GSMA

The Mobile Economy Sub-Saharan Africa 2024

GSMA

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

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

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Executive summary

Driving growth and innovation

Mobile connectivity is a key driver of digital transformation and socioeconomic growth in Sub-Saharan Africa. Governments and businesses are increasingly using 4G and 5G networks alongside technologies such as AI and IoT to enhance productivity and service delivery. Despite growing demand for mobile, a significant usage gap persists. This underscores the need for efforts by operators to address the barriers to mobile internet adoption, such as device affordability, online safety and digital skills.

The adoption of 4G continues to rise in the region and is forecast to account for 50% of total connections by 2030. 5G adoption is accelerating and forecast to contribute $10 billion to the region's economy by 2030, accounting for 6% of mobile's total economic impact. Meanwhile, the mobile ecosystem supported 1.5 million jobs directly and more than 2.2 million jobs in other sectors in 2023.

Key trends shaping the mobile ecosystem

5G: advanced technologies remain a future prospect

Operators in pioneer 5G markets around the world are increasingly moving towards more advanced forms of 5G to unlock new use cases and monetisation opportunities. However, such technologies remain a distant prospect in Sub-Saharan Africa. Operators need to prove the business case for their initial 5G investments (using non-standalone architecture) before committing to more advanced forms of the technology. Operators and their partners also need to accelerate the development of relevant 5G use cases and applications for enterprises in the region.

Industry in context: challenges lead to market consolidation

The telecoms industry in Sub-Saharan Africa faces significant challenges, driving market consolidation. Key issues include inflation and currency volatility (which increase capital costs), high sector-specific taxation for operators, and escalating energy costs due to unreliable grids and a reliance on diesel. Such factors place considerable financial pressure on operators, resulting in market exits or consolidations in some instances. The challenging environment threatens investment in the sector, which is crucial if the region's digital divide is to be reduced.

Investment in the sector is crucial if the region's digital divide is to be reduced

Aerial connectivity: interest grows in the evolving NTN market

Aerial connectivity will play an important role in realising universal connectivity in Sub-Saharan Africa. Although satellite solutions have been offered for several decades, the emergence of low Earth orbit (LEO) and high-altitude platform systems (HAPS) has spurred interest in non-terrestrial networks (NTNs). SpaceX's Starlink has been expanding rapidly across the region. Mobile operators are also active in aerial connectivity – mostly through partnerships with satellite companies.

Generative AI: operators move to realise its potential

As digital transformation accelerates in Sub-Saharan Africa, AI is coming to the fore. The United Nations forecasts it could contribute up to $1.5 trillion to the region's economy by 2030. Mobile operators are gradually adopting generative AI (genAI), focusing on customer service, network optimisation and operational efficiency. Strategic partnerships are underway to help operators maximise the value of the new technology. Despite momentum, challenges persist, including a shortage of skilled AI professionals and data privacy concerns.

GSMA Open Gateway: momentum builds

Although it has been possible to expose network APIs for some time, operators have struggled to adopt a standardised approach that achieves scale. However, recent initiatives by the mobile industry have sought to provide fresh momentum behind developing a common set of network APIs. By June 2024, 53 operator groups had signed up to the GSMA Open Gateway initiative, representing 240 mobile networks and accounting for 67% of mobile connections globally.

Operator commitments are beginning to translate into commercially available network APIs. In February 2024, South Africa became the first country in Sub-Saharan Africa to implement Open Gateway APIs when Cell C, MTN and Telkom launched the Number Verification and SIM Swap APIs, with applications in fraud detection and digital security.

Policies for growth and innovation

Despite a strong appetite for mobile in the region, Sub-Saharan Africa has a high usage gap of 60% – the highest in the world. This suggests challenges in fulfilling the near-universal broadband connectivity envisaged by governments in the African Union's Digital Transformation Strategy For Africa 2020–2030. To address the challenges, policymakers can look to the following actions:

- **Improve the affordability of mobile services to close the connectivity gap –** Urgent reform to taxation is needed to address the affordability of mobile service and smartphones, which is a key barrier to mobile broadband adoption.
- **Use universal service funds (USFs) effectively –** Insights from a GSMA study show that many USFs in Africa are underperforming and have become ineffective in closing the connectivity gap. It is imperative to reform structural and operational aspects of USFs across Africa to improve their effectiveness.
- **Implement the right spectrum policies for inclusive digital development –** Operators need new spectrum capacity to provide consistent speeds to more users as 5G services expand. The right amount of capacity helps minimise the number of base stations needed, which can keep costs down and save on carbon emissions. The outcome of WRC-23 provides the next steps on the road to enabling low- and mid-band spectrum to be used for 4G and 5G connectivity. This spectrum now needs to be incorporated into the long-term spectrum roadmaps of administrations.

> **Urgent reform is needed to address the affordability of mobile service and smartphones**

The Mobile Economy Sub-Saharan Africa

Unique mobile subscribers

2023 **527m**
44% penetration rate*

2030 **751m**
53% penetration rate*

CAGR 2023-2030 **4.5%**

*Percentage of population

Mobile internet users

2023 **320m**
27% penetration rate*

2030 **518m**
37% penetration rate*

CAGR 2023-2030 **6.2%**

*Percentage of population

SIM connections

(excluding licensed cellular IoT)

2023 **1.0bn**
88% penetration rate*

2030 **1.4bn**
103% penetration rate*

CAGR 2023-2030 **4.1%**

*Percentage of population

4G

Percentage of connections (excluding licensed cellular IoT)

2023 **31%**

2030 **50%** ↑

5G

Percentage of connections (excluding licensed cellular IoT)

2023 **1.2%**

2030 **17%** ↑

Smartphones

Percentage of connections

2023 **51%**

2030 **81%**

Licensed cellular IoT connections

2023 **27m**

2030 **51m**

Operator revenues and investment

2023 **$38bn**

Total revenues

2030 **$61bn**

Total revenues

Operator capex for the period 2023–2030: **$62bn**

Mobile's contribution to GDP

2023 **$140bn**

7% of GDP

2030 **$170bn**

Public funding

2023

$20bn

Mobile ecosystem contribution to public funding (before regulatory and spectrum fees)

Employment

2023 **1.5m jobs**

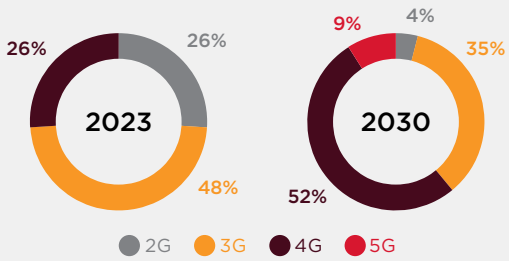
Directly supported by the mobile ecosystem

Plus 2.2m indirect jobs

Subscriber and technology trends

ECCAS

Technology mix*



Subscriber penetration

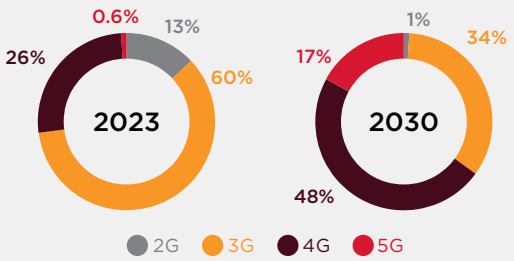
2023	36%
2030	46%

Smartphone adoption

2023	42%
2030	69%

ECOWAS

Technology mix*



Subscriber penetration

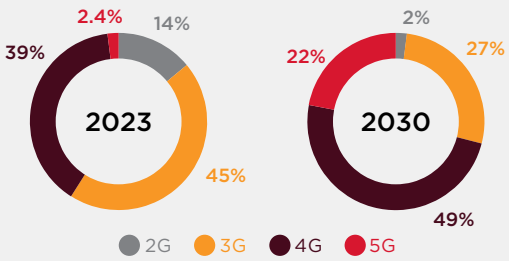
2023	48%
2030	57%

Smartphone adoption

2023	54%
2030	83%

SADC

Technology mix*



Subscriber penetration

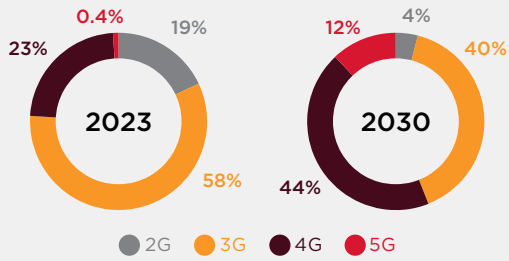
2023	43%
2030	51%

Smartphone adoption

2023	53%
2030	81%

EAC

Technology mix*



Subscriber penetration

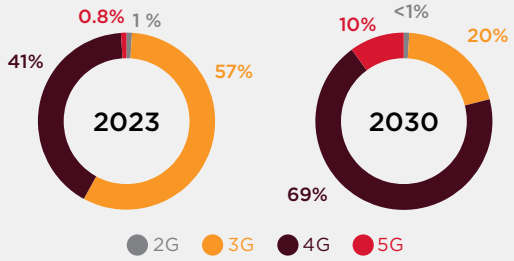
2023	40%
2030	49%

Smartphone adoption

2023	40%
2030	76%

Ethiopia

Technology mix*



Subscriber penetration

2023	40%
2030	50%

Smartphone adoption

2023	36%
2030	80%

* Percentage of total connections (excluding licensed cellular IoT)
Note: Totals may not add up due to rounding.

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The mobile industry in numbers

The usage gap in Sub-Saharan Africa remains significant, at 60%

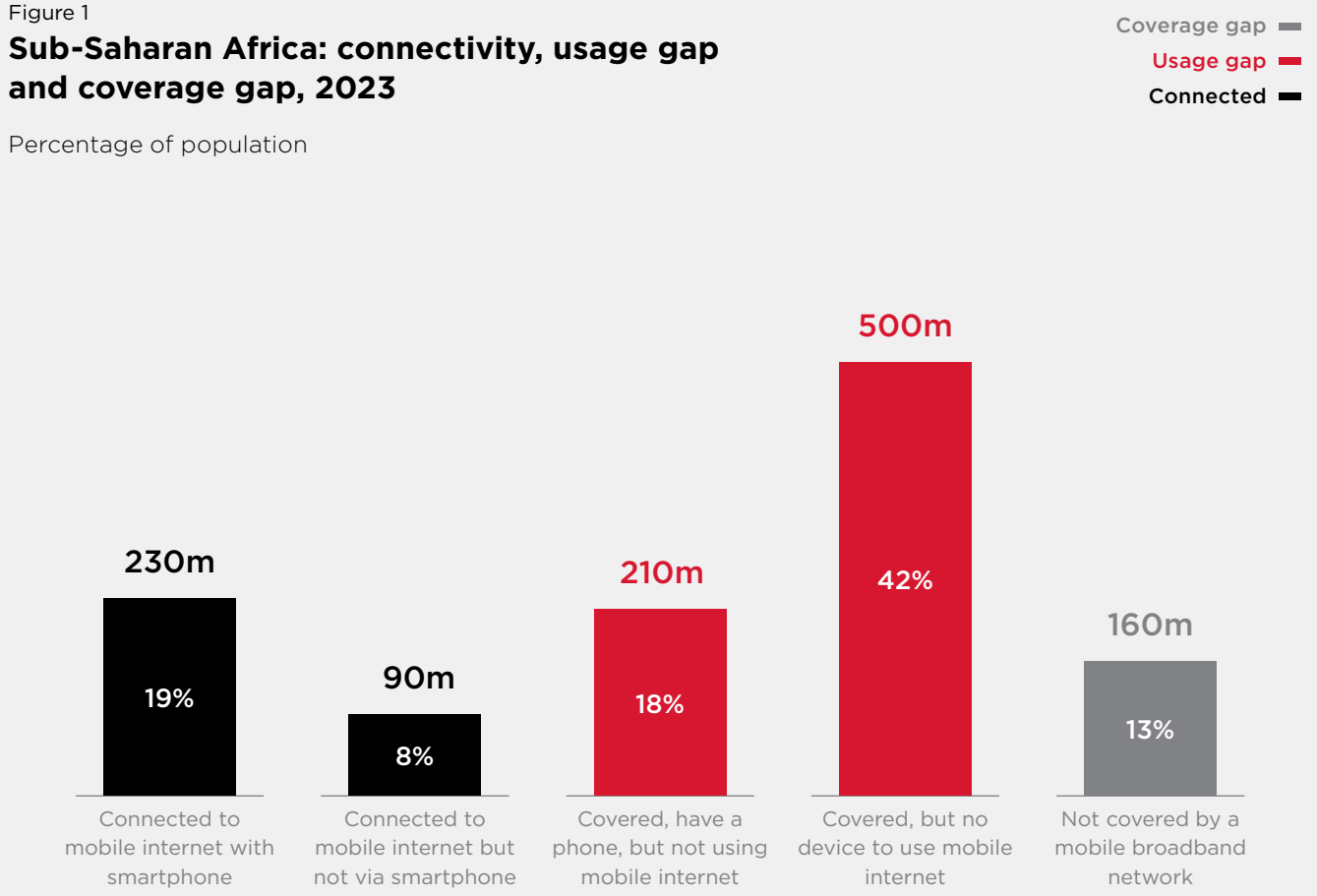
By the end of 2023, nearly 44% of the population in Sub-Saharan Africa subscribed to a mobile service, amounting to 527 million subscribers. Mobile internet penetration has been growing, reaching 27% in the region by the end of 2023. Despite progress, the usage gap remains significant, at 60%. Mobile operators and other stakeholders continue to implement initiatives to reduce both the usage and coverage gaps, with the goal of enhancing digital inclusion and driving economic development across the region.

The landscape for mobile internet connectivity varies significantly across Sub-Saharan Africa. In countries such as Chad, the Central African Republic and Mozambique, penetration levels remain below 15%, while in more advanced markets such as South Africa and Seychelles, penetration exceeds 50%. The main challenges contributing to this disparity include affordability (particularly the cost of smartphones) and limited digital skills.

Figure 1

Sub-Saharan Africa: connectivity, usage gap and coverage gap, 2023

Percentage of population



Source: GSMA Intelligence

By 2030, half of connections in Sub-Saharan Africa will be on 4G

By the end of the decade, 4G adoption in Sub-Saharan Africa is expected to reach 50%, making it the dominant technology. Although 3G currently accounts for the largest proportion of total connections, 4G is projected to overtake 3G by 2027.

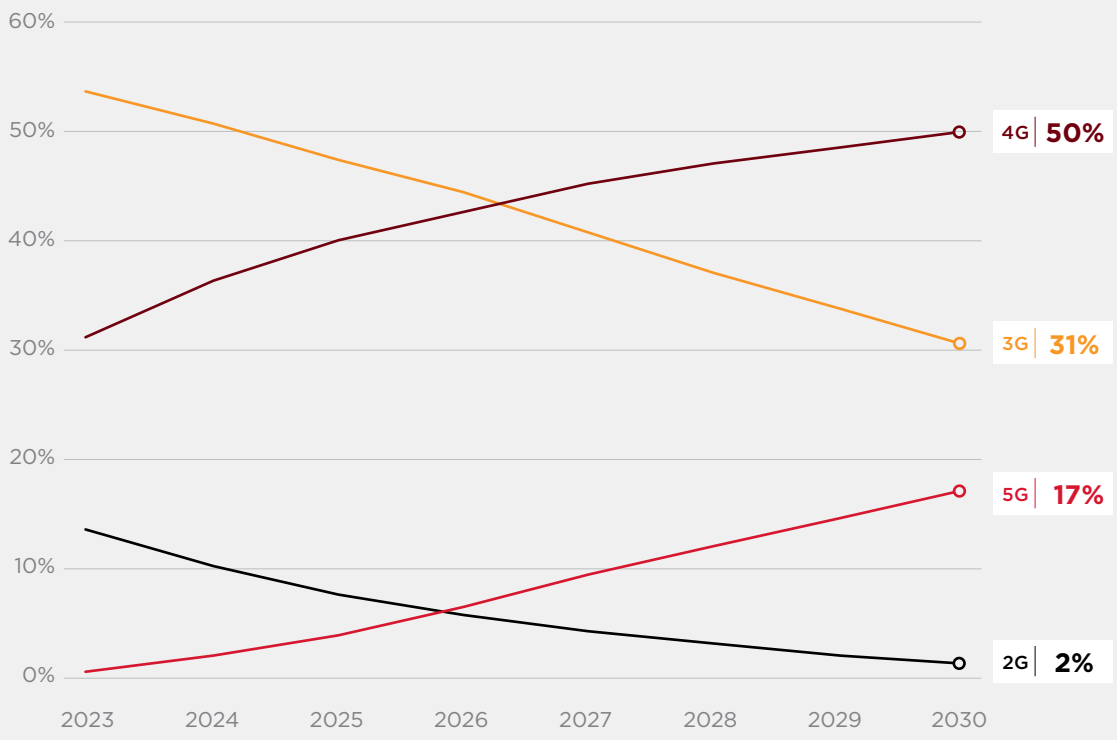
5G is gathering momentum in the region, with operators investing in network modernisation to prepare for its deployment. In March 2024, Somtel and Telesom became the first mobile operators in Somalia to launch commercial 5G services, with initial rollouts in the country's capital, Hargeisa. 5G adoption in the region is expected to gain momentum in the second half of this decade, rising to 17% by 2030.

As countries in Sub-Saharan Africa transition to more advanced technologies such as 4G and 5G, South Africa stands out as the only country to announce plans to sunset both its 2G and 3G networks (by 2027).

Figure 2

Sub-Saharan Africa: mobile adoption by technology

Percentage of total connections



Source: GSMA Intelligence

By 2030, 5G adoption will reach 17% in Sub-Saharan Africa

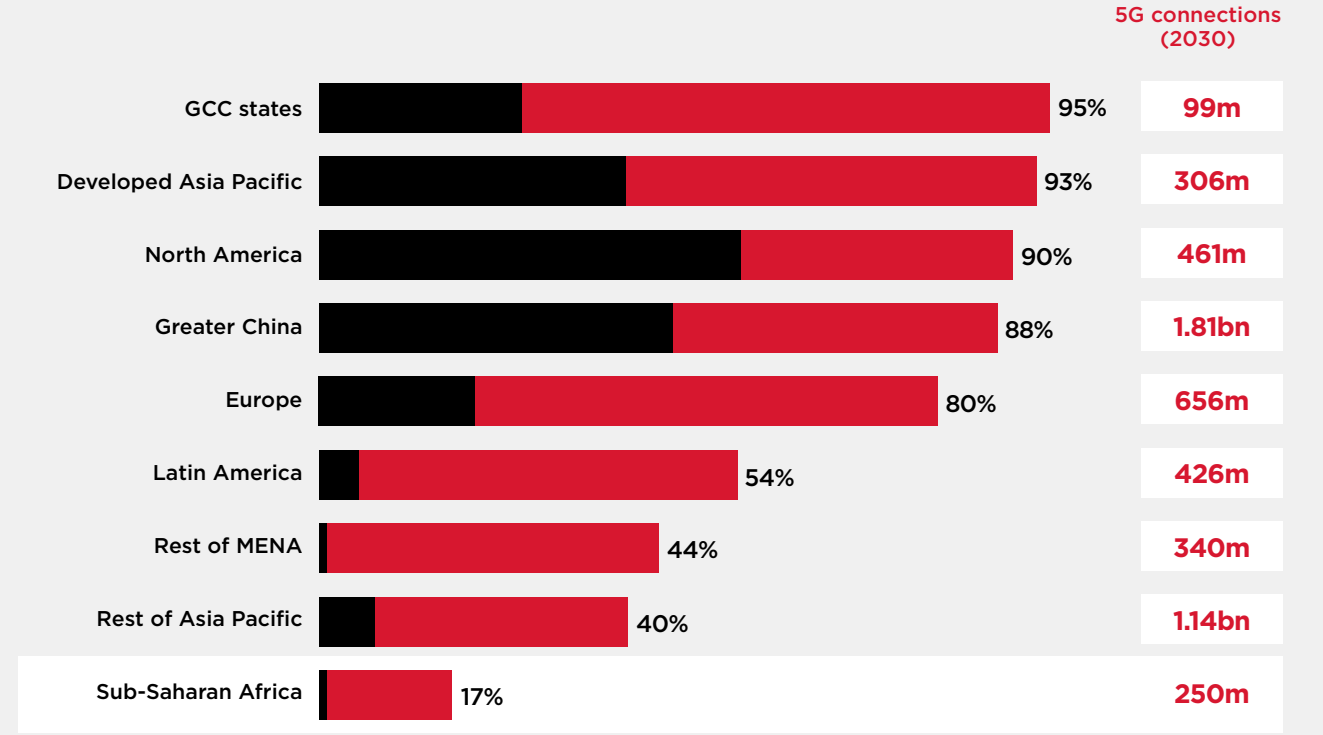
The pace of 5G adoption in Sub-Saharan Africa varies significantly across the region. South Africa, Nigeria and Kenya will account for more than half of all 5G connections in 2030. Although the growth of 5G in the region will be steady, a larger share of the customer base will still be migrating to 4G, which will remain the dominant technology for some time.

To meet increasing demand for broadband, FWA is emerging as a pivotal technology. FWA can act as a primary broadband connection and help improve coverage in the region. While 4G FWA has been a first step, 5G's potential is coming to the fore, offering fibre-like speeds. 5G FWA services have already been launched in Angola, South Africa, Nigeria, Kenya, Zambia and Zimbabwe.

Figure 3

5G adoption

Percentage of total connections



Source: GSMA Intelligence

Mobile data traffic per connection in Sub-Saharan Africa to quadruple by the end of the decade

Mobile data traffic will grow by almost 6 GB per connection, per month in Sub-Saharan Africa between 2023 and 2030. This will be driven by the expansion of mobile broadband network coverage, greater access to smartphones, and rising demand for data-intensive content such as gaming and video streaming.

Growth will be fastest in the ECCAS region, led by Angola, Chad and Equatorial Guinea, all of which are expected to record a more than 10-fold increase in mobile data traffic during the period. That said, mobile data traffic per connection in ECCAS will remain below average in Sub-Saharan Africa, reflecting the lower levels of 4G and 5G penetration in ECCAS compared with SADC and ECOWAS.

Figure 4

Mobile data traffic

GB per month

Region	2023	2030	Increase
SADC	1.7	7.2	**×4.2**
ECOWAS	2.4	10.1	**×4.2**
ECCAS	1.1	6.8	**×6.0**
EAC	1.5	5.9	**×4.0**
Sub-Saharan Africa	1.9	8.0	**×4.2**
Global	13.0	48.0	**×3.7**

Top five smartphone markets in Sub-Saharan Africa, 2030

Number of smartphone connections

Nigeria	South Africa	Ethiopia	Tanzania	Kenya
230m	140m	97m	92m	72m

Source: GSMA Intelligence

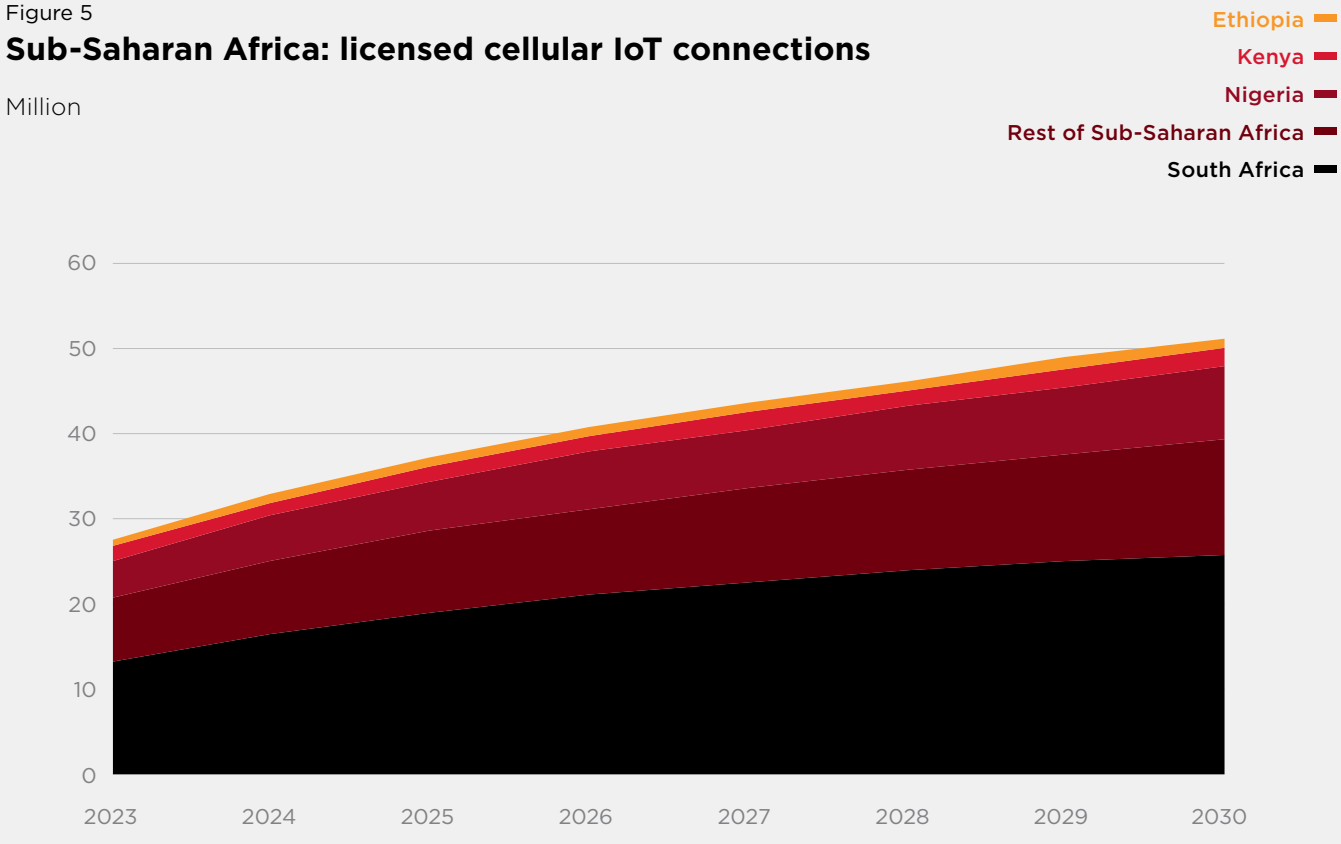
Licensed cellular IoT connections in Sub-Saharan Africa will almost double between 2023 and 2030

By 2030, Sub-Saharan Africa is forecast to have more than 50 million licensed cellular IoT connections, with South Africa contributing more than 50% to the total. The expansion of 4G and 5G networks in the region will drive significant growth in IoT applications. Government initiatives as part of smart-city programmes are also helping boost IoT deployments.

Mobile operators are helping the development of smart city solutions by providing connectivity and building new use cases through partnerships. In Sub-Saharan Africa, smart utility IoT connections will increase almost six-fold between 2021 and 2030, as highlighted by GSMA research.[1] By 2030, utilities will account for nearly 30% of IoT connections in the region. Operators have been collaborating in trials deploying IoT solutions, with many using low-power, wide area (LPWA) networks.

Figure 5

Sub-Saharan Africa: licensed cellular IoT connections



Source: GSMA Intelligence

1. IoT and Essential Utility Services: Opportunities in low- and middle-income countries, GSMA, 2023

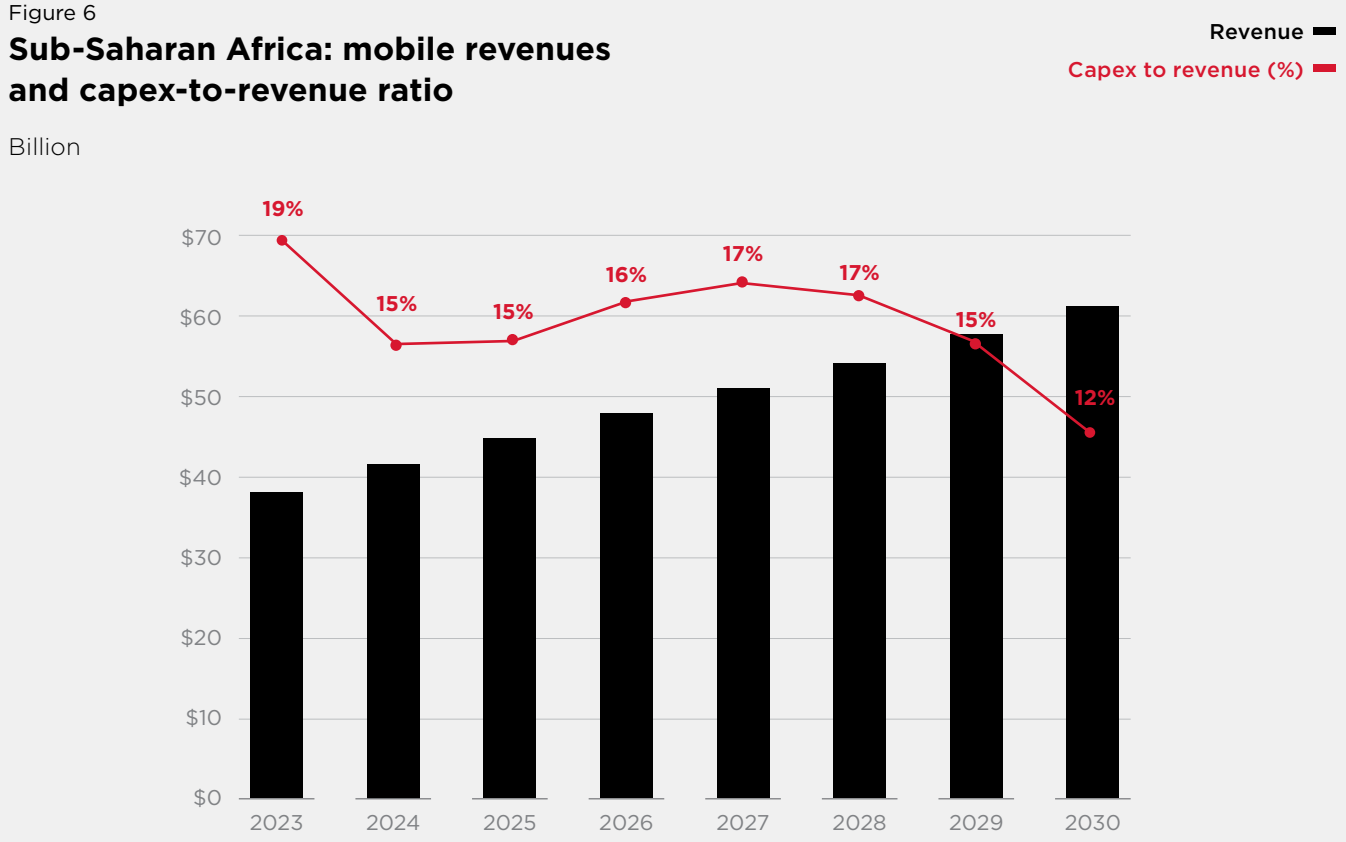
By 2030, mobile revenues will reach $61 billion in Sub-Saharan Africa

Mobile revenues have been growing steadily in the region. Growth is being driven by the expansion of 4G and 5G networks, the rise in the use of mobile data, and the growing adoption of technologies such as IoT. Annual mobile revenue growth is expected to stay in positive territory through to 2030.

Mobile operators in Sub-Saharan Africa have invested more than $28 billion in mobile capex over the past five years, with mobile capex/ revenue at 19% at the end of 2023.

Figure 6

Sub-Saharan Africa: mobile revenues and capex-to-revenue ratio



Source: GSMA Intelligence

The mobile sector added $140 billion of economic value in Sub-Saharan Africa in 2023

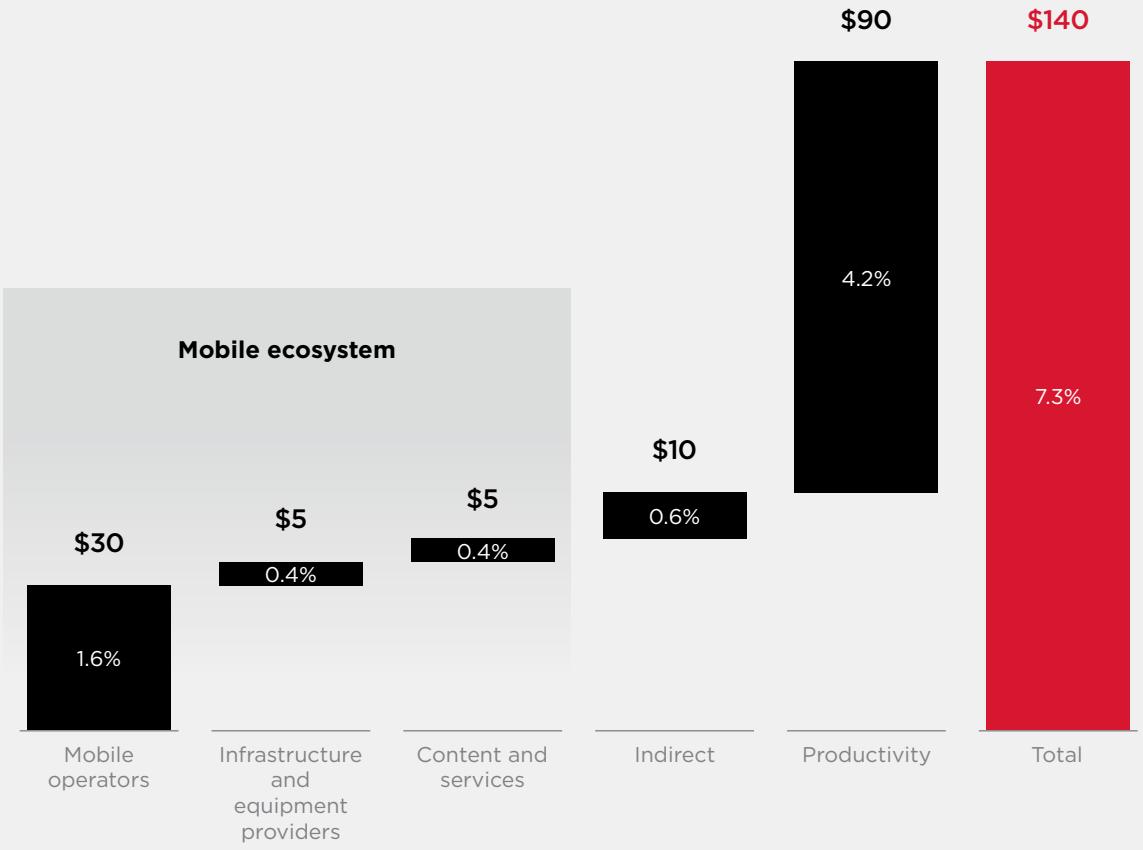
In 2023, mobile technologies and services generated 7.3% of GDP across Sub-Saharan Africa, a contribution that amounted to $140 billion of economic value added. The greatest benefits came from the productivity effects generated by the use of mobile services across the economy, reaching $90 billion. The direct contribution by the mobile ecosystem was also significant, at $40 billion.

The mobile ecosystem comprises three categories: mobile operators, infrastructure and equipment providers; and content and services. The infrastructure and equipment category includes network equipment providers, device manufacturers and IoT companies. Meanwhile, content and services encompasses content, mobile application and service providers, distributors and retailers, and mobile cloud services.

Figure 7

Sub-Saharan Africa: total economic contribution of the mobile industry, 2023

Billion, percentage of 2023 GDP



Note: Totals may not add up due to rounding.
Source: GSMA Intelligence

At the end of the decade, mobile's economic contribution will reach $170 billion in Sub-Saharan Africa

By 2030, mobile's contribution will reach $170 billion in Sub-Saharan Africa, driven mostly by the continued expansion of the mobile ecosystem and verticals increasingly benefitting from the improvements in productivity and efficiency brought about by the take-up of mobile services.

Figure 8

Sub-Saharan Africa: economic impact of mobile

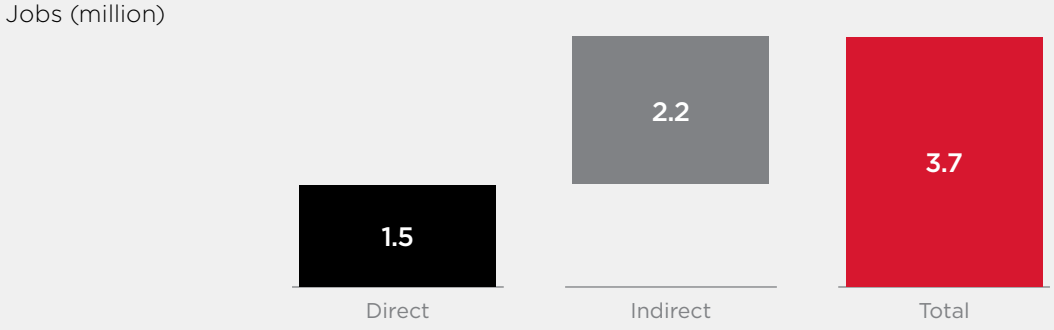
Source: GSMA Intelligence

The mobile ecosystem in Sub-Saharan Africa supported around 3.7 million jobs in 2023

Mobile operators and the wider mobile ecosystem provided direct employment to around 1.5 million people in Sub-Saharan Africa in 2023. In addition, economic activity in the ecosystem generated more than 2.2 million jobs in other sectors, meaning almost 4 million jobs were directly or indirectly supported.

Figure 9

Sub-Saharan Africa: employment impact of the mobile industry, 2023



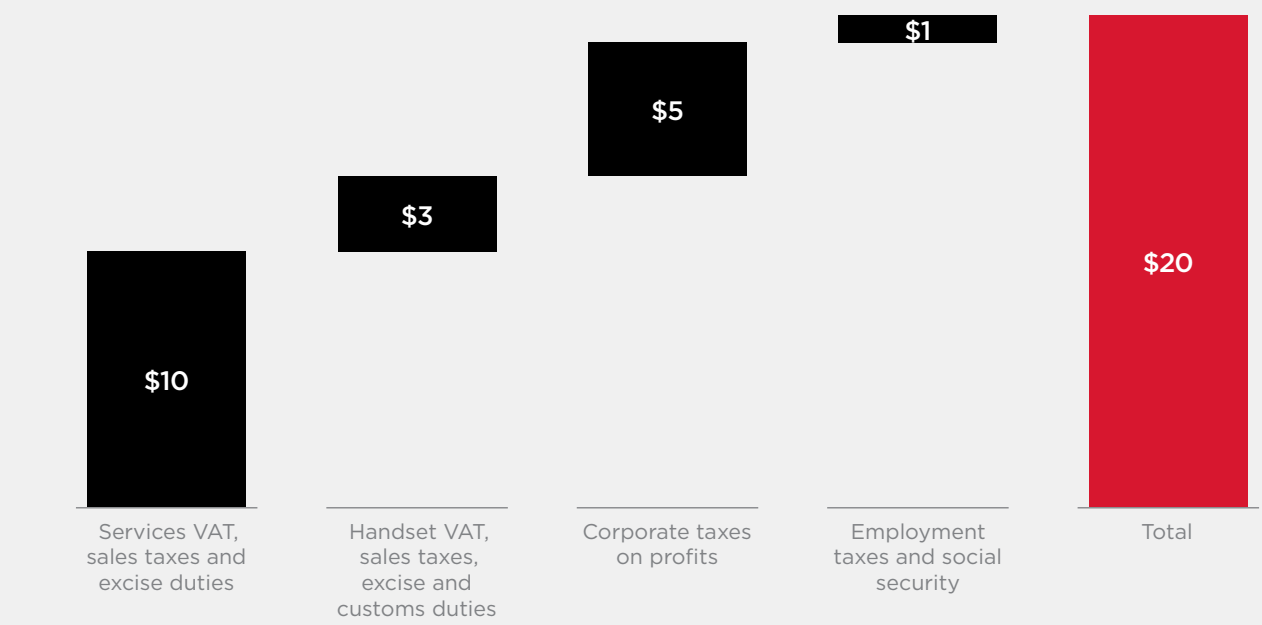
Source: GSMA Intelligence

The fiscal contribution of the mobile ecosystem reached $20 billion in 2023

In 2023, the mobile sector in Sub-Saharan Africa made a substantial contribution to the funding of the public sector, with almost $20 billion raised through taxes. The larger contribution came from services, VAT, sales taxes and excise duties, which generated $10 billion, followed by corporate taxes on profits at $5 billion.

Figure 10

Sub-Saharan Africa: fiscal contribution of the mobile industry, 2023



Note: Totals may not add up due to rounding.
Source: GSMA Intelligence

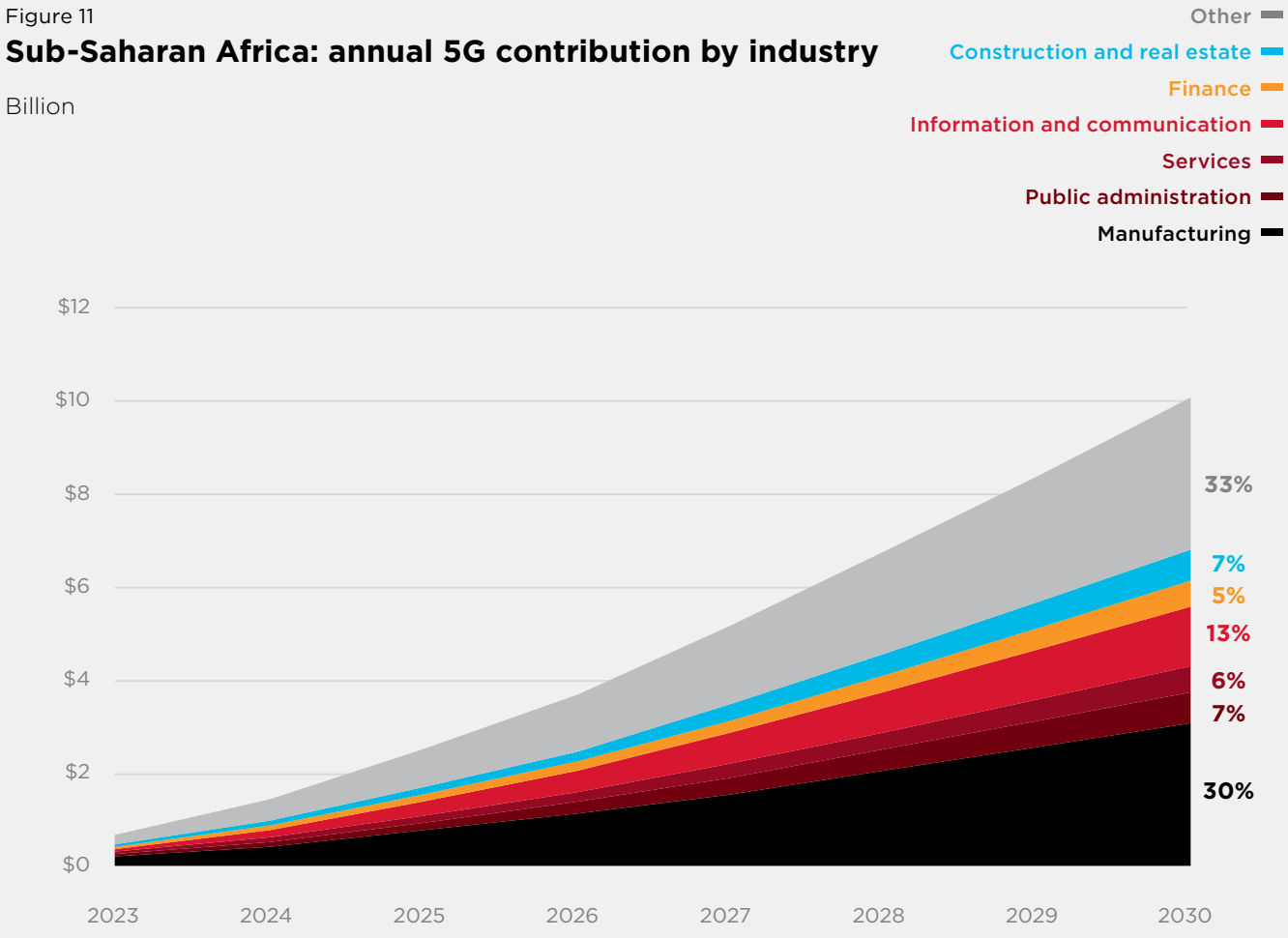
5G will add $10 billion to the economy in Sub-Saharan Africa in 2030

5G's contribution to the economy in Sub-Saharan Africa is expected to reach $10 billion in 2030, accounting for 6% of the overall economic impact of mobile. Much of this will materialise over the next five years. Towards the end of the decade, 5G economic benefits will level off as the technology starts to achieve scale and widespread adoption.

While 5G is expected to benefit most sectors of the Sub-Saharan African economy, some industries will benefit more than others due to their ability to incorporate 5G use cases in their business. Over the next seven years, 30% of the benefits are expected to originate from the manufacturing sector, driven by applications including smart factories, smart grids and IoT-enabled products. Other sectors that will experience significant benefits are the information & communication industry and the public administration sector at 13% and 7%, respectively.

Figure 11

Sub-Saharan Africa: annual 5G contribution by industry



Source: GSMA Intelligence

02

Mobile industry trends

2.1
5G: advanced technologies are a long-term prospect

5G technology is now available in more than 100 countries around the world. As of September 2024, 285 operators in 114 countries had launched mobile 5G services. The number of 5G connections will reach 2 billion globally by the end of 2024, accounting for nearly a quarter of total mobile connections. In several countries, notably China, South Korea and the US, 5G adoption has reached mass-market levels. In the US, 5G is expected to account for nearly two thirds of total connections by the end of 2024.

Around the world, FWA continues to be an important use case for 5G, in both the consumer and enterprise segments. 5G FWA is particularly needed in areas where consumers and enterprises have little choice of provider or where fibre deployment may not be cost effective. This is particularly true in Sub-Saharan Africa, where demand for enhanced connectivity is not being met by other connectivity solutions, particularly fibre. 5G FWA is present in more than half of the 34 live 5G networks across 21 countries in the region, as of September 2024.

Taking steps towards advanced 5G technologies

Operators in pioneer 5G markets around the world are increasingly moving to more advanced forms of 5G to unlock new use cases and monetisation opportunities. However, these technologies remain a distant prospect in Sub-Saharan Africa. Operators elsewhere have started deploying 5G networks based on standalone (SA) architecture, which offers capabilities including network slicing – allocating network resources dynamically according to specific service-level agreements. As of June 2024, 52 operators around the world had launched commercial 5G SA networks, with a further 10 expected to launch in 2024.

Operators in other regions have also started testing and implementing 5G reduced capability (RedCap) solutions, which serve as a platform for the successful migration of IoT applications to 5G networks. 3GPP Release 17 introduced the RedCap user equipment category for energy- and cost-efficient 5G IoT connectivity (also known as 5G NR-Light). The reduced complexity of NR-Light devices contributes to cost-efficiency, a smaller device footprint and longer battery life due to lower power consumption. A range of use cases will benefit from RedCap – notably, wearables, video monitoring and telematics.

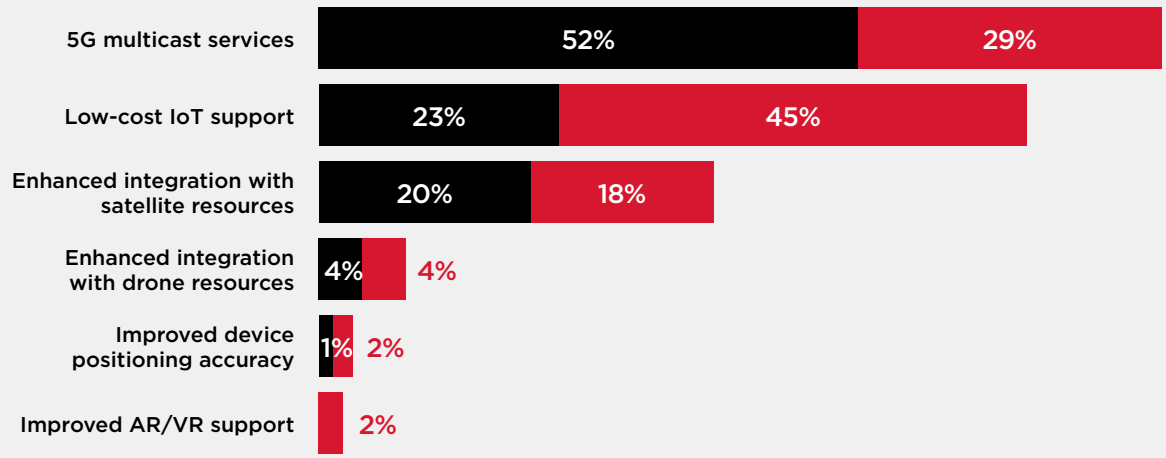
Operators are also looking to leverage 5G-Advanced to deliver new solutions for consumers and enterprises. As part of 3GPP Release 18 in 2024, 5G-Advanced is the next milestone in the 5G era and will enhance mobility by enabling uplink and multicast with better latency. This will increase accuracy for extended reality (XR) applications and improve the reliability of AI/ML data-driven designs. The GSMA Intelligence Network Transformation Survey 2023 shows that 5G multicast and low-cost IoT top the list of 5G-Advanced use cases for operators (Figure 12).

Figure 12

5G-Advanced: 5G multicast and low-cost IoT are priority use cases

Which 5G-Advanced use cases and applications are most important to your network transformation priorities? (Top two choices)

Percentage of operators (globally)



Source: GSMA Intelligence Operators in Focus: Network Transformation Survey 2023

The shift to more advanced forms of 5G is progressing slowly in Sub-Saharan Africa. Operators need to prove the business case for their initial 5G investments before committing to more advanced forms. That said, there are signs that some operators in the region are keen to explore the potential of advanced forms of 5G. In June 2024, MTN South Africa and Huawei signed a memorandum of understanding for strategic cooperation on Net5.5G, which the vendor says can offer speeds 10 times faster than 5G (delivering peak uplink rates of 1 Gbps and downlink rates of 10 Gbps). It can also improve latency and enable massive machine-type communications.

Private networks offer a route into the enterprise market

Many advanced 5G technologies are particularly suited to use cases and applications in the enterprise segment. Operators and their partners need to accelerate the development of suitable 5G use cases and applications for businesses in Sub-Saharan Africa. The dispersed nature of large enterprises in many countries in Sub-Saharan Africa often makes it difficult to serve them via public networks, particularly those located in remote areas where the deployment of conventional 5G networks may not be feasible in the near term. As a result, there is growing interest in private networks. Private networks have been deployed on 4G spectrum for several years in sectors such as mining and utilities. However, the arrival of 5G has given new impetus to private networks, with many performance advantages over 4G, including faster data transmission, lower latency and the ability to connect to more edge devices. MTN is among those at the forefront of private 5G in Sub-Saharan Africa, having deployed several private 5G networks for the mining industry, enabling remote monitoring, swift response to emergencies, and safety improvements.

For mobile operators, private networks are an important business case in the 5G era, with opportunities to create new revenue streams and serve additional enterprise customers. Operators already have a host of assets and capabilities to capitalise on, including access to spectrum, extensive local footprints, and experience in network deployment and operation.

2.2
Operating environment: challenges underpin market consolidation trend

The mobile industry in Sub-Saharan Africa contributes significantly to the social and economic development of the region. For this to be sustained, continued investment in the sector is necessary, especially in technologies such as 5G, AI and IoT. However, the impetus to invest and continue providing transformative digital technology is likely to be hampered by the soaring cost of doing business, driven by changes in macroeconomic fundamentals.

Table 1

Factors impacting the operating environment in Sub-Saharan Africa

Inflation and currency volatility	Exchange-rate fluctuations tend to impact inflation in Sub-Saharan Africa through exchange rate pass-through. When the depreciation of a local currency against the US dollar persists, inflation puts pressure on the cost of doing business. Given that most of the capital investments in telecoms in Sub-Saharan Africa are denominated in foreign currency, currency depreciation or devaluation leads to increased capital costs for operators. In Nigeria, for example, the National Bureau of Statistics reported that headline inflation increased to 34.2% in June 2024, from 22.8% in June 2023. The inflationary pressure is mostly driven by currency depreciation, with the official exchange rate depreciating by more than 90% in the same period. This has impacted the financial performance of operators in the country, with MTN and Airtel reporting losses in FY 2023, for example.
High and targeted taxation	Targeted taxation, such as excise duty on selected telecoms services, continues to negatively affect adoption of mobile services. In the 18 countries in Sub-Saharan Africa where data is available, the mobile sector paid an estimated $9 billion in taxes and fees in 2021, representing 30% of mobile sector revenues, on average. Mobile sector-specific taxes are a key contributor to total government tax revenues. On average, sector-specific taxes represent approximately 9% of total mobile market revenues. Sector-specific taxation causes mobile sector tax payments as a proportion of total government tax revenues to be higher than the sector's size in the economy (measured by market revenues as a proportion of GDP). Guinea, DRC and Niger have the highest levels of targeted taxation in the region. This impacts the sustainability of investment in these markets, given that returns are not predictable.
High and escalating energy costs	Operators in Sub-Saharan Africa have limited access to affordable and reliable energy from the national grid, including in large countries such as South Africa, DRC, Nigeria and Ethiopia. This results in an over-reliance on expensive alternative sources such as diesel, which is not sustainable in the long run and challenges the industry's ability to realise net-zero targets by 2050. In Nigeria, for instance, the industry has seen escalating energy costs, with diesel and petrol prices increasing by 66% and 257%, respectively, in 2023. Meanwhile, in Kenya, energy costs have increased by 63% over the last year, according to Safaricom, which intends to use solar to power at least 50% of its sites by 2050. In the DRC, operators face environmental taxes for providing backup diesel generators at non-serviced sites and are thus effectively penalised for providing energy redundancy.
High spectrum licensing fees	GSMA research shows that, on average, African countries (and those generally more indebted) have priced their spectrum significantly higher than others globally. Africa's median unit price of spectrum is four times that in the developed world. There is also a direct correlation between spectrum licensing fees and coverage and quality of service. Higher licensing fees directly impact coverage due to weakened incentives to invest.

Source: GSMA Intelligence

Operators turn to consolidation to sustain investment

As with any other industry, investors in telecoms have to make rational investment decisions based on available resources and sustainable returns on investment. If the challenges across Sub-Saharan Africa persist, investors will likely rethink their exposure to the markets. This is already happening, with operators increasingly considering market consolidation and, in some extreme cases, a market exit to remain afloat in response to the current situation.

Recent years have seen significant shifts in market structure. Examples include the following:

- Vodafone Group has scaled down its activities in Africa, selling its stake in Vodafone Ghana to Telecel, and part of its stake in Safaricom Kenya to other investors. The operator also sold its operations in Egypt to Vodacom Group.
- In December 2023, MTN agreed to sell its Guinea-Bissau and Guinea operations to Telecel. The sale was finalised in August 2024. MTN sold both companies for $1 each, reflecting their financial struggles. It previously disclosed it was exiting both markets due to the increased cost of doing business, which made it untenable to operate sustainably.
- In Kenya, Telkom Kenya opted out of a planned merger with Airtel Kenya. Although the transaction was annulled due to technicalities, it is evident that Telkom Kenya faced escalating costs.
- Millicom (Tigo) exited Africa in 2022 with the sale of its operation in Tanzania to a consortium led by Madagascar-based group Axian. Tigo previously sold its mobile business in the DRC, Senegal, Rwanda and Chad. Its joint venture in Ghana with Airtel was taken over by the government of Ghana in 2021.

2.3
Satellite: momentum builds behind aerial connectivity

Telecoms networks remain the primary form of connectivity, supported by the wide area coverage of wireless networks and the mass production and adoption of mobile devices. However, in recent years, technological advances in satellite and other non-terrestrial networks (NTNs) have helped to overcome certain limitations associated with aerial connectivity. This has resulted in significant performance improvements, lower deployment costs, and more commercially viable business models for satellite and NTN-based connectivity solutions.

Low Earth orbit (LEO) satellite and high-altitude platform system (HAPS) providers have attracted a lot of attention following significant investments and technical breakthroughs that improve the business case for delivering connectivity at scale. A key selling point for aerial connectivity solutions is the potential to provide ubiquitous coverage. Telecoms networks now cover more than 95% of the world's population but less than 45% of the world's landmass. Satellites and NTNs are well-suited to deliver connectivity in maritime, remote and polar areas, where deploying conventional terrestrial networks could be costly and challenging.

Aerial connectivity will play an important role in realising universal connectivity in Sub-Saharan Africa.

Through standardisation, 3GPP has laid the foundation for satellite-based connectivity to extend the reach of 5G to regions lacking terrestrial infrastructure. Four broad use cases have been identified:

- **service continuity** – coverage where it is not feasible using terrestrial networks such as maritime or remote areas
- **service ubiquity** – mission-critical communications such as for disaster relief during terrestrial network outages
- **service scalability** – offloading traffic from terrestrial networks to NTNs for better system efficiency
- **backhaul services** – transport for sites with weak or no backhaul capacity.

Aerial connectivity will play an important role in realising universal connectivity in Sub-Saharan Africa. The region is home to some of the most challenging terrain for terrestrial networks, including rain forests, deserts and mountain ranges. Even in rural and sparsely populated areas, the cost and complexity of deploying conventional mobile or fixed-line networks support the case for alternative connectivity solutions.

Although satellite solutions have been offered in the region for several decades, LEO and HAPS have spurred interest in NTN solutions. SpaceX's Starlink has been expanding rapidly across the region and is present in at least 14 markets as of September 2024. These include Benin, Botswana, Ghana, Kenya, Mozambique, Nigeria, Rwanda and Zambia.

A new era of partnerships

LEO and HAPS have ushered in a new era of collaboration between telecoms and satellite operators for solutions spanning use cases such as remote area connectivity, disaster response and maritime services. Examples include the following:

- **Airtel Nigeria** has set up a satellite dish in Lagos for Eutelsat OneWeb's LEO satellite broadband service. It will be used to bring high-speed internet to remote areas. The deployment is part of a broader deal between Airtel Africa and OneWeb, signed in November 2022. Eutelsat OneWeb began deploying services in each of Airtel Africa's 14 markets following tests in South Africa in September 2023.
- **MTN** is collaborating with Omnispace to explore using the S-band for satellite services in MTN's portfolio of wireless services. Omnispace will develop a next-generation, standards-based mobile and IoT network designed to serve MTN markets.
- **MTN Group** is partnering with satellite communication companies, including OneWeb, Starlink, Lynk Global and AST SpaceMobile, to trial various solutions. These include direct-to-device services and enterprise solutions, to increase connectivity in rural areas.
- MTN subsidiary **Bayobab** has signed a multi-year deal to use Eutelsat's LEO satellites, to expand cellular backhaul and coverage in rural areas and meet rising demand from enterprise clients across Africa. The deployment will be completed across Africa by the end of 2024, but service is already online in four countries on the continent.

For telecoms operators, satellites and NTN connectivity offer access to new customers in underserved areas and the capability to provide connectivity in remote areas. For satellite providers, operators' existing relationships with end users and (where relevant) spectrum holdings are crucial for satellite solutions to scale. However, the availability of compatible devices will affect the take-up of satellite-enabled services.

GSMA Intelligence estimates a total incremental revenue opportunity from satellite-to-phone services of more than $30 billion for telecoms operators by 2035.[2]

2. Satellite 2.0: going direct to device, GSMA Intelligence, 2022

2.4
Generative AI: exploring use cases and growing partnerships

AI has grown in prominence across industries in Sub-Saharan Africa, as in other regions. The UN Economic Commission for Africa estimates AI could contribute up to $1.5 trillion to the African economy by 2030. In this evolving landscape, operators in the region are gradually deploying generative AI (genAI) to enhance operations and services. According to a GSMA Intelligence survey, more operators are testing genAI than any other technology, signalling that 2024 will be pivotal for proving its value.[3]

3. Network Transformation 2023, GSMA Intelligence, 2023

Enhancing customer engagement and network optimisation

GenAI's most visible application in the telecoms sector is in customer service, where AI-driven chatbots and virtual assistants have become integral. These handle a range of customer inquiries, offering instant and accurate responses, thus reducing waiting times and significantly improving customer satisfaction. For example, in December 2023, MTN launched Zigi, an AI-powered chatbot, across countries including Nigeria and South Africa. In 2024, the operator upgraded Zigi to manage more complex customer-service tasks, and integrated it with billing systems for real-time account updates.

GenAI is proving indispensable for network optimisation and predictive maintenance. Operators are increasingly using AI to analyse large volumes of network data in real-time, identifying patterns and potential issues before they become significant problems. This broader digital transformation helps operators meet increasing demand for mobile services and better connectivity. For instance, Vodacom, in collaboration with Nvidia, is developing an AI-powered virtual network management platform. This creates a digital twin of Cape Town, encompassing all of Vodacom's infrastructure, helping inform decisions on enhancing network performance in the physical world.

Policymakers play a crucial role in supporting AI adoption. The Nigerian Communications Commission recently recommended embracing AI/ML to optimise network management, predict maintenance needs and enhance customer service through automation.[4]

Collaboration driving adoption

Regional operators are forming strategic partnerships with global tech firms to access advanced AI technologies and infrastructure. Such collaborations bolster operators' AI capabilities while paving the way for new business models and revenue streams. Recent examples include the following:

- **MTN migrates to Microsoft platform** – The operator is migrating its BSS and OSS applications to Microsoft's Azure cloud computing platform as part of Project Nephos. The project aims to leverage machine learning and AI to deliver operational efficiency across its footprint, starting with Nigeria and South Africa.
- **Safaricom adopts Nokia software** – The operator has deployed Nokia's AVA Energy Efficiency software to lower its power consumption and reduce costs. The deployment is expected to reduce network energy costs by 8–10%. The software uses AI and machine learning algorithms to automate the shutting down of idle equipment during low-usage periods, while maintaining service to customers.

Operators are likely to expand their portfolios of AI-driven services to include immersive customer experiences and advanced virtual assistants. However, challenges such as a shortage of skilled AI professionals remain. To support AI adoption and skills for the telecoms sector, the GSMA and IBM together have launched a Generative AI Training Program and Industry Challenge.

Addressing ethical concerns around AI is also crucial. The mobile industry is committed to the ethical use of AI in its operations and interactions to protect customers and employees, remove any entrenched inequality and ensure AI operates reliably and fairly for all stakeholders. The GSMA's AI Ethics Playbook serves as a practical tool for organisations considering how to ethically design, develop and deploy AI systems.

4. "NCC Urges Telcos to Reduce Operating Cost", Nigeria Communications Week, October 2024

2.5
GSMA Open Gateway: operators aim to unlock new monetisation opportunities

While it has long been possible to expose network APIs, operators have struggled to adopt a standardised approach that unlocks innovation at a global scale. This is the driving force behind the GSMA Open Gateway, which helps developers and cloud providers enhance and deploy services more quickly via single points of access to operator networks.

With the GSMA Open Gateway, common, northbound service APIs expose mobile operators' network capabilities within a consistent, interoperable and federated framework. The APIs are defined, developed and published in CAMARA, the open-source project for developers to access enhanced network capabilities, driven by the Linux Foundation in collaboration with the GSMA.

The GSMA Open Gateway comprises a library of 17 APIs. These are split into different families based on use case addressed. The APIs can facilitate numerous use cases, including tackling digital fraud, simplifying user authentication and addressing quality-of-service issues.

Operators unite to drive API progress

By the end of June 2024, 53 operator groups had signed up to the GSMA Open Gateway initiative, representing 240 mobile networks and accounting for 67% of mobile connections globally. The geographic breakdown of operator commitments indicates whether regions are at par, above or below their established market share. Europe, for example, is the leading region, with operators representing a quarter of GSMA Open Gateway commitments despite accounting for only 10% of mobile connections. Africa, by contrast, still sits considerably below its mobile market share despite it being a vibrant digital services marketplace, particularly in payments.

Many of the early API launches around the world have focused on fraud prevention and security, using Number Verification and SIM Swap. These represent easy wins, given the ever-present risks from fraudsters and breaches for operators and their customers.

South African operators launch GSMA Open Gateway APIs

South Africa saw a 24% increase in reported incidents of digital banking fraud in 2022, according to a report published by the South African Banking Risk Information Centre. This surge saw cyber criminals stealing more than ZAR740 million from unsuspecting victims.

To help tackle this problem, South African operators Cell C, MTN and Telkom launched two Open Gateway APIs with applications in fraud detection and digital security:

- **Number Verify** – This verifies the phone number associated with the SIM in the device connected to the mobile network. Initial use cases include app login, app onboarding and app password resets.
- **SIM Swap** – This obtains information on any recent SIM pairing change related to the user's account. Use cases include fraud prevention in banking and fraud prevention for password resets.

These API launches make South Africa the first country in Sub-Saharan Africa to implement GSMA Open Gateway APIs. Further launches are likely to occur across the region over the next 12 months. Momentum is building steadily in countries such as Ethiopia, with Ethio Telecom joining the GSMA Open Gateway initiative in early 2024.

Operators consider routes to market

According to the GSMA Intelligence Network Transformation Survey 2023, operators expect their internal teams (e.g. network engineers and internal developers) to be the main consumers of network APIs. Such teams can use network APIs to build new services for end users while also delivering internal efficiencies by using network APIs for purposes such as network monitoring and management.

Most operators also see an opportunity to expose network APIs to work with external developers. Some operators have focused their initial efforts on building direct relationships with developers. For example, MTN describes its Chenosis proposition as Africa's first cross-industry developer accelerator platform. It offers developers access to a library of open APIs, and includes tools such as low-code and no-code platforms. The idea is to allow both developers and non-developers to build solutions on the platform, appealing in particular to SMEs, which may lack the software development skills of larger businesses.

In addition to strategies focused on direct engagement with developers, many operators will likely collaborate with channel partners (companies that connect multiple operators to multiple developers). Hyperscalers, communications platform-as-a-service (CPaaS) suppliers and network infrastructure vendors are all vying to play this role in the GSMA Open Gateway ecosystem. As the number of partnerships between operators and channel partners grows, it will be for these collaborations to yield concrete examples of how federation and agreement on common APIs can create monetisation opportunities to sustain the momentum behind network APIs.

03

Mobile industry impact

3.1
Expanding rural connectivity

As of 2023, around 13% of the population in Sub-Saharan Africa was not covered by a mobile broadband network. The areas lacking coverage are often rural and remote. These are sometimes sparsely populated with challenging terrain, making for high investment costs for mobile internet providers. Expanding mobile broadband infrastructure in rural areas remains commercially difficult. To address this, operators have been exploring innovative business models, partnerships and solutions to reduce the coverage gap.

Broadening partnership models

Operators are increasingly turning to new infrastructure models, such as network-as-a-service (NaaS), to address the rural coverage gap. In a NaaS model, the mobile operator outsources the entire management of its network, including installation, equipment lease, energy, maintenance and operations, to a NaaS integrator such as Africa Mobile Networks (AMN), iSAT or NuRAN.

The model has gained traction in rural areas of Sub-Saharan Africa, allowing operators to extend network coverage with a lower level of risk. A recent example is the partnership between AMN and Starlink. As part of the agreement, the LEO satellite operator will provide backhaul to AMN's base stations in remote and rural communities globally. The initial deployment took place in Nigeria in April 2024. The partnership establishes AMN as the first operator in Africa to leverage Starlink for mobile backhaul. LEO constellations generally provide higher capacity than alternative satellite constellations, making this a more robust and scalable backhaul solution.

NTN solutions continue to gain momentum in Sub-Saharan Africa. Rwanda's government recently teamed up with SoftBank to deliver what is claimed to be the first publicly announced 5G connection from a HAPS UAV in the stratosphere. Meanwhile, MTN has announced it is planning trials with Lynk Global, AST SpaceMobile, Starlink and Eutelsat OneWeb across various African countries, including Ghana, South Africa, Nigeria, South Sudan and Rwanda.

Growing initiatives and investments

Governments in the region are taking steps to improve network coverage in rural areas. For instance, the Nigerian Communications Commission aims to expand telecoms access to 80% of rural areas by 2027, up from 40% currently. The commission is also considering satellite solutions, either through NigComSat or private operators, to achieve nationwide coverage. In Congo, the government plans to allocate $9 million from the Universal Electronic Communications Access and Service Fund to construct 186 telecoms sites in rural areas.

Alongside government efforts, mobile operators and infrastructure companies are making renewed commitments to enhance connectivity in Sub-Saharan Africa. Vodacom, for example, has announced plans to invest ZAR400 million in the Free State and Northern Cape provinces for 2024/2025. The investment will focus on improving network capacity, resilience and coverage, particularly in rural areas. Of the total investment, ZAR250 million will go towards RAN projects, while ZAR150 million will be dedicated to transmission financing, including the deployment of microwave and fibre-optic technology.

The mobile industry has been proactive in addressing the rural coverage gap. However, closing the digital divide in rural areas is a complex undertaking requiring continued collaboration between mobile operators, governments and other stakeholders.

3.2
The mobile industry's impact on the SDGs

The mobile industry continues to achieve its impact on the Sustainable Development Goals (SDGs), driven by the increased reach of mobile networks and growing take-up of mobile internet services. SDG 9: Industry, Innovation and Infrastructure, SDG 11: Sustainable Cities and Communities, and SDG 4: Quality Education are the highest scoring SDGs in Sub-Saharan Africa. The growing use of smartphones and mobile internet adoption, as well as improving affordability of mobile services are contributing to mobile's impact on the SDGs.

Figure 13

Mobile's impact on the SDGs in Sub-Saharan Africa

Source: GSMA Intelligence

Connectivity boosts digitisation and enhances urban services

Mobile technology contributes significantly to innovation and industrial development, serving as both critical infrastructure and a catalyst for growth. Connectivity, powered by mobile networks, enables industrial processes and manufacturing to use technologies such as AI and IoT, and opens up new opportunities for innovation. Mobile operators are therefore playing a crucial role in accelerating industrial innovation.

Operators are also contributing significantly to SDG 11 by enabling smart city solutions. The role of operators has evolved from providing connectivity to becoming integral co-creators of smart cities. They are now using emerging technologies such as IoT, AI and cloud computing to develop and implement smart solutions. These include digital meters and those designed to monitor and manage resources such as water and energy.

Recent operator examples across the areas of industry innovation and smart cities include the following:

- **Comsol's 5G in mining** – In early 2023, Comsol signed a reseller agreement with Ericsson to provide a private 5G platform, expanding the operator's business in South Africa's mining industry. The platform will enable Comsol to offer advanced networking solutions to mining customers, allowing them to experiment with and implement use cases such as augmented reality, autonomous vehicles and fixed wireless access.
- **Safaricom's smart water system** – In June 2023, Safaricom partnered with the Kenya Water Institute to deploy a smart water system at the institute's Nairobi and Kitui campuses. Using IoT-enabled water meters, the system collects live data for effective monitoring of consumption and detection of loss and leakage, ensuring accurate billing, enhanced revenue collection and improved operational efficiency.
- **Orange's IoT energy platform** – Orange has launched its IoT platform, Orange Smart Energies, for energy suppliers in Africa and the Middle East. The platform provides the option to pay with mobile money, enables tracking of payments and supports both pay-as-you-go solar equipment and prepaid smart meters. In partnership with energy producers, it provides a digital service and a distribution network that make it easier for everyone to access energy in rural areas. Orange Smart Energies serves 300,000 households in 12 markets, predominantly in Sub-Saharan Africa.

Mobile supports digital education initiatives

Mobile technology contributes to SDG 4, which seeks to ensure inclusive and equitable quality education, and promote lifelong learning opportunities for all. Digital transformation is making learning resources more accessible, enhancing educational outcomes and supporting continuous learning. By bridging gaps in education access and improving the quality of education, mobile technology is fostering a more inclusive society. Recent examples of how the mobile ecosystem is supporting digital education include the following:

- **Airtel's 5G connects schools for digital learning** – In 2023, Airtel Africa launched an initiative to connect 3,000 secondary schools in Tanzania with high-speed 5G data networks. This aims to boost digital learning and improve information access. Additionally, Airtel plans to establish smart classrooms in around 100 schools nationwide. The operator will also provide free server access to the digitised curriculum of the Tanzania Institute of Adult Education.
- **Huawei's ICT education initiatives** – In collaboration with Kenya's Information and Communication Technology Authority, Huawei is working on Kenya's 2024 Seeds for Future programme. This aims to develop local ICT talent, improve knowledge sharing and raise awareness of and enthusiasm for the technology sector. Over the past nine years, more than 240 Kenyan students have received virtual training through the programme. For 2024, the programme returns to its physical format, educating participants in 5G, cloud computing and AI.

04

Mobile industry enablers

According to the World Bank[5] and IMF,[6] the financial outlook for Sub-Saharan Africa is gradually improving after a turbulent period since 2020. Growth is expected to rise from 3.4% in 2023 to 3.8% in 2024. Economic recovery will likely continue beyond 2024, with growth projections reaching 4% in 2025. Public debt ratios have broadly stabilised, and several countries have issued Eurobonds in 2024, ending a two-year hiatus from international markets.

4.1
Improving the affordability of mobile services to close the connectivity gap

A funding squeeze persists as governments across the region struggle with finance shortages, high borrowing costs and debt repayments. The region continues to be more vulnerable to global external shocks, the threat of rising political instability and climate events. This has led to macroeconomic challenges such as currency devaluation, escalating energy costs and soaring inflation rates, especially in large economies such as Nigeria and Ethiopia.

Faced with these challenges, governments in Africa have raised funds through increased taxation to meet their development objectives. In some cases, the mobile sector's contribution to government tax revenues surpasses its size in terms of GDP, due to high levels of sector-specific taxation. An ITU survey of ICT national regulatory authorities around the world found that the number of countries that apply taxes specific to the ICT sector is much higher in Africa than in the rest of the world.

The sector is also taxed disproportionately higher than others, despite its positive externalities across various sectors. These include increased value from agricultural resources, improved access to global value chains, enhancements to education and healthcare provision, reductions in transaction costs for economic and public service activities, improved efficiency of government services, transparency and good governance.

Taxation and sector-specific taxes in particular exacerbate affordability concerns, excluding many citizens from the digital age. Sector-specific taxes increase the cost of broadband access and usage, making digital devices and services less accessible, lowering economic growth. The mobile sector is committed to paying taxes in the countries where it operates to support the government's development objectives. However, the industry calls for more structured taxation regimes that do not impact the affordability of services to consumers and investment in the industry.

> **The industry calls for more structured taxation regimes that do not impact the affordability of services to consumers and investment in the industry**

5. Global Economic Prospects: Sub-Saharan Africa, World Bank, 2024
6. Regional Economic Outlook: Sub-Saharan Africa, IMF, 2024

Policy recommendations for tax regimes that enable investment

While government revenue from taxation is crucial for any administration, this should be balanced with the need to ensure industry growth. Closing the high usage gap in the region should be prioritised to ensure all citizens have an equal opportunity to participate in the digital economy. As such, urgent taxation reform is needed to address affordability of mobile services and smartphones, which represents a key barrier to mobile broadband adoption.

1. Remove tax-related barriers to the affordability of mobile services

- Eliminate or decrease industry-specific excise taxes applied to mobile services.
- Reduce or eliminate import duties on mobile handsets and refrain from imposing VAT rates higher than the standard rate.
- Remove fixed-rate taxes imposed on consumers, such as activation and numbering taxes, which disproportionately affect individuals with lower incomes and contribute to making mobile services less affordable.

2. Establish a tax environment conducive to enhancing operators' ability to invest in mobile networks

- Remove sector-specific taxes/fees on mobile operators, particularly those imposed on operators' revenues irrespective of profitability, to ensure fair treatment of the sector and encourage investment in mobile infrastructure.
- Remove duties on the import of network equipment to reduce the cost of operators' investment in network expansion and innovation.
- Streamline and stabilise taxes within the mobile sector to reduce operators' compliance expenses and offer predictability, enabling more effective investment planning.
- Consider tax incentives in exchange for operators' commitments to making less financially appealing investments, such as providing connectivity in underserved, remote and rural regions.

3. Strengthen access to and use of mobile money and digital government services

This involves refraining from taxing mobile money services, improving their accessibility. Greater access to mobile money services can facilitate their integration into government payment systems, potentially leading to increased transparency, improved service delivery and more effective revenue collection.

4.2
Using universal service funds effectively

Governments in Africa and worldwide have introduced policies to incentivise internet infrastructure rollout in underserved locations and to stimulate consumer demand for services. In Africa, at least 51 of the 54 countries in the region have introduced or are introducing the universal service fund (USF) mechanism to deploy mobile broadband infrastructure in commercially unviable areas. The intention is to bridge the connectivity gap. In all cases, USFs are partly or entirely financed through contributions from telecoms service providers. With a coverage gap of nearly 200 million people and usage gap of just over 800 million, the scale of the challenge to realise universal connectivity in Africa underlines the need for effective use of USFs.

Insights from a GSMA study show that many USFs in Africa are underperforming and have become ineffective tools to close the connectivity gap. In view of the urgency to close the coverage and usage gaps, it has become imperative to reform structural and operational aspects of USFs across Africa to improve their effectiveness, or to discontinue the USF approach.

Political will among governments and policymakers is an important first step in the journey to USF reform.[7] This is necessary for improvements to the USF legal framework, and adherence to the core principles of an effective and successful USF – namely, accountability, clarity, service neutrality, transparency, sustainability and visibility.

Meanwhile, there is growing debate around a possible role for the USF in supporting initiatives to close the usage gap. For example, in Uganda, the USF is used to deploy digital literacy programmes in schools in rural and remote areas. In Ethiopia, the USF framework includes demand stimulation initiatives such as digital literacy, in phase 2 of the fund. That said, additional research is needed to understand the nature of the connectivity gap in various countries and ascertain the initiatives required to address it. These initiatives must be identified in close consultation with fund contributors, which can provide additional insights based on their experience in the market. Adequate mechanisms for monitoring and evaluation must also be implemented to ensure visibility, transparency and accountability in the use of USFs.

7. Political will defined as the commitment of actors to undertake actions to achieve a set of objectives and to sustain the costs of those actions over time.

Policy recommendations for the effective use of USFs

USF reform must be prioritised to ensure funds perform optimally and meet the objectives set, before considering expanding the fund's scope. This will ensure that the current challenge of underperformance is not carried forward to new projects. To increase the effectiveness of funds in the region, policymakers are encouraged to take the following steps:

- **Set clear and measurable targets for the USF** – Clearly define the parameters for USF projects and outline the key success measures following implementation.
- **Adopt mechanisms to incentivise fund disbursement** – Simplify the disbursement process, collaborate with stakeholders on project selection, and use incentives to increase the disbursement rate.
- **Implement evidence-based contribution rates** – Take an evidence-based approach, in consultation with service providers and other stakeholders, to decide a suitable contribution rate.
- **Ensure stakeholder consultation throughout the project lifecycle** – Service providers are at the forefront of implementing USF projects. Visibility of the way the fund is managed is key to the successful implementation of USF projects.
- **Use data for decision-making** – Detailed data on service gaps and local economic and social factors affecting people's ability to connect to the internet is critical to maximise the impact of the funds.
- **Maintain regular performance monitoring and evaluation** – Regular reporting is paramount to provide visibility and accountability in the USF process. This creates more confidence in the fund's relevance among stakeholders.
- **Establish a project costing system that accounts for overheads** – Put in place an appropriate mechanism to cost projects from end to end, considering extraneous circumstances that could impact the project (e.g. inflationary pressures on site building materials, local currency devaluation and security costs).
- **Build capacity and develop skills within the USF** – The effectiveness of a USF can only be as strong as the people managing it. As such, USF authorities must have personnel with the required skills and experience to design, implement and monitor projects properly.
- **Integrate fund contributors into a management board** – USFs should leverage the market insights and experience of fund contributors to make informed decisions that can enhance the impact of projects.

4.3
Adopting spectrum policy for inclusive digital development

Spectrum availability and licensing continue to be important means of improving connectivity. Governments and regulators in Sub-Saharan Africa should adopt forward-looking spectrum management policies, including:

- creating a spectrum roadmap
- ensuring access to mid-band spectrum – in particular, 3.5 GHz – given its importance to the future of 5G
- accelerating access to sub-1 GHz spectrum to provide widespread rural mobile broadband services.

Effective spectrum licensing, from roadmap to assignment, is critical to encourage the investment required to expand mobile access, meet the increase in demand for data services, and enhance the quality and range of services offered. Spectrum policy also has an important role to play in the race to net zero. Successful policies can help reduce carbon emissions from the mobile ecosystem while advancing mobile connectivity and increasing the enabling effect on emission-saving use cases for other sectors.

At its core, a spectrum licensing framework should:

- ensure access to sufficient spectrum for operators
- provide predictability to support the new network investment needed
- provide clear procedures for spectrum renewals, well in advance of the end of the licence tenure
- avoid costly restrictions on the use of spectrum beyond those needed to manage interference.

Spectrum roadmaps

A spectrum roadmap is essential to ensure there is enough spectrum to meet demand for mobile services in both the short and long terms. Roadmaps help governments forecast future trends and manage their work. For mobile operators, roadmaps encourage investment by offering increased certainty, based on the government's future allocation, renewal plans and radio spectrum management. Key themes for a spectrum roadmap should include:

- identifying emerging opportunities and challenges to a radio spectrum framework at least three to five years in advance
- determining future technology trends and drivers, and assessing their impact on spectrum policy and planning
- planning spectrum management programmes to address challenges and maximise opportunities
- creating a plan to regularly review and update the roadmap (an annual review is recommended).

Technology neutrality

Technology-neutral spectrum licensing helps enable legacy network shutdowns and is recognised as best practice when assigning spectrum to mobile operators. It enables mobile operators to refarm spectrum used for 2G or 3G to 4G and 5G at a pace driven by market demand. Experience shows it is possible to refarm bands without leaving any users behind. Implementing technology-neutral spectrum licensing maximises spectral efficiency and allows users to benefit from faster rollouts of 4G and 5G. It can lead to the delivery of better mobile broadband coverage and higher data speeds by allowing operators to upgrade technologies promptly.

Spectrum pricing

High spectrum prices hinder the rollout of mobile services. By contrast, sufficient spectrum bandwidth assigned at reasonable prices is strongly linked to greater population coverage, better download speeds and increased service adoption. The main goal of governments around the world should be to provide long-term benefit to their economy and ensure consumers and industry can get the most out of mobile spectrum resources and boost national productivity.

Spectrum policies with positive impact replacing SWNs

Single wholesale networks (SWNs) have almost died out. Their proponents believed they would better address certain concerns (e.g. coverage or spectrum efficiency) than the traditional model of network competition in some markets. SWNs have not proved successful in solving any of these problems to date, with plans largely abandoned for competition-based approaches.

The best way forward is for governments, regulators and mobile operators to collaborate on long-term solutions based on the following principles:

- Affordable access to low-band spectrum promotes mobile coverage and increases capacity.
- Establishing a robust spectrum roadmap allows long-term planning and minimises opex.
- Technology neutrality and spectrum refarming deliver efficiency.
- Voluntary infrastructure sharing will support wider coverage.
- Voluntary spectrum leasing or trading helps maximise efficiency.

Low-band spectrum

Low-band spectrum is a driver of digital equality, helping reduce the connectivity gap between urban and rural areas and delivering affordable connectivity. Without sufficient low-band spectrum, countries in Sub-Saharan Africa will struggle to address the digital divide. Those living in rural areas may be excluded from the latest digital technologies. There are numerous benefits for countries that prioritise access to more low-band spectrum for mobile. For example, adding the 600 MHz range to existing low bands can raise download speeds by 30–50% in rural areas.[8]

Through early adopters in the region, low-band 5G is expected to bring benefits of almost $3 billion to the economy of Sub-Saharan Africa, or around 0.08% of GDP, in 2030. While 5G penetration in the region is expected to continue to increase well into the 2030s, its socioeconomic impact as a percentage of GDP will already be similar to the impact in Europe and North America by 2030. This will pave the way for Sub-Saharan Africa to realise even greater benefits from low-band 5G going into the next decade.

Low-band 5G applications will mostly benefit the mining and retail industries, reflecting the level of economic activity driven by these sectors. The wide area coverage enabled by low bands will also be particularly important in driving the digital transformation of the agricultural sector, where IoT applications can support smart farming and agriculture.

8. Vision 2030: Low-Band Spectrum for 5G, GSMA, 2022

Mid-band spectrum

Mid-band spectrum, particularly 3.5 GHz, is important to the future of 5G because it offers city-wide coverage and capacity. In the short term, operators should have access to 100 MHz of contiguous spectrum in this band. Meeting long-term mid-band spectrum demand requires forward planning from policymakers. GSMA analysis shows that a total of 2 GHz of mid-band spectrum, on average, will be required to support the growth of 5G during 2025–2030. 5G growth in Sub-Saharan Africa is expected to develop rapidly in the second half of the decade and continue into the 2030s. The economic impact of mid-band 5G in the region will be around $13 billion or 0.4% of GDP in 2030.

As policymakers look to the future, the 6 GHz band offers significant potential. The mobile industry believes the following:

- 6 GHz capacity is required to meet increasing customer demand at speeds outlined in the ITU's vision for 5G. It will also be required for the future evolution of mobile.
- Mobile networks are already densified, but 6 GHz can enable growth of sustainable mobile capacity on existing macro-cell sites.
- Timely availability of 6 GHz, at reasonable conditions and prices, will drive cost-efficient network deployment, help reduce the broadband usage gap and support digital inclusion.
- Mobile networks will need, on average, 2 GHz of mid-band spectrum per country by 2030. This is challenging to achieve without 6 GHz.
- The 6 GHz band at 6.425–7.125 GHz should be made available for licensed, macro-cell mobile.

Figure 14

Mid-band spectrum available in Sub-Saharan Africa versus the requirement for 2025–2030

Source: GSMA and ITU

WRC-23: mobile spectrum for Africa's future

WRC-23 paved the way for better quality services, delivered to more people by the most affordable networks. Operators need the new spectrum capacity agreed at WRC-23 to provide consistent speeds to more people as 5G services take off. The right amount of capacity helps minimise the number of base stations needed, which keeps costs down and helps with carbon emissions.

In the mid-bands, WRC-23 took steps to meet mobile data growth by identifying additional spectrum for mobile. Final harmonisation of the 3.5 GHz band (3.3–3.8 GHz) was achieved across Europe, the Middle East and Africa, as well as throughout the Americas.

WRC-23 also identified 6 GHz for mobile use by countries in every ITU Region – EMEA, CIS, the Americas and Asia Pacific. Global, harmonised conditions for its use have been agreed in the ITU's Radio Regulations. This brings together a population of billions of people into a harmonised 6 GHz mobile footprint. It also serves as a critical developmental trigger for manufacturers in the 6 GHz equipment ecosystem.

WRC-23 also set the path for greater digital equality by defining mobile use of more low-band spectrum in the 470–694 MHz band in EMEA. Low bands play a crucial role in expanding capacity for internet connectivity, particularly benefiting rural communities with signals reaching over wide areas, as well as helping achieve good indoor coverage in urban areas.

WRC-23 provided the next steps for enabling low- and mid-band spectrum to be used for 4G and 5G connectivity. It is now important for this spectrum to be brought into the long-term spectrum roadmaps of administrations.

Operators need the new spectrum capacity agreed at WRC-23 to provide consistent speeds to more people as 5G services take off

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