West Africa, with its large population and growing economies like Nigeria and Ghana, also holds immense potential. These regions have been active in embracing digital transformation.

We are optimistic about our prospects in Africa for the upcoming years. We expect to grow as we focus on tailoring our solutions to meet the unique needs of each market. With ongoing investments in technology and infrastructure, we believe Africa will remain a dynamic and exciting market, offering ample opportunities for innovation and expansion.

Caroline Kamaitha,
vice president for the Africa enterprise & cloud, SES

Alongstanding challenge for residents in rural and ultra-rural areas of Africa is staying connected. Recent advancements in satellite communication technologies are poised to revolutionise the continent's connectivity landscape. As investments into the satellite industry continue to grow, leveraging satellite connectivity is becoming easier than ever – making digital transformation and digital inclusion in this region more achievable than ever.

Challenges in the African connectivity landscape stem from the digital divide rooted in insufficient network coverage and affordability challenges. Satellite connectivity emerges as a crucial solution, providing much needed primary and backup services. While fibre penetration is rising, reaching only 55% of the population within a 25km range underscores the difficulty and expense of achieving full coverage.

> "There is a shift towards 'meaningful connectivity,' signifying a deeper emphasis on network improvement. This shift aligns with the African Union and the World Bank Group's ambitious goal of achieving universal connectivity by 2030."

SES's commitment to enhancing connectivity in the region is highlighted by our success in enabling mobile network operators (MNOs) to roll out mobile backhaul services in remote areas, where the total cost of operations is typically high (relative to the average revenue per user). This, in turn, expands connectivity to previously underserved and unserved communities – elevating the competitiveness and efficiency of key sectors across the continent, including education, banking, agriculture, and mining.

The African continent presents unique challenges due to its diverse countries grappling with political, economic, and regulatory challenges. Africa's vast and challenging landscape and varied connectivity levels make it one of the most underserved regions globally, with only 43% internet penetration. While some countries are well-connected, many need help in basic connectivity, exacerbated by the limitations in communication networks, reliable power, and infrastructure. SES plays a pivotal role in addressing these challenges, tailoring solutions to Africa's diverse needs with both geosynchronous (GEO) and medium earth orbit (MEO) satellite connectivity.

These solutions encompass latency-tolerant services, as well as high-speed, low-latency communications for 3G, 4G and broadband access for key industries across Africa, such as mining, oil and gas, and especially agriculture – an industry that accounts for 23% of the continent's GDP and accounts for over 55% of its employment. In this space, the improvements in speed and accuracy of information delivery can contribute greatly to the growth of this crucial sector. Furthermore, SES solutions are also poised to enable governments across Africa to strengthen public services in e-health and e-learning, while also

> "The African continent presents unique challenges due to its diverse countries grappling with political, economic, and regulatory challenges. Africa's vast and challenging landscape and varied connectivity levels make it one of the most underserved regions globally, with only 43% internet penetration."

enhancing capabilities in defence and security.

Our collective success story in Africa has so far been driven by our over 70 GEO satellites and 20 O3b satellites (our current MEO constellation). Over the past decade, SES has revolutionised connectivity in Africa, working with key partners like Moov and Gilat and enhancing connectivity in over 30 African countries. Collaborations with pioneers like Gilat Telecom in the DRC and Orange in the Central African Republic have enabled the extension of high-performance connectivity, including 3G and 4G cellular services.

This is set to change with our recently launched second generation MEO satellite constellation, O3b mPOWER. With just six satellites, O3b mPOWER is set to provide high throughput, low latency and uniquely flexible connectivity services in the second quarter of 2024, driving Africa's digital transformation and supporting the growth of its rapidly expanding digital economy.

Separately, the O3b mPOWER gateway in Gandoul, Senegal that was built in partnership with Sonatel to more effectively serve customers across Africa, is now ready to deliver high-performance, low-latency, and cloud-optimised connectivity services for our enterprise and government customers across the continent. ∎

Looking ahead: Despite the enthusiastic adoption of technological advancements in Africa over the last two decades, a significant digital gap persists. 70% of the continent still needs to be connected, with over two-thirds of sub-Saharan Africa requiring connectivity due to affordability challenges. Influenced by geographical and societal factors, the sharp digital divide emphasises the need for lowered data and handset prices.

This digital landscape is further complicated by the growing demand and sophistication of African consumers. Africa is a global leader in mobile money and mobile phone user numbers, and as such, the demand for connectivity is strong. Also, as the continent moves towards 4G and even 5G, there is a growing expectation for a level of experience that is consistent with global standards. However, for many African countries, basic connectivity remains a challenge due to geographical obstacles, unreliable power, limited infrastructure, challenging terrain, and other factors that hinder the expansion of network infrastructure.

In response to these challenges, there is a shift towards 'meaningful connectivity' (more than 10Mbps), signifying a deeper emphasis on network improvement. This shift aligns with the African Union and the World Bank Group's ambitious goal of achieving universal connectivity by 2030. SES aims to play a pivotal role in this transition, recognising satellite connectivity as an ideal solution to address the root causes of the digital divide.

Michel Dothey,
co-founder and CCO, neXat

Ernest Sheka,
senior VP Sales, Africa, neXat

Today, rural areas are the most important markets for the satcom business. The need for internet connectivity is continuously growing everywhere, but the competition with mobile and fibre terrestrial operators is challenging. Nevertheless, our African business has experienced solid growth over the last 12 months, especially for our C-band services for enterprises.

The African market is not so different from the others, however, the lower average revenue per inhabitant is lower, making this market more demanding in terms of cost, flexibility, and efficiency.

The main challenge we see now is the arrival of Starlink. Thanks to the development of our SD-WAN aggregation solution, this has also become an opportunity to expand and develop our offering for the terrestrial mobility market, such as rail and maritime. Our SD-WAN mobility offers seamless aggregation of Starlink connectivity with 4G/5G, while offering complete monitoring via our OSS/BSS platform, such as geo-positioning of the coverage journey on a map.

There is a clear increase in demand for satellite connectivity as it becomes more affordable. The arrival of LEO constellations like Starlink and now OneWeb is clearly changing the picture, but traditional GEO satellites are not dead.

Driving the African market forward will be a mixture of technologies rather than one in particular. LEO, MEO and GEO technologies will find their niches. GEO will remain important for C-band for applications needing a very stable service that is not achievable with LEO; Ku-band for broadcasting (even if slightly decreasing); and in Ka-band with the broadband ultra-high throughput satellites (UHTS) whose cost is lower than the LEO and hence very well suited for low earning regions. GEO Ka-band, for example, combined with multicasting, provides additional drastic cost reduction, and is potentially The solution for large scale e-learning, especially for rural areas in Africa facing a dramatic lack of teachers. This is also an area where we intend to play a major role in the coming years.

The most vibrant African countries are those with the fastest growing per capita income, and those that realise the potential benefits of satellite technology for their population, and refrain from applying prohibitive taxes that are counterproductive.

Our most exciting success from 2023 is related to the new business line we are opening, making our sophisticated OSS/BSS platform, available for teleport and satellites operators. It's letting them realise dramatic cost reductions of their operations by maximizing automation at all levels while helping their distributors to resell their services more efficiently.

We didn't see a lot of changes to the regulatory environments in 2023: prohibitive taxes are still in place for GEO and we noted that Starlink succeeded to win licences in several countries. Starlink is also accessible in countries where it holds no license though – we encourage a 'same rules' for all approach so that there is equal opportunity for all businesses. We believe the sky should be open for all, without restrictions nor discriminations. ∎

Looking ahead: At neXat, we plan to continue our legacy satellite service business worldwide, but with the additional development of a highly secured version of our OSS/BSS platform, we will focus on the governmental markets going forward.

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Es'hailSat, the Qatar Satellite Company, was established in 2010 to deliver satellite services to broadcasters, telcos, enterprises and governments in the MENA region and beyond.

With a goal to be a truly global satellite operator and service provider, Es'hailSat commenced operations with Es'hail-1 in 2013, supporting key broadcasters, beIN Sports and Al Jazeera Media Network. Es'hail-2, the company's second satellite was launched in 2018 and is co-located with Es'hail-1 at the MENA hotspot of 25.5^0E/26^0E orbital location. Es'hailSat's high-powered satellites with Ku-band and Ka-band capabilities, provides the region with advanced and sophisticated services.

Es'hailSat's Teleport in Doha provides satellite Telemetry, Tracking and Command (TT&C) operations and capacity management, along with teleport services such as uplink, downlink, contribution, multiplexing, encoding, playout, VSAT services, hosting services, data centre and other services.

Es'hailSat plans to expand with newer satellites in other prime orbital locations around the globe, offering customers the most flexible and reliable services.

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Hughes Network Systems, LLC, an EchoStar (Nasdaq: SATS) company, provides broadband equipment and services; managed services featuring smart, software-defined networking; and end-to-end network operation for millions of consumers, businesses, governments, airlines, and communities worldwide.

The Hughes flagship internet service, Hughesnet®, connects millions of people across the Americas, and the Hughes JUPITER™ System powers internet access for tens of millions more worldwide. Hughes supplies more than half the global satellite terminal market to leading satellite operators, mobile network operators and military customers. Hughes products and services have helped bring in-flight video and broadband to thousands of aircraft for over twenty years.

A managed network services provider, Hughes supports approximately half a million enterprise sites with its HughesON™ portfolio of wired and wireless solutions. To learn more, visit www.hughes.com or follow HughesConnects on Twitter and LinkedIn.

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IEC Telecom Group is a leading international satellite service operator with nearly three decades of engineering expertise in end-to-end low and high-throughput cyber-secure voice and data services for land and maritime use. The brand's portfolio includes a wide range of hybrid satellite and LTE products, solutions, and value-added services.

IEC Telecom enables digitalisation for remote units on land and offshore. For urban networks, the Group provides powerful satellite back-up to ensure the business continuity of customer enterprises.

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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· Public transport & bus management
· Smart cities & smart highways
· Remote monitoring & surveillance
· Mining & exploration
· Asset tracking & RFID

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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.
Our customer focussed team provides expertise in equipment supply, installation, systems integration, commissioning, handover, training, maintenance, support, and network monitoring.

Stratosat's main solution offerings are:
· High-speed satellite broadband connectivity, mobility solutions (CoTM & CoTP)
· Establishment, management, monitoring & maintenance of gateways, teleports & similar facilities (Managed Services).
· Tailor-made Communication Network Solution Design & Project Management.
· Satellite Equipment Supply & Distribution and Implementation & Management of Large Astronomy Projects.

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chapter
Broadband 6

Martha Suarez,
president, Dynamic Spectrum Alliance

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.

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. ■

Karim Yaici,
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

Demographic and 4G Data, Select African Countries
World Bank, GSMA Intelligence | 2022

Handset 4G Launch
Population
(↔) 4G Share of Mobile Connections

Libya
2018 — 6.8 Million (↔) 44.1%

Cote d'Ivoire
2016 — 28.1 Million (↔) 18.8%

Nigeria
2016 — 218.5 Million (↔) 20.5%

Namibia
2013 — 2.6 Million (↔) 46.3%

Tanzania
2015 — 65.5 Million (↔) 16.1%

Zimbabwe
2014 — 16.3 Million (↔) 28.4%

Mauritius
2012 — 4.7 Million (↔) 27.5%

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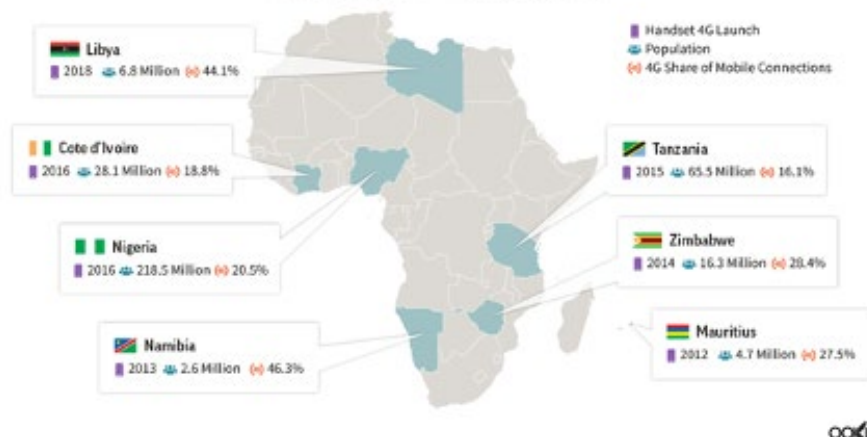
markedly over three years, despite being the last one to launch 4G in 2018, and arguably, where operators had the most challenging environment.

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

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.

4G Median Mobile Download Speeds Comparison in Select African Countries
Speedtest Intelligence® | Q2 2020 – Q2 2023

	Q2 2020 Median Download (Mbps)	Q2 2023 Median Download (Mbps)
Côte d'Ivoire	9.21	23.80
Tanzania	10.04	20.83
Libya	8.27	15.08
Namibia	15.90	26.92
Zimbabwe	10.86	17.71
Nigeria	12.68	19.35
Mauritius	18.70	27.33

Median Speed (Mbps)

SPEEDTEST   OOKLA

4G Median Mobile Upload Speeds Comparison in Select African Countries
Speedtest Intelligence® | Q2 2020 – Q2 2023

	Q2 2020 Median Upload (Mbps)	Q2 2023 Median Upload (Mbps)
Tanzania	6.73	11.41
Libya	4.10	6.43
Nigeria	6.58	9.43
Zimbabwe	5.53	7.79
Côte d'Ivoire	6.78	9.07
Mauritius	8.55	11.05
Namibia	10.87	12.37

Median Speed (Mbps)

SPEEDTEST   OOKLA

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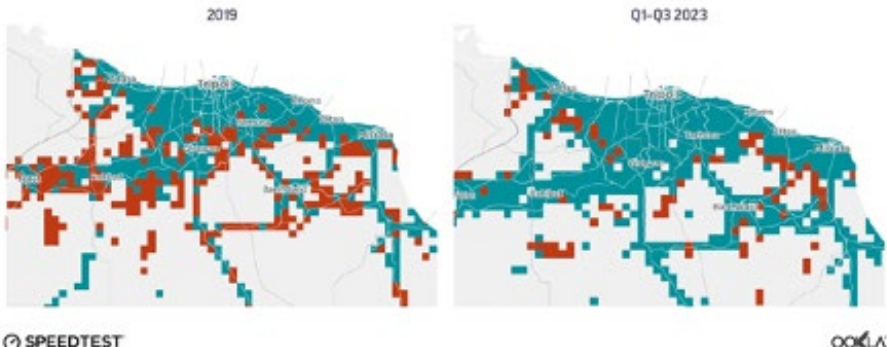
Green squares show locations where 4G service is available and red squares where 4G service is unavailable.

4G Service Availability in Otjozondjupa Region, Northern Namibia
Speedtest Intelligence® | 2019 and 2023
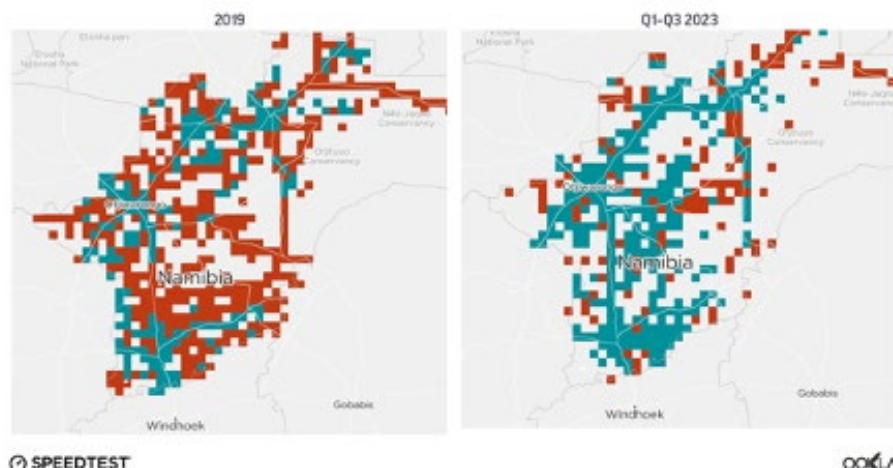
Green squares show locations where 4G service is available and red squares where 4G service is unavailable.

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

4G Service Availability in Nigeria
Speedtest Intelligence® | 2019 and 2023
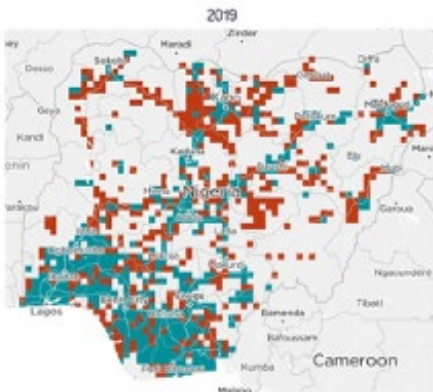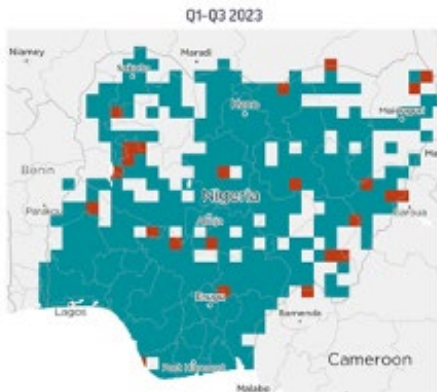
Green squares show locations where 4G service is available and red squares where 4G service is unavailable.

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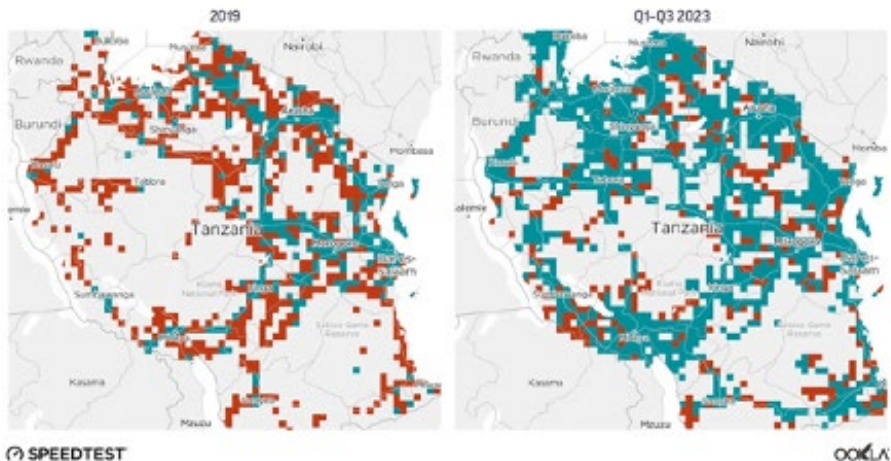
Green squares show locations where 4G service is available and red squares where 4G service is unavailable.

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
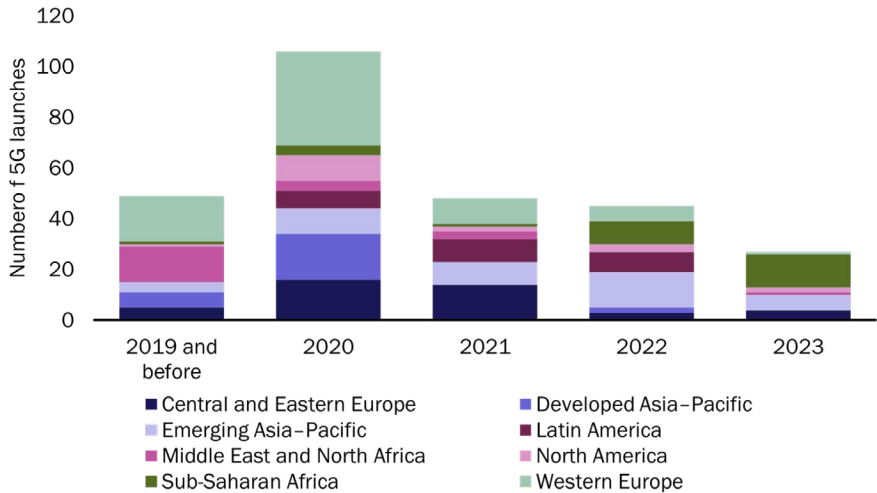
Source: Analysys Mason

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. ■
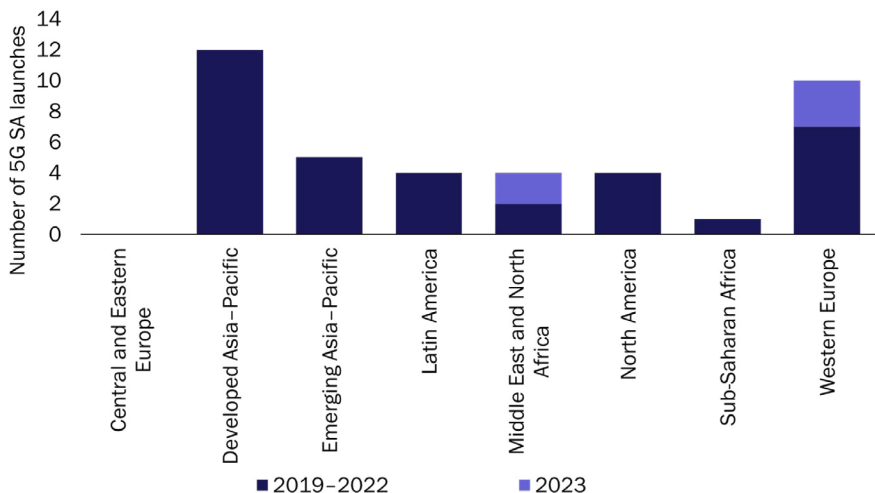
Source: Analysys Mason

5G SA launches, worldwide, 2019–2023

Abdelkader Najja,
VP Middle East & Africa, BICS

> "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."

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,

> "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. "

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.

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

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

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. ∎

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

"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."

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.

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.

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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 subsidary 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. 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. ∎

"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."

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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6Harmonics

6H New GSW-5500

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6Harmonics, a Canadian Company, has its roots in developing long-range broadband. In late 2021, the company assembled a new management team to develop a new product strategy.

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.

The new 6H edge intelligent systems comprise H/W with edge S/W, either on-prem or cloud-based 6Harmonics controller S/W. Communication port options will include 4G/5G, WIFI6, TVWS, LORA, Etc. The new platform offers high value to digital divide solution providers and resource extraction operators such as: O&G, mining, forestry, fisheries, farming, and utility companies.

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Broadband

Cellular Backhaul

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The Hughes flagship internet service, Hughesnet®, connects millions of people across the Americas, and the Hughes JUPITER™ System powers internet access for tens of millions more worldwide. Hughes supplies more than half the global satellite terminal market to leading satellite operators, mobile network operators and military customers. Hughes products and services have helped bring in-flight video and broadband to thousands of aircraft for over twenty years.

A managed network services provider, Hughes supports approximately half a million enterprise sites with its HughesON™ portfolio of wired and wireless solutions. To learn more, visit www.hughes.com or follow HughesConnects on Twitter and LinkedIn.

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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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Intracom Telecom is a global technology systems and solutions provider operating for 45 years in the market. The company is the benchmark in fixed wireless access, and it successfully innovates in the 5G/4G wireless RAN transport and small-cell SON backhaul international arena. Intracom Telecom offers a comprehensive revenue-generating software solutions portfolio and a complete range of ICT services, focusing on IoT, SDN/NFV, Big Data analytics & data-driven intelligence, and Smart City solutions. Furthermore, the company is developing security integrated systems for critical infrastructure protection and border surveillance, having extensive know-how and a proven track record in this industry. Moreover, it addresses the Energy & Utilities industry, emphasizing on smart metering and end-to-end IT solutions. Intracom Telecom serves telecom operators, public authorities and large public and private enterprises. The Group maintains its own R&D and production facilities and operates subsidiaries worldwide.

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Mining

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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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· Public transport & bus management
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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.

sepura

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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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Stratosat's main solution offerings are:
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· Tailor-made Communication Network Solution Design & Project Management.
· Satellite Equipment Supply & Distribution and Implementation & Management of Large Astronomy Projects.

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chapter
Fibre
7

Mike Last,
group chief marketing officer, WIOCC Group

Expanding across the continent

Subsea

As predicted in last year's chapter introduction, 2023 has very much been the year of the African mega-systems. The 12,000km Google Equiano cable, containing 12 fibre pairs with 144Tbps design capacity was declared live between South Africa and Portugal early in the year, with landings in Togo, Nigeria, and Namibia. The St Helena branch was activated on 1 October 2023

The Meta-led 45,000km 2Africa cable, with a design capacity of up to 180Tbps on key parts of the system, continues its deployment, ultimately landing at 27 locations across 19 African countries. 2Africa is expected to be fully operational by late 2024, with the eastern seaboard and the Mediterranean Sea expected to come online earlier than this.

As well as increasing inter-continental and inter-country connectivity, these new subsea cables bring other significant benefits. Designed and implemented over cable routes that are diverse to existing subsea systems and with numerous new landing points on Africa's coastline, the cables offer capacity purchasers the opportunity to build greater resilience into their networks and service offerings to customers. The need for more diversity in subsea connectivity was clearly demonstrated in early August when an incident - reported to be a rockfall off the Congo coast - damaged the West Africa Cable System (WACS), South Atlantic 3 (SAT3), Africa Coast to Europe (ACE) and an Angola domestic festoon system, causing widespread network disruption throughout the region. Some service providers were able to implement restoration via east coast subsea systems (although with increased latency and, in some cases, considerable network congestion) and on the new Equiano cable throughout the month it took to complete repairs to the cables and bring them back into full service.

Another key feature of the two new systems is that they are based on open access principles, enabling service providers to access capacity at carrier-neutral data centres and open-access cable landing stations on a fair and equitable

basis, supporting the development of healthy internet ecosystems.

Owners of the PEACE cable, a 12,000km multi-Tbps system (up to 192Tbps on some segments), announced plans to extend the system to Singapore by mid-2024, adding around 13,000km to the system.

New submarine cable builds announced in 2023 include T3, a 45Tbps, 4 fibre-pair system reinforcing the route between South Africa, Mauritius, Reunion and Madagascar, and the Angola-domestic Unitel North Submarine Cable (UNSC), a 1,145km, 38.4Tbps subsea cable comprising two segments running across the mouth of the Congo river. In addition to connecting the province of Cabinda, the UNSC cable also includes branches to connect offshore oil and gas platforms. Finally, the Africa-1 consortium is continuing discussions to bring further subsea connectivity to the east coast of Africa.

Terrestrial

The termination of increasing volumes of international subsea capacity into Africa is a key driver for investment in terrestrial infrastructure. Widespread deployment of 4G/5G mobile technologies continues to underpin mobile broadband rollout, whilst the growing implementation of FTTX is also supporting the increase in remote working practices. Finally, the ongoing migration of services and applications into the cloud, supporting digital transformation in Africa, completes the major influences driving further investment in terrestrial fibre infrastructure.

According to Hamilton Research, Africa's total inventory of terrestrial fibre optic transmission networks passed the milestone of 1 million route-kms during 2018. By June 2023 the amount of operational fibre optic network reached 1,279,026km, compared to 936,102km in 2018

and 524,847km in 2013. In the twelve months since June 2022, an additional 94,998km of fibre optic network has entered service, an average of 260km of new fibre optic network entering service per day. In addition, there was in June 2023 a further 116,580km of fibre optic network under construction, 133,830km planned, and 68,805km proposed.

Approximately one-fifth of the total fibre inventory in sub-Saharan Africa is within cities: of the inventory of 1,279,026km of operational terrestrial fibre in June 2023, at least 294,192km was metropolitan fibre rings and FTTH/B (fibre-to-the-home/ building) networks. These metro rings distribute bandwidth from fibre optic nodes to districts and suburbs around each city. The FTTH/B networks provide the last mile access, delivering fibre bandwidth right to the door.

As in 2022, pan-African operators including Airtel, Liquid Intelligent Technologies, MTN, Paratus, and WIOCC have once again announced network builds in numerous countries during the year.

Many of the 38 fibre network operators (FNOs) in South Africa have continued to build out national backbone routes and have significantly extended their FTTH/FTTB networks. Nine of these pass over 100,000 customers, In August, Vumatel announced that its residential Fibre-to-the-Home (FTTH) network had reached 50,000km, and that it passed more than 2 million homes. At the same time, OpenServe announced that its own fibre networks passed over 1 million homes, up 24.4% year-on-year, with more than half a million homes connected to fibre. MetroFibre, the fourth largest operator, announced plans to pass an additional 85,000 to 100,000 homes on its network during 2023.

West and Central Africa has also seen significant network deployments this year. In February, a ceremony was held in Bangui to inaugurate the completion of a cross-border link from Central

African Republic (CAR) to Congo. This component of the Central Africa Backbone (CAB) project saw the completion of 935km of terrestrial and sub-river fibre-optic network, constituting the first sections of the national optical backbone in CAR and interconnecting the neighbouring countries of CAR, Cameroon and Congo. In March, a new festoon submarine cable entered service connecting Guinea Bissau to the Africa Coast to Europe (ACE) cable in Dakar (Senegal) – making it the first submarine cable to land in Guinea Bissau, previously the only coastal country in West Africa without direct connection to a submarine cable. March also brought activation of Fast Congo's 620km route between DRC's capital city Kinshasa and Muanda, the landing point of the WACS submarine cable. This was more recently complemented by Silicone Connect's deployment of a cable across the Congo river interconnecting Brazzaville (Congo) and Kinshasa. July saw a new cross-border fibre route completed by Unitel Angola and Bayobab Zambia interconnecting Karipande (Angola) and Chavuma (Zambia).

In the East Africa region, Liquid Intelligent Technologies (LIT) announced the deployment of a new 16,576km terrestrial fibre route connecting Mombasa (Kenya) to Johannesburg (South Africa). The Tanzania Telecommunications corporation (TTCL) signed a contract with Huawei to expand the National ICT Broadband Backbone (NICTBB) fibre optic backbone by 1,520km in 23 districts, and signed a further contract to interconnect with neighbouring Mozambique via a 72km extension running between Mangaka and Mtambaswala.

At WIOCC, our fibre pair investment on Equiano is already driving improved services to our clients. During the west coast cable outages in August, we were able to transition clients' traffic onto our Equiano capacity in a matter of hours, as well as helping many other major players in the industry, including those who were not clients previously, to restore connectivity services at short notice. We have also continued to expand our terrestrial infrastructure in key countries, particularly in South Africa and Nigeria - where we have our own 16Tbps-ready national networks - and across much of the SADC region, including Zambia and Malawi. ■

Léa Zouein,
analyst MEA, Dataxis

The market is largely dominated by mobile internet

In 2022, less than 5% of African households were connected to fixed broadband and only 1% to fibre while mobile internet had a population penetration rate of about 45%. This shows the importance of 4G and 5G technologies to reach connectivity in the region.

In sub-Saharan Africa, mobile internet has been a substitute for fixed line which are few and expensive. Not only is mobile internet more accessible, but owning a smartphone is also becoming more common, as shown by the population penetration rates in a range of countries including South Africa (65.73%) in 2022 and Kenya (51%). While 4G would enable a broader and simpler usage of applications such as video streaming, 5G is for now primarily destined for industry usage and to support the deployment of IoT.

However, several issues are still at stake in

the region, preventing a complete development of mobile broadband: technical (deployment of a functional network), financial (price of subscriptions and smartphones) and geographical (how to cover the most remote rural areas) difficulties remain.

For the time being, the low growth of 4G is mainly due to technical constraints as operators need to set up efficient network coverage both in cities and in the more isolated rural areas. Since more than 60% of the sub-Saharan population lives in rural areas, one of the major challenges for telecom companies is to extend their networks and increase the population penetration rate of mobile internet (around 45% in 2022), and 4G subscriptions (around 14% in 2022).

While most countries have a functioning 4G network, very few have begun to commercialize 5G: for instance, Kenya since Q2 2022 through Safaricom offers or Nigeria since Q3 2022 through MTN. More recently, in Q1 2023, both Tigo and Vodacom began commercializing 5G in Tanzania. In Mozambique, Vodacom also began offering 5G subscriptions from Q2 2023. Still, population penetration rate remains low: 0.6% in Nigeria, 0.1% in Tanzania or 0.2% in Mozambique.

The development of both 4G and 5G is still far from complete. However, with the strong demand and the increasing number of licenses issued by regulators, it is estimated that the number of 5G subscriptions will be multiplied by three, and 4G subscriptions by two until reaching 48% of mobile internet subscriptions. The simultaneous development of 4G and 5G allows sub-Saharan Africa to meet the growing demand for connectivity coming from its population, and to set the ground for technological progress and improvements on industry applications.

Fixed broadband infrastructure, especially fibre, is struggling to develop

Fixed infrastructures, and especially fibre, are only starting to develop.

In sub-Saharan Africa, a two-speed connectivity development is currently occurring. On the one hand, in the most developed countries, fibre is the most widely used technology for fixed internet access. This is the case in Kenya with 55% of fixed wireline and wireless internet subscribers receiving fibre against less than 0.5% counted on the xDSL access at Q2 23. In Ivory Coast, fibre subscriptions account for 57% of fixed internet against less than 0.5% for xDSL. On the other hand, in most countries, xDSL remains the main connection mode to bring the internet to African homes. In 2022, in Burundi, xDSL accounts for 92% of fixed internet subscriptions while fibre accounts for only 2%. In Ethiopia, it's 87% of xDSL against 13% of fibre subscriptions. It is estimated that there will be a turnover between xDSL and fibre subscribers between 2027-2028 in many countries where xDSL prevails today. In different countries such as Democratic Republic of Congo, Botswana or Ivory Coast for instance, fibre subscriptions are expected to double by 2028.

In general, network operators follow a similar pattern across Africa: the first fibre deployments are taking place in the largest cities of the countries, usually in capital cities and then in the other major towns. This strategy is explained by a stronger potential market in these areas but also by ease of installation and cost reduction. For instance, after establishing its CanalBox fiber service in Ouagadougou in Burkina Faso in June 2021, Vivendi Africa Group (GVA) extended its network to the country's

second city Bobo-Dioulasso in May 2022. The same model took place in Gabon where GVA launched its fibre offer in Libreville in October 2017 and then in Port-Gentil in June 2022. The potential market is more important in major cities, where many profitable and connected businesses have established their offices, where the population density can create fundamental economies of scale for fibre operators, and where ISPs will find most households with high purchase power, required to subscribe to the costly fibre service. The next step will be to extend these services to the rural areas, where most of the African population lives but which remains very poorly connected to broadband.

The low connectivity rate coupled with the high demand represents an important opportunity for all players, provided that the current cost constraints are successfully overcome. At the dawn of a promising market, the challenge is to balance fiber deployment with profitability. In the most advanced country, such as South Africa, mergers allow network operators to increase their area of influence.

South Africa: a promising market?

South Africa is indeed one of the most developed countries in the region in terms of telecommunications. The country has succeeded in establishing the mobile internet infrastructure needed for 4G to spread successfully. In 2022, 75% of South Africans were connected to 4G on their mobile phones. This figure is expected to rise to over 90% by 2028. However, the country is still in the early stages of 5G developments. The delay in the transition to digital television has contributed to the slowdown in the deployment of 5G. Cutting off the analogue signal should free up bandwidth for mobile internet.

Telecom operators are also steadily increasing their investment in the fixed network. Vumatel is the market leader with 2 million homes covered by fibre at Q3 2023, an increase of 25% in one year. On 9 November 2022, the Independent Communications Authority of South Africa (ICASA) approved the takeover of part of the company by Vodacom which itself covered around 165,000 homes in the second quarter of 2023. The purpose is to consolidate the existing fibre coverage and to outperform OpenServe, which follows closely behind Vumatel with more than 1.1 million homes passed at Q2 2023.

To go further, in February 2022, Vumatel bought a 45% stake in the operator HeroTel whose network covered about 500,000 households at the same time. These commercial transactions are the witness of a more than dynamic market. In 2022, only 8% of homes in the country were connected to fibre, which represented 32% of fixed internet subscriptions. However, it is estimated that between 2022 and 2028, the number of fibre subscriptions will almost double. And yet, it will only represent 11% of households in 2028.

What to expect for the market?

Fixed broadband is far from being widely adopted. To face the lack of infrastructure and high installation costs, some companies are making the craziest bets, as shown most recently by Starlink for instance, which started its commercial activities in Nigeria and aims to cover the most isolated areas with some 2,000 satellites in orbit around the Earth. While the kit costs $599 in the US, it will only cost $99 in Nigeria. Although the amount remains very high for the region, it reflects a desire to make it affordable.

The company does not intend to stop there, having obtained in 2021 a license in South Africa, in February 2022 a license in Mozambique and in October 2022 a license in Malawi. However, the price remains extremely high compared to the inhabitants' income.

Starlink is not the first company to try new methods to connect more Africans to the internet. Loon, a subsidiary of Alphabet, the parent company of Google, abandoned in 2021 its project of stratospheric balloons floating over Kenya to bring 4G to the population. This idea is now taken up by World Mobile, which has obtained a license in Zanzibar and Tanzania and expects to obtain one in Kenya.

Meta's Aquila project to provide internet via high-altitude drones was also shut down in 2018, as were the company's WiFi hotspots, which are all expected to be deactivated by the end of 2022.

Thereby, whether via fibre, satellite, or drones, the challenges of fixed broadband connectivity in Africa are at the heart of heavy investments for operators who want to conquer this promising market. Broadband deployment should not be considered as an isolated issue in each country, but rather as a whole in the entire region. Not only do fibre networks often cross borders, either because operators are present in several countries or because of collaborations, but it also brings African economies closer together and accelerates the development of the whole region.

Although fibre seems to be the most likely evolution because of its attractive amortization, all innovations are beneficial to connect all the populations of the region, even the most isolated, to a quality, reliable and affordable network. The economic perspectives that can be activated by an improved connectivity to global networks will undoubtedly continue to foster initiatives from operators, well aware of the region's hidden potential. ■

Paul Hamilton,
managing director, Hamilton Research

International internet bandwidth

"Once the fibre network which is currently under construction enters service, the fibre reach of sub-Saharan Africa will increase to 62.0% (726 million)."

Africa's total inbound international internet bandwidth reached 36.7Tbps by December 2022. This was a 39% increase compared to 26.4Tbps in 2021, 21.0Tbps in 2020, 16.1Tbps in 2019, and 12.1Tbps in 2018. This total of 36.7Tbps in 2022 was split between sub-Saharan Africa, which increased by 37% to reach 23.8Tbps, and North Africa which increased by 43% to reach 12.9Tbps.

Almost two-thirds of all this bandwidth to sub-Saharan Africa is supplied to its three largest markets. South Africa's inbound international internet bandwidth was 7.515Tbps in 2022, Kenya was reported at 4.364Tbps, and Nigeria had an estimated 2.535Tbps.

Of the total bandwidth of 23.748Tbps in sub-Saharan Africa by December 2022, 21.813Tbps (91.9%) was supplied directly

2023/4 Africa Telecom Transmission Map. Republished with kind permission of Hamilton Research Ltd www. africabandwidthmaps.com
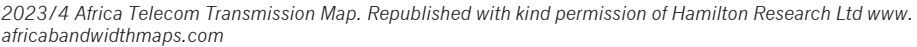
by submarine cable. This total of 21.813Tbps was a 253% increase compared to 6.184Tbps in December 2018. The completion of new cross-border links, and the expansion of capacity on others, has seen the volume of intra-regional traffic backhauled to submarine cable landing points increase by 35% in the last year to reach 1.914Tbps in December 2022. This compares to 1.422Tbps in 2021, 1.112Tbps in 2020, 713Gbps in 2019, and 547Gbps in 2018.

Fibre reach

The landing of new submarine cables and expansion of terrestrial transmission networks is bringing additional countries, regions, cities, and towns within reach of fibre networks for the first time. In the last year alone, network expansion has brought more than 40 million more people within access to high capacity national and international backbone networks, and in the last ten years more than 338 million.

In June 2023, 60.5% of the population in sub-Saharan Africa (709 million) was within a 25km range of an operational fibre optic network node. This compared to 57.1% (669 million) in 2022, 56.7% (647 million) in 2021, 55.9% (620 million) in 2020, 55.2% (584 million) in 2019, 54.2% (556 million) in 2018, 55.2% (522 million) in 2017, 48.1% (469 million) in 2016, 45.8% (436 million) in 2015, 44%, (410 million) in 2014, and 41.8% (371 million) in 2013.

Once the fibre network which is currently under construction enters service, the fibre reach of sub-Saharan Africa will increase to 62.0% (726 million), and once the network which is planned or proposed enters service it will increase to 66.0% (773 million).

Terrestrial transmission network

Africa's total inventory of terrestrial fibre optic transmission networks passed the milestone of 1 million route-kms during 2018. By June 2023 the amount of operational fibre optic network reached 1,279,026km, compared to 936,102km in 2018 and 524,847km in 2013. In the twelve months since June 2022, an additional 94,998km of fibre optic network has entered service, an average of 260km of new fibre optic network entering service per day. In addition, there was in June 2023 a further 116,578km of fibre optic network under construction, 133,830km planned, and 68,805km proposed.

Approximately one-fifth of the total fibre inventory in sub-Saharan Africa is within cities: of the inventory of 1,279,026km of operational terrestrial fibre in June 2023, at least 294,192km was metropolitan fibre rings and FTTH/B (fibre-to-the-home/ building) networks. These metro rings distribute bandwidth from fibre optic nodes to districts and suburbs around each city. The FTTH/B networks provide the last mile access, delivering fibre bandwidth right to the door. ∎

"The landing of new submarine cables and expansion of terrestrial transmission networks is bringing additional countries, regions, cities, and towns within reach of fibre networks for the first time."

AFRICA
TELECOMMUNICATIONS
MAP2023
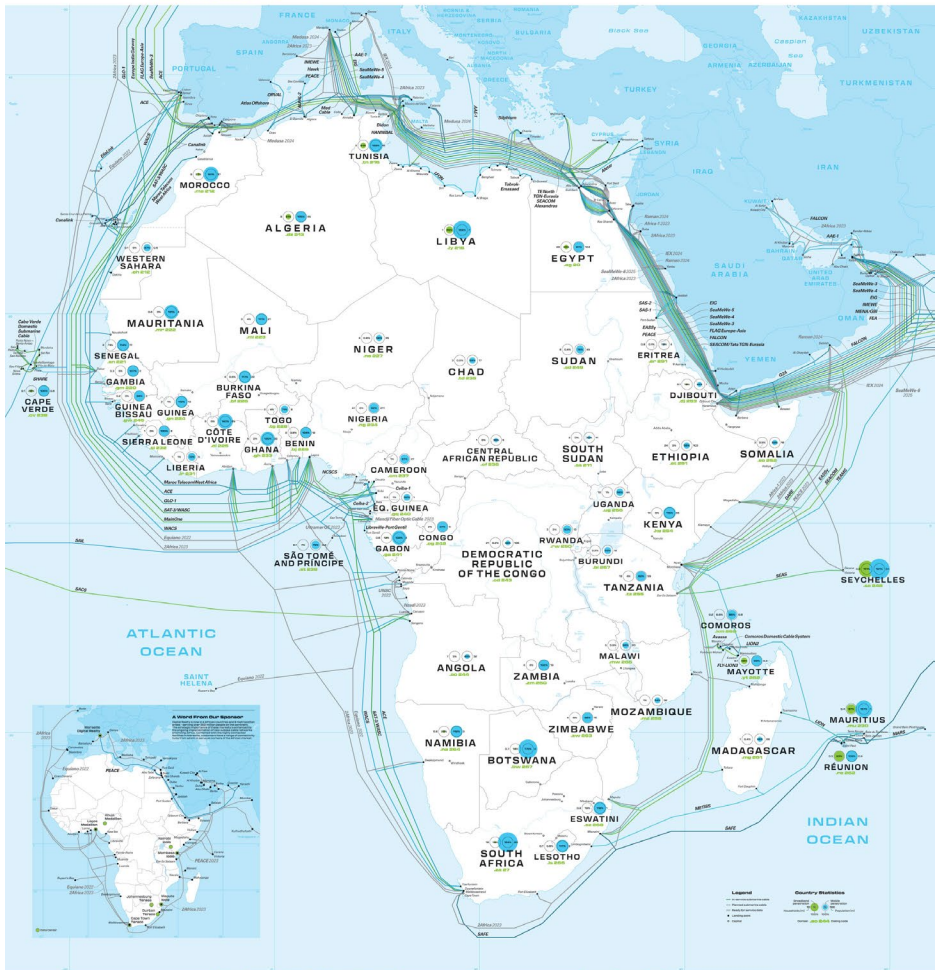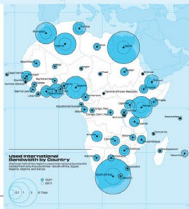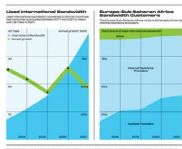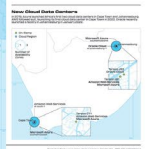
Ângelo Gama,
CEO of Angola Cables

The global economy has been slow to recover from the COVID-19 pandemic and more recently, the social and political disruptions caused by the conflict in Ukraine and the Middle East. These adverse developments have also had a negative impact on the Pan-African economy. Economic growth in sub-Saharan Africa has slowed to 2.5% in 2023, from 3.6% in 2022.

From an Angola Cables perspective, we feel the impact of the economic downturn. Many client budgets are under pressure, and within a competitive marketplace, it is our responsibility to ensure that we deliver not just on price, but on the intrinsic value of our solutions and services. As an integrated ICT services and solutions provider, we offer both wholesale and enterprise solutions that help business expand and grow - and this is a vital ingredient for a buoyant economy. Our robust international backbone network continues to provide express connections for businesses and users to connect to the world. Now, with the establishment of the Telcables subsidiary businesses in Nigeria and South Africa, we are in a position to offer localised solutions and a suite

"We are of the view that the global economy and the economies of Africa will take some time to stabilise and recover and this will have an impact on our planning and future investment."

"Southern Africa should continue to grow - but this will largely be dependent on managing the future electricity generation challenges. We also expect markets in West Africa to flourish following several crossborder projects and some of the new cables connecting countries such as Nigeria, Cote D' Ivoire, Ghana, and others."

of services suited to the local environment.

We are of the view that the global economy and the economies of Africa will take some time to stabilise and recover and this will have an impact on our planning and future investment. Our focus is on expanding our Clouds2Africa solution and increasing traffic across our broad global network. Apart from having express global routes, our sub cable network offers redundancy options which are important for mobile network operators (MNOs), ISPs and content providers. This was made apparent when the West African Cables System (WACS), SACS, SAT-3 and ACE subsea cables experienced a fault that impacted internet connectivity and traffic speeds to and from Africa. As a result of this, Angola Cables was able to make capacity available on SACS and through its partnership on the Equiano Cable to assist businesses and customers minimise disruptions and offer redundancy measures for customers during the extended period it took for the fault to be repaired.

Partnerships and collaboration (or a recently coined term - 'coopetition') is the name of the game. Alliances are important and will be so in the future - especially where capital intensive investments will need to be made. We also believe that data centres will play an increasingly vital role in the expansion of digital networks and cloud computing ecosystems.

There are several differences between the telecom and ICT landscapes in Africa and other regions of the world. These differences are influenced by a variety of factors, including economic development, infrastructure, regulatory environments, and unique challenges specific to each region. Success in the future telecoms/ICT market will depend on how readily operators and service providers can

> "Partnerships and collaboration (or a recently coined term - 'coopetition') is the name of the game. Alliances are important and will be so in the future - especially where capital intensive investments will need to be made."

adapt and provide smart, flexible solutions within a specific geography or region. ∎

Looking ahead: In 2024 and beyond, we believe the adoption of cloud computing and 5G technologies will drive the expansion of connectivity in Africa. We can expect to see much more competition in the cloud space. The introduction of other cloud operators - apart from the big players such as AWS, Microsoft Azure, Google and Alibaba will offer more bespoke and flexible cloud solutions. Our Clouds2Africa offering is well-suited to a range of enterprises from large to small and this solution offers a range of services that can be customised quickly and efficiently.

Regionally speaking, Southern Africa should continue to grow - but this will largely be dependent on managing the future electricity generation challenges. We also expect markets in West Africa to flourish following several cross-border projects and some of the new cables connecting countries such as Nigeria, Cote D' Ivoire, Ghana, and others that they will have access to.

In 2023, Angola Cables has established independent entities in both Nigeria and South Africa under the TelCables brand. In addition, our new node in West Africa gives businesses the option to connect to more than 300 nodes worldwide. In support of our businesses in Nigeria and South Africa, we have a global presence that can offer local solutions that are ideally configured for the unique needs and demands of businesses across central and southern Africa.

The Angola Cables network recently reached the highest peak of 12,664Tbps of data traffic across its international transmission and data internet backbone. The increase in traffic has been recorded over its subsea cable network which incorporates the SACS, Monet and WACS cables and its onward connections to Europe and Asia. This is an historic milestone in the volume of traffic and we expect this traffic to grow exponentially in the future.

Companies like Angola Cables and its subsidiaries, TelCables Nigeria and TelCables South Africa, will continue to play a constructive role in connecting businesses across Africa. Our aim is to provide customers with with a single point connectivity solution that gives them flexible access to local and international markets where they will be able to securely transmit or receive digital data or content wherever their business may operate.
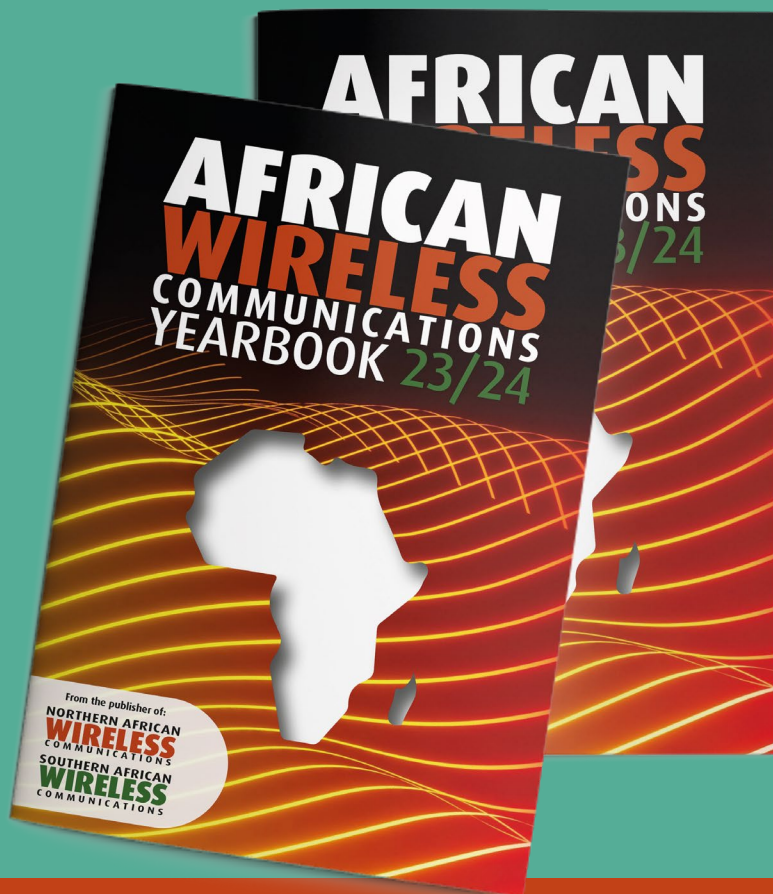
Mike Last,
group CMO, WIOCC Group

In 2023, WIOCC celebrated 15 years of providing market-leading digital connectivity solutions into, out of, and within Africa.

Exponential growth in digital connectivity-dependent products and services this year have created a surge in demand for reliable, scalable, internet connectivity and placed a strain on existing infrastructure. To meet this need, WIOCC made significant strategic investments in subsea and terrestrial cable systems. We linked our open-access connectivity infrastructure to the carrier-neutral, open-access digital hubs of WIOCC Group company, Open Access Data Centres (OADC), providing a unique, flexible converged open digital infrastructure (CODI) offering that is accelerating the continent's digital transformation and helping content providers, carriers, ISPs, and major enterprises to expand their digital products and services into new markets, when and at the rate they want.

Africa is a diverse, unhomogenised continent where the needs, maturity and economic potential of individual countries and regions vary markedly. What is common is the desire within these markets for reliable, affordable access to high-capacity international connectivity.

South Africa and Nigeria will continue to be at the forefront of the continent's digitisation, meanwhile the transformative international connectivity brought by the recently landed Equiano and 2Africa cable systems will boost the local and regional economies, particularly within the countries where they have been landed.

There have been many user success stories from 2023, but WIOCC landing the Meta-backed, >180Tbps 2Africa cable system at Amanzimtoti, Durban, South Africa, into the open-access OADC Durban data centre, is right up there as it has made this transformational additional international connectivity readily accessible to all providers.

Local data storage and processing are crucial for data sovereignty, reduced latency, data privacy and compliance, enhanced security, bandwidth optimisation, data accessibility, and support for the local economy. Storing data for clients in-country ensures that sensitive information is governed by local laws and regulations, strengthening data sovereignty and protection. Processing data locally minimises latency, benefiting real-time applications and providing a better user experience. It also helps organisations comply with strict data privacy laws. Moreover, local storage enhances security by reducing exposure to external cyber threats. Bandwidth optimisation and improved accessibility during disruptions are further advantages of local data storage and processing.

In certain markets, a protectionist stance adopted by incumbent operators and major players further compounds challenges. These entities may resist open competition, thereby impeding the development of a healthy, competitive environment that could foster innovation, drive down costs, and enhance overall connectivity options. ■

Looking ahead: In the next year, rapid urbanisation will increase demand for digital infrastructure, including internet connectivity and data centres, because the higher concentration of people necessitates network upgrades and last-mile connectivity expansion. Simultaneously, urbanisation leads to greater adoption of digital services, such as e-commerce and online banking, driving digital transformation across sectors like healthcare, financial services, and education.
The urban market presents lucrative opportunities for carriers, ISPs, MNOs, and businesses across Africa offering digital solutions, but it also intensifies competition, requiring constant innovation.

Wim te Niet,
vice president EMEA, EXFO

EXFO has made considerable progress in Africa over the last year, especially regarding Adaptive Service Assurance (ASA). We have successfully extended deployment of EXFO's best-in-class dynamic topology Context solution in the MTN network. EXFO's ASA platform models fibre optic networks, providing critical insight to detect and diagnose issues before outages or degradation of service can take place. In addition, we have been pleased to maintain a solid footprint of passive monitoring in networks that serve western and southern African markets.

We've seen several challenges on the continent this year. The major increase in power cuts due to such issues as aging infrastructure has led to operators having spent millions of dollars on power back-up systems; recession resulting from the pandemic has affected telco business in Africa overall; and the high cost of connectivity is still an important barrier to more extensive telco services penetration in some African markets.

However, we've also seen opportunities. Optical fibre testing and monitoring is in high demand because of massive deployment of FTTH networks. 5G network deployment is an important opportunity for EXFO's Adaptive Service Assurance portfolio, enabling new technology introduction for African operating companies. We're also seeing demand in the areas of submarine fibre optic cables and data centres.

Mobile payments service still have very important penetration in Africa with 70% of total volume worldwide. In some African markets, more than 80% of internet users use mobile payments. EXFO is actively supporting its African partners to proactively monitor this sensitive service through various Service Assurance solutions (passive or active monitoring, SensAI, Context).

When it comes to technology to support mobile networks, in some African markets 4G penetration is still low and operators are actively deploying 4G networks. That said, ZTO (Zero-Touch-Operations) is a recurring ask from our customers, especially with the increased complexity of networks. Overall, as in other geographies, trends of autonomous networking, AI, machine learning, 5G, and high-speed 400G networking are popular trends.

The African market is unique. The continent is vast, and that poses challenges to building fibre optic networks. This makes the monitoring of the fibre during the building phase critically important to ensure successful deployment. Furthermore, fibre cuts due to construction work, wild animals, and vandalism are common in Africa and cause almost daily outages. This is why a 24/7 monitoring solution is highly recommended to support service continuity. Also, legacy technologies are still widely used in Africa (2G/3G) which makes the African telecom landscape unique. ■

Looking ahead: We strongly believe that optical fibre deployment - for both backbone networks and FTTH - will be the main technology driver for the African telecom market over the next two years. This will enable the expansion of 4G networks and accelerate adoption of 5G technology around the continent.

South Africa is expected to continue leading the telecom market in Africa thanks to an extensive fibre network and leadership in 5G adoption. Also, we believe countries like Algeria and Nigeria, which are seeing massive fibre deployment, will enjoy considerable improvement in their telecom infrastructure over the next two years.

We see Africa as an exciting and important market for EXFO. With more than 600 million mobile subscribers forecast by 2025, Africa has huge potential and EXFO strives to remain a key player in both test and measurement and service assurance throughout the continent.

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Website

Network

Solutions

LinkedIn

Since 2008 WIOCC, the leading player in the deployment of carrier-scale, future-proofed network infrastructure into Africa, has been helping transform Africa's digital landscape by introducing client-centric innovations.

With the flexibility and scale to meet the ever-growing demand for reliable, high-speed capacity throughout Africa, driven by end consumers, enterprise users and the ecosystem that supports them. WIOCC's policy of continual investment in our network to create Africa's first, truly hyperscale network infrastructure means ongoing investment for growth, ensuring our readiness to meet the future data volume demands of end users throughout Africa.

Operating exclusively as a wholesaler, we have revolutionised the delivery of high-capacity connectivity between Africa and the rest of the world. Widely recognised as Africa's carriers' carrier, we offer carriers, content providers, cloud operators, ISPs and mobile operators reliable, seamless, high-capacity connectivity between more than 30 African countries and key global financial and commercial centres.

Our focus on building and maintaining strong, long-term relationships with each client enables us to develop bespoke solutions that meet their current requirements and have the capability to match future demands for growth, extra resilience and geographical expansion.

WIOCC
Africa's Digital Backbone

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Mining

Fleet management

Public Safety

Agriculture

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:

· Emergency services
· Commercial fleet management
· Public transport & bus management
· Smart cities & smart highways
· Remote monitoring & surveillance
· Mining & exploration
· Asset tracking & RFID

MobileMark
antenna solutions

Wireless Solutions for Exploration, Mining, Fleet Tracking & Surveillance

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Modern mining operations rely on a battalion of vehicles, ranging from massive extraction vehicles to modest-sized material transport trucks. These vehicles operate in tough environments where high vibration is a frequent wear and tear challenge. Mining companies throughout Africa have relied on our rugged, foam-filled mobile antennas for consistent connections. Mobile Mark's infrastructure antennas have been used for rapid deployment and redundancy coverage for effective wireless coverage in isolated settings.

chapter
Fixed Wireless Access

8

Paul Colmer,
EXCO member, Wireless Access Providers Association (WAPA)

Bridging the digital divide with WiFi for South Africa's future

It's no secret that South Africa is one of the most unequal societies on Earth, certainly when it comes to internet access.

According to StatsSA, 89.6% of South African households don't have WiFi internet access at home. That means the same 89.6% of South Africans are charged 50 times more for mobile data than the privileged 10.4% who do have WiFi, the equivalent to paying R1500 for a cup of coffee.

That's purely because our infrastructure is skewed in favour of a handful of large operators, and thus they can charge poor communities an extortionist premium for their data compared to wealthy urban clientele. Also, because broadband WiFi infrastructure – the only viable alternative for affordable internet access – lags significantly behind, our future is perilously stuck in limbo.

Make no mistake, the digital divide is one of the biggest threats to our society today. Inequality stems from many different sources, but one of the surest ways to fight inequality is education. Based on the numbers in the 2030 Reading Panel Report, only an estimated 18% of grade four learners can read for meaning. At the same time, most schools in South Africa's underprivileged and rural areas lack any sort of connectivity, let alone internet access for learners.

Without internet access, how are we ever going to turn this systemic tide of inequality?

The mobile data conundrum

Ironically, the Cisco Visual Networking Index suggests that, if we normalise data usage per citizen, the average African uses the same amount of mobile data as the average European. However, looking closer at the numbers, it also tells us the average African has 1/20th the access to broadband internet data compared to his European counterpart.

Sadly, in South Africa, mobile data is the only perceived option for reliable data access,

and that's because, currently, it is. We simply don't have the installed base of fixed broadband wireless alternatives to challenge the mobile cabal, even though mobile customers in poorer communities, who can only afford to buy small rations of prepaid mobile data each month, are fleeced by the exorbitant cost of this data.

One of the key reasons for this lopsided distribution of data infrastructure is, quite simply, profit. The first 10 years of fibre to the home (FTTH) in South Africa saw deployments to the wealthiest 10% of homes, because the returns on investment were based around the potential revenue of a home.

However, if we switch the equation and focus on the potential revenue per hectare as opposed to household, a very different picture starts to emerge. Take two different communities for example: Westville in Ethekwini, and Kayamandi in Stellenbosch. Based on historical census data, Westville has an average annual household income of R230,700 while Kayamandi's average household income is merely R14,600.

The data also tells us the connectivity revenue potential per household is R460 for Westville, and only R30 for Kayamandi. However, the potential revenue per hectare is only R1,852 in Westville, compared to R3,141 in Kayamandi.

Why is this important, and how does it address the mobile (and subsequently FTTH) data conundrum? Because, across the country, there are over 9.3 million homes that fall into an ISP revenue potential of greater than R1,000 per month per hectare. Moreover, of the 2.6 million homes that are in an ISP revenue potential area of more than R5,000 per month per hectare, 80% have household incomes of R10,000 a month or less.

These are the homes – and schools – that have historically been neglected by the fibre and fixed wireless providers, and this is where things

can and must change for us to turn the ship of inequality around.

Bridging the gap

We've been working with Wireless Internet Service Providers (WISPs) and other stakeholders like Project Isizwe, a non-profit organisation that partners with funders and ISPs, to find effective solutions to the data access crisis in rural and underprivileged areas.

However, if we're going to succeed, the most critical requirement is commercial viability, especially for commercial operators like WISPs. But identifying the sites where revenue per hectare makes infrastructure deployment commercially viable is just the start. Project Isizwe, for instance, has already developed a connectivity revenue potential per hectare map of South Africa based on 2011 and 2022 census data.

The next, more difficult step, is to give WISPs the tools and know-how they need to make it work. Interestingly, that's where schools come in, again. I already mentioned how important internet connectivity is to ensuring schools have the resources they need to give learners a proper education, thus narrowing the digital divide.

As it happens, in many of the underprivileged areas we surveyed, schools are the centre of the community, providing among other things a convenient location for housing the critical network equipment needed to supply the community with fixed broadband services. We've shown that providing these communities with affordable WiFi services is not only commercially viable, but because WISPs can make use of school facilities to house the transmission equipment, they'd otherwise be paying operators thousands per month to host, the schools themselves can be subsidised for free internet access.

As such, together with Project Isizwe, we have

already started to empower WISPs to connect 20,000 schools with free wireless internet access by the end of 2024. While 20,000 sounds like a high number, remember that we have a national network of 200-plus WISPs, so the target is very achievable.

A wireless future

This is not pie in the sky talk, by the way. In 2021, a two-year, $1 million study by WAPA, Microsoft, Project Isizwe, Stadia Capital, Adaptrum, IDC, and the United States Trade Development Agency, demonstrated the commercial viability of using TV whitespace (TVWS) in South Africa to deliver broadband internet access to 13 million people living in 3.5 million rural dwellings via WiFi hotspots in just three of the country's nine provinces.

For context, TVWS is under-utilised bandwidth reserved for older TV signals that can now be repurposed for delivering internet services at low cost. The point here is that we have multiple connectivity technologies we need

at our disposal to reach the communities we need to reach, and we also know exactly which communities we need to reach.

In the years we spent conducting the TVWS study, we also learned how to build the necessary networks, how to make data access uncapped, how to fine-tune the network hotspot model, and how to implement the token payment and voucherless systems and to make revenue collection seamless.

Now comes the next stage, taking those lessons learned, and moving forward, using all the means of transport in our purview to generate enough money to get all these schools connected. This is not just a social responsibility project, it's commercially viable, with a huge pre-existing market that we can tap into, a market that's been fleeced by the mobile operators for years.

So, my message to WISPs is this: join us. This is not the time to compete with each other, but rather to stand together and take the fight to the data bullies that currently hold the upper hand. We need to do this. It's not optional. Our future depends on it. ∎

Erman Tanin,
head of FWA, market area Middle East and Africa, Ericsson

Current status of connectivity

What is the current status of the global digital divide? According to Ericsson's analysis (Ericsson Mobility Report, July 2023), it is anticipated that even by 2028, about 30% of households worldwide will still be missing broadband connectivity. Additionally, 3GPP technologies are forecast to provide extensive coverage to

both individual subscribers and households. For instance, LTE is projected to reach over 95% of the global population and households, while 5G is expected to cover approximately 85% of the world's population by 2028. This huge potential for household coverage presents a great opportunity for communication service providers (CSPs) to offer fixed wireless access (FWA) services alongside their existing mobile broadband (MBB) offerings.

We anticipate that these numbers will be significantly lower in Africa, primarily because of its relatively limited broadband connectivity compared to other global regions. This raises a critical question: how can we effectively and

Broadband households by 2028 -Three FWA segments
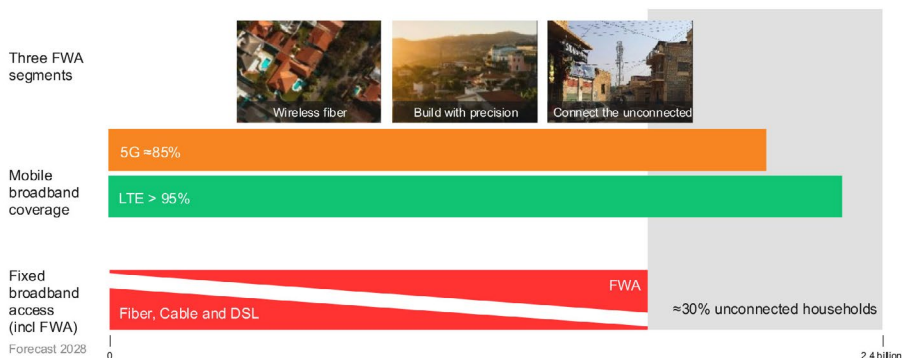
quickly provide connectivity to these households and businesses to bridge the digital divide? The solutions for home broadband can be categorized into three main segments: fixed-dedicated line solutions like fibre or DSL, satellite-based solutions, and finally fixed wireless access (FWA).

Different methods for household connectivity

The three main fixed broadband technologies are xDSL, cable, and fibre. xDSL and cable offer cost advantage with a relatively low investment requirement if existing copper or cable TV equipment is available. Fibre stands out for its exceptionally high speeds. However, both xDSL and cable are speed-restricted and distance-dependent with limited futureproofing. A further disadvantage of cable is that it lacks the capability to separate connectivity from services, which limits competition.

Fibre presents many obstacles, including very high upfront investments in civil engineering

and ducting projects. Deployment challenges such as obtaining permits often result in slow time to market. According to Fierce Wireless, FWA providers can enter rural and urban markets at about one-tenth the cost of physical fibre deployment (Fierce Wireless, 2018).

Governments are driving connectivity and broadband rollouts through various programs and subsidies, recognizing the link between increased broadband penetration and economic growth (Ericsson and Imperial College London, 2017).

On the other hand, FWA offers clear advantages over fixed connectivity options. Time to market is a clear winner. FWA eliminates the need for cumbersome civil works. It also provides flexibility by using the same resources for both mobile and fixed broadband, improving economies of scale.

The adoption of 4G FWA represents an initial step in providing FWA services. As it transitions to 5G, it is anticipated to provide ultra-fast speeds comparable to fibre optics, enhancing the overall fixed broadband landscape. A

number of markets including Angola, South Africa, Nigeria, and Zimbabwe, have already started offering 5G FWA services. When looking at why FWA is favoured over fixed services in certain scenarios, we see the obvious advantages such as lower CAPEX, faster time to market, increased monetization opportunities, and greater flexibility.

While fixed broadband services are limited to providing home connectivity, FWA can serve multiple use cases including mobile broadband and Internet of Things (IoT). This allows a single radio network infrastructure to support various use cases. Therefore, in a hypothetical scenario, 3GPP mobile resources can be used for MBB cases in case FWA adoption is limited.

Three types of FWA deployments

FWA mainly involves using 'wireless' access for the last mile of connectivity. While it sounds simple, there are three distinct deployment approaches for FWA: tethering; best-effort; and speed-tiered.

Tethering: in this approach, one or more mobile phones are used to establish communication with a household, including tethering to WiFi only devices. It operates under standard mobile operator pricing schemes, following standard retail, provisioning, and fault handling procedures.

Best-effort: in this approach, households acquire an indoor wireless router with wide-area wireless (such as 3GPP) capabilities for connectivity to and from the household. WiFi (or LAN cabling) is used within the house, between the router and other local devices. The device and subscription are nomadic, allowing the family to take and use the router anywhere, within the validity period of the subscription. The subscription reuses MBB paradigms, possibly with higher data allowances to cater to the whole household's needs. Device handling is also inherited from MBB, in terms of retail setup, provisioning, and fault management. It is like a mobile phone without a screen. Despite its nomadic nature, it resembles FWA from the household's perspective, and is labeled 'best-

Different types of Fixed Wireless Access

Opportunity for large scale offering
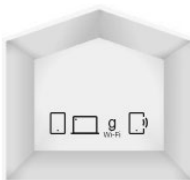
Tethering
Mobile Broadband
Standard MBB pricing, device logistics and management
Includes tethering to Wi-Fi only devices.
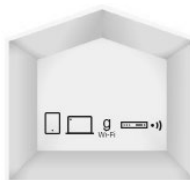
Best effort
Fixed Wireless Access
Nomadic indoor device (CPE) with MBB-like device handling.
Typically volume based price plans (e.g., GB bucket per month)
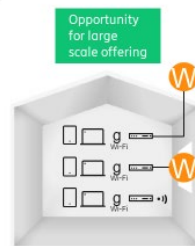
Speed-based
Fixed Wireless Access
Managed device (CPE), indoor or outdoor.
Price plan based on sold data rate. Subscription tied to known location.

effort' since it is a challenge to provide very high-grade guaranteed offerings when the customer premises equipment (CPE) is nomadic, and the subscription terms need to be valid everywhere.

Speed-based FWA: This is where we believe the industry needs to focus more. This approach focuses on provisioning households with a wide-area wireless-capable (such as 3GPP) device, such as an outdoor unit mounted on a roof or wall, or an indoor unit, either fully integrated like a standard router or with a more advanced antenna arrangement to improve performance. It follows the fixed broadband paradigm, enabling remote configuration and fault management from a customer service center over standard protocols. Pricing plans are specially designed for the service, emphasizing the sold data rate from fixed broadband offerings. In terms of pricing positioning, speed-based offerings typically have higher ARPU than best-effort offerings given the superior performance, with pricing levels similar to fixed broadband offerings. On top of it, service providers can use a mix of offerings with different price and speed tiers to target different segments.

Finally, the subscription agreements are typically location-specific, ensuring the service only works in the subscribed location. This is ensured either inherently through the fixed-mounted CPEs, or logically so that if the CPE is moved, the unit does not work, or the subscription is modified. Many service providers are already using this kind of location awareness for their subscribers, enabling a more surgical approach to delivering FWA services.

Last but not least, it is important to note that there are multiple levels of maturity for FWA deployments. The chart below shows how these different deployment options are adapted in different markets based on their needs (Ericsson Mobility Report, July – 2023).

Can FWA help close the digital divide in Africa?

FWA offers significant advantages over fixed technologies, particularly in terms of flexibility and time to market. And we are already seeing these implementations.

A recent initiative between FREE Senegal and Ericsson aims to connect several schools in Senegal with FWA technology, along with providing laptops, learning content, and teacher training to support the development of the ecosystem.

The project will run as part of Ericsson's Connect to Learn program, a global education initiative to improve educational opportunities through technology. For many schools around the globe, especially those in remote areas, connecting to the internet, and accessing online education relies heavily on mobile networks.

Originally designed as a solution for homes and businesses, the trial demonstrates FWA's potential to close the digital divide between urban and rural areas. Using the existing mobile network infrastructure is a cost-effective and efficient solution to connect schools, promoting equitable access to education and information across Africa. Imagine the time and cost associated with providing connectivity to remote areas with fibre or DSL!

Summary

In summary, FWA has emerged as the second most prominent 5G use case, following mobile broadband. Leading service providers are actively expanding and capitalizing on the potential of 5G FWA, driven by three primary scale advantages:

Regional FWA service provider adoption 2023

■ FWA (total) ■ Percentage of FWA that is 5G ■ Percentage of FWA that is speed-based
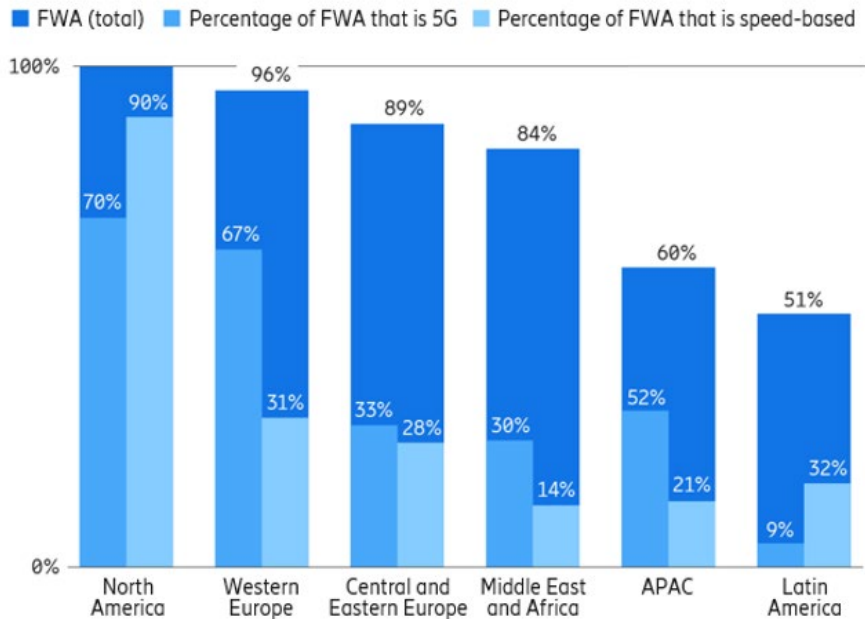
1. **Leveraging 5G's multi-use case network scale:** FWA enables CSPs to make shared investments, generating revenue from multiple use cases, which in the long run spreads risks and lowers initial upfront investments for new use cases.

2. **Harnessing the global 5G device ecosystem:** The scale of the global 5G device ecosystem is humungous, reaching 1 billion connections by 2022 (two years faster than the growth of 4G from the day of its launch). This rapid expansion enables the availability of affordable devices and a broad device ecosystem (Ericsson Mobility Report, July 2023).

3. **Leveraging the 3GPP innovation ecosystem:** 5G FWA attracts billions of dollars in R&D investment and a new spectrum, which contributes to the development of higher capacity and higher performance devices and networks.

To highlight a recent development, the 3GPP standard has extended the reach of millimeter wave technology, allowing for FWA connectivity at gigabit speeds over distances of up to 11km. FWA service providers are strategically positioned to address the connectivity needs of over a billion locations currently lacking access to high-speed and reliable broadband.

This positions FWA as a critical enabling technology in narrowing the digital divide and empowering both consumers and businesses across the entire African continent. ■

FIXED WIRELESS ACCESS: INTRODUCTION

Dobek Pater, Hloni Mokenela, Pieter Grootes, Ritu Sarmah, and Roald Kvevli – Africa Analysis

The need for 'meaningful connectivity'

Broadband connectivity is becoming increasingly important as a means of socioeconomic advancement. Several studies illustrated a positive relationship between broadband connectivity and higher GDP growth rates. COVID-19 related restrictions expedited the trend of increasing reliance on broadband for social and economic activities, including across Africa.

The minimum specification of broadband is often insufficient for an individual to be a full participant in society, even in Africa. Thus, the concept of 'meaningful connectivity' has been developed to identify the minimum requirements a good quality broadband service needs to meet to allow households/individuals not to be digitally marginalised.

The World Economic Forum (WEF) differentiates between two types of broadband connectivity:

- Internet to enrich day-to-day life requiring 2-3Mbps download, 512Kbps upload, and 500Mb monthly use
- Internet as a vital part of most activities requiring 25Mbps download, 10Mbps upload, and 50Gb monthly use

While the Alliance for Affordable Internet (A4AI) provides four components to define 'meaningful connectivity:'

- The right speed: users need sufficient speeds to access multimedia and other applications
- An adequate device: users must be able to both produce and consume content online
- Enough data: lack of data should not stand in the way of individuals fully using internet-based applications
- Frequent connection: if users can only connect to the internet every so often, it is less likely to be a meaningful tool

Broadband growth in Africa

In Africa, most of the continent's adult population uses mobile technologies to access the internet. However, true broadband quality connectivity on mobile networks is still quite limited in its availability. It is also often considerably more expensive than fixed connectivity on a per-Gb basis. This results in constrained use, especially in sub-Saharan Africa (SSA).

Historically, fixed connectivity has been used predominantly by businesses, government and other (non-residential) organisations. This has begun to change with extensive deployment of FTTH in some countries (e.g., South Africa) and the use of various fixed wireless access (FWA) technologies.

Despite many countries in Africa liberalising their telecommunications markets and developing broadband policies to expedite the

Mobile broadband population penetration by country (%), Q3 2022

Notes:
- MBB consists of 4G and 5G services
- Includes SIMs / connections used by businesses.

Median = 17.6%

Country Average 27.0%

Fixed broadband household penetration by country (%), Q3 2022

Note, includes connections in the business market.

Median = 3.65%

Country Average 15.11%

Source: TeleGeography, Africa Analysis, 2022

deployment of broadband infrastructure and adoption of broadband services, progress to date has been slow.

Countries with the highest levels of broadband penetration are mainly the North African countries and some of the small island states. Fixed broadband penetration remains at very low levels in most SSA countries. Moreover, broadband penetration, particularly fixed broadband, is skewed in favour of households and individuals with higher income levels and those in the urban areas where the broadband infrastructure footprint is higher. The gap between urban and rural use of the internet in Africa is more than threefold – the highest disparity among all regions globally.

Africa significantly lags other regions globally in internet usage. Within the continent, there are stark differences between more advanced countries and those that are part of the Least Developed Countries (LDC) group. Only 12% of the population has access to meaningful broadband (and only 6% in SSA). DSL is the main fixed wired connection technology, but mainly in North Africa. This is a legacy technology and in decline across practically all markets. It is being replaced by fibre and FWA technologies, mainly fixed 4G/LTE. Thus far, fixed 5G is available only in several countries and to a limited extent.

Many countries have formulated broadband policies and developed roadmaps to achieve wider broadband connectivity across all socio-economic segments. Examples of connectivity targets are provided below. However, many are already outdated in terms of timelines and required connectivity speeds.

FWA evolution

FWA technologies are gaining momentum due to their ease of deployment and ability to function where fibre or other connectivity solutions are not feasible. In Africa, FWA is seeing strong uptake due to expanding wireless network coverage, a growing range of services and tariffs, lower service prices relative to fibre services, and ease of adoption.

The initial FWA internet connectivity

Kenya

The National Broadband Strategy 2018-2023

Timeline	Consumers	Schools
Medium term	90% at 3Mbps 50% at 100Mbps	100% at 10Mbps 80% at 100Mbps
Long term	100% at 10Mbps 80% at 100Mbps	100% at 1Gbps

Nigeria

National Broadband Plan (NBP) (2020-2025)

Timeline	Consumers	Schools
Medium term	70% at 5Mbps for rural 70% at 15Mbps for urban	Fibre connectivity to 70% tertiary, 30% secondary and 15% primary schools
Long term	90% at 10 Mbps for rural 90% at 25Mbps for urban	Fibre connectivity to 100% tertiary, 50% secondary and 25% primary schools

South Africa

SA Connect Broadband Policy (2013-2030)

Timeline	Consumers	Schools
Medium term	90% at 5Mbps 50% at 100Mbps	100% at 10Mbps 80% at 100Mbps
Long term	100% at 10Mbps 80% at 100Mbps	100% at 1Gbps

Ghana

National Broadband Strategy 2012

Timeline	Consumers
Medium Term	• 2Mbps speed for heavy users • Speed of over 2Mbps for communities, groups etc. • 1Mbps speed for domestic users

was delivered using WCDMA (3G) and WiMAX technologies. Newer generations of wireless technologies, such as 4G/LTE, have improved FWA and expanded coverage, driven by mobile networks.

Advancements in 5G network technologies have significantly improved the download, upload, and latency capabilities of FWA services. Some of the new FWA technologies can deliver performance similar to that of fibre and cable. Fixed 5G can offer 10x to 100x more capacity than 4G, allowing for increasingly higher and potentially symmetrical download and upload speeds. It also provides lower latencies (under 10ms) which is critical to many emerging 5G use cases.

FWA relies to a large extent on the mid-band spectrum to provide broadband services. Enhanced Mobile Broadband (eMBB) services are the most common and most extensive initial use case when operators launch 5G networks.

The use of mid-band spectrum (1.6GHz to 7.125GHz) for 4G and 5G services is becoming increasingly popular, as it provides a very good combination of network coverage and capacity for these technologies.

The 6GHz band will become more important for 5G deployments in the future. As the demand for bandwidth in both

4G and 5G networks increases, national telecommunications regulatory authorities around the world have been working on making more spectrum available for the provision of services. Spectrum that is under-utilised for the provision of mobile broadband services – particularly in peri-urban and rural areas – can be used for FWA services.

FWA adoption in Africa

In Africa, FWA technologies are seeing increasing deployment and service uptake due to quicker and less costly network build than wired technologies. Deployment capex and operator pricing strategies make the provision of FTTx services unfeasible in many areas, while satellite broadband services remain expensive.

The resultant expanding wireless coverage and a growing choice of services and tariffs is resulting in a stronger uptake of FWA services, particularly in SSA. As of September 2022, there were 7.07 million FWA connections in Africa; 58% of these in SSA. FWA connectivity represented over 22% of all fixed broadband connections on the continent and over 38% in SSA. In 2021, 58% of the SSA population lived in rural areas, where FWA can be deployed faster, with more comprehensive coverage, and with lower total cost of ownership (TCO) than wireline solutions.

Share of fixed broadband technologies in Africa (Q3 2022)

Other wireless, 2.8%
Fibre, 16.7%
Cable, 1.0%
Satellite, 0.7%
FWA, 22.4%
DSL, 56.5%
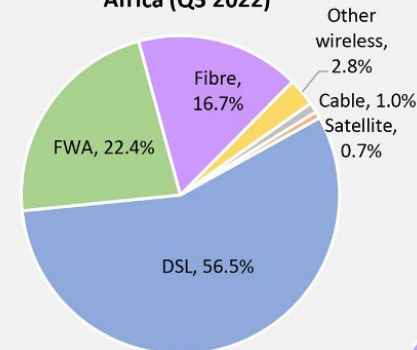
Note: DSL is present mainly in North Africa

The technology mix in SSA differs to that of North Africa. Limited wired access technologies result in higher representation of FWA.

Share of fixed broadband technologies in SSA only (Q3 2022)
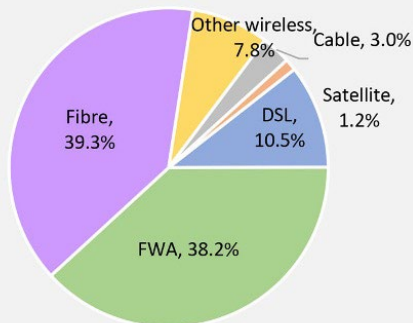
Other wireless, 7.8%
Cable, 3.0%
Fibre, 39.3%
DSL, 10.5%
Satellite, 1.2%
FWA, 38.2%

Source: TeleGeography, Africa Analysis, 2022

Market share of fixed broadband technology categories by country (%), Q3 2022

Fixed broadband household penetration by country (%), Q3 2022

Source: TeleGeography, Africa Analysis, 2022
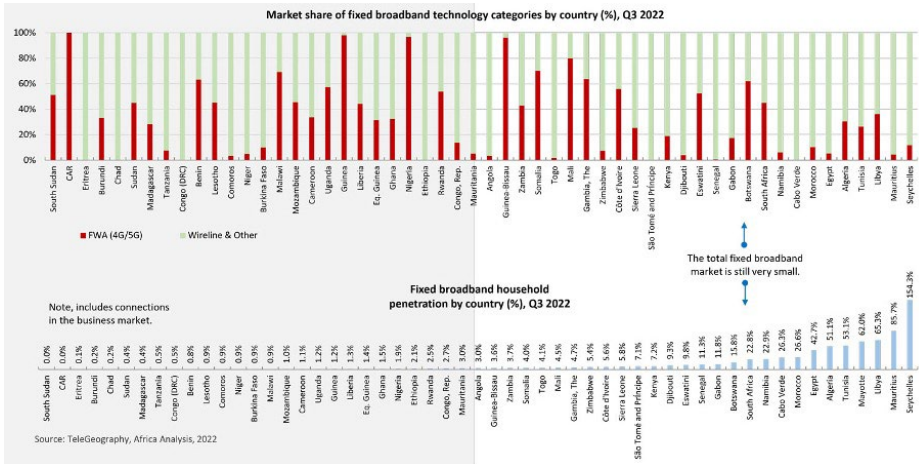
Fixed 4G, and more recently fixed 5G in some countries, are being used by operators for the deployment of FWA to compete with and complement wireline technologies. By the fourth quarter of 2022, almost all countries in Africa had 4G networks and 13 countries and territories had begun to offer commercial 5G services - all of them in SSA. Operators in ten other countries were piloting 5G networks and preparing to launch commercial operations.

Apart from the small island states/territories, 5G infrastructure is still extremely limited. Even 4G networks have been deployed to date mainly in the urban environment. The opportunity for the build-out of 4G infrastructure remains high, while 5G network build-outs are only in their early deployment phase (in the countries where they do exist).

African deployments

Currently, mid-band spectrum is mainly used to provide FWA services in Africa. Operators require enough spectrum to provide good quality fixed 4G and 5G services, ranging from contiguous 20MHz to tens of MHz spectrum frequencies. Several IMT spectrum bands are useful for the provision of FWA services, which normally include the 2.6GHz and the 3.5GHz bands. To be useful, spectrum bands need to be part of the broadband ecosystem, including critically the availability of requisite and affordable CPEs (e.g. WiFi routers).

When deploying FWA, operators usually follow a 'push' strategy, building out FWA infrastructure and making services available in areas where there is an expectation that such services are required. Geographic areas are identified mainly based on population density and sometimes also on the existing use of mobile broadband services. FWA products are sold predominantly on data volumes, although they are differentiated on speed in terms of marketing. Some operators sell fixed 4G products on data volumes, but fixed 5G on speed.

Access to requisite spectrum and efficient use of the spectrum are one of the main challenges faced by operators. To mitigate

this, some operators have been refarming spectrum, as well as acquiring new spectrum licences where possible. Spectrum sharing is one potential solution to more efficient use of available spectrum.

Affordability of CPEs and FWA services by consumers is another challenge. Operators are actively trying to source lower cost CPEs and offer a wide range of service options to suit various levels of affordability. Additionally, customer education is undertaken to drive awareness and demand for broadband services.

Key takeaways

Good quality broadband connectivity is becoming increasingly important as a means of socio-economic upliftment. As digitisation of societies progresses, quality broadband will be critical to avoid marginalisation.

The addressable market for fixed broadband connectivity in Africa is expected to increase from 56 million households in 2022 to 82 million in 2035. Fixed 4G and 5G connections in Africa are projected to grow from 4.3 in 2023 to 17.7 million in 2035, at a CAGR of 12.6% (the base case).

This growth depends on the availability of spectrum. Various forms of government intervention to support broadband adoption will result in higher broadband penetration among households. Such measures could increase the growth of Fixed 4G and 5G connections to over 21 million, or an additional 14% growth. The adoption of these connectivity services will likely be much higher if retail prices of CPE and services decline substantially over the long-term future from the current prices. Allocation of 6GHz spectrum frequencies to FWA is critical

for available capacity expansion to continue providing high quality broadband services. The more spectrum is available, the better the broadband services. To this extent, it is critical for governments and regulatory authorities to make the requisite spectrum available to the FWA operators in sufficient quantities – the 2.3GHz, 2.6GHz, 3.5GHz, 6GHz and 26GHz spectrum bands. This will allow them to provide wider coverage on a nation-wide basis and operate their networks most efficiently.

However, several constraints currently limit growth, including the rate or urbanisation across different countries in Africa; household income levels vs. prices of good quality broadband services; and the rate of fixed broadband networks deployment.

Apart from making the spectrum available, governments and regulatory authorities can leverage various other intervention measures to expedite network deployment and drive broadband adoption, by reducing input costs for the network operators, including reduction or complete removal of import duties and excise taxes on imported network equipment; cutting the cost to deploy network infrastructure through infrastructure sharing regulations and the use of Universal Service funds to cover the high cost of backhaul network deployment; and enhancing demand for broadband services through the introduction of government demand-side incentives to make the adoption of broadband services more affordable. For example, introducing subsidies for monthly service subscription and/or data consumption, as well as CPE and/or connection activation, and incentivising the network operators to offer discounts on services provided to public institutions such as institutions of learning or to low-income households. ◼

John Tenidis,
marketing director, wireless solutions portfolio, Intracom Telecom

Over the past year, our company has witnessed a period of restart and gradual return to normalcy following disruptions caused by the pandemic.

We've been supporting and maintaining networks and are now observing new investments in network expansion. Our portfolio includes supplying fixed wireless access (FWA) networks to ISPs and telcos, wireless transmission networks to mobile operators, control and management networks for electricity companies, as well as private networks for armed forces, police forces, and the mining industry. Our clients are proactively considering network capacity, scalability, and the growing demand for remote interaction in both business and private settings. These trends have positively impacted our booked business over the past year, and we anticipate continued growth in the future.

The continent faces significant challenges in the realm of ICT, including limited infrastructure, affordability issues, and the digital divide. The lack of network coverage, inadequate broadband infrastructure, and unreliable electricity supply hinder the expansion of ICT services. Affordability remains a major hurdle, with high data costs and limited access to affordable devices inhibiting widespread adoption. Moreover, the digital divide persists, with disparities in access to ICT services across urban and rural areas and among different socio-economic groups.

However, Africa also holds promising opportunities. The mobile revolution has created avenues for mobile-based services and innovative solutions tailored to the mobile-centric market. Initiatives aimed at improving internet connectivity offer prospects for enhanced access and higher speeds. Additionally, the continent has seen a surge in digital innovation and entrepreneurship, fostering economic growth, job creation, and localized solutions.

The ICT trends in Africa include mobile technology dominance, improving internet connectivity, growth of e-commerce and digital platforms, thriving digital innovation hubs and start-up ecosystems, adoption of artificial intelligence and data analytics, and efforts to promote digital skills development. The rural and sparsely populated areas have historically posed challenges to progress, creating a divide that needed to be bridged. Previously referred to as the digital divide, the advent of 5G technology has revealed that communication is as crucial to human life as water and energy. Therefore, ensuring equal access to communication is fundamental for the prosperity of communities. It is no longer acceptable for communication facilities to be prioritized for desk workers over farmers toiling in the fields. Africa faces a unique challenge stemming from its cultural and lifestyle diversity. Recognizing the potential brought by achieving equal access to communication is key.

The African telecom and ICT market differs from global markets due to infrastructure challenges, a mobile-centric focus, affordability concerns, rural connectivity needs, localization and adaptation requirements, and the emergence of innovative payment solutions. Africa faces significant obstacles in terms of limited network coverage, inadequate broadband infrastructure, and access to electricity. The market heavily relies on mobile technology, with mobile phones being the primary means of internet access. Affordability plays a crucial role,

leading to the provision of affordable options and data pricing considerations. Extending wireless connectivity to remote areas is a unique challenge due to the large rural population and geographical constraints. Localization and adaptation are necessary.

Despite Africa's wealth in natural resources, the second most populous continent struggles to achieve the living standards of other regions. The implementation of ultra-fast broadband technology holds promise for improving quality of life and increasing prosperity. The new 5G FWA technology can impact various areas such as the economy, politics, social dynamics, industry, academia, and professional life. To fully leverage its benefits, local skills must be developed to cater to specific regional needs.

South Africa, Kenya, Nigeria, Egypt, Ghana, and Libya are among the most vibrant countries in Africa. South Africa boasts an advanced telecom infrastructure with widespread coverage and high-speed broadband. Kenya is known for its leadership in mobile technology and digital innovation, while Nigeria has the largest telecom market in Africa, with significant investments in network expansion and digital transformation. Egypt has a well-established telecom infrastructure and serves as a regional hub for telecom operations. Ghana has made strides in expanding broadband connectivity and promoting digital services. In Libya, there is a fascinating initiative aimed at enhancing governmental services nationwide, leading to pivotal projects focused on modernizing operators FWA networks. These countries will continue leading the way; however, other African nations like Uganda, Morocco, Senegal, Ethiopia, Ivory Coast, etc. have also pockets of progress in their telecom development.

We have supplied one of the largest mines in sub-Saharan Africa with our WiBAS™ Point-to-MultiPoint (PtMP) Wireless Systems, and supply our technologies to one of the leading MNOs for the deployment of a network funded by government to connect officials, civic facilities, and civilian serving sites.

The problem with doing business in Africa is the fragmentation of the regulatory framework in so many countries, with different pace of progress. For example, in Nigeria the 26GHz band was allocated to 5G, in Ghana the same band is reserved for 5G and was taken away from FWA, and in South Africa the same frequency band is available for FWA without plans for 5G yet. To address this diversity of regulatory frameworks a broad portfolio of products is required, and an intensive plan of country-specific homologation is in place. We take into consideration this diversity and we adjust and expand our product portfolio accordingly to be able to satisfy customer demands as soon as they appear. The diversity of regulatory framework has a negative impact on keeping up business expansion at the same pace across the continent. ■

Looking ahead: We firmly believe in Africa's huge potential to invest in modernizing and expanding telecommunication infrastructures. The vastness of the land, the diversity of the populations and the magnitude of nations on the continent has no similar on our planet, yet with one distinct characteristic; the wide gap between those who have connection and those who do not.

We see a tremendous opportunity for our solutions enabling access communication networks, ones that provide real broadband and uncompromised quality to citizens, no matter where they are. Our industry has previously focused on improving connectivity on the move and neglected fixed locations. As opportunities arise, we are eager to participate in projects focused on implementing ultra-broadband wireless access.

Yisrael Nov,
VP global sales, Parallel Wireless

Parallel Wireless' presence in Africa started when we decided to address 'connecting the unconnected.' In the last few years, we have established a footprint in Africa for solutions including 2G, 3G, 4G and now 5G which meet the continent's special requirements such as support for transmission over satellite and equipment powered by standalone power sources (e.g. solar).

In this past year we have expanded our deployments with our existing customers by starting our journey to deploy urban solutions with our next generation ORAN-based technology. These solutions support multi-band, multi-layer, and multi-RAT networks.

Africa is characterized by a unique cultural, environmental, and commercial landscape. Due to the generally low ARPU, in comparison with other markets, operators have limited resources for investment in infrastructure, whether for maintenance or for upgrades. The sheer size and wild expanse also result in fewer access roads, which make physical installations trickier. On top of that, power supply is inconsistent and very expensive in proportion to the ARPU. This can hamper network rollout and forces us to use innovative approaches to ensure smooth, continuous operation.

Operators have fewer inhouse resources available for developing and upgrading the network, so 5G adoption is still sparse and even 4G is limited to densely populated areas. On average there is less familiarity with technical aspects, which makes it harder to communicate advanced concepts like ORAN and RAN Centralization. As a result, many operators

develop a strong reliance on their vendors, which leads to little appetite for ORAN, though it could help them improve the cost-efficiency of their networks.

There is a growing realization that connectivity and broadband are not a luxury, but a necessity to enjoy the fruits of a global economy. The cost of satellite communication (multi-beam and LEO satellites) is decreasing and is therefore more accessible, improving the business case for connecting additional sites to a satellite backhaul.

5G will be a key technological driver in the next few years. Apart from the technological boom surrounding the deployment of the network itself, the increased broadband capacity, and the support for new capabilities (such as massive IoT deployments) that 5G brings will transform the African market. With true broadband access reaching so many new consumers and businesses, the whole region will be able to participate more actively in the global economy.

We're seeing new opportunities due to the rises in energy unit costs and cell-site power consumption, and a surge in interest in 5G, both the technological capabilities and in finding the right path to implementation. There is a global debate in terms of how best to roll out 5G. Operators are deliberating how far they can afford to go in the short term; embrace 5G completely with RAN and core network equipment (5G SA) or just purchase new 5G RAN equipment to give customers a partial 5G experience (5G NSA).

As a subset of this process, operators are showing a growing wariness about the power consumption of the network. The concerns are both for the ability to reliably supply all this power across the network and how they can afford to pay for it. That is why the demand

for power efficient solutions has ascended in priority. In countries where energy is relatively expensive, the ability to optimize 5G network power consumption is critical. We expect that the ability to deliver power savings will be a major factor in the selection of vendors.

We have also noticed more interest in the power of AI to impact the industry by making networks smarter, more reactive, and more efficient. The fact that mobile networks are relatively new in Africa may allow them to embrace smarter network components faster. ■

Looking ahead: We expect 2024 and 2025 to be exciting across the continent.

South Africa stands out as it is one of the most advanced countries when it comes to mobile networks. Due to the relatively high ARPU, we see more competition among mobile networks which leads to more pressure on each operator to innovate with better technology and better services.

Nigeria has a relatively dense population and is fortunate to enjoy a good supply of valuable natural resources. This means that even if the market can't bear a high ARPU, the operator has the financial capability to invest in the mobile network. And if that isn't motivation enough, the fact that there is a new entrant in the telecommunications space means that we will probably see a race to win over consumers.

The third country to watch out for is Ethiopia. While there is no expectation of high ARPU, the fact that there are two new entrants will keep competition fierce, for service, for coverage and for subscribers.

We are very active in East Africa, where we have worked closely with an operator who required a complete solution. They asked us to supply the full end-to-end solution, including RAN equipment, transmission, power, infrastructure, delivery, and deployment. We expect to see additional operators who will seek to deploy ORAN technology and will need similar assistance.

We are happy to say that we see more awareness on the part of the regulators of the challenges and difficulties that stand before MNOs as they attempt to provide consumers with good quality service. With everything that they are facing, there is growing appreciation of just how big an engineering feat it is to roll out and maintain a mobile telecom network. Regulators seem to grasp that they can also be part of the solution. Thanks to this, there is increasing evidence of network sharing between two or more operators, a practice that is aided, sometimes even made possible, by the regulator.

In parallel, there seems to be a much more proactive push by the regulators and governments to encourage rural service and coverage. Given the boost this can give to local communities, this is indeed great news. There is no doubt that giving everyone the right to access broadband is increasingly becoming a priority.

Next year we expect interest in ORAN to continue to strengthen as more and more MNOs realize that the best way for them to optimize their investments in mobile connectivity is to break their reliance on proprietary hardware. The ORAN ecosystem has grown and is now fully capable of providing MNOs with opportunities to upgrade their networks without being locked-in to a single vendor.

The dual challenges of adding capacity and reach to their networks will also lead operators to consider RAN Centralization. This will disrupt the industry and more operators in Africa will adopt Open RAN.

Danny Ben-Simhon,
regional sales director - ME and
Africa, Siklu

Our years of experience in Africa have highlighted the inadequacies of the electrical grid, which are severely hampering the spread of broadband connections and the closure of the digital divide. This makes it difficult to utilise street light infrastructure and other site acquisition projects for the deployment of wireless networks. In addition, to use South Africa as an example, power is not available 24/7 due to load shedding, which sometimes lasts 10-12 hours a day.

The lack of a steady supply of electricity from the grid leads one to consider back-up power solutions, which will require installation in a secure estate or area; otherwise batteries and solar panels get stolen. Therefore, back-up power solutions apply to both metropolitan and rural areas, and more so in the latter as the grid does not even extend to certain regions.

The assets at stake range from the fixed broadband wireless infrastructure, to the cables and other wired infrastructure and the CPE installed at the home. You need the community to protect the infrastructure by making them part of the roll-out - as sales people and local community representatives, and also when it comes to the skills transfer

"Another interesting technological achievement concerns the use of dual-band wireless systems that dramatically extend the range of highcapacity wireless systems."

necessary to operate and manage the local network. A combination of technologies, and a combined effort with involvement from local and overseas governments in terms of investment, are required.

Another interesting technological achievement concerns the use of dual-band wireless systems that dramatically extend the range of high-capacity wireless systems. A long range wireless link is almost always less expensive to deploy than an equivalent length fibre line, but the long range PtP wireless networks deployed in Africa are usually 'sub-6' systems, which have capacity limits and other limitations. However, there is a relatively new technique that uses software to combine the high-capacity capabilities of E-band radios (70/80GHz) with long distance transmission capabilities of the lower band radios (e.g., 5GHz) to deliver an astounding 10Gb at distances of >10km. Deployments to date have shown that this is a very cost-effective solution.

Previous approaches to accomplish such a feat meant sacrificing up time availability or adding parallel links, resulting in significant additional costs and complexity. The software also removes the need for an external switch or router to further reduce CAPEX. Field testing and the many operational deployments of this unique technology have also proven that it is a vendor agnostic solution that can help overcome supply chain issues and get projects up and running sooner.

Furthermore, as accounting for rain events is a must in most parts of the continent, the software enables an adaptive modulation and advanced QoS operation for the E-band and lower-band radio combination. This means that when a significant rain event occurs, the adaptive capabilities will kick in to lower the capacity of the E-band link and improve the link budget.

Or, if the capacity reaches a user-defined low threshold, then the traffic is routed to the lower band radio to maintain the availability of high-priority traffic. All of this can be done in less than 10 microseconds, which conforms to the highest public network operational standards. This is a cost-effective technique that could be very useful in many areas in South Africa and elsewhere, and, as a result, we expect it to gain further traction. ■

Looking ahead: In 2024, we see things ramping up for license-exempt 60GHz band mesh terragraph deployments and increasing demand for 10Gbps backhaul in the 80GHz domain, as the congested 5.x GHz deployments cannot provide the interference-free, fibre-like, fixed wireless broadband that demanded by both residential and business customers. The combination of the 60GHz massive-mesh terragraph, which has a 1km diameter coverage area for each node and works well in densely-populated areas, and the 10Gbps 80GHz extended range backhaul is proving to be a much less expensive and time-consuming solution than the equivalent wireline options for gigabit-level connectivity.

This illustrates a single user success story that stood out for us and our partner in South Africa, Skywire, in 2023, regarding the Innibos music and cultural festival. The Innibos event organizers were anticipating 40,000 attendees each day. Based on their previous experiences, public cellular networks would not be able to handle the high demand for connectivity in such a crowded area. After a quick calculation, it became evident that Innibos would require massive bandwidth, reaching multi-gigabit levels. The event would need multiple gigabits to account for the expected amount of video content that would be transmitted wirelessly from performance stages and other areas to a central production studio located on the premises.

To provide multi-gigabit bandwidth, many operators and solutions providers would typically consider using a fibre link, but laying fibre for a temporary event is expensive and time-consuming. On the other hand, the scalable fixed-wireless combination of backhauling over extended-range 80GHz and meshing over the 60GHz band for onsite applications, has increasingly become the preferred connectivity option around the world, and especially here in the typically congested urban Africa areas, as it offers both interference-free operation as well as a faster deployment time. To meet the backhaul requirement, Skywire looked for their nearest fibre POP with a clear line-of-sight to the event's arena. A path analysis to the nearest fibre POP, some 3.8km away, revealed a marginal line-of-sight and this type of connection could only be accomplished with a fixed wireless system featuring a very narrow beam capability – and the solution was a Siklu multi-Gigabit 80GHz radio.

For onsite connectivity, Skywire needed to backhaul a dozen high-end WiFi 6, dual-band access points operating at the highest-rate. After reviewing the project's wide area and the available equipment options, Skywire selected the Siklu's MultiHaul™ TG mesh solution, as it operates in the ultra-wide, interference-free and license-exempt 60GHz band, and the MultiHaul T280 terminal units. These terminal units feature an integrated switch and power-over-Ethernet capability, which enabled a simplified connection directly to the served WiFi access point, while eliminating the expense of adding another power adapter, longer cable runs and an external switch.

The end result was fibre-like backhaul private connectivity to all WiFi APs and other devices throughout the venue and even higher capacity performance from the venue to the fibre POP, with no need to use public cellular networks.

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6Harmonics, a Canadian Company, has its roots in developing long-range broadband. In late 2021, the company assembled a new management team to develop a new product strategy.

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.

The new 6H edge intelligent systems comprise H/W with edge S/W, either on-prem or cloud-based 6Harmonics controller S/W. Communication port options will include 4G/5G, WIFI6, TVWS, LORA, Etc. The new platform offers high value to digital divide solution providers and resource extraction operators such as: O&G, mining, forestry, fisheries, farming, and utility companies.

6Harmonics

6H New GSW-5500

6H Rugged Edge Compute & Communications

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Intracom Telecom is a global technology systems and solutions provider operating for 45 years in the market. The company is the benchmark in fixed wireless access, and it successfully innovates in the 5G/4G wireless RAN transport and small-cell SON backhaul international arena. Intracom Telecom offers a comprehensive revenue-generating software solutions portfolio and a complete range of ICT services, focusing on IoT, SDN/NFV, Big Data analytics & data-driven intelligence, and Smart City solutions. Furthermore, the company is developing security integrated systems for critical infrastructure protection and border surveillance, having extensive know-how and a proven track record in this industry. Moreover, it addresses the Energy & Utilities industry, emphasizing on smart metering and end-to-end IT solutions. Intracom Telecom serves telecom operators, public authorities and large public and private enterprises. The Group maintains its own R&D and production facilities and operates subsidiaries worldwide.

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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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· Smart cities & smart highways
· Remote monitoring & surveillance
· Mining & exploration
· Asset tracking & RFID

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Léa Zouein,
Analyst Middle East Africa, Dataxis

Monetising OTT for MNOs in sub-Saharan Africa

Three main hurdles persist in sub-Saharan Africa and prevent OTT platforms from being widely used across the region: unstable internet connections, high prices and lack of payment options. The most apparent solution in the region is to adapt the business model of each platform to offer the most relevant plan.

Several platforms such as Netflix, Showmax or Disney offer special mobile subscriptions at lower prices than traditional subscriptions, which has proven to be a real asset. While in 2022, less than 5% of households were connected to fixed internet and only 1% to fibre, mobile internet had a population penetration rate of about 45%. By partnering with mobile operators, OTT platforms can offer packages that include both a subscription to the platform and data,

at low cost and with a simplified payment method since everything is reconciled on the mobile bill. By early August 2023, Disney+ had launched a mobile plan with MTN in South Africa. Two months earlier, in June 2023, the same type of partnership was signed between MTN and Viu SA to provide Viu Premium subscription with data at a reduced price to the operator's customers. The growing number of these partnerships across sub-Saharan Africa reflects the importance of smartphones as viewing devices in a region where fixed internet is struggling to develop.

However, paid subscriptions are harder to sell; freemium seems to be an interesting alternative. At a time when the cost of the internet is already high, offering free content financed by advertising is a way of attracting consumers who do not have the resources to pay for both data and subscription, and also removes the barriers of payment method. Yet, in an advertising market that is still too unstructured, it is difficult for platforms to adapt their advertising strategy to be as relevant and therefore profitable as possible.

Added to all this is the question of the profitability of investments in technology and content to launch and maintain an OTT platform efficiently.

High speed connectivity

The increasing availability of high-speed connectivity, especially for mobile, has positively impacted OTT uptake by making content more accessible and affordable for sub-Saharan populations. On the one hand, the development of mobile internet, and more especially of 4G, will make it possible in the long term to lower even more the price of mobile data and make it more affordable to most consumers.

On the other hand, the OTT market could even more benefit from a quality fixed network. The fixed network, especially fibre, is still struggling to be developed in the region. Due to a lack of infrastructure and resources, few areas are currently connected to a quality and affordable fixed internet network. Even though initiatives are multiplying to connect the territory, such as Starlink's satellites in orbit, fixed internet is far from having reached its potential in the region.

With an efficient internet connection, viewers would rather choose to watch content on larger screens such as televisions to get the most out of the content's potential. Moreover, the aggregation of platforms on connected devices such as smart TVs or streaming devices would allow operators to bring together as many services as possible on a signal device and facilitate the user experience. The condition remains that the internet connection is sufficiently reliable for these devices to work.

South Africa illustrates the impact that high speed connectivity can have on OTT adoption: in 2022, fibre subscriptions reached 33% fixed internet while OTT penetration stood at around 20% of households. As the fibre network continues to expand, new OTT platforms are being launched such as Disney+ and SABC+ in 2022 and Paramount+ expected this year, bringing the number of platforms available to around 20 in the country. If neighbouring countries also manage to kick off the deployment of fibre optic networks, it could create the conditions for the success of OTT services. What's left is to convince consumers not only to subscribe but also to renew their subscription over the years.

Market opportunities

Because internet connectivity is one of the main obstacles to the full adoption of OTT platforms in sub-Saharan Africa, MNOs and ISPs have seen the opportunity to offer both internet and content. Most operators started to try their hands at this like Nigeria's 9Mobile, which launched 9TV Nigeria at the end of 2022 or Kenya's Safaricom which launched BAZE in 2021.

However, the shutdown of Vodacom's platform VideoPlay in 2022, when it had the third-largest market share in the region behind Netflix and Showmax, and the low market share penetration of telecom operators' platforms reflect the limits of such projects. Let's not forget that content is king and drives subscriptions. But creating the most attractive catalogue is very expensive and time-consuming. Many platforms are launched but do not survive the market and its complexity: offering essentially local content, adapting to the different languages spoken and offering the most relevant and

accessible subscription plans while still being profitable. Telkom launched Telkom One in November 2020 and closed it in November 2022. It is the same situation for Cell C with its platform Black (2017-2019) or Econet with Kwese Play (2017-2019).

Therefore, the best opportunity for MNOs and ISPs is to partner directly with OTT platforms whereby each fulfils its original role: the OTT platform provides the catalogue of content and the telecom operator provides the data. MTN Group has several partnerships throughout the region with different platforms such as StarNews, Showmax, Molotov, Wi-Flix or CineMagic. Vodacom, which shut down its own platform, has partnerships with Netflix, Showmax, CineMagic, Amazon Prime Video and Viu for instance. ■

Ross Flynn,
project manager,
Mobile Ecosystem Forum

Value added services, often abbreviated as VAS, are non-core services offered by telecom operators to enhance the basic voice and data communication services. This seems easy to understand but ask a roomful of people what this term means, and you're guaranteed to get a wide variety of answers.

Many different products spring to mind. Some may think of the original VAS like voicemail or SMS. Others will think of gaming, being one of the most popular non-core telecom services out there. Whatever pops up, it can be difficult to comprehend the full breadth and variety of content and services within this catch-all term without leaving something out, not even considering additional details like whether the service is monetised or not, or which needs and preferences they might cater to.

This is because these supposed 'non-core' services are so engrained into our daily lives that we begin to take them for granted. Watch any of these services being disrupted for even 10 minutes and you will see from the backlash of the customer just how essential they really are to our daily lives. What began as simply connecting people through voice calls has evolved into a vast ecosystem of services, data-driven applications, and innovations.

Across the vast and diverse continent of Africa, the utility of VAS is especially developed as it plays a pivotal role in enhancing connectivity, expanding access to information, and improving the quality of life for millions of Africans. Due to just how diverse the continent is, we've seen mobile VAS innovate and come up with creative ways to serve the underserved, for example, those in rural regions who may not have reliable network connection. As the fastest growing continent there remains a huge untapped market and plenty left to be done.

Education is one of the most important VAS that just isn't spoken about enough. VAS education is transforming how Africans access learning opportunities. Mobile-based educational content, such as e-books, video lessons, and interactive quizzes, are making quality education accessible to students, even in underserved regions.

There is a real opportunity for VAS to improve the quality of life in Africa. For example, a significant portion of Africa still faces the

problem of illiteracy with more than one third of adults in sub-Saharan Africa being unable to read. In response to this, we're now seeing services in Africa that use advancements in voice AI to reach non-literate users. Creative user interfaces are used to convey information without the written word. This is increasing the penetration of VAS services in general while improving the connectedness of Africa as a whole. VAS in education contribute to a more educated and skilled workforce, which is essential for sustainable development.

Africa has witnessed a remarkable rise in mobile money services, which have revolutionized financial inclusion. Mobile banking and payment VAS, such as M-Pesa in Kenya and Ecocash in Zimbabwe, have allowed millions of people to access banking services, make payments, and transfer money even in remote areas with limited access to traditional banks. African countries remain at the cutting edge when it comes to financial inclusion through mobile VAS and the rest of the world's financial institutions can glean many lessons from it.

One such innovation was M-Pesa integrating into services like PayPal and Western Union increasing financial reach for millions in Kenya. By enabling financial transactions, expanding access to markets, and fostering entrepreneurship, VAS contribute to economic growth and job creation.

Telemedicine and mobile health (mHealth) services are becoming increasingly popular in Africa. VAS in healthcare enables remote consultations, appointment scheduling, and health information dissemination. They are critical in rural areas with limited healthcare infrastructure. Patients in Africa can connect with consultants and securely send information to be diagnosed. Mobile health services improve healthcare access, particularly in remote areas, helping to combat disease and reduce maternal and child mortality rates.

VAS is being used to empower farmers and promote agricultural development as well. Mobile-based agricultural advisory services provide farmers with crucial information on weather forecasts, crop management, and market prices, helping them make informed decisions and improve their yields. VAS in agriculture, healthcare, and education are instrumental in poverty alleviation efforts, providing marginalized communities with tools for self-improvement.

Africa's vibrant entertainment industry is leveraging VAS for content delivery. Mobile TV, music streaming, and gaming services are booming. However, there are still issues in this area. There is still a lack of content in local languages that are made specifically for a specific local audience.

Luckily, there is good news on the horizon. Streamers are beginning to invest more in local African content. Netflix recently announced a slew of new African TV show renewals and productions. Due to the success of surprise hits like Squid Games, streamers are realising there is an appetite for quality programming outside of the traditional Hollywood channels. There is a dawning realisation among the streamers that audiences globally are capable of watching non-English shows that explore other cultures. This is something that the traditional linear networks were slow to grasp and something that streamers, made available through mobile VAS are all too happy to cash in on.

Despite their transformative potential, VAS in Africa faces challenges like infrastructure limitations, regulatory issues, and affordability. However, these challenges also present opportunities for innovation, public-

private partnerships, and investment in digital infrastructure.

VAS have become a cornerstone of the telecom industry's evolution. They are not just add-ons but integral components that enhance the customer experience, drive revenue diversification, and keep telecom companies competitive in an ever-changing market. As technology continues to advance, we can expect to see even more innovative and personalized VAS that cater to the evolving needs and preferences of users, further solidifying the importance of these services in the telecom sector in continents as diverse as Africa. ■

Reimagining the future of finance
An exert from Boston Consulting Group's Global Fintech 2023

Industry fundamentals remain strong

The financial services industry is one of the largest and most profitable segments of the global economy, representing $12.5 trillion in annual revenue pools and creating an estimated $2.3 trillion in annual net profits or additional value — based on one of the highest average profit margins across all industries of 18%.

There is ample room for growth in the fintech sector, especially in emerging markets, given that 1.5 billion adults globally are still unbanked, with an additional 2.8 billion adults underbanked (defined as not having a credit card, using data from the World Bank Financial Inclusion Project). The total represents more than half the world's population. Moreover, almost 44% of adults globally are still heavily dependent on cash for major transactions, while 89% use a mobile phone or smartphone.

There is also still significant room for growth in digital usage in banking — currently at about 39%, compared with 98% in computer software. The figure dips as low as 17% on average for countries in the Middle East and Africa. It is important to note that although the fintech sector is coming of age, it is still at a very early stage of development, representing less than 2% of annual financial services revenues globally — or roughly $245 billion out of $12.5 trillion.

By 2030, global banking and insurance revenue pools are expected to reach $21.9 trillion, a 6% compound annual growth rate (CAGR). Annual fintech revenues are projected to grow more than sixfold from 2021-2030 to reach $1.5 trillion. Banking fintechs' revenues — lending, deposits, payments, and trading and investments — are projected to grow from 4% to 13% penetration (at a 22% CAGR) of banking revenue pools by 2030 and are expected to represent one-fourth of global banking valuations.

Leapfrogging incumbents

Africa and the Middle East can leapfrog incumbents by adopting new technologies.

In Africa, although cash is still king, fintech could be a vehicle to solve the access issue, as most of the population is still either underserved by banks or fully unbanked. As the youngest and fastest-growing region globally — with a median age of 19 and projected population growth of an additional 1.2 billion people by 2050 — demographic shifts and earning-power increases will deepen the need for financial access.

We expect some degree of leapfrogging in technology, particularly when it comes to cashless payments. In Nigeria, 73% of adults

have a smartphone, but a mere 2% have credit cards. Accordingly, most Africans' first interaction with the financial services sector may be through their smartphones—presenting major fintech opportunities in payments and lending for regional champions with full-stack attacker models.

Historically, telco-fintech players, such as M-Pesa, developed by Vodafone's subsidiary Safaricom, have led much of the segment's growth in the region. Such players are expected to maintain their major role, alongside grassroots fintechs. We project a fintech revenue CAGR of 32% until 2030, with South Africa, Nigeria, Egypt, and Kenya being the key markets.

Three models to engender internationalization

Looking ahead, we expect a geographic expansion of fintech ideas to develop mainly through three models: the emergence of local champions, the rise of multinational fintechs, and the expanding role of big techs.

The emergence of local champions. Segments and markets with onerous regulatory constraints or high capital requirements will be fertile ground for the emergence of local champions, some of which will attempt to replicate successful models from geographies where fintech has reached a more advanced stage of development. All fintechs will be subject to local parameters but will feature more homegrown innovation.

The rise of multinational fintechs. Few fintechs, PayPal being one, have managed to successfully build a multinational business. But this status quo is poised to change within some subsegments, such as KYC/AML (Anti-Money Laundering), cross-border payments, wealthtech, etc. Multinational fintechs will likely evolve across countries that possess similar economic profiles

and consumer needs.

Big-tech expanding its footprint. Big techs such as Google, Meta, Tencent, Apple, Ant Group, and Amazon are looking to further integrate financial-services apps (especially in low-regulation segments such as payments) into their offerings through local partnerships, and eventually bring them out globally. This handful of very powerful companies, by virtue of their ubiquity, massive customers bases, and depth of customer data, are well-positioned to bring fintech-related offerings to their trusting, global audiences. They will advance either in the form of customer-facing superapps — a somewhat problematic scenario, owing to government scrutiny of potential antitrust issues — or by providing analytics to incumbents from the vast consumer datasets they possess. We have seen recent breakthroughs in this direction, such as Brazil's central bank permitting Meta's WhatsApp to include a payments offering for SMEs.

The path toward growth

Significant risks and uncertainties remain, especially concerning regulation, data privacy, competition from big tech, and interest-rate volatility.

The lack of comprehensive regulation and oversight in the fintech industry, to varying degrees by industry and region, can lead to trust uncertainty among customers and prospects, which in turn can result in a low adoption rate for fintech solutions.

At the same time, the ecosystem must find a balance, as potential regulatory overreach can also hinder growth and innovation, with rigid regulations leading to higher costs, slower approvals, and reduced investment.

Fintechs also face reputational risks, which can stem from different factors. One such risk is

2021, Share of Digital Engagement by Category[1]

- **27%** Clothing and Footwear
- **17%** Personal care
- **3%** Food and drink
- **98%** Computer software
- **61%** Event tickets
- **58%** Consumer banking

Only 17% of Middle East & Africa uses Digital Banking
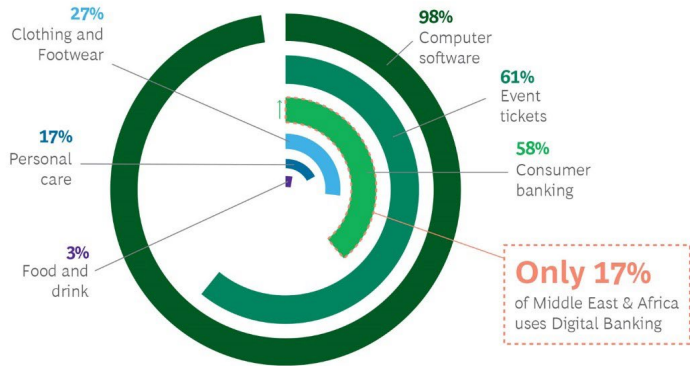
	Unbanked	Underbanked		Unbanked adults (M)	Underbanked adults (M)	Cash Usage (%)	Mobile Penetration (%)
	27%	50%	**World**	**1,546**	**2,829**	**44%**	**89%**
	5%	27%	North America	15	83	21%	93%
	8%	52%	Europe	54	357	23%	96%
	25%	55%	APAC	820	1,787	59%	85%
	35%	42%	LATAM	164	199	60%	87%
	52%	43%	MEA	493	403	58%	83%

related to data breaches and the mishandling of sensitive data. Fintechs that collect large amounts of sensitive data in an unregulated manner are at a higher risk of data breaches, which can result in severe and long-lasting reputational harm, causing a loss of customer trust and loyalty, and potentially leading to legal consequences.

Moreover, the entry of big-tech companies into the fintech industry can drive prices down and eliminate competition, creating a monopolistic environment that negatively impacts smaller fintech startups, overall innovation, and consumers. Combining this dynamic with a higher interest rate environment that can pressure funding and therefore stifle innovation creates a tall set of challenges. Fintech startups may struggle to compete with traditional FIs that have access to cheaper funding sources.

Ultimately, however, the fintech future is bright provided that all stakeholders heed the call to action and collaborate effectively and cooperatively for the greater good. ■

Mobile money in Ethiopia: advancing financial inclusion and driving growth
An exert; originally published by the GSMA

Financial inclusion

Formal financial inclusion is a key contributor to economic development and poverty reduction. It allows people to save for economic shocks and their long-term well-being, enables access to credit to establish and expand businesses or pay for education, and to obtain essential protection such as crop and health insurance. While the percentage of the adult population in Ethiopia who have an account at a financial institution has steadily increased from 22% in 2014 to more than 46% in 2022, formal financial inclusion remains significantly lower than in other East African countries.

There is a large gap in financial inclusion between urban and rural areas, where more than three quarters of the population resides, as well as regional disparities in account ownership. Poorer and less literate Ethiopians, who are more likely to live in rural areas, also tend to be unbanked. The Ethiopia Living Standards Measurement Survey (LSMS 2018–2019)

conducted by the World Bank also found a rural-urban gap, with 59% of urban versus 18% of rural adults reporting having a bank account. According to Global Findex data, only 39% of women versus almost 55% of men have an account at a formal financial institution.

Increasing financial inclusion is a priority for the government, as demonstrated by the new National Financial Inclusion Strategy (2021–2025), which aims to increase formal financial account ownership among adults to 70% by 2025. It also recognises the need to improve women's financial inclusion and aims to halve the gap in account ownership between men and women by 2025. Global Findex data shows that in 2022, 5% of adult men and just over 4% of adult women had mobile money accounts in Ethiopia.

While mobile banking services were first piloted in Ethiopia in 2015, they have remained limited in scale. Regulatory reform in 2020 allowed non-bank

Formal financial inclusion in Ethiopia compared to other East African countries
(Percentage of the adult population)

	Ethiopia	Kenya	Rwanda	Tanzania	Uganda
2017	35%	82%	50%	47%	59%
Most recent available year*	46%	79%	77%	52%	66%
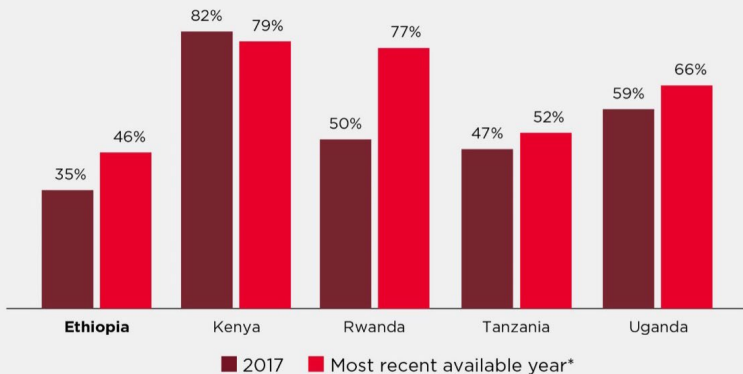
*2020 for Rwanda, 2021 for Kenya, Tanzania and Uganda, and 2022 for Ethiopia
Source: Global Findex (2021)[1] and Finscope (2020)

Mobile money account ownership in Ethiopia in 2022
(Percentage of the population aged 15+)

Source: World Bank, Global Findex Database

■ 2017 ■ 2022
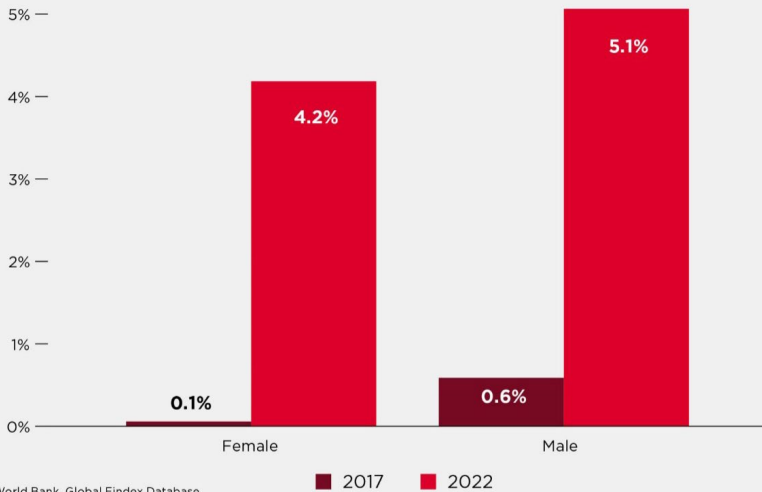
organisations to offer mobile money services. This is a crucial development for financial inclusion in Ethiopia, as MNO-led mobile money services in other African countries, notably Kenya, Ghana, and Uganda, have had enormous success in advancing financial inclusion in regions where traditional financial institutions have failed.

Until September 2022, Ethiopia had only one state-owned mobile operator, Ethio Telecom. However, the liberalisation of the sector has allowed Safaricom to enter the market and launch services. The Ethiopian Communications Authority (ECA) is also seeking a new international MNO to enter the market.

Competition between Ethio Telecom and new entrants is expected to drive uptake of digital financial services (DFS) via mobile money and improve financial inclusion. The specific objectives of Ethiopia's National Financial Inclusion Strategy (2021–2025) related to mobile money adoption are to expand agent networks to remote areas to deliver mobile money services; accelerate the use of mobile money for G2P/P2G payments and social protection/humanitarian payments; and

increase awareness of mobile money services, particularly in rural and remote regions that are currently underserved. The strategy also includes plans to improve interoperability between payment systems, which would enable mobile money services to scale faster.

Mobile money impacts

Regulatory reform has given impetus to mobile money in Ethiopia, reflected in the significant growth of mobile money accounts in the country. Ethio Telecom launched a mobile money service, telebirr, in 2021 and has rapidly grown its mobile money subscriber base. Since entering the market in November 2022, Safaricom has established a presence in 22 Ethiopian cities, covering 22% of the population by May 2023.

Globally, there is strong evidence that mobile money has an impact on smoothing consumption and the ability to cope with risk. One study in Kenya showed that consumption among M-Pesa users is unaffected by negative income shocks, whereas non-

users experience a 7% drop in consumption. Another study in Tanzania found that the consumption level of villagers who were mobile money users was unaffected by climate shocks such as floods or droughts, whereas non-users saw a 6-11% decrease.

Most studies show that mobile money increases consumption and can reduce poverty. In Uganda, mobile money adoption increased total household per capita consumption by 7-10%. A study in Kenya found that mobile money lifted 2% of households out of poverty and that long-term consumption grew by 8.5% among those living in areas with many mobile money agents. It also found that poverty reduction was greater among female-headed households and that access to mobile money brought significant changes in occupation choice, largely among women, who moved away from agriculture to business and retail.

Recent research has also explored the potential of mobile money to promote the development of women-led microenterprises. In Mozambique, providing mobile savings accounts and improving the financial management skills of female-headed businesses is associated with an increase in business performance, a narrowing of the gender profit gap and financial security for microentrepreneurs.

Moreover, an assessment by the International Monetary Fund (IMF) has found that digital financial inclusion can accelerate GDP growth, while a study by Vodafone, Safaricom and the United Nations Development Programme (UNDP) found that countries with successful mobile money adoption experienced higher GDP growth compared to countries without mobile money. Recent studies have shown that in markets with mobile money services versus those without, mobile money can increase tax revenue by increasing GDP per capita, improving institutional capacity, and simplifying tax collection payment processes.

Drawing on these empirical findings, we have modelled the projected impact of scaling mobile money in Ethiopia. We found that it could lift between 200,000-700,000 people out of extreme poverty by 2030, depending on the level of adoption. Our modelling also suggests that, depending on the level of adoption, mobile money adoption could increase real GDP by 0.7-2.5% by 2030, equivalent to $1.5 billion to $5.3 billion in 2022 prices or 69-251 billion birr.

Mobile money adoption trends

According to the 2022 GSMA Consumer Survey, among mobile money account owners in Ethiopia, 51% had made a transaction in the last 30 days and 30% in the last week. However, mobile ownership, a prerequisite for mobile money adoption, is relatively low in Ethiopia, especially among women. In the GSMA Consumer Survey, 76% of men compared to 55% of women, reported owning a mobile phone.

The affordability of mobile handsets and subscriptions is a major challenge to mobile money adoption. According to the Alliance for Affordable Internet (A4AI), the cost of a smartphone is particularly significant, and represents almost 97% of average monthly income in Ethiopia compared to 34.36% in Kenya and 33.29% in Nigeria. Current inflation at over 30% and heavy taxes levied on imported mobile phones have compounded the affordability challenge. In addition, the manufacturing of local phones, which gained some momentum in 2016, has been crowded out by a shadow market for cheap phones.

Recent research by the GSMA identifies two viable strategies to lower handset costs: improving the cost-efficiency of handset manufacturing and expanding access to handset financing for end users. The most promising approaches to drive down the costs of mobile phones include developing lower-end internet-enabled handsets, optimising component costs, refurbishing phones, and reducing procurement, distribution, and marketing costs.

Following examples in Africa such as Orange Senza, MTN Smart T, Techno T091 and Vodacom Smart Kitochi, there is an opportunity for Ethiopian MNOs to provide access to more affordable smart feature phones, with the additional benefits of longer battery life, greater resilience and relevant pre-loaded apps and content. In parallel, financing schemes that use alternative data for credit assessments, or accept a handset as collateral, present an opportunity to boost mobile ownership by reducing the upfront cost.

Awareness of mobile money services is a critical step. Key drivers include the maturity and competitiveness of the local market, the presence of extensive agent networks and the robustness of mobile and mobile money infrastructure. Mobile money awareness in Ethiopia is limited, and women and those living in rural areas tend to have lower awareness compared to men. In the GSMA Consumer Survey, only 35% of female respondents reported being aware of mobile money compared to 49% of male respondents.

Among mobile owners who are aware of mobile money, the main barriers preventing them from owning an account was the lack of perceived relevance of the service to their everyday financial activities. 50% of both men and women in the Consumer Survey reported insufficient funds to warrant opening an account and more than 40% of men and women reported a preference for cash. Mobile money service providers will need to expand payment use cases and offer products that are targeted and relevant to end-users to incentivise a shift towards mobile money.

Crucially, relevance is related to the availability of services in local languages. While Oromo and Amharic are spoken by the majority, Ethiopia has approximately 88 languages. For users to be able to use services, they need to understand them. While telebirr is offered in five different languages, users from minority linguistic groups risk being excluded or face challenges in using the full suite of functionalities of mobile money.

Previous research by the GSMA Mobile Money programme highlights the importance of education for individuals to use DFS safely and confidently, including basic and financial literacy. Almost half of Ethiopian adults do not have basic literacy and, at the national level, 57% of men and 43% of women are literate. Adults in Ethiopia have less formal education

Mobile money awareness in Ethiopia compared to other Sub-Saharan African countries
(Percentage of total adult population)

Country	Male	Female
Ethiopia	49%	35%
Ghana	99%	98%
Kenya	99%	100%
Nigeria	68%	57%
Senegal	100%	99%
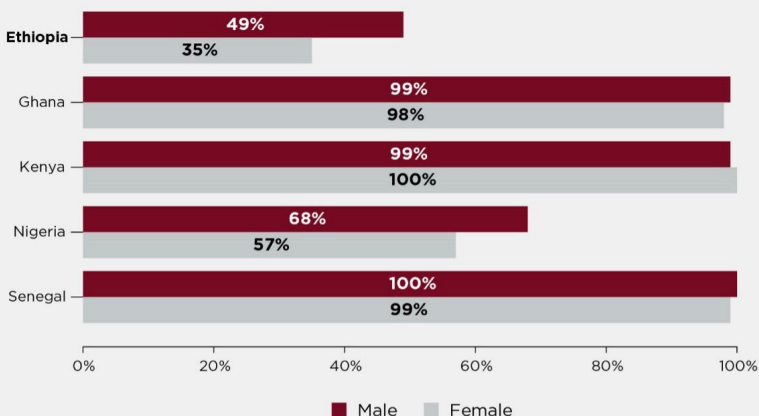
Source: 2022 GSMA Consumer Survey

than those in most other countries in sub-Saharan Africa, and children are expected to spend less time in formal education than in most other sub-Saharan African countries.

While mobile money providers have tried to overcome some literacy barriers by offering services that use simpler interfaces and local languages, scaling mobile money will require targeted upskilling strategies and training in rural areas. Improving digital and financial literacy and skills will be critical to drive mobile money adoption and usage.

Moreover, enabling policy and regulations, better payments interoperability, sufficient and widespread access points and high-quality agent networks are key factors that will determine whether Ethiopia sees high levels of adoption of mobile money services.

KYC and an efficient digital national identity scheme will be a key enabler as more robust identity verification is needed to help mobile money providers (MMPs) offer a wider suite of financial products. Better cybersecurity and stronger implementation of cybersecurity laws will reduce the risk of fraud and build confidence in mobile money services. A personal data and protection legislation will also help build consumer trust while guiding service providers on how to ensure personal data protection.

Conclusions

Recent market liberalisation that has allowed MNOs to deliver mobile money services in Ethiopia could be transformative for financial inclusion. Though there is currently one state-owned MNO in the market, with Safaricom receiving its licence and additional entrants expected to enter the market, there is a significant opportunity to financially include millions of Ethiopians.

While regulations are enabling and payments interoperability has improved, signalling a maturing digital financial services ecosystem, there are significant challenges to scaling adoption, which will require concerted and collaborative effort from the government and policy makers, public and private sector organisations, MMPs, donor and development agencies and local civil society organisations. These organisations should prioritise the following strategic actions to overcome challenges and increase financial inclusion through mobile money in Ethiopia. ■

Mobile phone ownership in Ethiopia compared to other Sub-Saharan African countries
(Percentage of total adult population)

Country	Male	Female
Ethiopia	76%	55%
Ghana	92%	86%
Kenya	93%	88%
Nigeria	91%	86%
Senegal	89%	77%
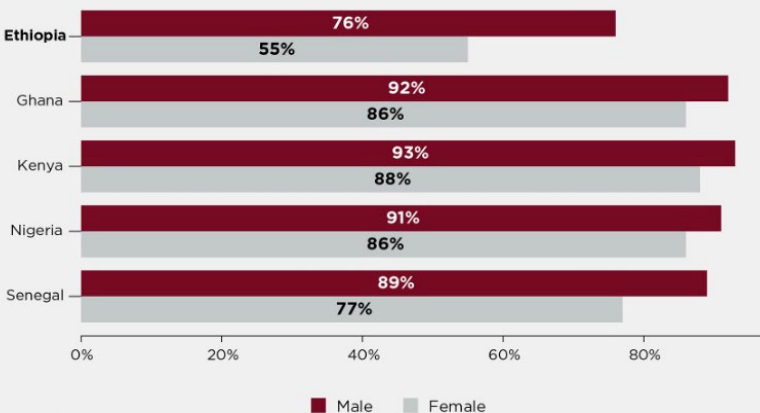
Source: 2022 GSMA Consumer Survey

Ali Karaosman,
operations director MEA, Telecoming

Technology plays a key role in Africa. According to the GSMA, there will be 15 million 5G network connections in West Africa by 2025, 41 million in sub-Saharan Africa, and 116 million in North Africa and the Middle East. This will enable the development of economic and social innovations — developments with a real impact on people's lives.

As a sportech company, Telecoming is very interested in the digitalization process of the sports industry. Connectivity in stadiums and other sports venues will enable new interactive experiences, increase the ability of users to generate and enjoy content, and respond to new consumption patterns of the younger generations.

One of the trends that we've seen in Africa, which could have significant potential, is Superapps. In Asia, millions of people use them daily and in Africa, there is a growing interest since they allow access to services such as messaging, payments, transportation, etc., within a single application. This model is exciting because it limits data use and keeps users loyal to a single environment with an increasingly complete offer. There's a long way to go, but we are already collaborating with operators that are developing Superapps.

The region is also the global epicentre of mobile payments, with growing demand for alternative payment technologies, such as direct carrier billing (DCB). Merchants and mobile operators work together to promote DCB as an effective payment method beyond digital content. Telecoming is committed to continuing to add value to this increasingly dynamic market by growing our sports entertainment offering. The DCB industry in Africa and the Middle East is set to grow annually by 20% over the next five years, representing a unique opportunity to offer high-value propositions.

Africa is a highly dynamic region where mobile extends to practically the entire population. Beyond calls and messages, the network is an infrastructure enabling the development of other services. More than 60% of the African population is under 25 years old. The next generations will enter strongly into the mobile economy, imposing their consumption habits on the small screen. Some products, such as games and sports, are of common interest among the African population, and their mobile consumption is total. Operators must offer services with new experiences. ■

Looking ahead: Many technologies will impact Africa in the coming years. We will see innovation in many markets, which will have a deep impact on many industries, including sports and entertainment. Mobile will continue its consolidation as a point of access to purchases and as a preferred payment technology. This purely mobile experience will be transferred to other markets, such as ticket sales, transportation and restaurants.

We must also pay attention to subscription-based businesses. The subscription economy in Africa and the Middle East is valued at more than $11 billion annually and will grow at double-digit rates every year, driven mainly by digital services.

Among all this, Africa will not be oblivious to the artificial intelligence (AI) developments already reaching all markets. The erruption of AI will mean an adaptive challenge in many industries but will bring endless opportunities for all markets.

Wayne Nelson-Esch,
regional director of operations,
Avatar World Group (AWG)

The past year has been a challenging one on multiple fronts for the digital entertainment and content business across Africa. Digital services are however still a very important growth area for all regional OPCOS' as customers become more connected. This enables access to high quality digital entertainment services and content across various genres, necessitating a customer focused approach to providing services that are relevant, high quality and contextual for customers that deliver value.

Customer spend and affordability is a challenge for many mobile operators. Users are a lot more discerning on what they spend on mobile telephony services (i.e. voice, data, bundles, digital services, etc.). This results in pressure on the 'mobile airtime wallet.' This in turn requires digital service providers to ensure that the types of products and services they offer provide real value to customers. If a customer sees value from the content offered in the service, they're more likely to subscribe.

The opportunities in Africa today include giving customers more payment options for digital services; providing new types of services that could be ad-funded; bundling of digital services to create a more complete package; higher localisation of content; providing segment focused offerings that take the customers persona, segment, affordability and accessibility into account; and providing mobile first content offerings, offering services customers can actually consume.

As smartphones become more widely available, and high-speed data networks

> "Customer spend and affordability is a challenge for many mobile operators. Users are a lot more discerning on what they spend on mobile telephony services (i.e. voice, data, bundles, digital services, etc.)."

(4G/5G) grow, rich media services will continue to grow. Digital services with a video and/or gaming component are popular. We see that when you give a positive customer experience, customers engage. When you give them access to data or service offerings, their spend increases over time. Digital services that are thematic based with a specific value proposition and go-to market strategy tailored to segments are growing e.g. kids, women, sports.

Africa has over 1 billion people across 55 countries. Within those countries you have multiple customer segments, profiles, languages, and affordability levels that are far more diverse than first world or other third world global markets. Other first world global markets have higher levels of affordability, accessibility and literacy rates compared to many parts of Africa. Third world global markets (India, Brazil etc.) have similar challenges to Africa, as well as their own unique challenges. One therefore cannot apply a cookie cutter approach and assume just because it worked in Brazil or India, that it's going to work in Africa. Even within African continent, what customers want in East Africa is going to be different from those in West Africa. Affordability and accessibility are key differentials in the African market compared to other global markets. Local laws,

regulations, exchange controls etc. also provide a unique challenge to operating in Africa compared to other markets.

With respect to digital services, I think the overarching market need is to provide good value propositions at an affordable price that gives customers access to the content and services they want. The need is therefore packaging digital services into bundle offerings with data at a good price point and marketing those to the correct client segment. Multiple payment options are key to this, i.e. customers can choose how they pay for their services and get the same value regardless if it is airtime, mobile money, credit card, Add2Bill, mobile operator loyalty points, vouchers etc. ◼

Looking ahead: Technology, smartphones and data networks are growing. Content providers must incorporate smart technologies into their service offering.

Just as YouTube offers different video quality (360p, 720p etc), content providers should do the same to enhance the client experience. Applying more gamification mechanics into services could also stimulate usage and engagement on services.

South Africa, Nigeria and Ivory Coast are the markets to look out for in the digital space over the next few years, as they have shown the potential to grow and innovate across different aspects of the digital landscape.

Cloud Gaming can transform gaming for families, midcore gamers and hardcore gamers, as well as giving telcos the first mover and innovation advantage, retention amongst high-value customers and driving usage and revenue of data services on 5G networks. We hope to build on our success in Africa as we keep telling the AWG Cloud Gaming story and showcase our successes across the continent.

The regulatory environment across Africa is always changing. For example, in South Africa, digital services with video and gaming elements are required to classify and provide age restriction ratings on services based on the film and publication guidelines. While this is an ongoing process, it is certainly positive for customers where they can now see if content is suited for themselves or their children.

We also need to ensure that customers are treated fairly in terms of engaging in digital services. So mobile operators and industry regulators will have policies in place to ensure customers are made aware of what they are subscribing to, and the cost of the service. For mobile operators, the customer experience/NPS score of customers is important. Ensuring customers have a positive experience with the services offered by a telco is paramount, and regulations and policies are put in place to ensure that happens.

Markets and consumers continue to evolve ever more rapidly. Outdated models for billing and delivery of VAS services are under huge pressure. The value proposition of services and their delivery to customers need to evolve. In addition, the reliance on airtime as a billing mechanism needs to change.

Available airtime in customers' airtime wallets continues to decrease. Mobile operators will prioritise core business services (voice and data) over VAS services going forward. Giving customers alternative methods of payment and affordable price points is critical. Lastly, it is paramount that customers gain value from the services they are subscribed to. This means that usage and engagement on services needs to increase. It is vital that both mobile operators and companies like AWG, who they use to deliver digital services, build in mechanisms to ensure more customers are using and consuming the content on a more consistent basis.

Todd Ashton,
vice president and head of
Ericsson South and East Africa

Ericsson is on a mission to empower a sustainable and connected Africa as part of our 'Africa in Motion' strategy. During our 100 years' presence in Africa, we have built wireless networks for every generation – from early 1G networks to the first advanced 5G networks. Over the past year, the number of our employees in Africa has reached 2,300. We now have 23 offices across the continent, and we support technologies from 2G to 5G.

This year, we partnered with Econet to modernize its radio access network (RAN) and mobile core network in Zimbabwe in preparation for 5G implementation.

We have also joined forces with Tigo to introduce 5G in Tanzania and upgrade the existing 4G network, leveraging the latest energy-efficient products from the 5G Ericsson Radio System portfolio. We recognize the importance of rural connectivity and have been actively working with our partners to implement solar-powered rural site solutions in some African markets, including Benin, in partnership with MTN Benin. Finally, we initiated a collaboration with Free Senegal to establish a proof-of-concept project to provide connectivity to schools using fixed wireless access (FWA) as part of our 'Connect To Learn' program, a global initiative that aims to bridge the educational divide.

With a rising demand for 5G capabilities on the continent, a major opportunity we have identified is the similarity in the air interface between 4G and 5G that allows for a more efficient spectrum repurpose compared to any other technology. We are currently focusing on helping communication service providers (CSPs) reuse the 4G spectrum for 5G deployments through the Ericsson Spectrum Sharing (ESS) solution.

Another opportunity that helps drive sustainability in the ICT sector is lowering the energy consumption of communication networks. This enables CSPs to cut down on costs and reduce emissions. Our E-band solution has the lowest energy consumption and size pair in the industry, so we are well-positioned to meet this requirement.

We also see a great opportunity in boosting digital skills across Africa. We have partnered with Smart Africa Digital Academy to enhance critical digital skills of senior public sector officials; between November 2022 and January 2023, we ran virtual workshops on emerging technologies for 100 policy makers and regulators from 19 African countries.

One facet that presents a challenge as well as an opportunity is addressing the escalating capacity requirements of mobile networks in many African markets that comes with the exponential growth of mobile data consumption. Long-haul microwave links are ideal for high capacities at longer distances and fit well with the need to connect rural areas of the continent.

The main trend dominating the ICT sector in Africa is increasing 5G adoption. According to the Ericsson Mobility Report, there were 7 million 5G subscriptions in sub-Saharan Africa in 2022. The study projected this number to grow to 150 million by the end of 2028, accounting for 14% of total connections. Last year marked a turning point as 3G adoption began to decline for the first time. We predict that 4G will be the main contributor to new connections for the next five years.

Mobile money has become a life-changing tool across the continent, providing access

to safe and secure financial services but also to energy, health, education, and employment opportunities.

According to GSMA data, 2022 witnessed a 17% growth in the adoption of mobile money and a 21% hike in transaction volume in Africa. The number of mobile money accounts on the continent hit 781 million, and our Mobile Money Open API service powers 80 million of them. Meanwhile, transaction value reached US$836.5 billion in 2022.

While we have witnessed impressive market developments in recent years, Africa's ICT sector still has significant growth potential compared to leading economies. According to a 2022 report by the International Finance Corporation (IFC), Africa has the lowest number of internet connections of all inhabited continents – only 22%. The lowest adoption rate is in rural households due to high illiteracy levels, low income, lack of access to financial services and the concentration of economic activity in urban centres. Many rural areas also lack reliable mobile connectivity. In 2022, only 40% of the adult population in sub-Saharan Africa were connected to mobile internet services.

Expanding robust mobile coverage into rural areas is a priority for Africa that will bring multiple benefits – from improving the population's

access to vital services to driving digital and financial inclusion and opening new economic opportunities. Additionally, the continent's digital transformation has given rise to a thriving e-commerce ecosystem. Online marketplaces and platforms have gained popularity, enabling businesses and consumers to connect and transact digitally. FinTech innovations have also flourished, providing digital payment solutions, lending platforms, and insurance services.

Cross-border cooperation has been an important enabler of our activities in Africa, as it helps us develop locally relevant solutions tailored to the needs of the market and bring 5G networks to new countries. This year, we strengthened our partnership with AXIAN Telecom; we are helping modernize the company's infrastructure in Madagascar and Tanzania to increase network capacity and offer faster and more reliable connections.

As part of our efforts to support education in Africa, we continued mapping school connectivity in 35 countries by the end of 2023 within the framework of our three-year global partnership with UNICEF. The collaboration supports the UN's Giga initiative, a global program led by UNICEF and the International Telecommunications Union (ITU) that seeks to connect every school to the internet. ◼

Looking ahead: We envision our technologies shaping the future of mobile networks in Africa, driving connectivity, bridging gaps, and enabling the digital revolution. Connectivity will continue to play a critical role in uplifting the continent's economy. We foresee the growth in 5G and 4G network coverage becoming a major catalyst for innovation, connection, and opportunity for Africans everywhere.

We aspire to contribute to extending affordable broadband access to over a billion individuals in Africa to bridge the digital divide, enable them to reap the full benefits of the digital economy and help achieve the UN's Sustainable Development Goals (SDGs).

We will also continue to leverage digital technology to drive financial inclusion, which is an essential element of advancing economic development on the continent. Another focus area for us is reducing time to market and flexibility in launching services for our customers towards their subscribers.

Renaud Ganascia,
sales director for Africa,
Digital Virgo

Africa has provided a lot of opportunities for Digital Virgo and as we finish 2023, we are assessing our future on the continent. While we have set the standard for francophone countries and integrating direct carrier billing into local markets, our eyes are set firmly on anglophone and polyglot countries. These provide opportunities not only to integrate DCB and mobile money payments, but also local content that appeals to telco customers. As Africa is developing its 4G and 5G connectivity, the desire for better and more diverse content is key for customer growth and retention.

One of the biggest opportunities is that we're no longer limited to just mobile devices. The growth in the use of smart devices that easily connect to the online environment means that there are more chances to develop digitalization of content for telecom operators. Content must now be adaptable to all smart devices giving customers more chances to access it. The second-screen phenomenon has been widely acknowledged in numerous studies, as an increasing number of individuals use mobile devices while watching television. According to the latest Nielsen report, 50% of Generation Z has already adopted this practice as a habit.

This trend is particularly important in the sports industry. To align with this evolving landscape, we've already implemented significant enhancements to our gaming offerings: more content, but also additional features and enhanced connectivity.

Television is a fascinating field that is available on a variety of devices. Telecoms operators are bringing more premium offerings to their customers, and we're helping them by providing services like Veedz.tv, which give users full control over their broadcasts and offer intelligent, dynamic content for an enhanced user experience. Our ability to combine international and local content plays a key role in distribution success. Our partnerships with media leaders such as TF1 and Canal+ are key to unlocking the power of international content and personalizing local content.

When it comes to content monetization in Africa, one of the most significant challenges lies in the region's unique characteristics, notably language and regulations. The key to overcoming these challenges lies in our 'glocal' approach, which involves staying closely connected to the realities faced by telecom operators and their customers, while also facilitating the entry of merchants into the African market. Adapting content to align with the technical, cultural, and legal specificities is at the forefront of our partners' and clients' concerns, needs, and expectations. ∎

Looking ahead: As we look to 2024, our aim is to expand the availability of our TV offerings to a broader range of countries. Simultaneously, we are committed to adapting our content and services to meet the needs of local markets, which includes incorporating local languages for fibre customers. This strategic approach is designed to assist telecom operators in their efforts to enhance customer growth and retention.

The demand for content continues to experience exponential growth each year, and telecom operators stand at the forefront of this trend. Our fundamental mission is to support them in maximizing the opportunities presented by these ever-evolving trends, with a particular focus on creating scalable, sustainable, and optimized ecosystems.

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Roaming

Global IoT

Business Analytics

Fraud & Security

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chapter 10
Towers

Matthew Edwards,
product director, TowerXchange

The rocky road ahead for towercos in Africa

The African cellular network industry is facing tough times but remains resilient. Currency devaluation in Nigeria has caused consumers to tighten their belts while investment costs have increased precipitously. Investment in South Africa is shifting from network expansion to network resilience as blackouts and vandalism threaten the performance of Africa's most advanced telecom network. Networks are continuing to expand in East and Central Africa where growth in sites and technology upgrades have been more robust, but the industry is facing one of the toughest winters in years. What does the road to recovery look like?

How towercos work

Towercos own and operate telecom masts on behalf of mobile network operators (MNOs). By separating passive infrastructure from the active mobile network, towercos are enabling mobile subscribers in SSA to grow from 515 million in 2021 to 613 million in 2025 by freeing up capital, bringing fresh investment into passive infrastructure, and enhancing network efficiency and performance. But with market conditions so tough, how can networks continue to reach new customers? Towercos can play a key role in supporting the expansion of telco networks despite tough macro environments.

The traditional lease between towercos and MNOs includes several features that guarantee mobile operators' consistency of service and towercos consistency of returns. A large proportion of towerco returns are priced or paid for in hard currency which enables them to offset devaluation risk and continue to purchase oil, batteries, and steel on international markets. Mobile operators also rarely default which means towercos work with some of the most credit worthy companies in Africa. Low default risk and hard currency earnings enable access to capital more cheaply than other firms on the continent.

Africa has had a turbulent year politically, with coups and instability plaguing many countries.

However, no new regime has been stupid enough to attack the mobile networks on which their citizens rely. Telecom towers are largely safe, even in warzones, and that further enables towercos to invest with confidence. Alongside all this you also have robust growth in population and economic prosperity, accelerating demand for voice and data services that drives revenue in the telecom tower sector. These protections are no panacea but they position towercos as important partners in network development in Africa.

State of the market

Africa's telecom tower industry has long been one of the most robust in the world. Since the early 2010s there have been independent towercos across the continent, and networks are weathering the current storm so well thanks to the injection of outside capital and improvements in network management. In sub-Saharan Africa, TowerXchange tracks 96,672 telecom towers owned by the continent's various towercos (out of 183,064 total towers in sub-Saharan Africa).

The newest towerco to be formed in Africa is MAST Services in South Africa, which will take

9,000 towers off Vodacom's balance sheet and manage them independently. The creation of Vodacom's own towerco is part of a wider global trend which has seen MNOs form their own towercos; Vodafone, Deutsche Telekom and Axiata have all created their own captive towercos and then sought to sell part, or all, of the new entity. In Africa most towers are now owned by towercos, and it is towercos that must confront the double challenge of high energy costs and expensive capital.

Meeting the challenges

Energy remains the industry's number one challenge. In South Africa grid quality has declined, leading to loadshedding – planned blackouts – of up to 8 hours a day. Those long gaps in service mean that cell towers need to be powered by large banks of batteries or diesel generators. In South Africa mobile networks have slowed 5G rollouts and cancelled coverage expansion plans to invest in energy infrastructure with their towerco partners. Vandalism and theft are on the rise too, which makes the investment case more challenging. This brings South Africa

Breakdown of ownership of Africa's 183,064 telecom towers (Q3 2023)

MAST Services
9,500

IHS Towers
30,261

American Tower
24,040

Swiftnet
3,900

ANM
3,099

SBA Communications/
Minara Towers
3,226

TowerCo
of Africa
2,427

MNOs
95,392

Helios Towers
11,165

Other small towercos
7,150
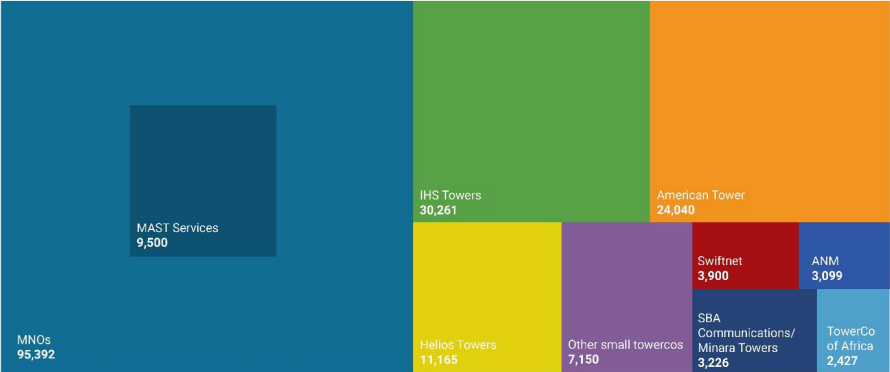
Source: TowerXchange

into alignment with the rest of Africa where mobile networks have expanded much more quickly than the electricity grid.

At the same time that grid reliability is failing and electricity costs are rising, technology upgrades and new co-locations are pushing up site loads. 4G densification and early 5G deployments in major urban areas across Africa are pushing up the energy demands of sites. Consumers want reliable data and towercos are responding by installing new diesel generators, battery banks and solar and wind deployments. In Africa, towercos have developed a unique expertise in energy management, delivering power-as-a-service to their customers, a service now critical to meeting customer needs. Innovation continues as towercos experiment with power purchase agreements and new technologies like super-capacitors, biofuels, or fuel cells.

Energy is key not only to lowering costs and improving resiliency, but also to meet the industry's ambitious carbon reduction targets. Africa is at the forefront of the climate crisis and both MNOs and investors are pushing ESG higher up the priority list. In response, major towercos have set out their own carbon-reduction roadmaps with 100s of millions of dollars committed to reducing emissions and divesting away from diesel and towards clean energy solutions. But carbon reduction is no easy task when demand for infrastructure is growing, capital is limited, and hard currency is in short supply.

Across the continent

Looking at three of Africa's other major telecom markets will paint a picture of a continent.

In Nigeria the Naira has declined from an official rate of 460 to the dollar in April 2023 down to a parallel market rate of 1,000 per dollar in October 2023. That pushes up the costs of imports like fuel, steel, and telecom equipment for those that bill in Naira like the country's mobile operators. A gigabyte of data has reduced in price from N1200 in November 2019 to N350 in October 2022. That pressure on costs domestically and internationally is making it difficult to operate.

Nigeria is the largest tower market in Africa with just under 40,000 towers, largely managed by towercos without an electricity grid to rely on. Hundreds of millions of liters of diesel are burned each year to keep this network running, and towercos like IHS Towers and American Tower have been active in trying to replace that fossil fuel with solar power and energy storage solutions to keep cell towers active 99.9% (or more!) of the time.

In amongst all this activity, comes the news that MTN will be awarding 2,500 sites to American Tower which used to be managed by IHS Towers. Competition remains fierce between towercos and many of these new sites will need building from scratch. This means new sites will still be added in Nigeria to tackle its huge infrastructure deficit, but this growth is expected to slow while the economy adjusts to the new exchange rate and consumers face higher prices.

In the DRC we have seen an increasingly competitive market develop too. Helios Towers's 2,233 sites have been joined by Eastcastle Infrastructure, which has more than 1,000 sites active or under construction. The Madagascan AXIAN Telecom-backed TowerCo of Africa has entered the market too and is finalising its licence. While AMN, a rural specialist, has 517 sites live serving ultra-rural communities.

While Nigeria faces tough economic challenges, in the DRC we see public companies, entrepreneurs and innovators rushing to invest

private capital into African infrastructure. The DRC is the largest country by landmass in SSA, but less than half the population have cell phones, and for those that do service quality is poor. Each telecom tower has to serve an average of 6,500 SIMs, or about four times the load in the developed world. Four strong MNOs (Orange, Vodacom, Airtel and Africell) compete for customers backed by internationally supported towercos. The road is long, but progress is being made.

In one of Africa's most dynamic economies we see strong network growth under pinned by towercos. Kenya is lucky to enjoy a good grid which means towercos can focus on back-up power rather than spending significant sums on providing primary power with diesel generators. This reduces the capital required per site and enables a faster network rollout. Safaricom and Airtel are supported by three good towers to rollout 4G and kick-start 5G in high density areas.

American Tower have been active in Kenya since 2018, but independent towercos Alan Dick & Co and Atlas Tower have been building too adding 100s of sites a quarter between them. A reliable grid and high technology adoption has also helped drive advancements in network design. Street furniture such as small cells and distributed antenna systems (DAS), as well as inbuilding solutions is accelerating the development of a dense network ready to support high capacity 5G.

The inflationary recovery after the disruption of COVID-19 lockdowns could have toppled Africa's telecom sector. However, despite massive supply chain disruption, explosive energy costs and rising costs of capital we have seen relative peace and continued growth, albeit at a slower pace. Some markets remain strong and will continue to grow while others are consolidating. Some markets like South Africa and Nigeria may need a year or more to bounce back to growth, but across the continent we're seeing telecom tower companies invest and expand to underpin the growth of Africa's economies. ■

Proportion of towers owned by towercos
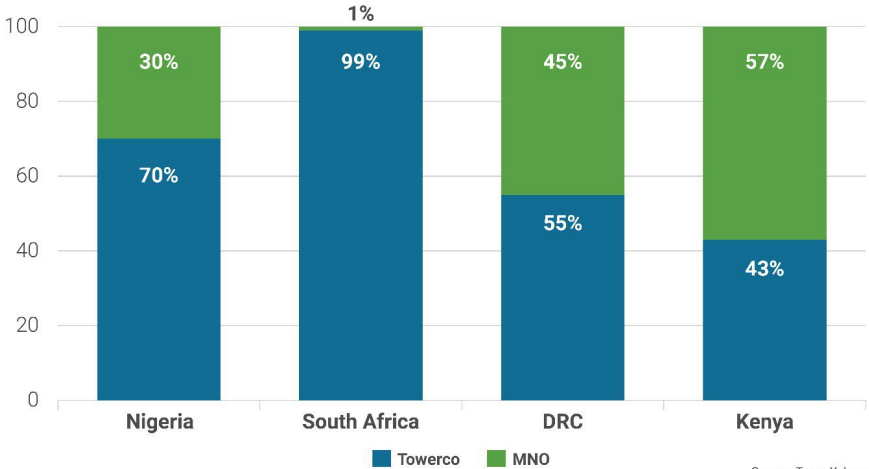
Source: TowerXchange

Alessandro Ravagnolo,
partner, Analysys Mason

Alex Pericleous,
principal, Analysys Mason

In-house energy service companies: the best of all possible worlds

The physical components found within a mobile site can be conveniently categorised into three main groups: active, passive and energy-related.

The active part of the network is typically owned directly by mobile network operators (MNOs). Conversely, the ownership and responsibility for passive infrastructure and energy-related equipment (both of which can more readily be shared between co-locating MNOs) has progressively shifted towards third-party tower companies (towercos). In emerging markets, where power management is complicated by the absence of widespread and dependable electricity grids, most of the tower sale and lease-back (SLB) arrangements have encompassed both passive and energy components.

Putting aside financial and deleveraging considerations, MNOs are progressively demonstrating a greater inclination towards outsourcing power management (and associated equipment). This preference could be attributed to the intricate nature of power supply and management, which is more remote to existing MNO skillsets than passive asset management, and necessitates different monitoring systems and dedicated resources especially when power is self-generated, is shared between multiple consumers (that is, different co-located MNOs) or is the target of cost and usage reductions.

In recent years, specialised energy service companies (ESCOs) have been established and expanded in emerging markets, particularly in Africa. These entities dedicate themselves solely to supplying power and overseeing power equipment and the associated operations and maintenance (O&M) duties, without getting involved in passive infrastructure. Notable ESCOs include Aktivco, Applied Solar Technologies, Biswal, Distributed Power Africa, Energy Vision, ESCOTEL, GreenWish Partners, IPT Powertech and Voltalia.

As the use of ESCOs gains traction, there can be an interplay between towercos and ESCOs. Central to these discussions is the optimal approach to delivering power as a service (PaaS): either through a unified towerco–ESCO entity (T-ESCO) or as an independent energy service company (I-ESCO) (Figure 2).

Towercos perceive power management as an integral facet of their growth strategy

Towercos should include PaaS in their operational scope for three reasons.

Experience and familiarity. Much of the complexity associated with running a towerco in emerging markets originates from the management

Mobile site components

Source: Analysys Mason
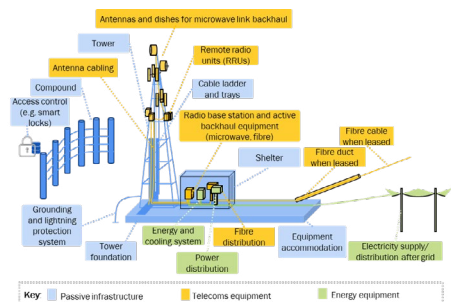
of power equipment. This includes refuelling, uptime monitoring, maintenance, security, and end-of-life equipment replacement. Given the historical context of SLB deals, towercos have amassed significant expertise in this space. This service is incremental to the passive infrastructure sharing and towercos see it as increasing the value they provide to their MNO clients.

Organic growth avenue. PaaS is seen as an important route to organic growth for towercos. Energy is a significant cost for MNOs; it accounts for approximately 15% of network opex. As these networks expand, increasing coverage and undergoing technological upgrades, energy demand will grow. This is especially challenging in countries where power infrastructure is limited and energy is scarce. towercos can seize the opportunity to leverage mobile network operator investments as well as make their own investments to meet the escalating demand. Several MNOs and towercos have already committed substantial capital to upgrade their power infrastructure.

Operational and commercial synergies. The integration of PaaS offers a confluence of operational and commercial synergies. Operationally, it enables the integration of network operations centre (NOC) monitoring, site visits, supplier management and asset oversight. From a commercial standpoint, towercos can present themselves as comprehensive solution providers, catering to various aspects of MNOs' needs.

These arguments form a compelling case for African towercos seeking to develop their own PaaS offerings.

Power business models at telecoms tower sites

	Electricity sourcing (including self-generation)	Power asset ownership	Power O&M	Electricity consumption
Vertically-integrated MNO	MNO	MNO	MNO	MNO
Towerco Pass-Through (Towerco)	MNO	Towerco	Towerco	MNO
Towerco ESCO (T-ESCO)	T-ESCO	T-ESCO	T-ESCO	MNO
Independent ESCO (I-ESCO)	I-ESCO	Towerco / MNO / I-ESCO	I-ESCO	MNO

Financial markets may incentivise the segregation of PaaS from tower co-location services

Institutional investors and towerco executives may have different views. Towercos in emerging markets have consistently been undervalued by public markets relative to their counterparts in developed regions (Figure 3).

Discussions with investors have identified several factors beyond country risk premium that may be contributing to the lower trading multiples of emerging market towercos. Exposure to power emerges as a key factor. PaaS is not universally perceived as an infrastructure-grade investment due to the susceptibility to energy cost fluctuations, shorter contract durations, heightened operational risks, abbreviated equipment lifespan, and elevated refresh capital expenditure and operating costs.

In essence, infrastructure investors associate greater risk with PaaS when contrasted with tower colocation. As a result, they may not be willing to attribute the same valuation multiples to this part of the business. Consequently, some investors gravitate toward towercos that emphasise PaaS to a lesser extent.

Could the establishment of captive ESCOs offer a solution?

Towercos that offer power-related services to MNOs (that is, T-ESCOs) should contemplate segregating their PaaS operations into distinct entities while retaining operational and financial control, effectively creating captive ESCOs. This strategic move entails straightforward financial benefits. T-ESCOs can clearly explain the relative revenue and margin contributions of both services (colocation and energy), aiming for enhanced valuation.

Additionally, this approach may attract minority investors experienced in energy-related ventures. The
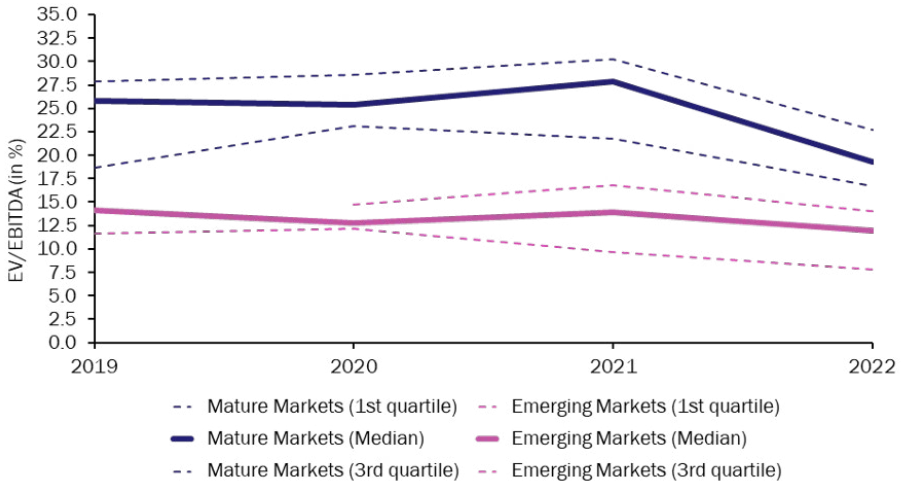
Towercos EV/EBITDA

Note: Mature market towercos: American Tower, Crown Castle, Cellnex Telecom, Inwit, Rai Way, SBA Communications Corp, Vantage Towers. Emerging market towercos: GTL Infrastructure, Helios Towers, IHS Holding, Indus Towers, PT Dayamitra Telekomunikasi, Tower Bersama Infrastructure.

captive nature of the newly formed ESCO would still enable T-ESCOs to capitalise on the strategic and operational advantages of offering both services seamlessly. Transparency regarding pricing allocation between the two business units could yield long-term benefits, including better risk management, enhanced operational accountability and improved relationship with MNOs. Moreover, potential strategic benefits abound, such as expanding PaaS offerings beyond the existing portfolio of owned sites (including MNO-owned sites and smaller towercos lacking this capability), fostering experimentation and innovation, and ultimately out-competing I-ESCOs.

However, the complexity in successfully delivering this captive ESCO should not be underestimated, as T-ESCOs must ensure that the two distinct entities have the appropriate incentives to drive both cost (for example, maintenance and supplier management) and revenue synergies (for example, commercial negotiations).

In some cases, re-negotiation of master service agreements with tenants might be necessary, as these agreements may not currently consistently differentiate commercial terms for energy and site colocation.

Conclusion

Towercos should consider the separation of their ESCO business into dedicated special-purpose vehicles to maximise value creation and visibility on returns on investments of the whole company for their shareholders. This is especially true for towercos operating in emerging markets, but there are merits in considering this option in developed markets as well. Management should not underestimate the cultural and implementation complexity of such strategy and must clearly identify the rules of engagement between the ESCO and the towerco entities through a master service agreement that ensures a full alignment of interests between the business units. ∎

The changing face of Africa's tower market

An exert from Mordor Intelligence's Africa Telecom Towers and Allied Market size and share analysis – growth trends & forecasts (2023-2028)

The telecom tower industry has drastically evolved over the past decade. The core towerco proposition and business models have been successfully adapted to match the demands of new markets in Africa. Many towercos are anticipated to hunker down in their core building business over 2023-2028, buying and leasing vertical real estate, and such towercos may still see plenty of 5G antenna overlaid onto their towers.

The Africa telecom towers and allied market size in terms of installed base is expected to grow from 199,092 units in 2023 to 249,652 units by 2028, at a compound annual growth rate (CAGR) of 4.63% during the 2023-2028 forecast period.

With the outbreak of COVID-19, the telecom industry has witnessed a significant increase in demand for internet services due to a major chunk of the population staying at home and remote working conditions. This has led to an expansion in demand for downloading, online video viewing, and communication through video conferencing, all of which are leading to increased network traffic and data usage.

Several initiatives by telecom operators and other organizations, especially in low and middle-income countries, are expected to spur growth in the rural areas as the residents of these areas gain increased access to internet connectivity. Furthermore, with businesses going mobile and adopting new concepts like BYOD to increase employee interaction and ease of use, it has become essential to provide a high-speed and quality network.

The organizations have been looking

Africa Telecom Towers And Allied Market
Installed Base in Thousand Units
CAGR 4.63%

249.65
199.09
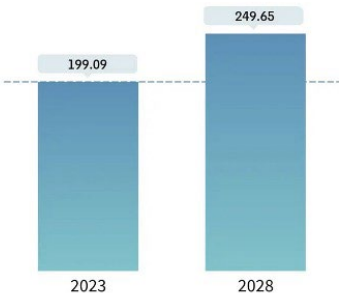
2023   2028

Source : Mordor Intelligence

Study Period	2018 - 2028
Base Year For Estimation	2022
Market Volume (2023)	199,092.05 units
Market Volume (2028)	249,652 units
CAGR (2023 - 2028)	4.63 %
Market Concentration	Medium

Major Players

IHS Towers of strength   helios towers   AMERICAN TOWER   Eskom   ZESCO

*Disclaimer: Major Players sorted in no particular order

forward to adopting BYOD aggressively in their operations, fuelling the market growth over 2023-2028. Moreover, development in cloud-based services for mobile users and the roll-out of 4G LTE services worldwide have increased the investment into networks by carriers, which drives the demand for telecom towers.

The increasing emphasis on improving internet connectivity to rural areas is one of the major factors stimulating the deployment and improvisation of the telecom infrastructure in these areas, thereby aiding the market's growth. Smartphone penetration, raising awareness, increasing penetration of digital technologies, and investments from several organizations and governments have been increasing the adoption of internet connections in the region.

The emergence of the KaiOS operating system and its partnerships with operators across Africa is helping overcome the affordability barrier for low-income users. The free resources offered, such as the 'Life' app, also help new users develop digital skills and understand how the internet can be relevant. Such initiatives are expected to boost internet penetration in these countries significantly.

Market developments

The African telecom and allied market is moderately competitive and has many global and regional players which account for a considerable market share and focus on expanding their client base globally.

Some of the major players in the market are IHS Towers (IHS Holdings Ltd), Helios Towers PLC, American Tower Corporation, Eskom Holdings Limited, etc. These players focus on research and development activities, strategic alliances, agreements, and other organic & inorganic growth strategies to stay in the market

landscape over the forecast period.

In October 2022, American Tower's African business unit ATC Africa signed a multi-year, multi-product agreement with Airtel Africa. As part of the agreement, Airtel Africa would use ATC's communications sites across Kenya, Niger, Nigeria, and Uganda to support Airtel's network rollout.

In February 2023, ZESCO Limited launched a refreshed core ideology and a US$6 billion projected investment across the utility's value chain of generation, transmission, distribution, and supply. The company always aims to increase its customer base. The company uses reflective market fees for all new electricity connections to provide its customers with an effective and efficient service. The connection fees have not been increased or changed but are market-driven. The company is taking up more projects to expand its regional presence.

In March 2023, Helios partnered with mobile network operators in South Africa to provide power-as-a-service to its sites due to the country's ongoing power crisis, Helios owns and maintains over 13,500 telecom tower sites in eight African nations.

Also in March, Axian Telecom announced a deal to upgrade its network in the Madagascan unit Telma with Ericsson. Ericsson announced that the solutions would provide Madagascar with faster and more reliable mobile services nationwide, reducing energy consumption and enhancing the 5G ecosystem.

Later in April 2023, Egbin Power PLC announced the construction of its Power Station in Lagos, Nigeria, with a 1,900MW gas-fuelled power plant. The project is now undergoing permitting. It will be built in a single step. The project's development is anticipated to begin in 2024, with commercial operations beginning in 2025.

TOWERS: INTRODUCTION

TOWERS: INTRODUCTION

Estimated Number of 5G Mobile Subscriptions, in Millions, Sub-Saharan Africa, 2021-2027

Year	Subscriptions
2021	2.59
2022	7.24
2023*	16.97
2024*	29.36
2025*	45.59
2026*	67.97
2027*	104.43
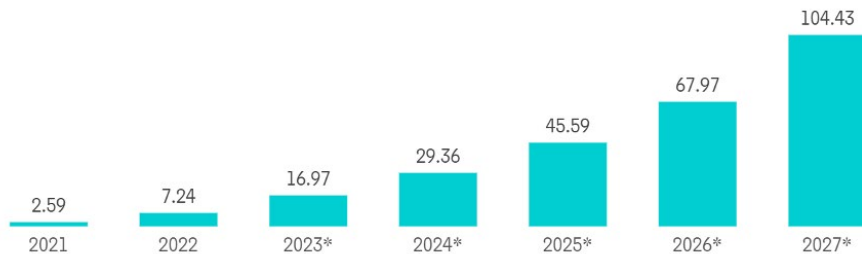
Source: Ericsson

Privately-owned towers to register significant growth

Privately-owned towercos own passive infrastructure on a site and lease space to MNOs to host their active equipment. They can either be pure-play independent towercos with no residual equity retained by an MNO or have a minority stake held by an MNO.

Countries like Nigeria have witnessed substantial tower infrastructure growth over the past few years. Towercos have gained significant traction due to their extensive portfolio of telecom towers which helped telecom operators and MNOs to roll out services in record time. In addition, MNOs in the country have indulged in outsourcing various telecommunications infrastructure needs to independent telecom tower providers, positively impacting the segment's growth in the region. Market vendors like IHS buy mobile towers from telecom companies or MNOs, build them themselves, and then lease them back to the operators. The company now operates in Cameroon, Côte d'Ivoire, Rwanda, and Zambia.

As MNOs seek to drive capital and operational efficiency and divest their tower portfolios to focus on their core business, the privately owned telecom tower segment is expected to gain significant traction in the coming years. Greater outsourcing to independent towercos could release a significant amount of capital which MNOs can reinvest in their networks to improve network coverage and accelerate 5G rollouts in Africa in the coming years. For instance, Helios Towers plans to build 1,000 telecom towers in South Africa to fuel the growth of 5G. The company has negotiated with local players and wants to buy existing cell towers from wireless carriers like Vodacom and MTN.

According to the survey from Ericsson, the 5G mobile subscription size is anticipated to cross 104 million by 2027 in the sub-Saharan Africa region. Such projected growth in 5G mobile subscriptions signifies a considerable demand for 5G infrastructure. Thus, the privately owned telecom tower segment will hold a significant share in the African telecom tower market in the coming years, owing to the increasing demand from MNOs to rollout their network in African countries and the growing acquisition of telecom towers by privately-owned telecom tower companies in the region.

South Africa to dominate the market

Rural mobile connectivity is becoming vital in South Africa, helping to bridge the digital divide and providing access to information, communication, and services to people living in remote areas. A growing number of telecom tower companies are expanding their infrastructure in rural areas and gaining substantial investments. This is expected to drive the telecom tower market in the country during the forecast period.

For instance, in March 2023, Infra Impact Investment Managers helped its portfolio company, Eagle Towers, secure a ZAR 100 million secured loan facility to support growth and expansion plans. The loan facility will help Eagle Towers drive increased telecommunication coverage and reduce access costs in South Africa. Eagle Towers builds, operates, and maintains telecom towers across South Africa, especially in rural areas.

New vendors are entering the market and acquiring 4G spectrum to expand network coverage across South Africa. In May 2023, Rain entered the mobile market for the first time, providing high-definition voice calls, SMS, data, and national 4G mobile coverage through its infrastructure. After acquiring spectrum in the 2022 auction, the operator overlayed its existing 4G network with a new layer that provides for more comprehensive reach.

Mobile network operators have made significant progress in rolling out 5G services, positively impacting market growth. In October 2022, Telkom launched its 5G high-speed internet network using Huawei Technologies. The telco wants to boost its fast-growing mobile data and fixed-line broadband businesses amid increasing broadband demand.

Moreover, the country's government efforts to boost broadband adoption are driving telecom tower demand during the forecast period. The South African government plans to turn off 2G and 3G networks by March 2025 to free up spectrum for 5G and 4G services. This is expected to make the country an attractive market for telecom tower companies in the coming years owing to the growth in 4G network coverage, increasing demand from rural areas for telecom towers, and faster 5G rollouts by market vendors. ■

Consumers with a 5G Smartphone, in Percentage (%), in South Africa, 2022

Intend to Upgrade to a 5G Subscription	Already own a 5G-capable Smartphone	Do not own a 5G-capable Smartphone
42	17	25
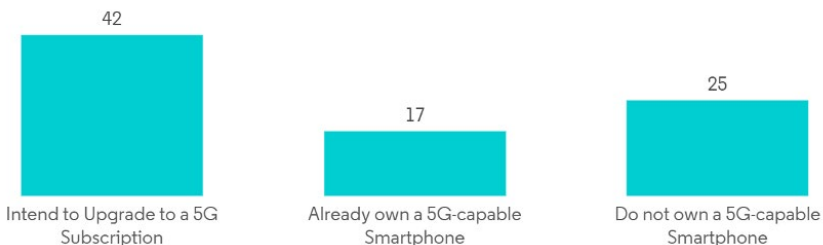
Source: Ericsson

Ani Chiuzan,
chief marketing officer, PowerX

We have seen continued growth across the African markets in consumer demand for telecoms coverage (both geographically and in bandwidth) which in turn fuels the necessity for reliable service, new tower sites and infrastructure ready for 4G and 5G upgrades.

The pressure on MNOs and TowerCos to increase CAPEX and reduce OPEX has never been greater.

For MNOs, this comes at a time when the end-user market is increasingly competitive. Although the number of mobile subscribers in Africa has continued to rise, ARPU is in a six-year downward trend - with consumers demanding more services in return for less per capita expenditure.

For TowerCos, this brings additional pressure. They are asked by their MNO customers to provide BTS growth at competitive prices in spite of poor grid infrastructure that keeps the cost of uptime SLAs high. The competitive TowerCo market across Africa is driving up the need for more value for money across all services - PaaS, NaaS and fibre.

The combined squeeze on income per capita and stress on CAPEX has required MNOs and TowerCos to address the operational efficiency of passive tower infrastructures. As well as seeking efficiencies to drive down OPEX, operators are committed to substantial reductions in their GHG emissions, commitments which are passed through the ecosystem to TowerCos, operations and maintenance service providers, OEMs, technology providers alike. This is particularly resonant in Africa where dependable grid power continues to be elusive, and there is an overreliance on energy generation on sites from alternative sources such as renewables or on-site diesel generators. Leading TowerCos in the region that have been operating renewable energy infrastructure for the last 10+ years have publicly shared that commercial models indicate energy generation from solar on site is becoming more cost-efficient than connecting to grid.

With the pressure to better manage tighter CAPEX and OPEX budgets, we see heightened focus on the key role digitization plays in facilitating growth. We have seen varying levels of investments in data acquisition from the large volumes of geographically dispersed passive infrastructure assets. The technology exists that enables access to data – IoT, sensors, site connectivity. The real revolution now comes from connecting the data across the organisation.

For PowerX, these challenges have accelerated adoption of our solutions at scale as a critical enabler to efficiently manage energy consumption, operations, and maintenance costs, enable resilient revenue growth and optimise capital expenditure.

PowerX is the first platform that combines data science, ML/AI with automated workflows integrated into business processes to improve efficiency, resilience, and sustainability at tower sites. By analysing data which already exists within a tower network infrastructure, our data intelligence platform scrutinises vast quantities of previously unused information - providing insights into undetected anomalies, trends, and opportunities for improvement. These translate into actionable optimisations to a network's performance, which when integrated into business processes, can optimize, provide comprehensive, real-time visibility,

across the organization, into every aspect of a network operation that achieved and/or can achieve further efficiencies. For a typical user, efficiency gains lead to reductions in on-site fuel consumption of 30%, 10-30% less CO_2 emissions, 20% energy cost reduction and 30% less generator run-time.

The African market is unique when it comes to powering the hyper-growth in mobile connectivity for the next generations: despite its significant challenges with power infrastructure, the region is leading the way when it comes to adoption of hybrid power and PaaS business models.

For the African market however, there are additional challenges. Much of the difficulty and expense in power and asset maintaining/servicing for remote sites is in the unpredictability of events that require intervention. MNOs and TowerCos are often reacting to unforeseen (but not necessarily unexpected) problems: a malfunctioning battery, an unexplained disconnection from the grid, an incorrect power configuration on a site, a faulty rectifier module.

Trawling through vast troves of real-time operational data from thousands of base stations and towers, data science algorithms automate detections of anomalies and patterns at a scale that has not been easily accessible to engineers and operators before. This unique insight into potential problems puts the TowerCo – for the first time – in the driving seat of preventative maintenance and problem-solving.

Now, instead of having a maintenance truck roaming a region stacked full of replacement parts that might be needed in the event of an unforeseen failure of the renewable power generation system, a real-time feed with granular fault diagnostic can alert an O&M team that a specific circuit breaker has failed at a specific site which can then lead to a high probability of the renewable storage system running out of back up power or ending up costing a lot more to keep the site running. A targeted intervention can take place, under conditions and on a schedule controlled by O&M teams.

This predictability has ripple effects through a TowerCo's OPEX. As well as reducing miles driven to sites, maintenance fuel costs, wear and tear on vehicles, risks to human lives and potential losses due to environmental hazards, CFOs can stabilize and forecast cashflow better than ever before. It extends the window of financial predictability, which in turn benefits the roll-out of new regions and 5G base station in-fill.

In 2023, demand for our technology has grown exponentially. With large scale deployments across the African markets, we have seen applications tailored to the most pressing local need for efficiency gains and OPEX reduction. Customers in Uganda, for example, were looking to leverage significant investment in solar panel technology, having identified that their solar real estate was not working as optimally as it should. Our AI-driven data analytics pinpointed multiple efficiency gains and by the end of the year their solar yield exceeded their target. ∎

Looking ahead: For 2024 and beyond, the tower industry will experience a seismic shift away from analogue, manual processes toward digitisation.

The benefits of embedding data intelligence tools into business processes and digitizing infrastructure management allow TowerCos and MNOs to automate workflows, compress time to revenue, reduce headcount, produce savings at scale and disseminate data across the enterprise to all stakeholders, opening up at the same time new opportunities for more efficient energy management to meet the stringent sustainability goals that shareholders demand.

Tom Greenwood,
CEO, Helios Towers

There is a huge growth opportunity in Africa. Although we have doubled the company's size in the past two years through acquisitions and now have 14,000 towers across nine markets, this growth has come with its own unique set of challenges.

In Africa, we have vast geographies to cover and significant infrastructure and power challenges. The land mass is 60% larger than in our EU markets, but we only have a fraction of the tarmac roads. Connectivity between the sites is often challenging, and grid availability is 16 hours on average per day versus 24 hours a day in the EU.

Many people in our markets are more used to having a mobile phone signal than power in their own homes. In the DRC, the grid is only available on average seven hours per day, and in Madagascar, nine hours per day. However, over the last eight years, we have seen a 90% improvement in power uptime performance. Back in 2015, we were at around 22 minutes of downtime per tower per week. In 2022, we were at two minutes and 46 seconds. We are not stopping there - we have set ourselves a target for 2026, achieving 30 seconds of downtime per tower, equivalent to almost 100% of power uptime.

We invest in alternate power solutions to improve service reliability and reduce fuel consumption. Not only is this the most environmental action but it also reduces the utilisation of the most expensive form of energy to power a site. Today, 31% of our sites utilise solar or hybrid, something we are looking to

> "We are seeing strong demand from mobile operators to expand coverage and upgrade technology from 2G to 3G, 3G to 4G, and 4G to 5G. There is significant growth ahead given most of the technology in our markets is still either 2G or 3G."

drive over the future towards our target to reduce carbon emission by 46% by 2030 and ambition of being Net Zero by 2040.

We are seeing strong demand from mobile operators to expand coverage and upgrade technology from 2G to 3G, 3G to 4G, and 4G to 5G. There is significant growth ahead given most of the technology in our markets is still either 2G or 3G. In more urban locations, rather than using a 50m-tall tower, we use products that are better adapted to more densely populated areas. In-building systems, outdoor desks, street furniture and lampposts with small antennae are all products that help fulfil the demand for connectivity, along with addressing the need for infrastructure to support newer technologies. Our colocation model, which can concentrate up to six tenants on a tower, works efficiently to support our customers as they develop newer technologies. This also means that only one generator or power supply is needed for multiple network operators.

A trend we have seen, and one we expect to grow exponentially over the coming years, is a focus on sustainability. Colocation is a big factor in our Sustainable Business Strategy, but we are also committed to reducing our carbon

emissions through other means. As some areas in Africa have non-existent or unreliable access to mains electricity, we depend on generators to guarantee power for our customers. To reduce this carbon impact, we have pledged to invest US$100 million in low-carbon solutions, in an initiative called 'Project 100,' as part of our drive to reach our carbon reduction target.

In Africa, the markets where we operate are home to the most urbanised cities in the world. Kinshasa, the capital of DRC, has a population of 17 million people. By 2035, it is forecast to have 27 million people. It will be the next global mega city and will need 5,000 plus telecoms points as a service to get to that size.

Tower companies are real estate companies for mobile operators. The added service that Helios Towers offers is power. We are effectively a power company for our customers, whereby we provide our customers 99%, almost 100%, power uptime within what we do. We - and other tower companies in the region, of which there are not that many - need to have power expertise, which means that each of our 14,000 sites are essentially micro power stations as well.

For densely populated environments where there is poor mobile coverage and limited space for traditional tower infrastructure, we have developed innovative distributed antenna systems (DAS) to improve connectivity. The Tanzania Communications Regulatory Authority asked our customers to develop a solution for the Kariakoo Market – the country's biggest and busiest market. Coverage and capacity were a challenge and market vendors had been deploying their own boosters to try to improve their signal. We collaborated with our MNO customers to develop a future-proof solution that could accommodate multiple operators and support 2G, 3G, 4G and additional spectrum bands. We expanded coverage from an existing tower nearby to equipment on two existing lampposts in the market. We connected these to the grid and installed a battery backup system. This bespoke solution has significantly improved coverage and capacity and vendors both inside and outside the market building are now able to do business much more effectively.

Where possible, we always try to connect off-grid sites to a grid supply to reduce fuel consumption. In Tanzania, we have worked with TANESCO, the national electricity company, to expand the grid to more rural areas. In 2022, we connected 325 sites to the grid, reducing our diesel consumption. 83% of our sites in Tanzania are now connected to the grid. ■

Looking ahead: One of the core pillars in our Sustainable Business Strategy is '22 by 26' - growing our tower portfolio to 22,000 towers by 2026. The mobile industry is uniquely placed to contribute to all 17 UN SDGs and we believe that the benefits of a more connected future should be accessible to all. Today, our telecommunications infrastructure covers over 141 million people, and we expect this figure will grow to 250 million by 2026.

While striving towards this target, we have set parallel goals, such as having at least 30% female representation in our workforce by 2026. Meanwhile, we are aiming to train 70% of our colleagues in Lean Six Sigma by 2026, the principles that sit at the heart of our people development.

We are fully on track to become a Net Zero carbon emissions business by 2040 and we are extremely proud of how the business is championing sustainability and looking for ways to maximise our impact in the communities in which we operate.

Jerome Perret,
CEO, IT-Development

Over the past year, our fortunes in Africa have continued to reflect our enduring commitment to the continent. Our journey with Africa began in 2005, when we forged a first partnership in Cameroon with a subsidiary of Orange. Since then, our dedication to the African market has remained unwavering, expanding our presence across various countries in both West and East Africa.

In 2020, we reached a pivotal milestone by securing the group contract with MTN, marking a significant achievement for our team. We have already implemented ClickOnSite in South Africa, and we are in the process of extending our services to other countries within the region and the group.

An African burgeoning population creates a demand for robust infrastructure, offering fertile ground for our services. However, navigating diverse cultural landscapes presents unique challenges. Adapting to regional work methodologies is a primary hurdle. Addressing education gaps and pockets of illiteracy led us to implement visual aids like maps and graphics

"In 2023, I witnessed regulatory shifts in African markets. Interestingly, anticipated catalysts for our business - regulatory actions - didn't have the expected impact."

for better accessibility. Furthermore, operating in developing countries brings logistical complexities, with lengthy commutes for users being common. Despite these challenges, we view them as opportunities for growth and improvement, driving innovation to cater to the specific needs of the communities we serve.

A notable African trend is the focus on addressing rural technological needs. Companies like AMN are taking on this significant challenge. Even in developed nations like France, profitability hurdles exist in rural areas, raising questions about the sustainability of such ventures. This demonstrates commendable ambition. The interest in these underserved regions highlights the importance of connectivity for rural communities. There's a substantial market opportunity for solutions bridging the digital divide and providing essential services. Monitoring progress in initiatives targeting rural Africa is vital, ensuring a balance between ambition and economic viability for long-term success.

In Africa, the adoption of 5G technology has been notably slower, from my perspective at least. African countries approach this technology as cautious followers, questioning its practical benefits. While consulting firms and vendors heavily promote 5G, actual demand on the continent remains limited. This sentiment is echoed by many CTOs of major African mobile network operators. This cautious approach reflects a prudent evaluation of technological investments, with African markets prioritizing practical applications. It's crucial to acknowledge that infrastructure and user base in Africa differ from more mature markets, influencing the pace of technology adoption.

For me, the standout success story from 2023 is Axian Group's rise. Its increasing prominence positions it as a key player in Africa. Drawing

parallels between Hassanein Hiridjee and Xavier Niel, both catalysts for change in their territory, is inevitable. Like Niel's tech disruption, Hiridjee's dynamic approach in Africa promises to reshape business. With Axian's trajectory, expect ongoing surprises in innovation. This success story underscores how visionary leadership fuels meaningful transformation and innovation in the African market like in any other.

In 2023, I witnessed regulatory shifts in African markets. Interestingly, anticipated catalysts for our business - regulatory actions - didn't have the expected impact. Fines on mobile network operators aimed at spurring mobile development were notable, yet surprisingly, didn't affect our business. This highlights the intricacies of African regulatory dynamics. I remain vigilant, engaging with local authorities for compliance. Despite varied

"I foresee a surge in towerco development across Africa in 2024, driven by strategists like Christel Heydemann, CEO of the Orange Group."

impacts, I acknowledge the second pivotal role of regulatory frameworks in shaping Africa's telecom landscape.

The nature of our work necessitates a collaborative approach across borders, and we have experienced a positive environment for ClickOnSite in 2023. This has allowed us to forge valuable partnerships and leverage collective expertise to address the unique challenges and opportunities that the African market presents. ∎

Looking ahead: In 2024 and 2025, the African market is witnessing a surge in data centre development. This complements and, at times, competes with mobile services, addressing the low fixed internet penetration. Additionally, there's a global push for enhanced asset management, notably gaining traction in Africa, aligning with international standards. These advancements signal a maturing tech landscape in Africa, poised to influence the market's direction.

I anticipate that the most vibrant countries or regions in Africa will likely be those with high population density. These areas tend to exhibit higher levels of innovation and dynamism compared to others. The concentration of people often leads to a greater demand for technological solutions, which in turn fosters a fertile ground for innovation and economic growth.

Looking ahead to 2024 and 2025, we remain optimistic. As Africa's significance in the global market continues to grow, we anticipate an even greater

need for collaborative efforts to drive innovation, development, and sustainable growth across the continent. Our commitment to Africa and our current customers position us well to play an active role in this landscape.

I foresee a surge in towerco development across Africa in 2024, driven by strategists like Christel Heydemann, CEO of the Orange Group. Their determined efforts to maximize regional assets are poised for impact, potentially reshaping the sector. While it may not emulate a conventional towerco like TOTEM, these strategic initiatives change the way towers and assets are operated on the continent.

Industry leaders adopting a proactive approach, leveraging existing infrastructures, and innovating for sustainable expansion, highlight Africa's dynamic telecom landscape. This forward-thinking is set to propel substantial progress, foster fresh collaborative opportunities, and ultimately elevate connectivity and accessibility of services continent-wide.

Sumedha Tatke,
director – marketing and product management, Tarantula

Tarantula is a global software company and a proven market leader in telecom site management solutions. As a trusted advisor and long-term partner for tower site owners and operators in more than 30 countries worldwide, we are a vital part of the daily management of more than 450,000 towers and US$50 billion worth of assets across the world. Africa is an area of strong focus for us, with several leading multi-country towercos using our product to manage their tower portfolios.

We have been very active in Africa over the past year, enhancing our brand awareness and increasing our footprint. We signed up with a multi-country towerco that is continuing to expand in the region, and we are deep in the deployment process of our site management solution for them. We also continued our partnership with our existing customers in the region, while enhancing our product capabilities to deliver additional value.

The African market is no different to the rest of the world when it comes to tower carve-outs, M&A transactions, and diversification of the products being offered by infrastructure providers.

Similar to the US and European market, the MNO trend of carving out tower portfolios into separate tower companies continued in Africa as well in the last 12 months. We also saw many tower companies getting into the fibre domain, offering backhaul and dark fibre to the tower as new products to their customers. Last but not least, we saw the ongoing trend of densification and upgrades to towers in the region as towercos needed to provide sustained services to their customers.

Interestingly, despite the high demand for digitalization and site management tools, we saw a huge dependence on manual data capture and siloed data systems that did not talk to each other. This was all the more evident from the lack of automation in contract management and customer billing areas.

The towerco-MNO framework contracts are extremely complex, with multiple levers having an impact on the tower cash flow. However, empowering towercos with the appropriate tools to have a single source of truth in the correct contract data as well as customer usage information, ensures that customer billing is accurate and reliable. This was a great opportunity for us to provide a platform for business process automation with centralization of asset, contract, project, and process information, generating billing data and tower cash flow analysis.

The biggest differentiator between the African markets and other global markets is the energy requirements.

With low grid connectivity and limited use of renewable or alternative energy sources, tower owners continue to rely on diesel for ensuring power to the tower. As towercos start to offer energy as a service to increase their stickiness with their customers in many markets, we will continue to see digitalization and optimization requests from our customers on the energy management front. ■

Looking ahead: The need for centralized site management as well optimization of rollout and operations cannot be emphasized enough. With siloed departments managing site data through manual operations, tower owners are consistently turning to digitalization tools to automate business processes and data collection. As we go into 2024 and beyond, our deep expertise in this domain will be the cornerstone of optimizing site portfolio management.

Rupert Chappell,
sales director, telecom EMEA, vHive

In the evolving landscape of Africa's telecommunications sector, vHive enters with a mission to enhance connectivity for African communities. Recent successful projects led by vHive and prominent TowerCos in Africa serve as a beacon of innovation, ushering in a new era of digital transformation to the region and establishing the company's strong footprint in the continent.

Renowned as an established industry leader in the US and European telecommunications markets, vHive is now set to embark on a transformative journey across Africa, setting the stage for accessible connectivity, one tower at a time.

Africa presents a unique tapestry of challenges and opportunities. Just as rivers were once integral to the prosperity of villages, connectivity through modern towers has become a critical enabler for these communities to thrive in today's global landscape. Today, TowerCos purposefully construct their towers near rural, underserved communities, recognizing that development follows connectivity, which is key for global commerce participation.

Power instability emerges as a significant hurdle, with a considerable portion of assets operating off-grid. In countries like Nigeria, escalating energy costs compound the challenge, necessitating innovative solutions for sustainable tower operations. Safety regulations and security concerns, including theft of tower components, further underscore the complexities.

The digital divide persists as a critical concern, delineating those with internet access from those without. vHive's solution emerges as a catalyst for mitigating this divide, collaborating with TowerCos and MNOs to bridge the gap. By providing accurate tower data, vHive empowers these entities to optimize resources and extend connectivity to underserved populations.

Amidst challenges, opportunities abound. The youthful population, known for its tech-savvy mindset, can eagerly embrace technologies such as drones and AI/ML. This affinity not only presents efficiency for tower-related tasks, but also positions them as valuable contributors in adopting new methods and technological proficiency. The transformative power of connectivity is emphasized, positioning TowerCos and MNOs as catalysts for integrating African communities into the global economy.

Ownership changes and the quest for AI solutions define the evolving African telecommunications landscape. Tower owners and operators seek to unravel the complexities on their structures, employing AI to detect overloading issues and equipment discrepancies. From an MNO perspective, the discrepancy between As-built and As-planned configurations poses challenges. The dependence on manual survey methods is evident, necessitating automation for accurate, consistent, and shareable data.

This year, we were also announced Best-In-Class Software Platform for Asset Digitization by Frost & Sullivan, which we're very proud of. It's been recognized that. for TowerCos, a unified view and understanding of the tower's performance and potential value, with a visual cloud-based platform serving as a single-source-of-truth with photorealistic 3D tower replicas, is the future. AI and computer vision analytics quickly identify equipment and issues, providing instant insights into asset conditions and profitability.

For one example, we have worked with one of South Africa's largest TowerCos to resolve the

> "Surprisingly, Africa showcases a readiness to adopt these new technologies, surpassing even more developed regions. Tower owners and operators exhibit a progressive approach, acknowledging the imperative to stay ahead in a rapidly evolving landscape. The transformative potential of digitization in Africa becomes a beacon of hope, driving connectivity advancements and reshaping communities."

issue of accurately accounting for changes on towers. Our digital twin solution, which features autonomous data capture, advanced AI analytics and intuitive 3D simulation software, removes the complexity and limitations of manual data collection, by using low- cost, off-the-shelf drones controlled by a powerful software platform. The simplicity of data capture uses autonomous auto discovery drone technology, enabling an optimal amount of accurate data, systematically, easily and at scale.

With our solution, the South African client was able to significantly reduce its inventory records, to 45% less equipment compared to the typical TowerCo. The user-friendly 3D simulation capability allows TowerCo teams to easily explore vertical space possibilities, add new levels, and accommodate new tenants effortlessly to expedite new equipment installations and seize every opportunity for growth.

Surprisingly, Africa showcases a readiness to adopt these new technologies, surpassing even more developed regions. Tower owners and operators exhibit a progressive approach, acknowledging the imperative to stay ahead in a rapidly evolving landscape. The transformative potential of digitization in Africa becomes a beacon of hope, driving connectivity advancements and reshaping communities.

While TowerCos predominantly gravitate toward South Africa and West Africa, MNOs span across the continent, collectively propelling digital transformation. Cross-border collaboration emerges as a prominent trend, fostering a collaborative environment for technology adoption. In this scenario, even smaller players find avenues to contribute to multinational groups. ■

Looking ahead: Africa, with its vast complexities and opportunities, stands as a colossal opportunity for vHive – we are well-equipped to handle local nuances and support the continent's growth. With ongoing and upcoming projects, this marks just the beginning for vHive's in Africa.

In a continent where connectivity is synonymous with progress, vHive's mission aligns with ensuring MNOs' equipment is optimized and TowerCos' returns are maximized, for productive and profitable tower operations. By doing so, vHive aims to join telecom stakeholders in reshaping the narrative, enabling entire villages to become vital nodes in the global economy. The journey toward digitization in Africa is not just a project; it's a transformative odyssey, and vHive is committed to be at the forefront, steering Africa toward a connected future.

Yusuf Paruk,
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Insite Towers Co.

Carla Da Silva Caires,
national sales director,
Insite Towers Co.

Andrew Edmondson,
chief executive officer,
Insite Towers Co.

Jason Legassick,
chief commercial officer,
Insite Towers Co.

South Africa has its share of challenges, but within those challenges, we see opportunities. Take our growing population, for instance - more people means a greater demand for improved and faster communication. However, when you venture outside our cities, you'll notice a significant lack of basic services like reliable power supply and essential infrastructure.

Accordingly, we offer comprehensive solutions that benefit various groups in our ecosystem. We've designed tailor-made solutions that encompass both infrastructure and power provision. This allows us to establish mutually beneficial partnerships with community centres, such as schools, and private homes. Our goal is to provide a platform for easy access to information and communication, bridging gaps in time and space.

We believe that solving these issues can't be done in isolation - it's a collective effort. It requires the seamless integration of physical infrastructure, power supply, and cooperation from mobile network operators; and calls for a sensitive and realistic collaboration between us and the communities we work with. Together, we can make a real difference.

The African market needs access to power, infrastructure and cellular networks. Unfortunately, we are lagging in this regard. However it is narrow-minded to think that a single technology is going to fix a problem – it requires an understanding on the market at large and being able to tailor unique solutions for our customers.

Unique solutions encompass multiple factors, and this is why we put plenty energy and time into creating strong relationships that focus on the bigger picture, not just a solution for 'right now,' because it is the key to success for everyone… fostering a solid partnership means showing up and delivering on your word, especially in communities where the need for connectivity is pervasive.

Our standout success story of 2023 is undoubtedly our Lebalelo tower in Limpopo province. Aside from the sheer breathtaking beauty of the site, the tower is built in a remote, hard-to-reach and inhospitable location. There are no tarred access roads and no power infrastructure around the site, yet we have successfully built a tower, provided power as a service for our customers while also providing a secure container to house each of our customers' individual infrastructure.

We have literally provided off-grid power, from mainly green generation sources. This has enabled the tower to link, several, remote communities and therefore is an attractive opportunity for mobile network operators. ◾

Looking ahead: We are placing greater emphasis and energy on bridging the digital divide and expanding into rural areas that have largely been left behind.

Success is about creating strong partnerships and the needs of the mobile network operators provides the impetus for us to go out there and build towers in rural, remote and hard-to-reach places. Therein exists a symbiosis where each party, including the surrounding community, has something to gain in the process.

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About us

Contact us

Solutions

PowerX, a Software-as-a-Service company, provides the market-leading data intelligence platform for managing and optimising energy assets. The platform's advanced data science tools and workflows, integrated with enterprise business processes, deliver efficiency, resilience and sustainability for critical asset operations. In telecommunications, for example, the PowerX solution has achieved auditable 15%-30%+ energy and maintenance cost reductions, asset utilisation improvements, CO_2 emission reductions and revenue assurance.

PowerX is a highly scalable, hardware agnostic platform that is quick and easy to deploy. The solution leverages AI to automate improvements and processes at scale helping operational teams identify inefficiencies, prioritise responses and manage to resolution with detailed diagnostics and integrated workflows. The result is enterprise-wide visibility, specific insights and automated control actions, with increased workforce productivity, reduced cost and site-level efficiencies at scale across large, distributed estates.

Find out more: www.powerx.ai

Power$x$

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Red Cube

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Customers

Tarantula is a global software company and a proven market leader in telecom site management solutions. We are a trusted advisor and long-term partner for tower site owners and operators in more than 30 countries worldwide. We leverage our extensive industry knowledge to empower our customers to build profitable and sustainable businesses. Through an end-to-end, purpose-built telecom site portfolio management solution and knowledge-driven services, we are a vital part of the daily management of more than 450,000 towers and US$50 billion worth of assets across the world.

Tarantula is owned by Lumine Group, a division within Volaris Group, a subsidiary of Canada-based Constellation Software Inc. Our offices are situated in Singapore, UK, and India. For further information, please visit: www.tarantula.net

tarantula.
Monetizing Towers

Thanks to...

Compiling the African Wireless Communications Yearbook each year could not be achieved without the help and support of those who contribute to its contents through opinion, statistics, research, and interviews.

We are therefore indebted to every person and company that contributed to this edition or agreed to be interviewed for the appropriate sections and below is an acknowledgement of this year's contributors.

As publisher of both Southern African Wireless Communications and Northern African Wireless Communications, we look forward to continuing this partnership within the regular issues throughout 2024 and as part of africanwirelesscommms.com – please keep in touch!

Thank you from team Kadium.

AFRICAN WIRELESS COMMUNICATIONS YEARBOOK 23/24

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Access Partnership makes innovative technology work for the world. Guiding businesses and governments through complex regulatory challenges, we design frameworks that optimise deployment, drive growth, and attract investment.

We deliver in over 200 markets worldwide through specialist knowledge across all areas of the digital economy. From setting strategy and designing policy to ensuring compliance and measuring success, we expertly advise every step of the regulatory journey.

We're tech optimists who believe that innovative technology has been the driver of transformative change in the world. As the pace of innovation accelerates and as paradigms shift, we believe the potential for economic growth and human progress will increase.

But while change is inevitable, progress is not. Invention alone doesn't lead to breakthroughs. Technology needs to work in the real world, not just the lab. And it needs to work for all: for companies and countries, and for the benefit of everyone.

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Sustainability

ESG Management System

Our Funds

Investment Philosophy

AIIM, a member of Old Mutual Alternative Investments (OMAI), has been investing in African infrastructure since 2000 with a track record extending across eight African infrastructure funds. AIIM's team of 40+ investment professionals is based out of five locally staffed offices across the continent in Cape Town, Johannesburg, Nairobi, Lagos and Abidjan providing direct on-the-ground coverage of all AIIM's key markets.

AIIM currently manages an aggregate AUM of US$2.7 billion in assets across the power, renewable energy, digital infrastructure, mid-stream energy and transport sectors with operations in 19 African countries.

To bridge the continent's digital infrastructure gap, AIIM, through its UN Sustainable Development Goal-aligned AIIF4 fund, invests in world-class digital infrastructure facilities and services across the telecommunications tower, data centre and fibre sub-sectors, stimulating expansion of local businesses, and enabling multinational companies to scale African operations.

AIIM is a licensed FSP approved by the Financial Sector Conduct Authority in South Africa.

ACKNOWLEDGEMENTS

Dataxis is a market research and event organizer company, headquartered in Berlin with offices in Mauritius, Paris and Buenos Aires. The company, controlled by its top management and backed by private investors, currently operates within three primary areas:

- Market intelligence: quarterly monitoring of the TV, OTT, telecom, media and digital sectors, covering more than 50 markets, 200 countries and over 4,000 players, including Tier 2 and Tier 3 companies. Dataxis can provide key performance indicators, statistics and forecasts on a global scale, as well as research results from our analysts on specific sectors (Research Highlights).
- Events planning: 25 on-site conferences will be held in 2024 gathering experts and companies from the TV, OTT, advertising, broadband, mobile and refurbishment sectors to discuss the latest trends, explore new strategic opportunities and forge new partnerships.
- Advertising: Implementation of marketing services to generate leads and engage your targets: white papers and emails to inform a database of 60,000 qualified contacts.

Dataxis can also organize a customized event (Event Creator) or host a sponsored webinar to connect with decision-makers and generate new business.

Market Intelligence services

Events

Advertising

The Dynamic Spectrum Alliance (DSA) is a global cross-industry, not-for-profit organization advocating for laws, regulations, and economic best practices for more efficient utilization of spectrum and affordable broadband for all.

Consumer demand for wireless connectivity is surging, and spectrum is a finite source. Through communication with governments and regulators, the DSA promotes licence exempt access to the spectrum and the sharing of underused spectrum bands to unleash economic growth and innovation.

Through technical materials, events and workshops, the DSA highlights the potential of spectrum sharing. Our regulatory responses and whitepapers are available to view on the DSA website. A recent report, entitled 'Solving the Spectrum Crunch' examines dynamic spectrum coordination systems (DSMS), and how these have emerged as a critical regulation tool.

The DSA holds key workshops with regulators to discuss and debate innovative spectrum sharing methods and models, preparing them for WRC-23 and beyond.

Dynamic Spectrum Alliance

Latest DSA whitepapers and reports

'Solving the Spectrum Crunch' full whitepaper

Submission to Governments and Regulators

ACKNOWLEDGEMENTS

Ericsson enables communications service providers and enterprises to capture the full value of connectivity.

The company's portfolio spans the following business areas: Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses.

It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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GSA (the Global mobile Suppliers Association) is a not-for-profit industry organisation representing companies across the worldwide mobile ecosystem who are engaged in the supply of infrastructure, semiconductors, test equipment, devices, applications and mobile support services.

We actively promote the 3GPP technology road-map – 3G; 4G; 5G – and we are a single source of information for industry reports and market intelligence. The website https://gsacom.com is used by industry professionals and organizations from over 200 countries globally as a single source of information on 4G & 5G. Users, who can register for free on the web site, download over 220,000 reports, charts and presentations annually.

The GAMBoD databases, are a unique search and analysis tool we developed to provide the industry with up to date information on the growth and expansion of the mobile broadband ecosystem of devices and networks. The GSA research team constantly updates GAMBoD with new 4G and 5G devices and shows progress of 3GPP technology adoption and spectrum usage by mobile operators. The data can be searched and filtered to give technology, device and regional analysis that can be used in your reports or presentations.

Free registration for industry reports

GSA industry databases - by subscription

GSA

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The Mobile Ecosystem Forum (MEF) is a global trade body established in 2000 and headquartered in the UK with members across the world. As the voice of the mobile ecosystem, it focuses on cross-industry best practices, anti-fraud and monetisation. The Forum provides its members with global and cross-sector platforms for networking, collaboration and advancing industry solutions.

MEF runs six market-specific programmes enabling members to share best practice, create new initiatives and meet new partners:

Enterprise Communications, Payments, Connectivity, Mobile IoT, Personal Data & Identity, Content & Advertising.

Activities areas:

- Insight: MEF pools members expertise to create reports, white papers, conferences, other educational documents.
- Interaction: members collaborate with and learn from each other via webinars, virtual and physical events, working groups, informal networking.
- Impact: as a trusted and independent authority, MEF can affect market behaviour. Members collaborate on best practice schemes, industry code of conducts, anti-fraud initiatives, registries, regulatory consultations etc.

Global reach and member diversity

A wealth of MEF and Members reports

Platform for discussions and networking

Industry collaboration to reduce the impact of fraud

Mordor Intelligence is a trusted partner for businesses seeking comprehensive and actionable market intelligence. Our global reach, expert team, and tailored solutions empower organizations and individuals to make informed decisions, navigate complex markets, and achieve their strategic goals.

Check out our wireless research reports

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Open Access Data Centres
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WIOCC Group company Open Access Data Centres (OADC) is Africa's fastest-growing data centre company.

Established to transform the provision of data centre services for Africa, OADC constructed five core data centres, over 30 edge facilities and won the Best Data Centre / Edge Service Innovation award at the Global Carrier Awards 2022 in the first 12 months of operations.

Committed to investing over $500m deploying and operating a unique open-access, core-to-edge, pan-Africa data centre ecosystem, OADC is deploying its open-access, Tier III hyperscale data centres at major cable landing locations and in key business hubs throughout Africa. In parallel, it is rolling out OADC EDGE data centres to meet rapidly growing demand for content storage, processing and delivery at the network edge, and support service providers cost-effectively extending theirnetwork reach.

OADC prides itself on delivering unparalleled client service, offering expert assistance and tailoring bespoke solutions to client needs.

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Open Access Data Centres (OADC) has been established to transform the provision of data centre services in Africa. As a WIOCC Group company, it leverages strong existing relationships with clients in Africa and well-established delivery capabilities across the continent, together with the proven and long-standing data centre expertise of the OADC Executive team.

The company is implementing a world-class, pan-African, carrier-neutral data centre footprint that will deliver an unparalleled client experience offering expert assistance and support, partnership in tailoring bespoke solutions and leading-edge information systems to support client business decision-making.

OADC is deploying its open-access, Tier III core data centres at major cable landing locations and in key business hubs throughout Africa. OADC EDGE data centres are being deployed into smaller locations, serving the ongoing need to support service providers in extending network reach, and the growing requirement for content storage, processing, and delivery at the network edge.

OADC is an environmentally responsible company and as such is pursuing a wide range of environmental and management accreditations.

ACKNOWLEDGEMENTS

On behalf of its members TCCA supports all standard mobile critical communications technologies and complementary applications. Our members are drawn from end users, operators, and industry across the globe. TCCA members design, manufacture, build, implement, utilise, analyse, promote, develop, and deploy critical communications worldwide. Collectively we have created the critical communications of today. Together we are shaping the critical communications of the future.

We believe in and promote the principle of open and competitive markets worldwide using open standards and harmonised spectrum. We drive the development of common global mobile standards for critical broadband and maintain and enhance the TETRA Professional Mobile Radio (PMR) standard. TCCA is the 3GPP Market Representation Partner for critical communications and our members actively contribute in 3GPP working groups. TCCA supports the ETSI MCX Plugtests™, is a member of the MCS-TaaSting project, supports the Mission Critical Open Platform (MCOP) project.

TeleGeography builds and maintains massive data sets used to monitor, forecast, and map the telecommunications industry. Hundreds of companies around the world rely on this intelligence to plan their next move.

This includes managing submarine cable investments, designing cloud-based networks, researching international markets, and benchmarking their services against competitors. TeleGeography's data is collected and analyzed by experts with decades of experience. Their unique, unbiased perspective is crucial; it results in research customers can actually use to make big decisions.

ACKNOWLEDGEMENTS

Tower xChange
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TowerXchange is the community for the movers and shakers of the passive telecom infrastructure world. Formed in 2012 the company has charted the worldwide growth of the telecom tower ecosystem.

Through five regional Meetups and over 4 million words of interviews, editorial and analysis TowerXchange has supported the growth of the global telecom tower industry.

Over three quarters of the world's towers are now managed by towercos and there is nowhere else on earth you can find out more about them than TowerXchange and its regional Meetups.

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Wireless Access Providers Association (WAPA)

Lesley Colmer,
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Wireless Access Providers Association (WAPA) is a non-profit trade association established in 2006 as the collective voice for the wireless industry. Its primary objective is to promote wireless industry growth through self-regulation, promoting best practices, and educating members and the markets on new wireless technologies and business models. WAPA offers members regulatory advice, technical training, code of conduct, a forum for knowledge-sharing and business enablement opportunities. WAPA positions itself to interface between the government regulator (ICASA), network operators, service providers, and consumers. The organisation regularly submits and presents to government on regulations affecting the wireless industry. It tirelessly lobbies for more progressive and efficient spectrum management in South Africa and is focusing on the possibilities of TVWS spectrum for interference-free access.
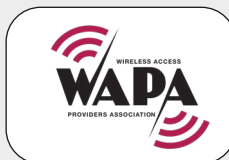
ACKNOWLEDGEMENTS

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WIOCC Group company WIOCC is Africa's digital backbone, the leading player in the deployment of carrier-scale, future-proofed network infrastructure into Africa, and in 2023 celebrated 15 years of providing digital connectivity solutions into, out of and within Africa.

Operating exclusively as a wholesaler, WIOCC offers carriers, content providers, cloud operators, ISPs and mobile operators reliable, seamless, high-capacity connectivity between more than 30 African countries and key global financial and commercial centres.

WIOCC revolutionised the delivery of high-capacity connectivity between Africa and the rest of the world, and has the flexibility and scale to meet the ever-growing demand for reliable, high-speed capacity in Africa driven by end consumers, enterprise users and the ecosystem that supports them.

Our focus on building strong, long-term relationships with clients enables us to develop bespoke solutions that meet their current requirements and have the capability to match future demands for growth, extra resilience and geographical expansion.

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World Teleport Association (WTA)
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Since 1985, the World Teleport Association (WTA) has been the only trade association that focuses on the business of satellite communications from the ground up. At the core of its membership are the world's most innovative operators of teleports, from independents to multinationals, niche service providers to global carriers. WTA is dedicated to advocating for the interests of teleport operators in the global telecommunications market and promoting excellence in teleport business practice, technology, and operations. Companies that do business with teleports also find that WTA is the best investment they can make to open new channels to the industry.

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