

Spectrum Policy in Africa

Enabling investment and empowering consumers
through effective spectrum pricing





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The average amount of IMT spectrum below 7 GHz
assigned to mobile operators at the end of 2025

Africa

Rest of the world

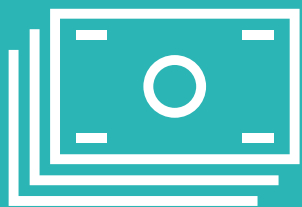
570 MHz

750 MHz

Operators in Africa pay

24%

more per unit of spectrum than those in
the rest of the world



Many African
operators face
licence obligations,
which significantly
raises the true cost
of spectrum



21 OUT OF 54

countries in Africa do not
have a fully technology-neutral
licensing framework



Only

9 OUT OF 54

countries in Africa have
a licence duration of
at least 20 years



Only

9 OUT OF 54

countries in Africa
have published a
spectrum roadmap



The potential impact of spectrum policy reforms in Africa

An additional

50 MILLION

people covered by 4G networks
(increasing 4G population coverage by 3 percentage points by 2035)



An additional

170 MILLION

people covered by 5G networks
(increasing 5G population coverage by 11 percentage points by 2035)



At least

30%

increase in average download speeds



More than

\$120 BILLION

cumulative increase in GDP across Africa between 2026 and 2035



Executive summary



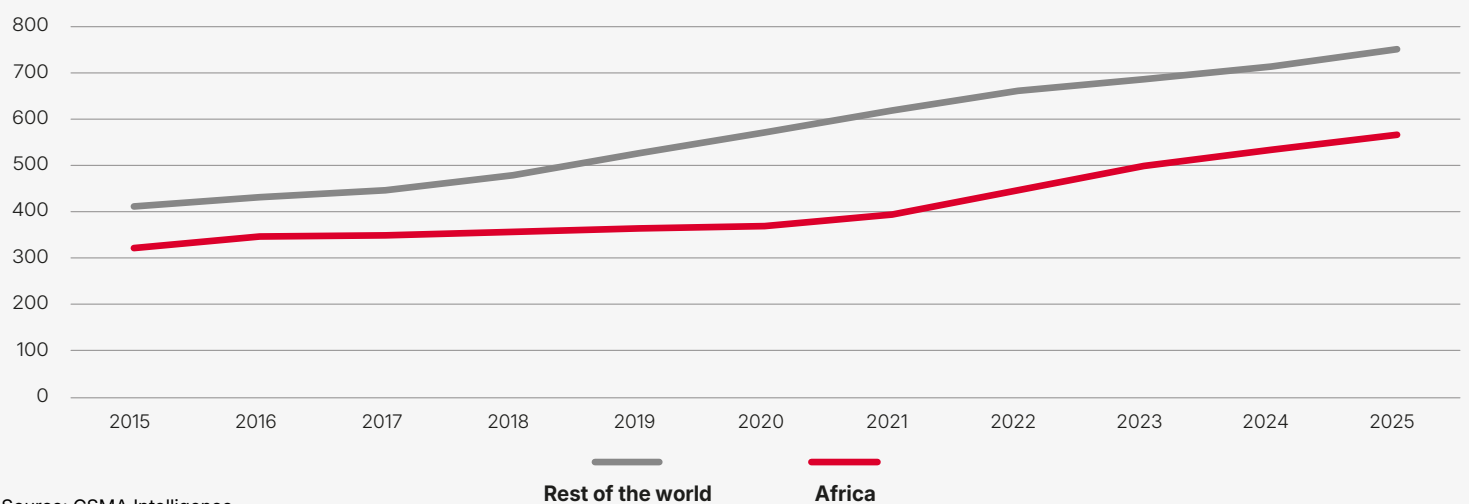
Mobile operators in Africa have invested significantly to expand network coverage and capacity. Since 2015, mobile broadband coverage has increased from 59% to 92%, while 4G coverage has increased from 7% to 83%. 5G has also been launched in many African markets in recent years, reaching 15% of the continent’s population at the end of 2025. However, despite this investment, the region continues to lag behind the rest of the world on almost every measure of mobile connectivity. At the end of 2025, 28% of the population in Africa were using mobile internet on their own device, compared with 66% in the rest of the world. The 8% coverage gap (where no mobile broadband network is available) is comparatively smaller but still four times higher than the coverage gap in the rest of the world on average. Africa also trails behind on network quality and data-consumption indicators.

At the same time, mobile operators in Africa face an increasing challenging investment environment, with rising costs and declining average revenues per user (ARPU), which have fallen by almost 50% compared to 10 years ago in real terms. Addressing this while accelerating connectivity will require a range of policy and regulatory reforms, one of the most important being spectrum pricing. There are a number of major challenges that the mobile industry in Africa faces:

- **Operators in Africa have less spectrum than operators in the rest of the world:** At the end of 2025, the average amount of IMT spectrum below 7 GHz assigned to operators in Africa was approximately 570 MHz, compared with around 750 MHz in the rest of the world (see Figure i). This means other countries have, on average, assigned over 30% more spectrum to mobile operators than in Africa. This spectrum gap exists in both low bands, which are needed to extend coverage, and mid-bands, which are needed to enhance capacity and quality of service.

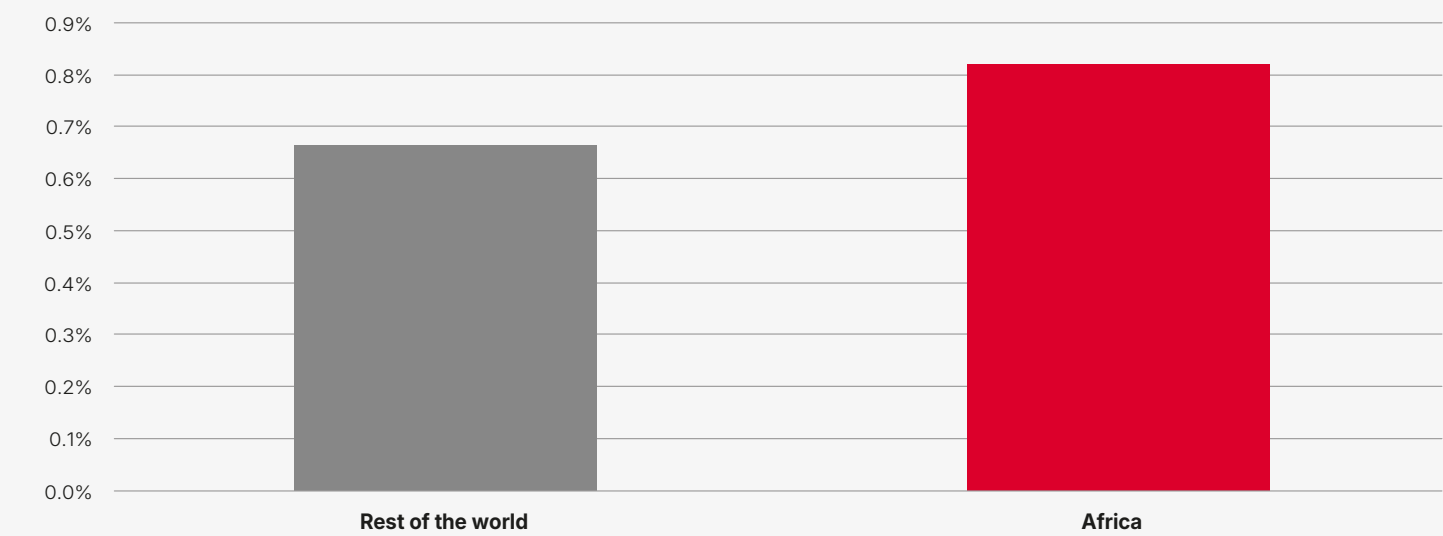
- **Operators in Africa pay more per 100 MHz of spectrum than operators in the rest of the world:** When considering the total cost of spectrum as a proportion of revenue (spectrum-cost-to-revenue ratio) and when normalising it by the amount of spectrum assigned, the cost of spectrum is 24% higher in Africa than in the rest of the world on average (see Figure ii).
- **The true cost of spectrum can be significantly higher with licence obligations:** Operators in many African markets face licence obligations (typically coverage and/or quality-of-service (QoS) requirements) that carry a significant cost on top of one-off and annual spectrum fees. In four markets analysed for this study, the cost of obligations is 3–45 times higher than the cost of spectrum.

Figure i
Average spectrum assigned to operators in Africa and the rest of the world MHz



Source: GSMA Intelligence

Figure ii
Average WACC-adjusted spectrum-cost-to-revenue ratio per 100 MHz



Source: GSMA Intelligence

In addition to spectrum costs, operators in many African markets can face challenging licensing and policy environments:

- **21 out of 54 countries in Africa do not have a fully technology-neutral licensing framework.** 26 countries do not have a unified licensing framework (though not all of them overlap). Technology-neutral licensing allows operators to refarm spectrum bands historically used for 2G and 3G to 4G and 5G without additional regulatory cost or delay. It is closely linked to service neutrality, which allows operators to offer whichever services best match the technology and spectrum they hold. These reforms can act as enablers of network expansion by providing operators with greater flexibility in how they use spectrum, deploy new technologies and sunset legacy technologies.
- **Only 9 out of 54 countries in Africa have published a spectrum roadmap.** Spectrum roadmaps provide an important means of ensuring sufficient spectrum will be available to meet the requirements driven by future demand and changing technologies. Information on future spectrum release and the conditions under which the spectrum will be made available is critical for operators to prepare investment plans, secure financing and deploy new technologies.

- **Only 9 out of 54 countries in Africa have a licence duration of at least 20 years.** Longer licence durations provide greater certainty for operators to undertake long-term investments in new technologies and to expand network coverage and capacity. The use of longer licences of 30–40 years, or even indefinite licence terms, can further enhance predictability.

Given that Africa faces some of the largest connectivity deficits in the world, it is critical to release more spectrum and to ensure that spectrum pricing, licence conditions, obligations and renewal frameworks support sustainable investment and efficient spectrum use. Getting this balance right will allow operators to expand coverage, improve QoS, support growing traffic demand and accelerate digital adoption while ensuring that operators have the capacity to continue investing in the networks needed to drive Africa’s digital development. In this context, it is important for governments and regulators to apply the following regulatory principles outlined in Table i.

Table i
Policy recommendations

Spectrum pricing	Other recommendations
• The primary objective of assigning spectrum should be to assign it to the users who will deliver the greatest social and economic benefits to society, rather than maximising public revenues. • Regulators should not anchor spectrum costs to historical prices and outdated benchmarks. They should instead reflect the forward-looking value that licence holders are likely to realise from having the spectrum. • Where regulators use auctions, reserve prices should be set at low levels to allow room for price discovery and to minimise the risk of unsold spectrum. Furthermore, ongoing charges (e.g. annual fees) should not be imposed if operators have already paid for spectrum in an auction. • Should regulators decide to impose obligations on licence holders, the cost of meeting those obligations should be paired with discounts in spectrum costs that preserve commercial viability. Moreover, any obligations should be designed in such a way that their costs do not exceed their incremental social benefits, and regulators should engage in a dialogue with licence holders to arrive at practical and sustainable solutions. • For existing and active spectrum licences, there should be a presumption of licence renewal, ideally automatically renewals with indefinite licences. To ensure that spectrum is assigned to the most efficient users over time, regulators should enable spectrum trading and leasing.	• Regulators should make all spectrum allocated to mobile services (IMT) available to operators, to ensure there is no artificial scarcity and to support better coverage and network quality for consumers. • Regulators should adopt technology- and service-neutral spectrum licensing, under a unified licensing framework. • Licence durations should be set at a minimum of 20 years to incentivise network investment. • Regulators should publish long-term spectrum roadmaps that set out forward-looking plans on future spectrum allocations to allow operators the maximum time to plan their investments. • Looking ahead to the next 10–15 years, governments should allocate the full upper 6 GHz band for mobile use to ensure they meet the minimum requirement for mid-band spectrum needs in high-density urban areas in high-demand countries. To ensure sufficient coverage and capacity in rural areas and deep indoor locations for new technologies, the 600 MHz band should be allocated for mobile use.

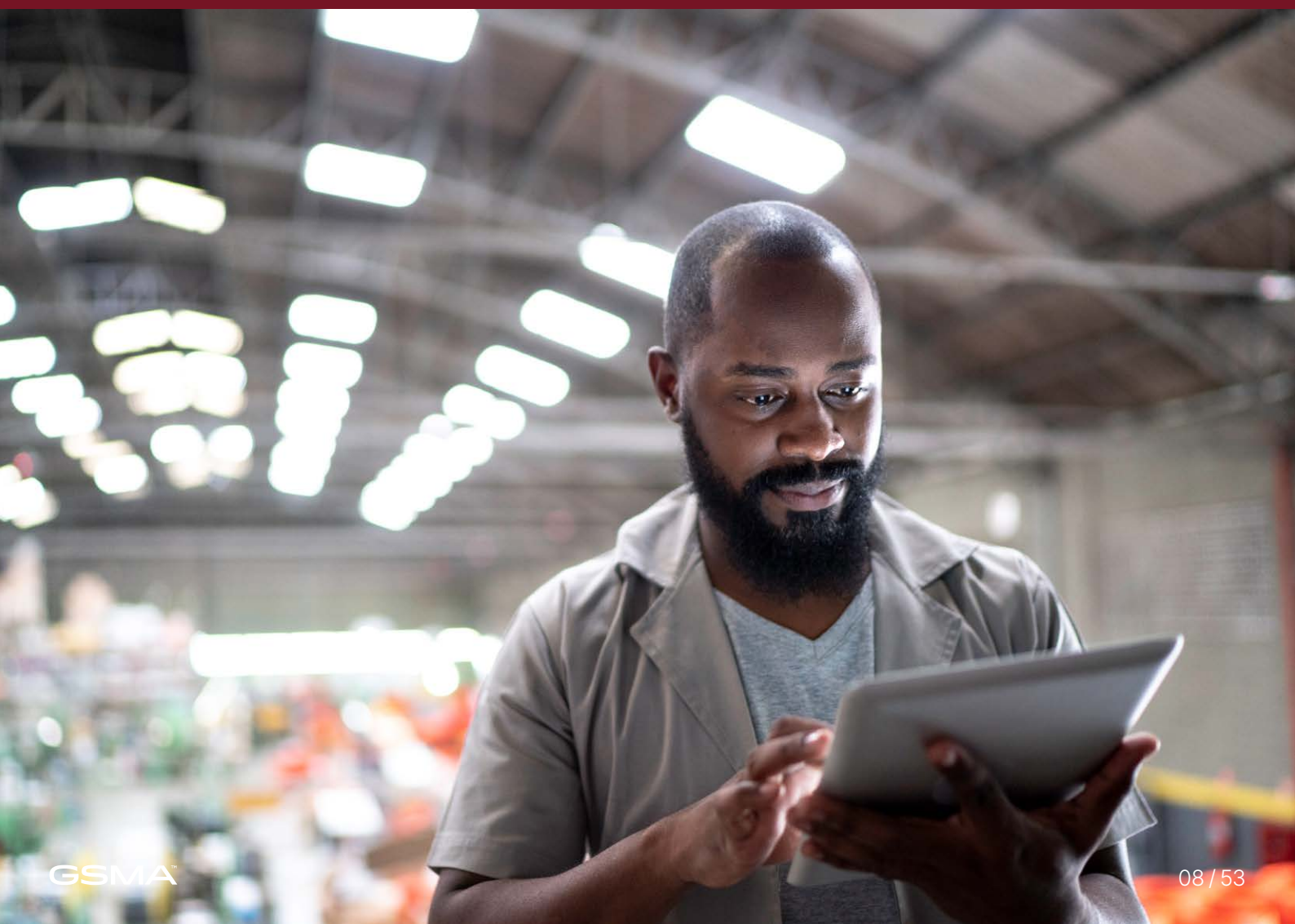
Source: GSMA Intelligence

Adopting these policies will lead to substantial benefits for consumers, businesses and the wider economy by 2035. The potential benefits would include:

- an additional 50 million people covered by 4G networks (increasing 4G population coverage by 3 percentage points (pp))
- an additional 170 million people covered by 5G networks (increasing 5G population coverage by 11 pp)

- an increase in average download speeds increase by 30–50%
- a cumulative increase in GDP across Africa by more than \$120 billion (in 2024 prices) between 2026 and 2035 (by 2035, the reforms could increase the continent's GDP by up to 0.5%).

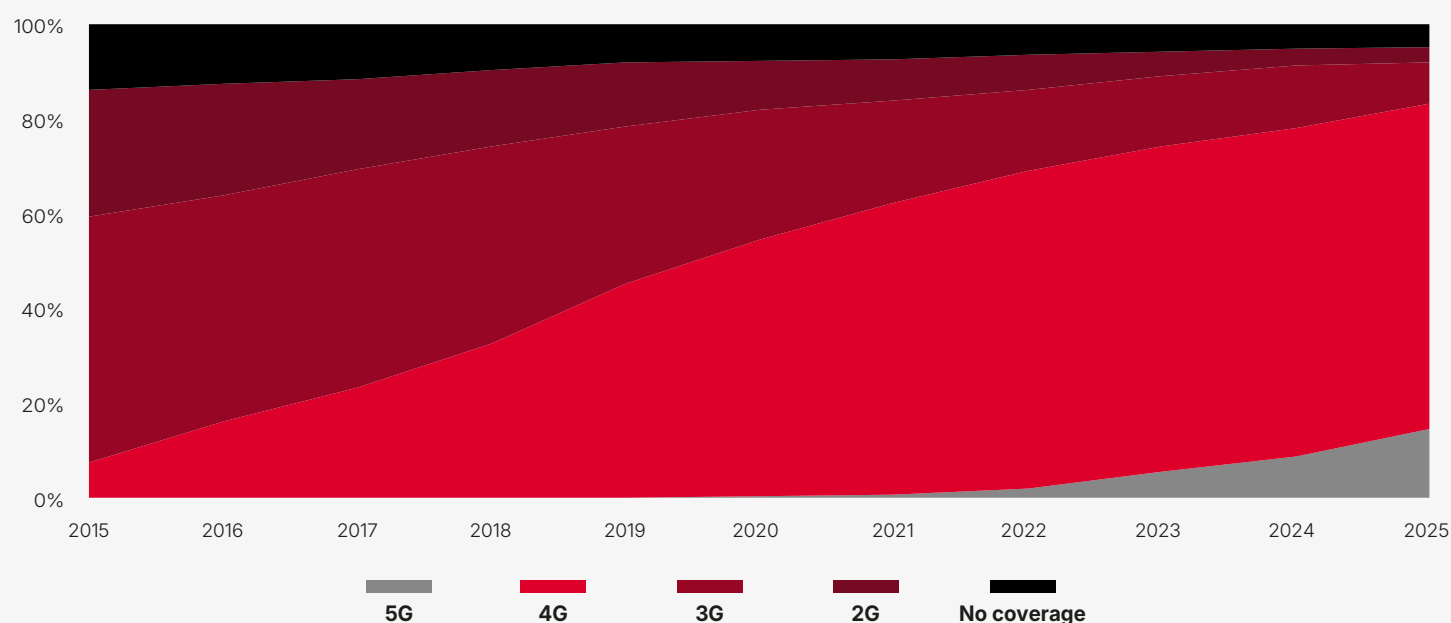
1. The state of connectivity and investment in Africa



Over the past decade, mobile operators in Africa have invested significantly to expand network coverage and capacity. Since 2015, mobile broadband (defined as 3G technologies or above) coverage has increased from 59% to 92%. In the same period, 4G coverage has increased from 7% to 83%, while 5G has also been launched in many African markets in recent years, reaching 15% of the continent's population at the end of 2025. However, despite this investment the region continues to lag behind the rest of the world on almost every measure of mobile connectivity.

Figure 1

Network population coverage by technology in Africa

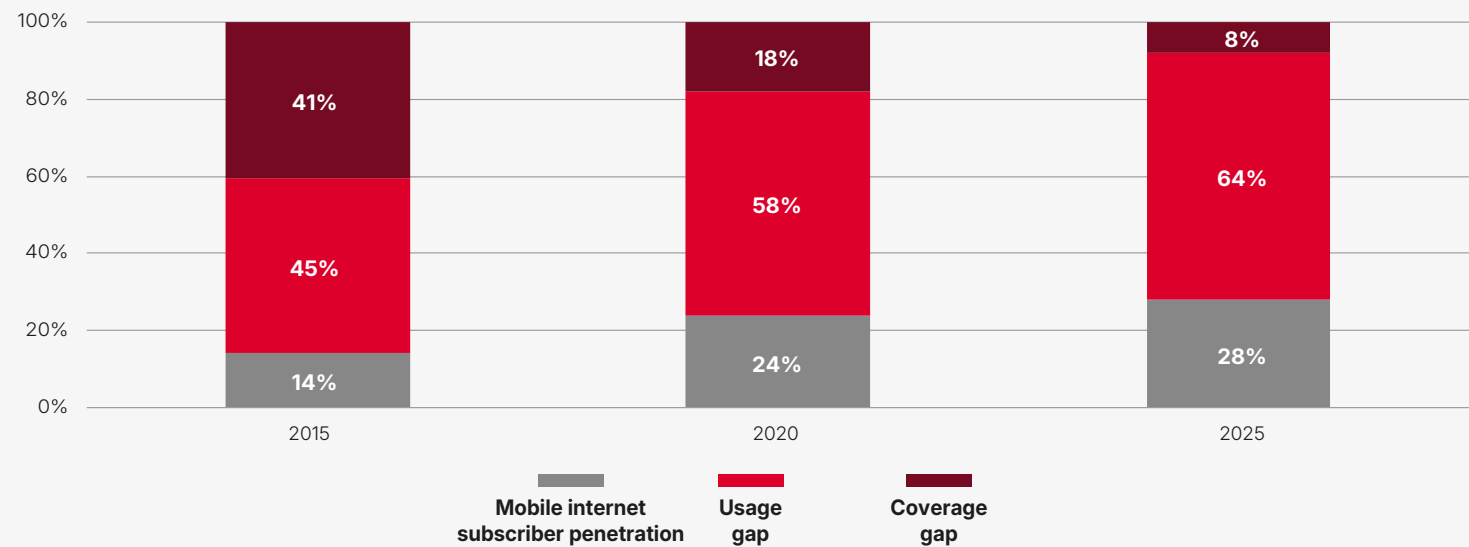


1.1 A persistent digital divide

At the end of 2025, 28% of the population in Africa were using mobile internet on their own device, compared with 66% in the rest of the world. This primary connectivity challenge is the usage gap – the share of the population covered by mobile broadband networks but not yet using – which stood at around 64% in Africa, double the level observed in the rest of the world excluding Africa (32%).

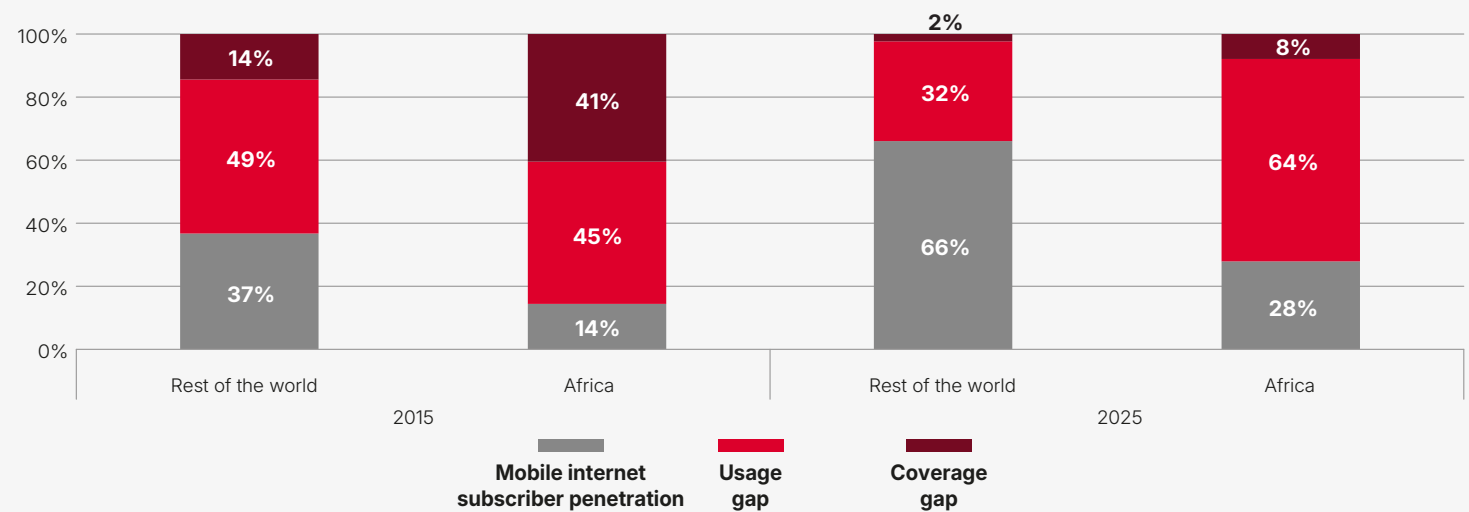
The coverage gap, where no mobile broadband network is available, is comparatively smaller but still substantially higher than the average of the rest of the world (8% versus 2%). Africa accounts for almost half (46%) of the 270 million people globally who lack mobile broadband coverage and almost one third (32%) of the global usage gap.

Figure 2a
State of connectivity in Africa: mobile internet subscribers, usage gap, coverage gap



Source: GSMA Intelligence

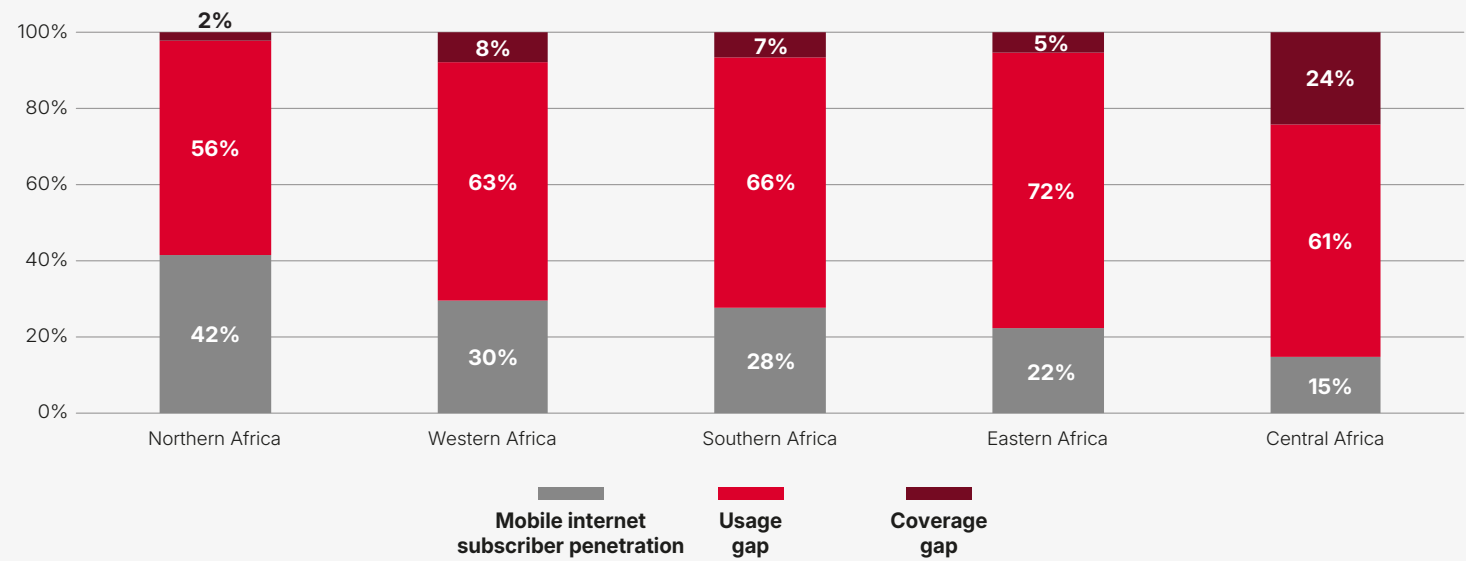
Figure 2b
State of connectivity in Africa and the rest of the world



Source: GSMA Intelligence

These trends differ across Africa's sub-regions. Mobile internet adoption is highest in Northern Africa (42%) and lowest in Central Africa (15%), which also has the largest coverage gap at 24%. Across all sub-regions, the usage gap is the dominant connectivity challenge, though it is particularly acute in Eastern Africa at 72%.

Figure 3
State of connectivity in Africa’s sub-regions in 2025

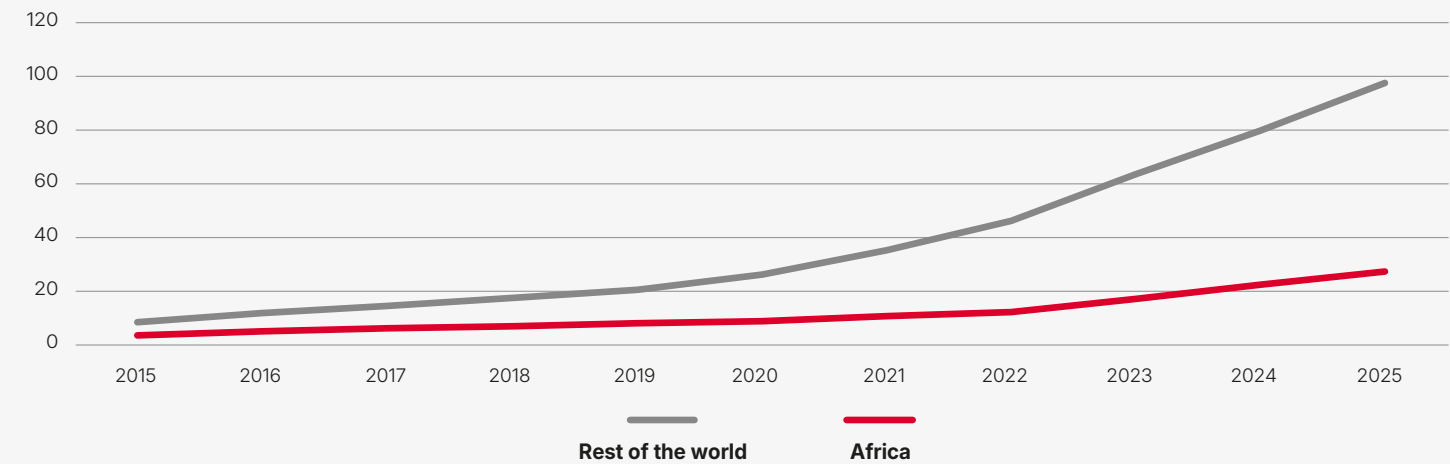


Network quality is also lagging in the continent. Average mobile download speeds in Africa reached more than 27 Mbps in 2025, almost a third of the average of the rest of the world (98 Mbps), while upload speeds reached 9 Mbps against an average of 17 Mbps in the rest of the world. Both metrics have improved steadily since 2015, but the

gap with the rest of the world has not materially narrowed. A key factor explaining this is that almost half of mobile internet subscribers in Africa still use feature phones and 3G smartphones, compared to 91% on average using 4G or 5G smartphones in the rest of the world.

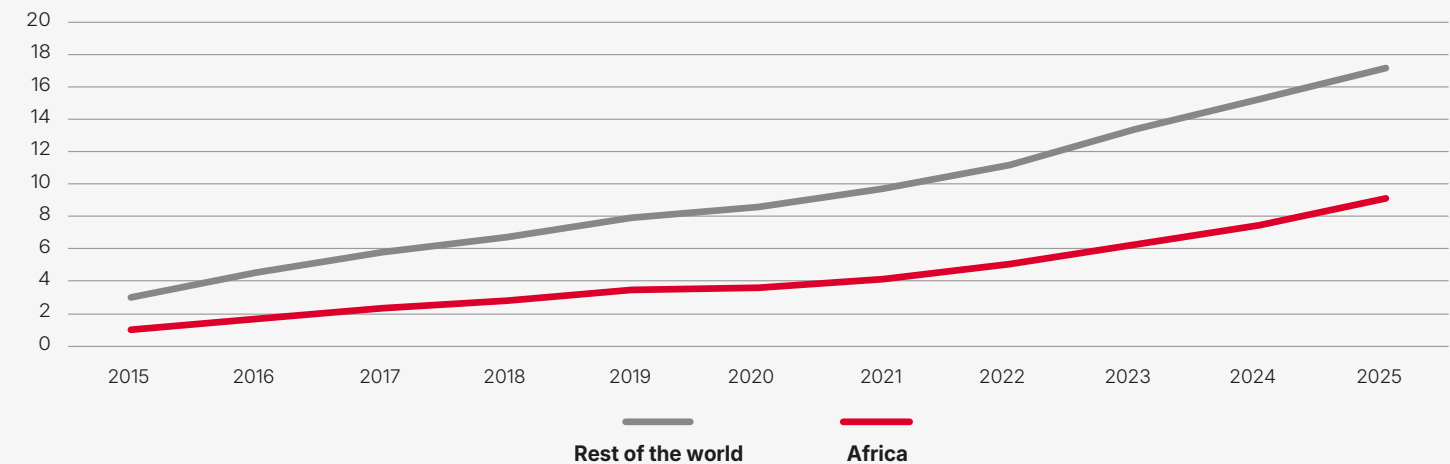


Figure 4a
Average mobile download speeds in Africa and the rest of the world
Mbps



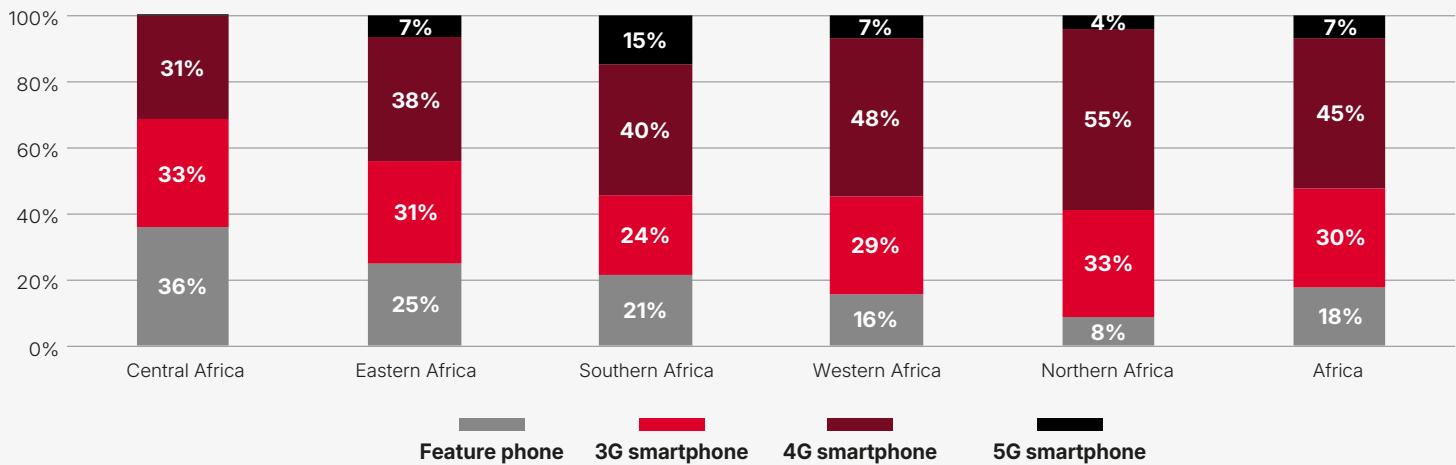
Source: GSMA Intelligence

Figure 4b
Average mobile upload speeds Africa and the rest of the world
Mbps



Source: GSMA Intelligence

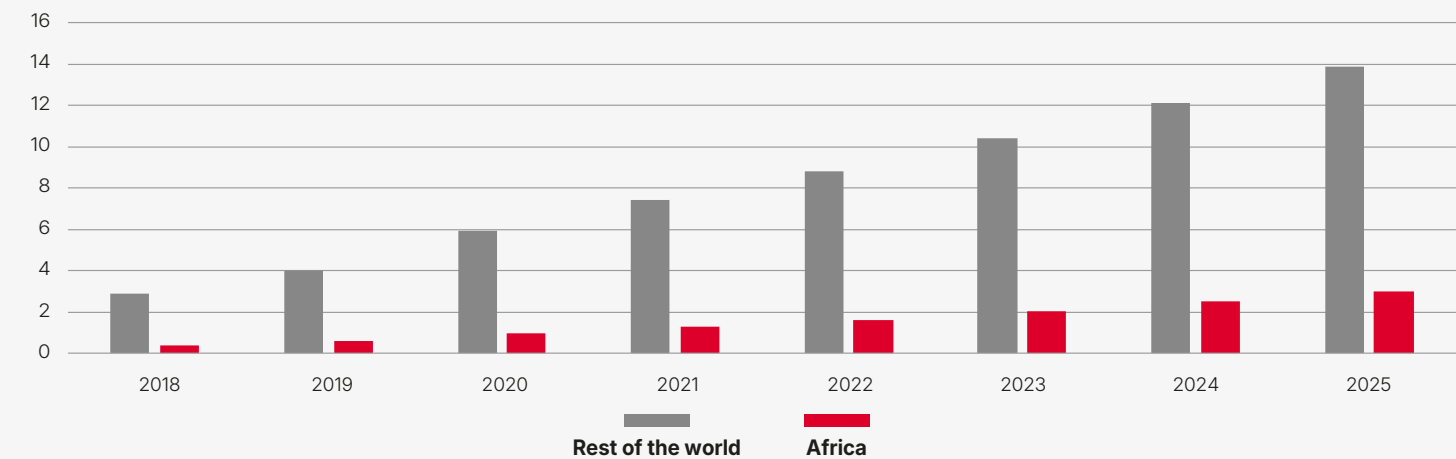
Figure 4c
Device type as a share of mobile internet subscribers in Africa, 2025



Source: GSMA Intelligence

There is similarly a data consumption gap between Africa and the rest of the world. Average mobile data traffic per connection in Africa stood at around 3 GB per month in 2025, compared to 14 GB on average in the rest of the world.

Figure 5
Average data traffic per connection in Africa and the rest of the world
GB



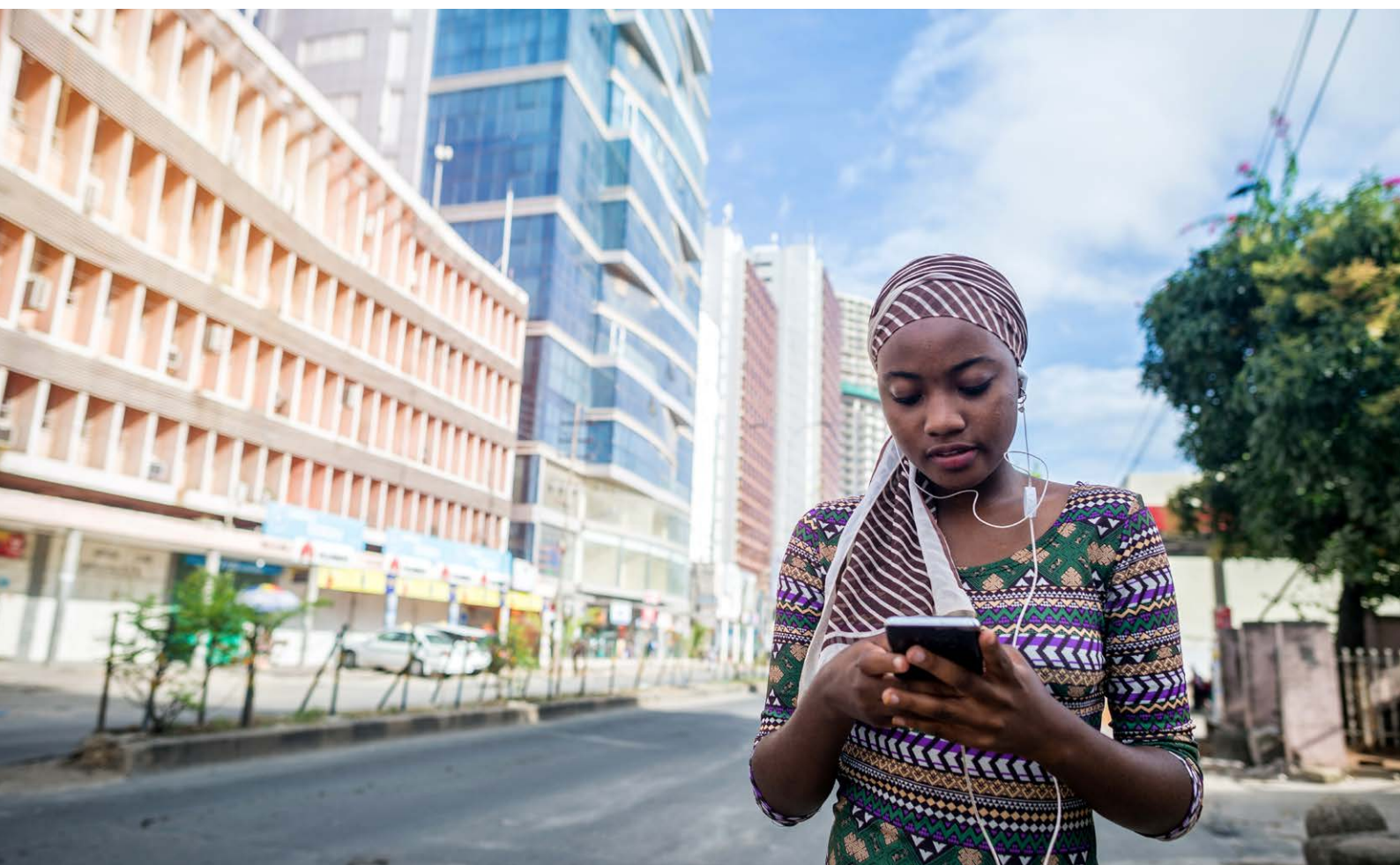
Source: GSMA Intelligence

1.2 Financial pressures are increasing on both operators and consumers

The demand-side picture comes against an increasingly challenging backdrop for operators. The average revenue per user (ARPU) in Africa has continued to fall in real terms, down by around 49% in the last decade (2015–2025), a trend mirrored globally as innovation and data-price deflation compress mobile unit revenues everywhere.

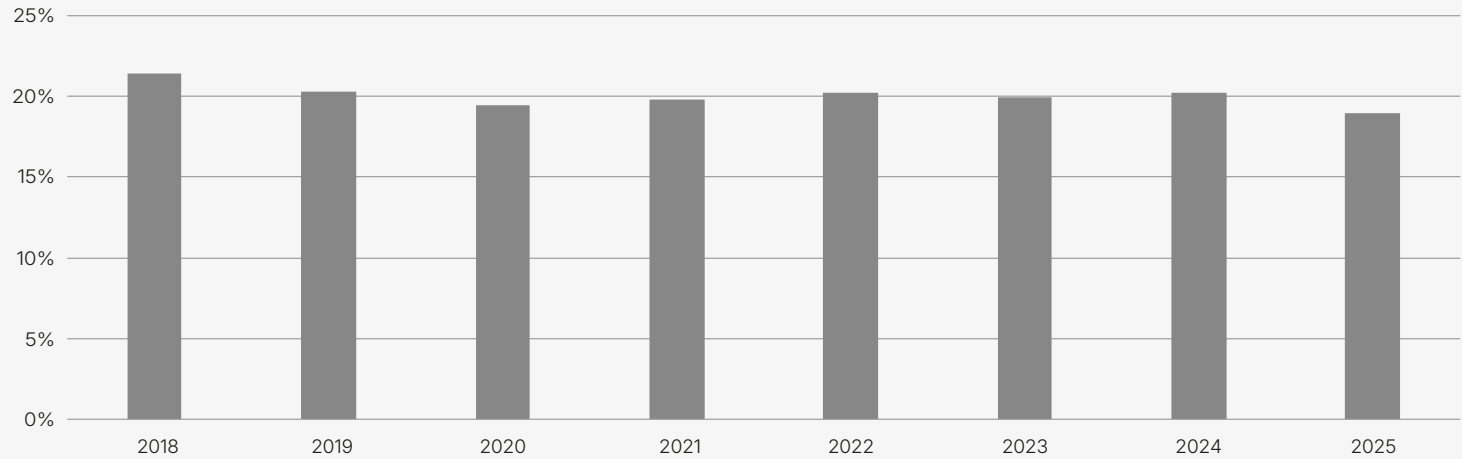
As consumers have begun to use mobile data, revenue per gigabyte in Africa has declined by 92%. This has helped make connectivity more affordable and supported greater adoption. For example, more than half of the countries in the region now have entry-level broadband services that are below the ITU affordability target of 2% of monthly gross national income (GNI) per capita.¹ However, it has also impacted the amount of returns to fund further investment. As data usage continues to grow, revenue per gigabyte is likely to continue falling, even as investment needs increase.

The combined effect shows up directly in investment. Despite sustained declines in revenue per connection and increasing pressure on margins, African operators have continued to invest at relatively stable levels over time, at around 20% of revenues. This suggests that the challenge is not a lack of willingness to invest, but rather a sector-wide constraint: operators continue to invest a significant share of their revenues despite declining revenue per connection. However, lower revenues ultimately translate into lower absolute investment levels, limiting the resources available to meet the region's substantial coverage, usage and quality investment needs.



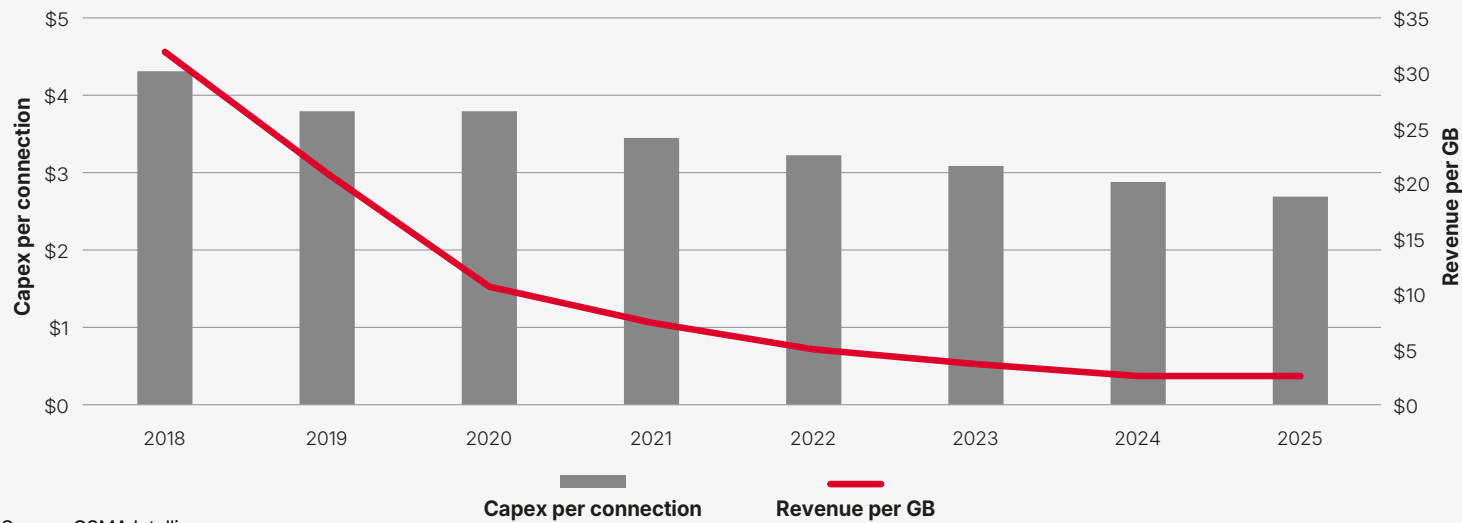
1 [The State of Mobile Internet Connectivity 2026](#), GSMA, 2026

Figure 6a
Average capex as a share of recurring revenue in Africa
USD real prices



Source: GSMA Intelligence

Figure 6b
Average capex per connection and revenue per GB in Africa
USD real prices



Source: GSMA Intelligence

Mobile operators across Africa therefore face pressure from two directions. On the demand side, adoption and usage are growing but remain low. Meanwhile, on the supply side, operators face greater financial pressure with less revenue per user, despite Africa’s coverage and usage gaps making investment more urgent than in other regions.

1.3 Spectrum policy and the risk to future investment

Addressing the affordability gap for consumers and the investment gap for operators will require a range of policy and regulatory reforms. These include, to name a few, reducing/removing sector-specific taxes, reforming Universal Service Funds, increasing the availability of reliable and affordable energy, reducing the costs of infrastructure deployment and addressing device affordability for consumers. In addition to these, one of the most important areas is spectrum policy.

The amount of spectrum available to operators, and the conditions under which they can use that spectrum, impacts the investment needed to deploy mobile networks (including the latest technologies) as well as the service quality that consumers and businesses experience. The cost of spectrum also has a direct impact on the ability of operators to invest. How spectrum is priced and assigned will determine how quickly operators can sustain the investment, innovation and affordability improvements needed to close Africa's connectivity gaps.

As set out above, ARPU and revenue per gigabyte of data have declined substantially across Africa over the past decade, a pattern that is also seen worldwide.² Globally, spectrum prices have fallen too, but not by enough to offset the growth in the total amount of spectrum operators hold and the declining revenues per user. As a result, the overall spectrum cost burden has continued to rise: the average global spectrum-cost-to-revenue ratio increased

from 4.8% in 2015 to 7.2% in 2025.³ Where that spectrum cost burden is high, coverage and network quality are measurably worse. A 10 pp increase in the spectrum cost-to-revenue ratio leads to 4 pp lower 4G coverage, 6 pp lower 5G coverage and 8% lower download speeds.⁴ The evidence also highlights the importance of assigning all available mobile spectrum, as a 10% increase in spectrum assigned increases 4G/5G coverage by 1–2 pp and increases upload and download speeds by 3–4%.⁵

A 10% increase in spectrum assigned increases 4G/5G coverage by 1–2 pp and increases upload and download speeds by 3–4%.

It is in this context that this report sets out the evolution of spectrum policy in Africa in the past decade. It considers spectrum assignments and pricing, as well as the current state of licensing. Going forward, additional spectrum will be required to support growing traffic demand, improve network quality and enable increased digital adoption. As countries assign new spectrum and renew existing licences, pricing and assignment decisions will play a critical role in determining whether spectrum acts as an enabler of investment and connectivity or becomes an increasing constraint on both.

A 10 pp increase in the spectrum cost-to-revenue ratio leads to 4 pp lower 4G coverage, 6 pp lower 5G coverage and 8% lower download speeds

² [Global Spectrum Pricing](#), GSMA, 2025

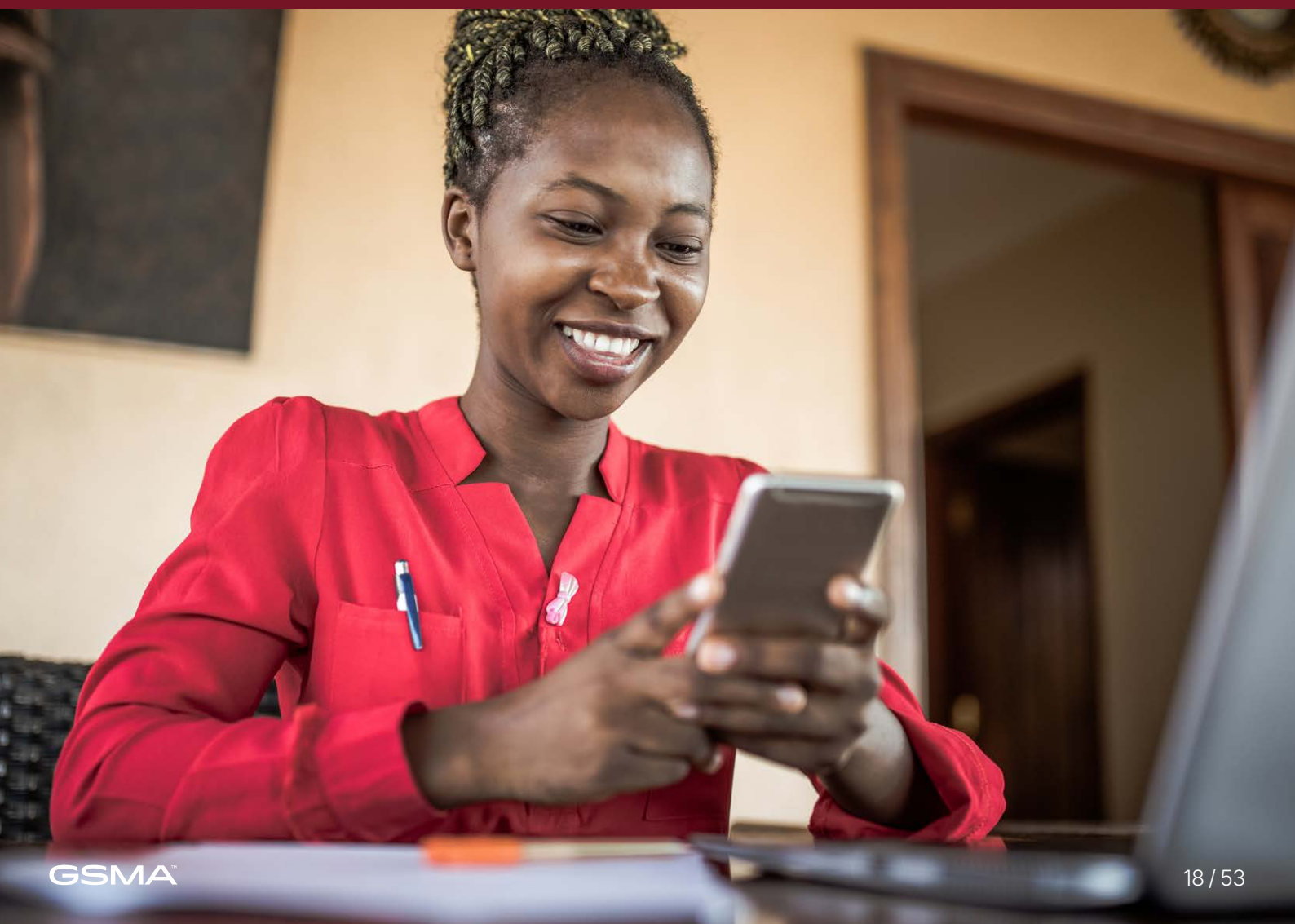
³ [Rethinking Spectrum Renewals](#), GSMA, 2026

⁴ [Global Spectrum Pricing](#), GSMA, 2025

⁵ Idem



2. Spectrum trends: assignments and pricing



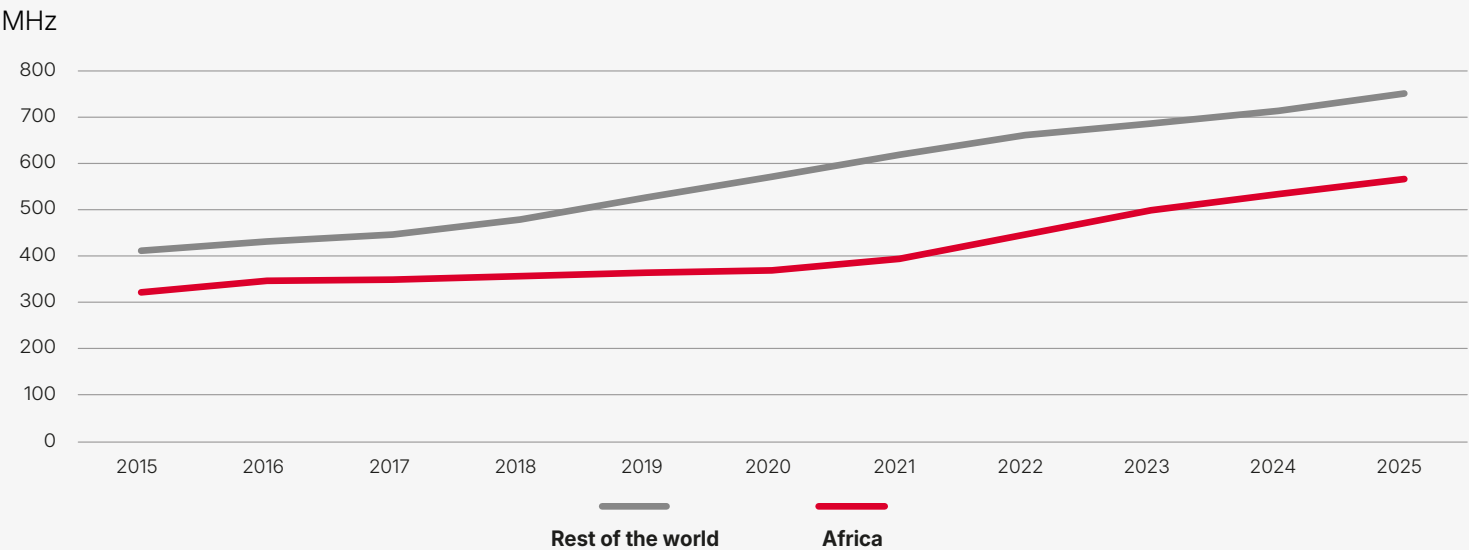
To understand Africa’s spectrum landscape, we first examine how much spectrum has been assigned to operators over the past decade and the prices paid for those assignments. Africa’s comparatively low spectrum holdings are an important part of the story, as they directly influence how spectrum costs should be assessed and compared across regions.

2.1 Operators in Africa have less spectrum than those in the rest of the world

At the end of 2025, the average amount of IMT spectrum below 7 GHz assigned to operators in Africa was approximately 570 MHz, compared with around 750 MHz in the rest of the world. This means other countries have, on average, assigned over 30% more spectrum to mobile operators than Africa.

This gap has persisted even as the amount of holdings has grown: average African holdings rose from around 320 MHz in 2015 to almost 570 MHz in 2025, a slower rate of growth than in most other regions over the same period. Leading countries have assigned over 1,000 MHz of low- and mid-band spectrum, underlining how wide the gap is between global leaders and Africa.

Figure 7
Average spectrum assigned to operators in Africa and rest of the world

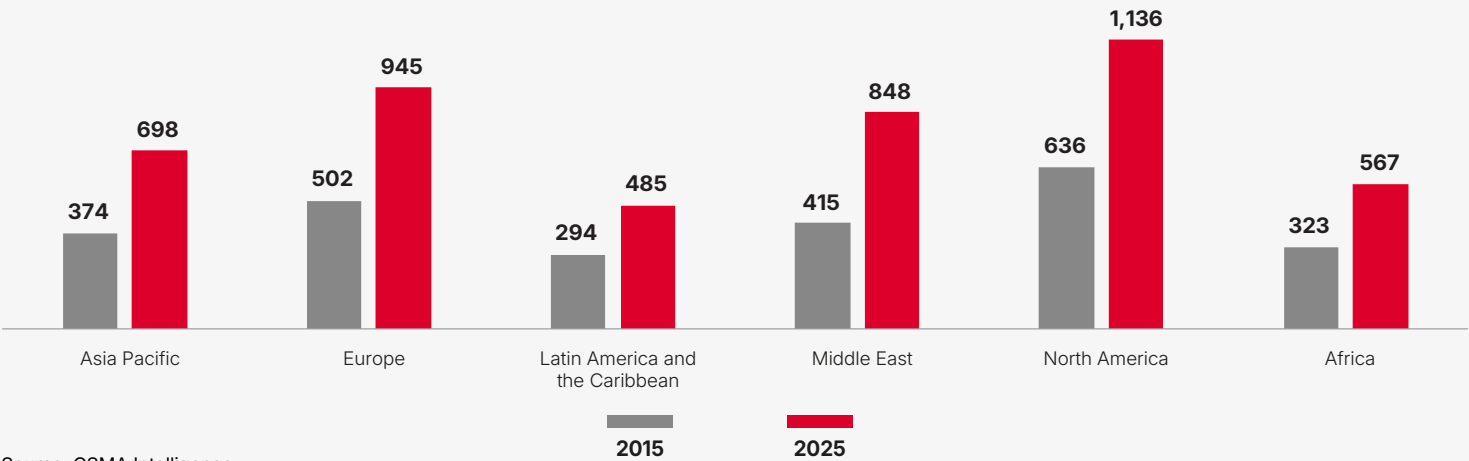


Source: GSMA Intelligence

Average spectrum holdings in Africa grew by 246 MHz between 2015 and 2025, the second-smallest increase by region. Although Latin America and the Caribbean had lower assignments in 2025 on average (485 MHz), Africa's

average holdings stood well below those of Asia Pacific (698 MHz), the Middle East (848 MHz), Europe (945 MHz) and North America (1,136 MHz).

Figure 8
Average amount of spectrum assigned to operators by region, 2015–2025
MHz



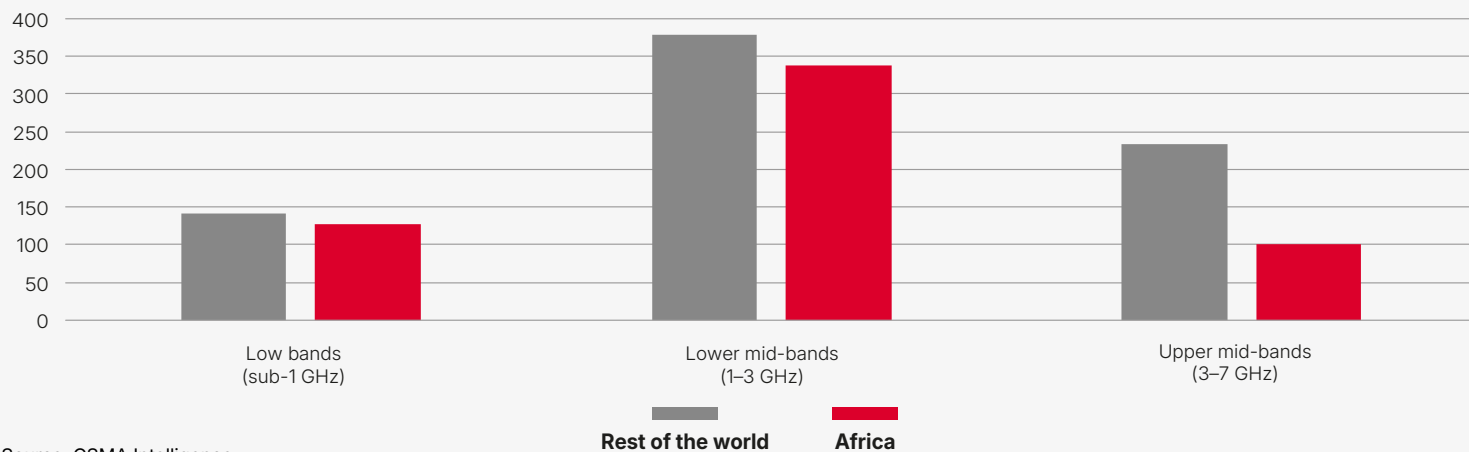
Source: GSMA Intelligence



2.2 The 5G spectrum deficit is widening Africa’s connectivity gap

Africa’s spectrum gap is visible across all major frequency ranges, but the gap is largest in the upper mid-bands (3–7 GHz) that support 5G networks and where operators have been building the capacity needed to support faster speeds, higher traffic volumes and more advanced digital services.

Figure 9
Average amount of spectrum by frequency band in Africa and the rest of world, 2025
MHz



Source: GSMA Intelligence

This gap reflects how early many African markets remain in the 5G spectrum assignment cycle. Only 24 out of 54 countries in Africa have assigned any spectrum in the 3.5 GHz range, the band most commonly used for 5G deployment worldwide, and only five countries have assigned at least 300 MHz in this band.

For low bands, the difference in assignment between Africa and the rest of the world is smaller in absolute terms than for mid-bands, but this is a reflection of the lower amount of spectrum allocated for frequencies below 1 GHz. Based on IMT allocations in Africa (which is part of ITU Region 1), there should be 190 MHz of spectrum available for mobile use – with 70 MHz in the 900 MHz band and 60 MHz in each of the 800 MHz and 700 MHz bands – but the average assignment is around 125 MHz. This means that, on average, one third of low-band IMT spectrum has not been assigned in Africa. Furthermore, only eight African countries have assigned all of their available IMT spectrum in the low bands (700, 800 and 900 MHz).

The assignment gap for low bands is closely linked to delays in making key coverage bands available. More than 30 African countries have yet to assign spectrum in the 700 MHz band, while more than 10 countries still lack assignments in both the 700 and 800 MHz bands. Empirical analysis shows that an additional 50 MHz of sub-1 GHz spectrum can increase 4G coverage by 7 pp and 5G coverage by 11 pp.⁶

Alongside spectrum assignment processes, completing the digital switchover (DSO) remains a critical enabler for releasing valuable sub-1 GHz spectrum and expanding affordable mobile broadband coverage, particularly in rural and underserved areas. Across the 54 countries in Africa, only around one third have completed the DSO process, with the remaining countries either ongoing or yet to start. Completing the DSO will allow countries to use less broadcast spectrum due to greater efficiency of digital terrestrial television and to reallocate that spectrum for mobile broadband.⁷

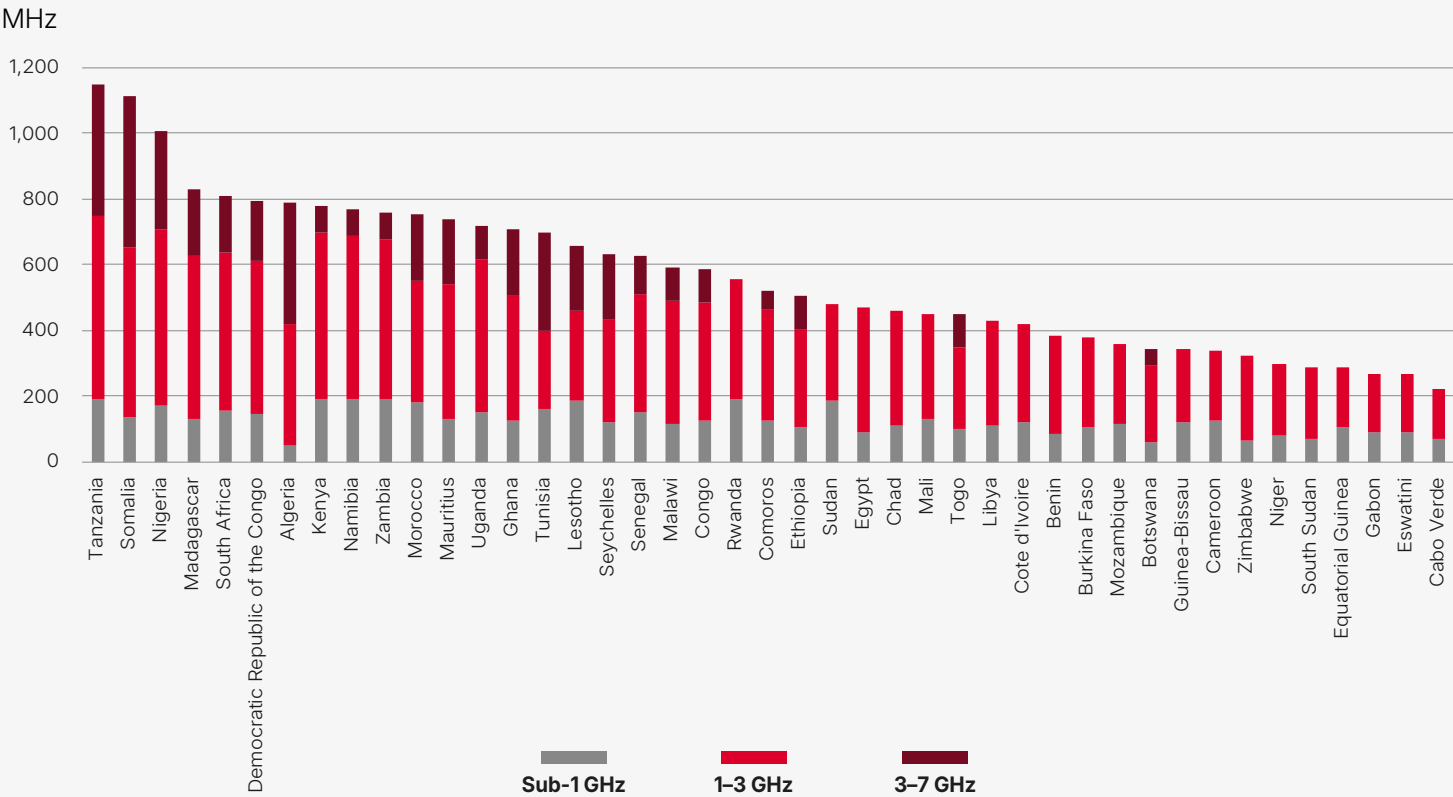
6 [Spectrum and Rural Connectivity](#), GSMA, 2025
7 For further discussion, see [Digital Switchover in Sub-Saharan Africa](#), GSMA, 2022 and [Socio-Economic Benefits of 5G](#), GSMA, 2023

In the lower mid-bands, IMT allocations should mean that countries can make 560 MHz available for mobile use. This includes the frequencies in the 1.8 GHz band (up to 150 MHz available), 2.1 GHz (120 MHz), 2.3 GHz (100 MHz) and 2.6 GHz (190 MHz). On average, around 40% of the total lower mid-band frequencies has not been assigned in Africa. As referenced earlier, this has a direct impact on the capacity available in mobile networks and, therefore, quality of service (QoS), as empirical analysis shows that a 10% increase in spectrum assigned increases upload and download speeds by 3–4%.⁸ Additional empirical evidence reinforces these findings and highlights the magnitude of the impact. A study by GSMA on QoS in Asia Pacific estimates that without the increase in assigned spectrum per country over the decade between 2013–2023, mobile QoS would have been approximately 20% lower.⁹

Taken together, these gaps highlight constraints at both ends of the spectrum range: insufficient low-band spectrum to maximise 4G and 5G coverage and insufficient mid-band spectrum to unlock the full performance benefits of 4G and 5G.

While regional averages provide a useful benchmark, spectrum assignments vary considerably across African markets. Several countries have assigned more spectrum for mobile than the global average, with Tanzania, Somalia and Nigeria assigning more than 1 GHz of low- and mid-band spectrum. At the other end, some markets have not even assigned more than 300 MHz of spectrum. Differences in the amount of spectrum assigned, the frequency bands available to operators and the stage of the spectrum assignment cycle have therefore resulted in a highly diverse spectrum landscape across the continent. In particular, access to upper mid-band spectrum remains uneven, reflecting different approaches and timelines for releasing the frequencies used to support 5G services.

Figure 10
Spectrum holdings by band and country in Africa, 2025



Source: GSMA Intelligence

8 [Global Spectrum Pricing](#), GSMA, 2025

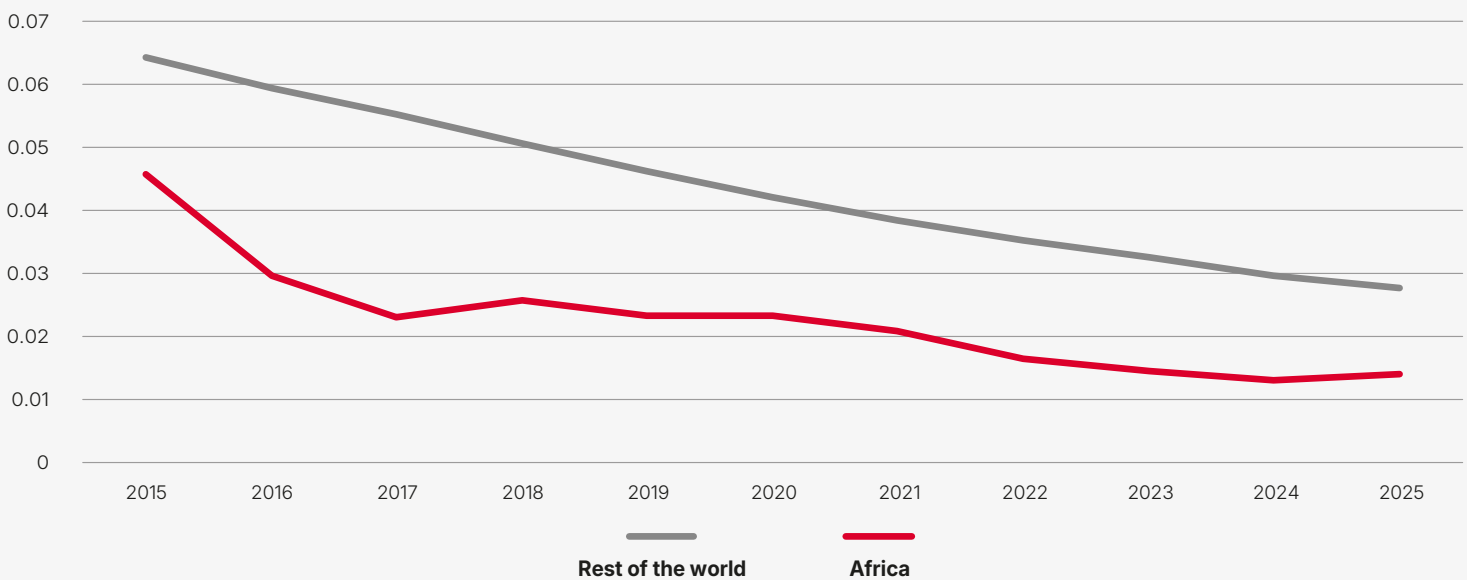
9 [Towards better quality of service in Asia Pacific](#), GSMA, 2025

2.3 Each additional megahertz now delivers less revenue than before, reshaping the value of spectrum

Both ARPU and revenue per gigabyte have fallen substantially in Africa, which is part of the same global dynamic of operators delivering rapidly increasing volumes of data at falling unit prices. This decline carries through directly into the revenue operators are able to generate from each unit of spectrum they hold. Revenue generated per megahertz per connection in Africa has fallen by more than 69% over the last decade and is well below global levels. A similar downward trend is occurring internationally as well.

This does not mean that the overall value of spectrum has declined; in fact, the value has significantly increased in terms of the economic and social value generated by 4G and 5G. However, this additional value has been retained by consumers and other digital ecosystem players, such as content and application providers, rather than the operators that acquire the spectrum and invest in the networks that use it.¹⁰

Figure 11
Average monthly recurring revenue per megahertz per connection in Africa and the rest of the world
USD/MHz/connection



Source: GSMA Intelligence

This declining revenue per megahertz has direct implications for spectrum. Many African markets remain under-assigned relative to international benchmarks, and while data usage across the region remains low by global standards, it is expected to grow substantially as smartphone adoption and mobile internet use increases. GSMA Intelligence forecasts that between 2025 and 2030, mobile data traffic in Africa will increase by a factor of around 2.6 (i.e. a 160% increase over five years). This points to significant future demand for additional network capacity, and by extension additional

spectrum, as operators work to improve coverage, QoS and usage levels.

How affordably that new spectrum is made available will therefore be a key determinant of whether operators can secure the resources needed to meet Africa's growing connectivity demands. Operators will need to acquire and deploy additional spectrum at a time when the commercial return generated by each unit of spectrum is already under considerable pressure.

10 [Global Spectrum Pricing](#), GSMA, 2025

2.4 Spectrum pricing trends in Africa

How to measure spectrum cost accumulation

Comparing spectrum costs across markets is not straight forward. Prices alone do not capture differences in purchasing power, operator revenues, spectrum holdings or licence structures. For this reason, the report uses a range of complementary benchmarks. Metrics adjusted for purchasing power parity (PPP) account for differences in economic conditions across countries, while revenue-based indicators measure spectrum costs relative to operators’ ability to pay. Cost-to-revenue ratio (CRR) metrics capture the annualised burden of amortised licence costs and recurring spectrum fees over time.

Several indicators are also normalised by assigned spectrum (MHz) to account for differences in spectrum holdings, allowing more meaningful comparisons across markets. Together, these measures provide a more robust assessment of spectrum affordability and cost burdens across Africa.

Table 1
Metrics used to measure spectrum costs in Africa

Metric	Unit of analysis	Definition
Licence cost metrics		
Unit price per MHz per capita (WACC-adjusted, PPP, annualised)	Licence/operator	Upfront licence price, annualised over licence duration and WACC-adjusted, converted to PPP and divided by spectrum bandwidth (MHz) and population
Unit price per MHz per recurring revenue (WACC-adjusted, annualised)	Licence/operator	Upfront licence price, annualised and WACC-adjusted and divided by spectrum bandwidth (MHz) and operator recurring revenue
Country-level spectrum cost estimation		
CRR (WACC-adjusted)	Country	Total annualised spectrum costs — upfront price (WACC-adjusted) plus annual regulatory fees — aggregated across operators, as a share of recurring revenue
CRR per 100 MHz (spectrum-normalised)	Country	CRR (WACC-adjusted) divided by total operator spectrum holdings, scaled per 100 MHz

Source: GSMA Intelligence



Low-band spectrum prices

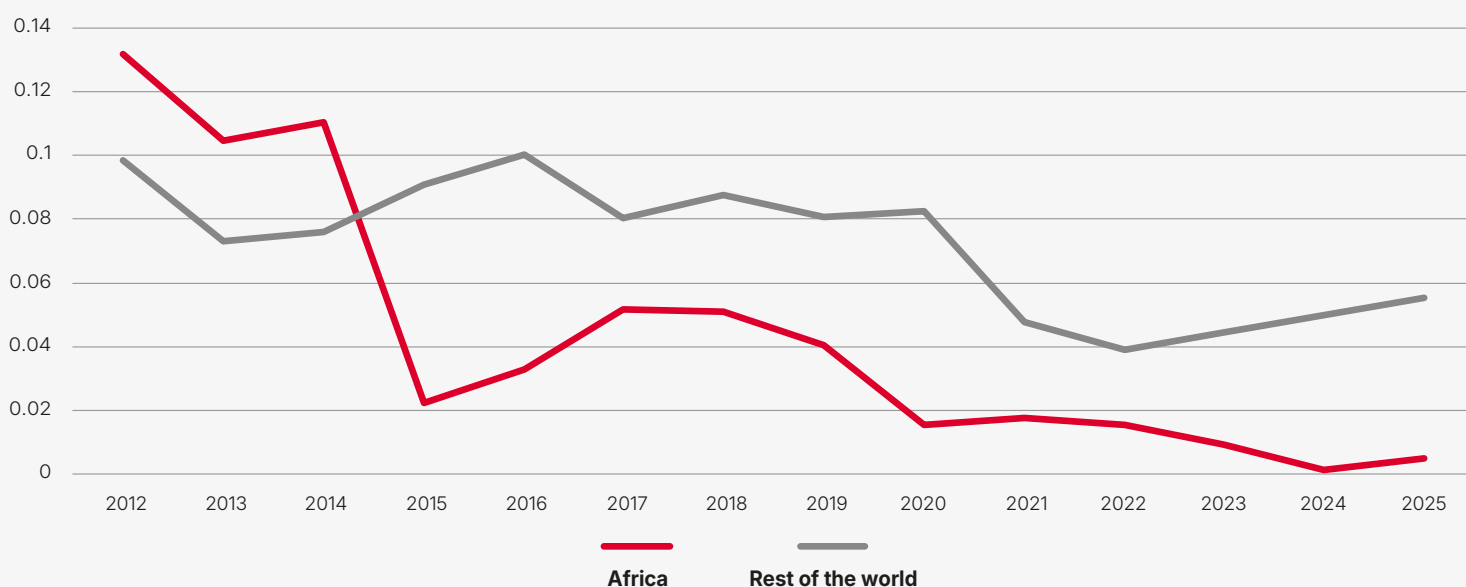
Consistent with the global pattern, unit prices for low-band (sub-1 GHz) spectrum licences in Africa – measured per MHz per capita, WACC-adjusted and expressed in PPP

terms – have gradually declined over the past decade, broadly in line with the rest of the world. Since 2015, low-band unit prices in Africa have been below those for the rest of the world.

Figure 12

Sub-1 GHz licence unit price per MHz per capita in Africa and the rest of world

Three-year trailing moving average (WACC-adjusted, PPP)¹¹



Source: GSMA Intelligence

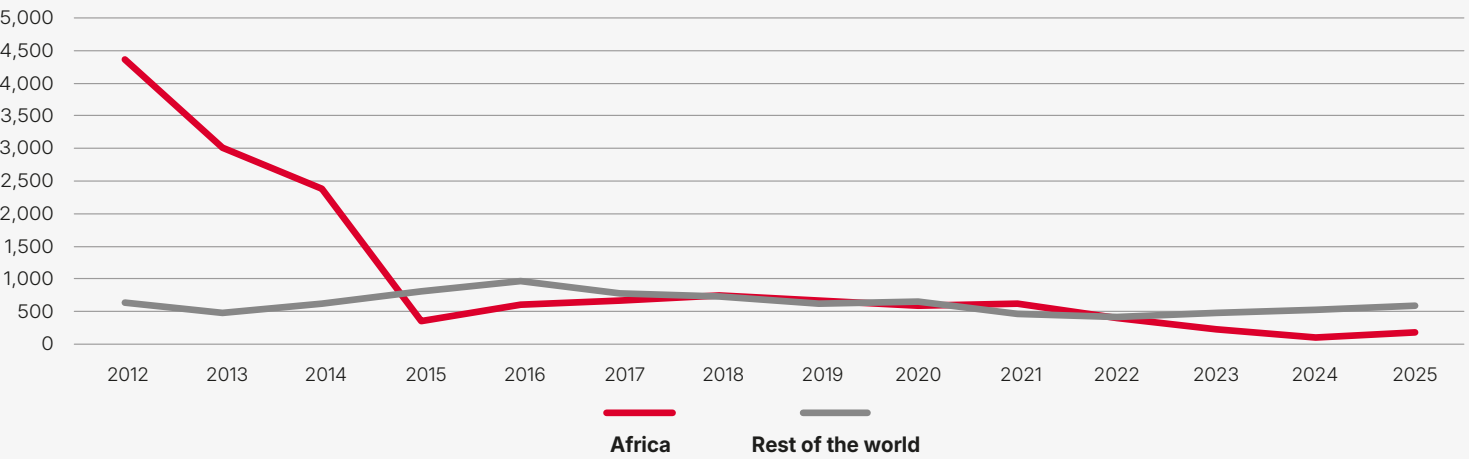
However, a lower per-capita price does not necessarily mean a lower price relative to the revenue base that has to support spectrum acquisition. When the same low-band licences are normalised by operator revenue (unit price per megahertz per USD million revenue) the picture changes: for much of the period shown, revenue-normalised low-band prices in Africa are similar to or have run higher than the average of the rest of the world. Because licence prices are annualised and amortised over the licence term, this higher relative cost is not limited to the year of assignment, as it continues to be carried forward into current revenue-normalised figures, meaning it still affects operators today. Both series have declined over time, consistent with the broader global trend, and the gap between Africa and the rest of the world has narrowed accordingly. Taken together, the two views of low-band pricing show a consistent result: prices that

appear moderate on a per-capita basis can still represent a disproportionate and persistent burden once weighed against the revenue that operators actually have available to pay for them.

The results for low-band prices also highlight the need to adjust spectrum prices going forward. Low-band prices have declined by 50% for Africa in the last 10 years, much higher than the decline in mid-band prices. Given the majority of countries in Africa still have additional low-band spectrum to assign, it is important that prices are not anchored to historical benchmark values but instead reflect the forward-looking value to operators, which is much lower. If the spectrum is priced too high, the result will either be spectrum going unsold (and therefore unutilised) or it significantly reducing the amount of capital available for network investment.

¹¹ For Figures 12, 13 and 14, the annual value is the median licence unit price across all licences awarded in a given year. The trend line then shows the three-year trailing (lagged) moving average of these annual medians, calculated as the average of that year's median and the two preceding years' medians, to smooth short-term fluctuations.

Figure 13
Sub-1 GHz licence unit price per megahertz per million USD of revenue in Africa and the rest of the world
Three-year trailing moving average (WACC-adjusted)



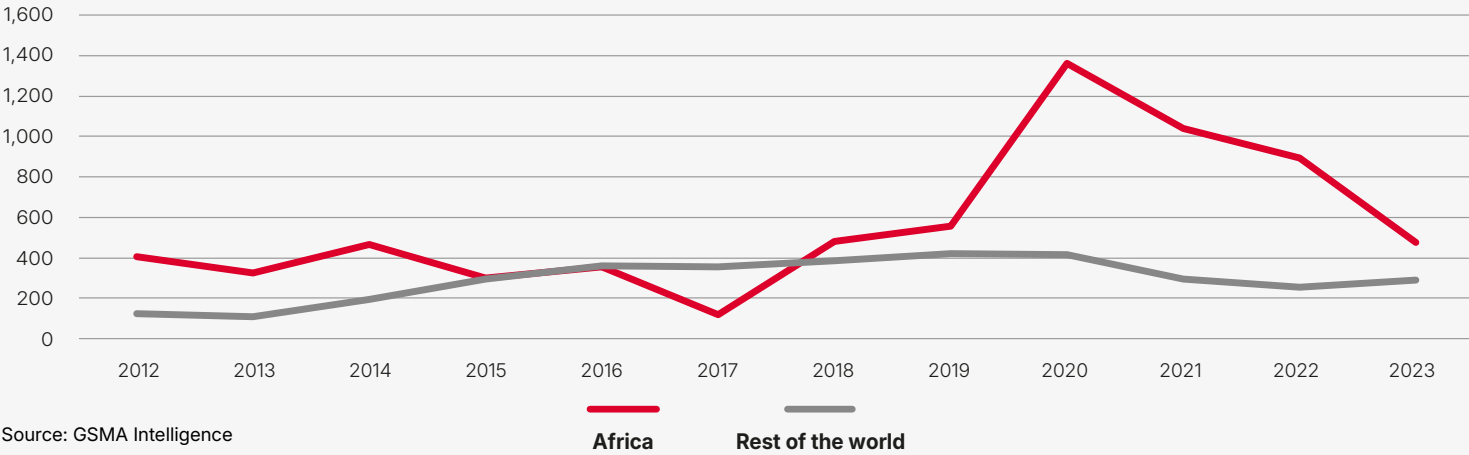
Source: GSMA Intelligence

Mid-band spectrum prices

Normalised by revenue, comparable data for Africa in the 1–3 GHz band is available only through to 2023, limiting the number of recent observations for this frequency range.

Within that period, the full series on a moving-average basis shows that revenue-normalised mid-band prices in Africa were, for most of the period, higher than the rest of the world.

Figure 14
Lower mid-band (1–3 GHz) licence unit price per megahertz per million USD of revenue in Africa and the rest of the world
Three-year trailing moving average (WACC-adjusted)

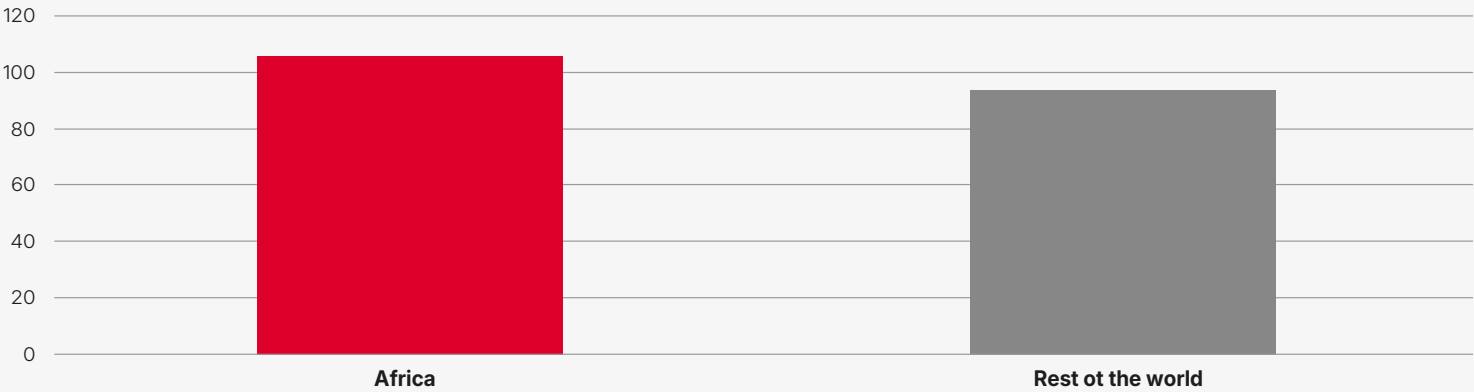


Source: GSMA Intelligence

For upper mid-band (3–7 GHz) licences assigned since 2019, the median price-to-revenue ratio is more than 10% higher in Africa than in the rest of the world (105 versus 94

per USD million of operator revenue). This indicates that a typical upper mid-band licence carries a higher spectrum cost burden relative to operator revenues.

Figure 15
Upper mid-band (3–7 GHz) licence unit price per megahertz per million USD of revenue
in Africa and the rest of the world from 2019
Median (WACC-adjusted)



Source: GSMA Intelligence

Taken together, these results show that once spectrum prices are normalised by revenue, African spectrum prices have generally been higher than those in the rest of the world. Given that spectrum costs are amortised over long periods, this means that spectrum affordability remains a

current challenge, rather than simply a historical one, in parts of Africa. At the same time, the picture is far from uniform, with substantial variation across countries and licences, a heterogeneity explored in the following section.



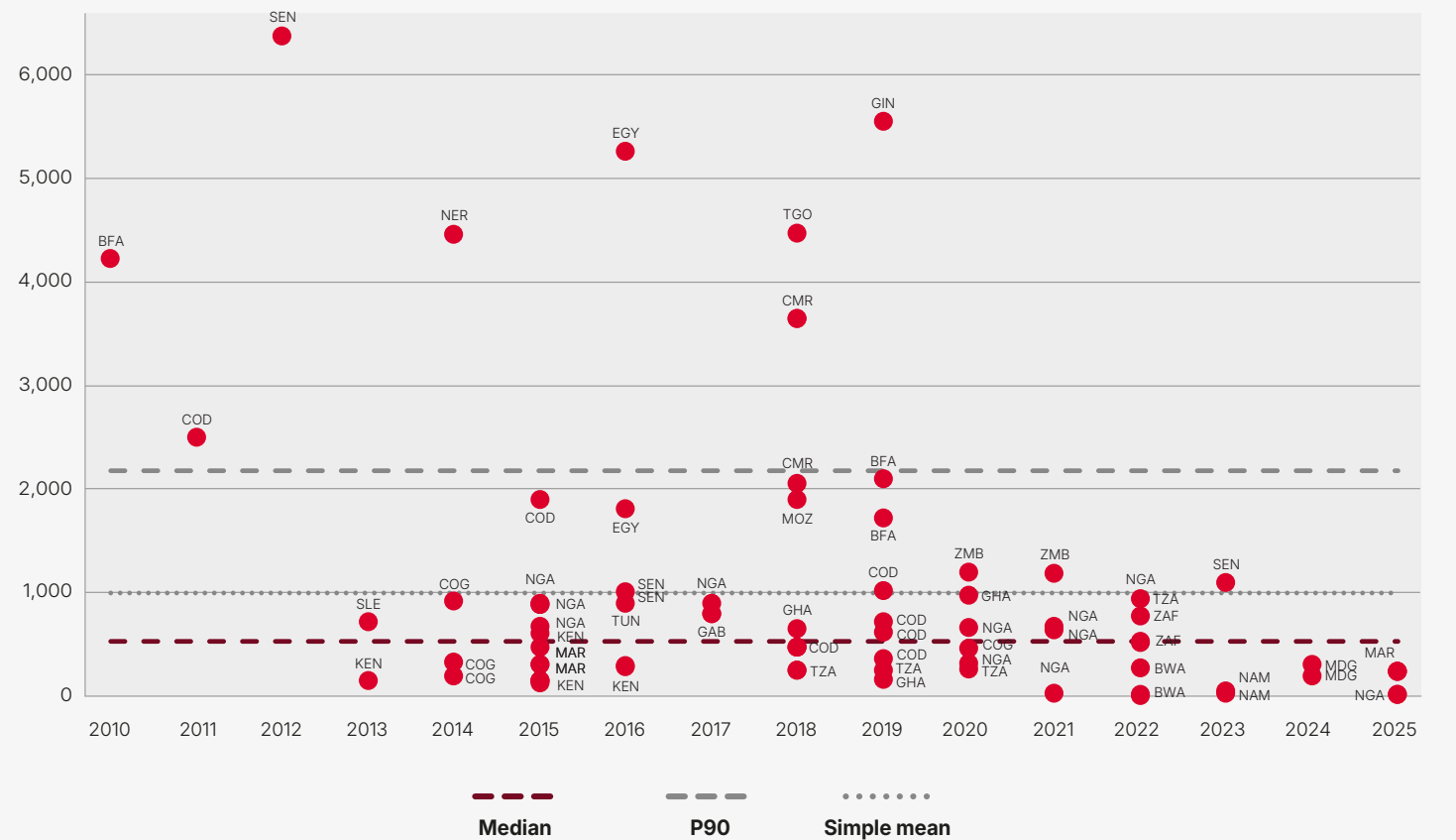
2.5 Significant variation in spectrum pricing across African markets

The regional averages presented above reveal important patterns in African spectrum pricing. These regional trends are also characterised by substantial variation across countries and licences. Spectrum costs relative to revenues vary significantly across African markets, highlighting substantial differences in the affordability of spectrum assignments. While some countries record spectrum costs that remain close to regional benchmarks, others consistently appear at the upper end of the distribution, indicating a much higher cost burden on operators. These results reinforce the heterogeneous nature of spectrum pricing across Africa and suggest that similar assignments can translate into very different affordability outcomes depending on market conditions and revenue generation.

Low band (sub-1 GHz)

Spectrum costs remain elevated in several African markets when measured relative to operator revenues. While many licences cluster around the regional median, a group of countries, such as Egypt and Zambia, consistently record significantly higher costs, with some assignments appearing among the most expensive in the region. The distribution highlights that the burden of low-band spectrum fees is not evenly shared across markets and that operators' licences in some countries face substantially higher spectrum costs relative to their revenue base compared to their regional peers.

Figure 16
Sub-1 GHz licence costs
MHz/year/USD million of market revenue (WACC-adjusted)



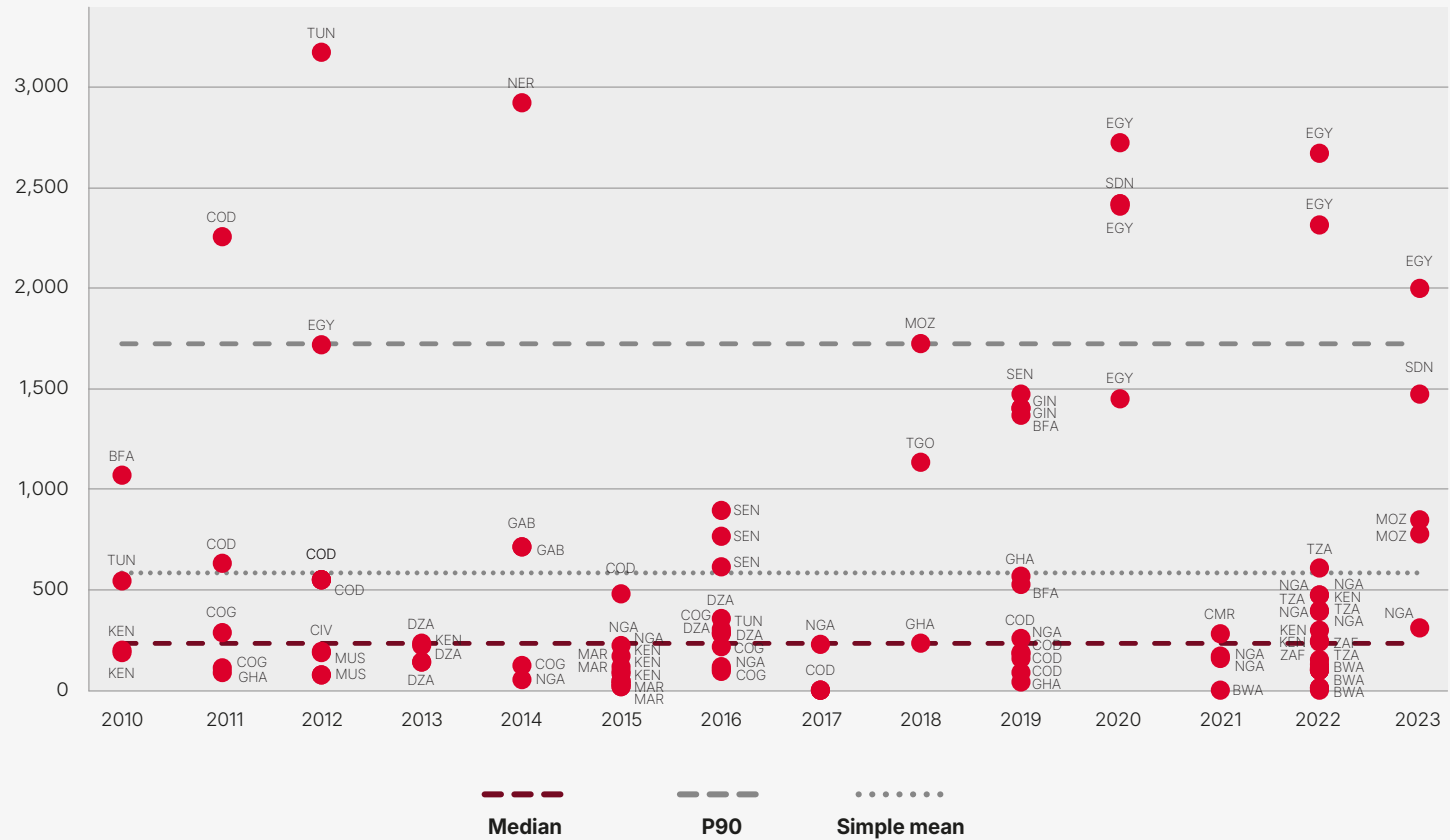
Source: GSMA Intelligence
Note: Zeros/missing excluded

Lower mid-bands (1–3 GHz)

A similar pattern is evident in the 1–3 GHz range. Spectrum costs relative to revenues vary considerably across countries, with a number of African markets consistently appearing towards the upper end of the distribution, including Egypt, Sudan and Guinea. The wide dispersion

in outcomes suggests that operators’ ability to absorb spectrum costs differs significantly across Africa, even within the same band range. This is particularly important given the growing role of mid-band spectrum in supporting network capacity and 5G deployment.

Figure 17
Lower mid-band (1–3 GHz) licence costs
MHz/year/USD million of market revenue (WACC-adjusted)



Source: GSMA Intelligence
Note: Zeros/missing excluded. Values above P95 excluded to make the chart legible (6 removed, 104 shown)

Upper mid-bands (3–7 GHz)

Although the number of assignments in the 3–7 GHz range is more limited, the available evidence again points to substantial variation in spectrum affordability across markets. Several licences appear at levels well above regional benchmarks when assessed relative to revenues,

suggesting that affordability challenges are already emerging in this band. As assignment activity accelerates, it will becoming increasingly important to ensure that spectrum costs remain aligned with operators’ ability to invest.

What Tanzania and Egypt reveal about spectrum pricing

Egypt: the importance of adapting spectrum pricing to local market conditions



Egypt provides a particularly relevant example of how spectrum affordability cannot be assessed in isolation from broader market and macroeconomic conditions. Despite operators having access to less spectrum than many regional and international peers, spectrum costs in Egypt are among the highest globally when measured relative to operator revenues. WACC-adjusted spectrum costs in recent years approached or exceeded 20% of revenues, while costs normalised by assigned spectrum remain close to 5% per 100 MHz, placing Egypt above most regional and international benchmarks.

A key factor behind these outcomes has been Egypt's challenging macroeconomic environment. Since 2014, the Egyptian pound has experienced substantial depreciation against the US dollar, while inflation has remained significantly above regional averages. Because spectrum costs and licence fees were historically denominated in US dollars, while revenues are earned in local currency, currency depreciation has significantly increased the effective burden of spectrum costs on operators. In addition to charging for spectrum, operators in Egypt are also charged licence fees for deploying new technologies. For example, operators paid a combined \$600 million for 5G licences, which were not accompanied with the assignment of any new spectrum.

The case of Egypt illustrates why spectrum pricing frameworks should take account of prevailing market and financial conditions. Over the last decade, spectrum costs increased more than fivefold in nominal terms and by more than 50% in real terms, with more than half of this increase attributed to currency depreciation. During the same period, operator revenues declined by 16% and investment declined by 40%. This highlights how higher spectrum costs ultimately reduce the amount of funds that operators can utilise for network investment. These findings demonstrate the importance of regularly reviewing spectrum pricing approaches to ensure that fees remain aligned with operators' ability to invest, particularly in markets facing significant macroeconomic and currency pressures.





Tanzania: more spectrum at moderate cost



Tanzania's 2025 auction provides a useful example of how spectrum awards can be structured to expand spectrum holdings while keeping the resulting cost burden relatively unchanged. What stands out is not one feature but the fact that reserve pricing, licence duration, payment structure and coverage obligations were designed together as part of a broader policy framework, rather than as separate levers. On 10 July 2025, the Tanzania Communications Regulatory Authority (TCRA) auctioned 200 MHz of spectrum in the 3600–3800 MHz band, the range most countries are using to roll out 5G. Four blocks were awarded to three operators, each on a 15-year licence, with no set-asides and no exclusions.¹²

A notable strength of the process was the approach to reserve pricing. TCRA set reserve prices to ensure competitive bidding and price discovery, rather than being anchored to a revenue-maximisation objective, as they set the reserve price at a 30% discount to estimated market prices. Coverage and QoS obligations attached to the licences were not demanding or onerous but ensured that licence holders would reach at least six administrative regions by 2028 and all regional capitals by 2033. Payment terms provided operators with some flexibility to spread costs over time rather than finance the entire licence before network deployment materialised.¹³ The 15-year licence term also provided a reasonable degree of investment certainty, though it remains shorter than the 20-to-30-year terms that promote long-term investment.

Following the auction, Tanzania's overall cost of spectrum inevitably rose, which is the expected outcome of a spectrum award.¹⁴ However, when considering the additional spectrum acquired, the total cost of spectrum in Tanzania per unit of spectrum was broadly unchanged relative to pre-award levels, indicating that operators secured significantly more spectrum capacity without experiencing a meaningful increase in cost burden per unit of spectrum.

Taken together, these elements point to a clear conclusion. Tanzania substantially expanded spectrum holdings through the 2025 auction, resulting in the country having the highest spectrum holding in Africa. The outcome does not mean that spectrum became inexpensive, but rather that a significant increase in spectrum capacity was achieved at a cost that remained proportionate to the amount awarded. This illustrates the practical benefits of combining realistic reserve prices with reasonable licence conditions as part of a coherent investment-focused spectrum policy framework.

¹² Public Notice on the Results of the Auction of Radio Frequency Spectrum in the IMT Band (3600–3800 MHz), TCRA

¹³ The TCRA 3600–3800 MHz Spectrum Auction: A Review and Learning for Regulators, Coleago Consulting, 2025. The same review notes that the 50 MHz block sizing and sealed-bid format may have limited allocative efficiency relative to a multi-round clock auction.

¹⁴ Even after accounting for its substantially larger spectrum holdings, with Tanzania holding almost 2.5 times more spectrum than Egypt, Tanzania's CRR-WACC remains roughly seven times lower.

2.6 The aggregate cost of spectrum

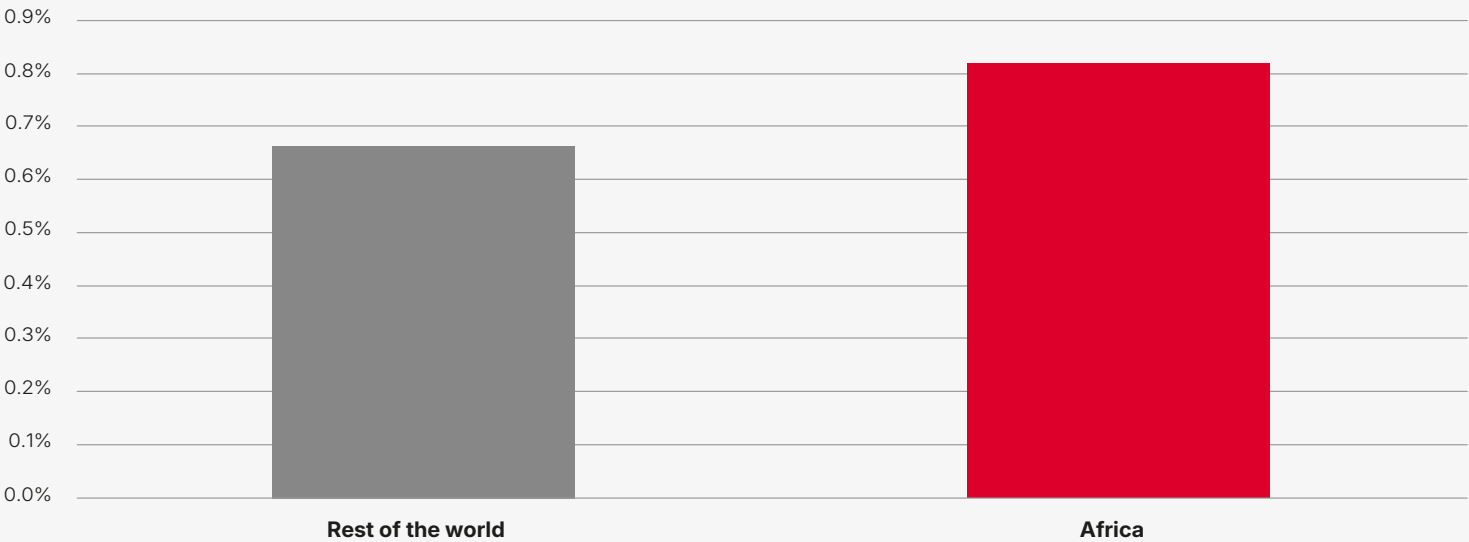
Licence-level pricing provides important evidence on the cost of individual spectrum assignments within Africa. However, to understand the cost burden that spectrum places on operators today, it is also necessary to consider the cost of an operator’s full spectrum portfolio relative to both its revenues and the amount of spectrum it holds.

To account for the substantially lower spectrum holdings observed across many African markets, this section focuses on spectrum-cost-to-revenue ratios, including prices normalised by spectrum assigned. The metric combines licence pricing, spectrum holdings and revenue information to estimate the burden that active spectrum portfolios place on operators relative to both revenues and spectrum assigned. Because upfront licence payments are annualised over the life of each licence, the measure captures the ongoing impact of both recent and historical assignments, reflecting the costs that operators continue to carry today rather than only the prices observed in current awards. Licence-level estimates are consolidated through operator portfolios and aggregated at the country level, providing a consistent basis for comparing spectrum cost burdens across markets with different levels of spectrum assignment.

While the overall CRR in Africa is less than the global average (6% compared to 7%), African operators record an average WACC-adjusted CRR of 0.82% per 100 MHz assigned, compared with 0.66% in the rest of the world, implying a spectrum cost burden that is 24% higher than the global average. This provides an important perspective on the affordability of spectrum in Africa. While the region holds significantly less spectrum than most other parts of the world, the burden associated with each unit of spectrum assigned is higher than the global average.

Of course, spectrum cost burdens are not uniform across the region and the average hides variation between higher- and lower-cost spectrum markets. Table 2 presents the countries that have higher spectrum costs (based on CRR per 100 MHz) than the regional average.

Figure 18
Average WACC-adjusted spectrum-cost-to-revenue ratio per 100 MHz¹⁵



Source: GSMA Intelligence

15 To improve cross-market comparability, this average excludes observations above the 95th percentile of the CRR-per-100 MHz distribution across the full sample.



Table 2
African markets with above-average spectrum cost burdens in 2024 and 2025¹⁶

Benin	Botswana	Burkina Faso	Cameroon	Egypt	Eswatini	Gabon
Mozambique	Niger	Republic of the Congo	Senegal	Sudan	Tunisia	Zambia

Source: GSMA Intelligence

The evidence suggests that the key challenge is not only making more spectrum available but ensuring that the financial cost attached to each additional megahertz remains aligned with the financial realities of the mobile

market. Achieving that balance will be critical if additional spectrum is to translate into greater investment, improved network performance, wider coverage and higher levels of digital adoption across Africa.

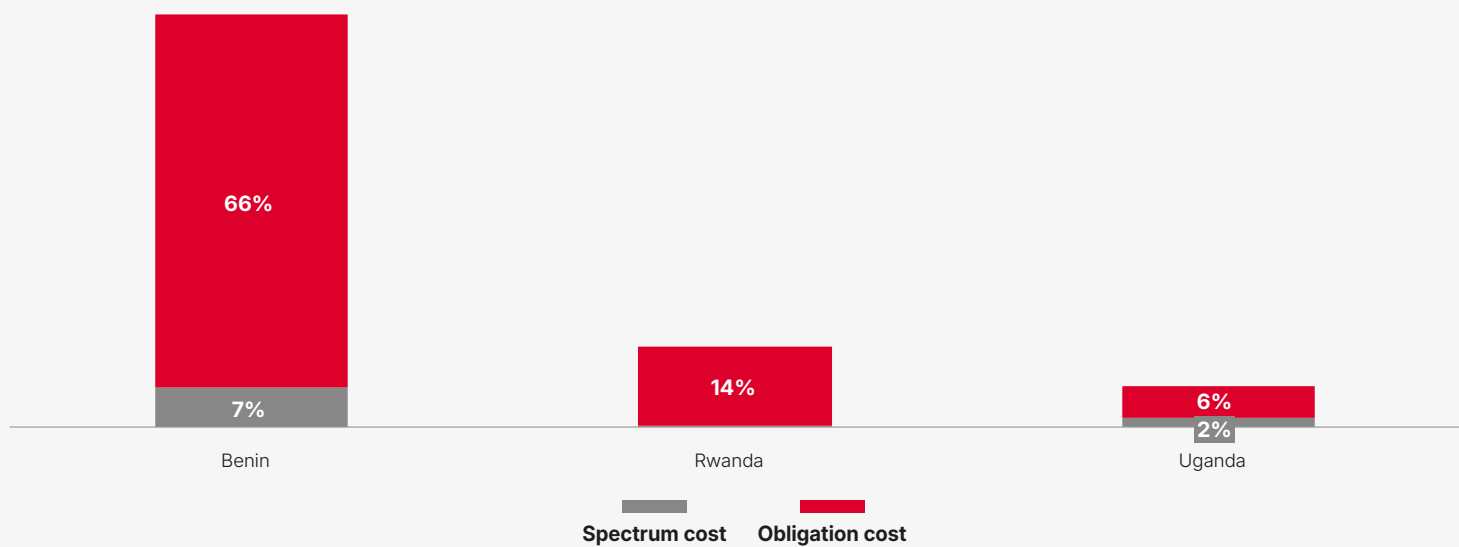
16 African markets with spectrum cost burdens above the regional average after controlling for spectrum holdings (WACC-adjusted spectrum-cost-to-revenue ratio per 100 MHz)

2.7 Licence obligations significantly increase the true cost of spectrum to operators

The analysis presented above considers annual spectrum fees as well as one-off upfront fees, for example when spectrum is auctioned. However, operators in many African markets face licence obligations – typically coverage and/or QoS requirements – that carry a significant cost. While quantifying these costs across all countries is challenging, given the different obligations in place and the lack of data, we have done so in three markets: Benin, Rwanda and Uganda. These three markets show that obligation costs can significantly exceed the direct cost of the licence and spectrum itself.

In Benin, direct spectrum costs already stand at an estimated 7% of annual operator revenue (among the higher levels observed in this study), but the geographic coverage and QoS obligations attached to spectrum licences add a further 66% of revenue. In Rwanda and Uganda, direct spectrum fees alone are modest (<1% and 2% of revenue respectively) and would not flag either market as high cost. But once obligation costs are included, the total cost rises to 14% of revenue in Rwanda and 8% in Uganda.

Figure 19
Spectrum cost and obligation cost as a share of revenue



Source: GSMA Intelligence

The scale of these figures shows that monetary licence and spectrum fee data alone can materially understate what spectrum actually costs operators in Africa. Compliance costs linked to rollout, coverage and other licence requirements can represent a substantial share of the total cost faced by operators and, in some cases, may exceed the direct spectrum payment by a considerable margin. As a result, assessments of spectrum affordability should consider the full licence cost to operators, considering both spectrum fees and obligations attached to licences. Where the total cost is excessive, regulators should consider either relaxing the obligations or reducing direct spectrum costs.

The examples of Benin, Rwanda and Uganda provide an illustration of this. All three countries impose a geographic coverage obligation, meaning operators must extend coverage outside of populated areas. In some cases, there are valid social and economic reasons for doing this, such as for transport links, tourist locations (e.g. national parks) and areas of significant economic activity that are not populated (e.g. industrial zones). However, an inflexible blanket obligation to provide coverage across an entire geography, which does not reflect the fact that a lot of mobile usage outside of populated areas is outdoors (meaning coverage can be provided with lower signal strengths), will either be impossible to meet financially or jeopardise more efficient investments (e.g. in newer technologies such as 5G) and lead to higher prices for consumers. In situations where geographic coverage obligations are being considered, regulators should engage in a dialogue with mobile operators to agree on a level of coverage and QoS that will deliver benefits that exceed the cost of the obligation. Furthermore, if obligations are imposed, the cost of meeting them should be discounted from the licensee's spectrum cost.

Some regulators around the world have addressed this by decoupling coverage obligations from the spectrum award itself, rather than bundling the two together. Austria's 2020 multiband auction combined band-specific deployment and coverage obligations with a reverse auction that separately procured coverage of underserved communities, allowing operators best placed to serve high-

cost areas to bid for that obligation independently of their spectrum holdings. France's 2018 licence renewal took a different approach but recognised the impact spectrum costs had on investment. The country's regulator traded a fee-free extension for a binding rollout commitment rather than pricing the obligation into the licence itself.¹⁷ Brazil's 2021 multiband auction provides another example. Rather than maximising auction revenues, the regulator embedded substantial investment commitments into the award design, including coverage, backhaul and connectivity obligations. Flexible payment terms, long licence durations and renewal certainty further supported investment incentives, allowing spectrum policy to contribute directly to network expansion and digital inclusion objectives.¹⁸

These types of models reduce the risk that bundled obligations either go unmet or inflate the effective price of spectrum – a risk that is present in many African markets today. Where obligations are put in place, it is important that they are carefully designed and that their incremental social benefits exceed their incremental costs. Well-designed obligations can extend coverage to underserved areas, raise service quality where commercial incentives are weak and advance goals such as digital inclusion and regional development. However, overly demanding targets that do not generate significant incremental benefits for consumers risk imposing costs greater than the benefits, crowding out productive investment or resulting in unused spectrum. In this respect, licence obligations should be tailored to each market's stage of development, ARPU levels and current phase of technology evolution, rather than replicating commitments designed for more developed markets.

This has also been reflected in the African Telecommunications Union (ATU) Recommendation on spectrum licensing, which notes that while licence obligations can be an important element in delivering policy objectives, they should always be carefully considered. The ATU recommends that regulators consult and negotiate with local mobile operators to design obligations that can realistically be met, with practical solutions, and that they are used in conjunction with measures to lower deployment costs.¹⁹

¹⁷ [Global Spectrum Pricing](#), GSMA, 2025

¹⁸ *Idem*

¹⁹ ATU-R Recommendation relating to Spectrum Licensing for Mobile/Broadband Systems (2021)

3. The broader spectrum and licensing environment



The evidence presented so far shows that when considering the amount of spectrum assigned and the obligations that are attached to spectrum licences, the spectrum costs in many African countries are significant. They therefore pose a significant risk of reducing investment at a time when it is most needed to close the connectivity gap in the region.

However, the overall spectrum assignment environment is shaped by more than spectrum prices alone. Licence terms, policy frameworks, renewal conditions and future assignments all affect the resources available for network investment and, ultimately, the pace at which coverage, quality and adoption can improve across African markets.

Across each of these areas, many countries in Africa can take steps to improve the conditions for investment and innovation by implementing recommendations from the ATU (see Table 3).

Table 3
Summary of key spectrum policy conditions across Africa

Dimension	ATU Recommendation ²⁰ and status across Africa
Technology- and service-neutral licensing	The ATU recommends that spectrum licences should be technology- and service-neutral, enabling spectrum to be used efficiently by mobile operators rather than being tied to declining technologies and services. 21 of 54 countries in Africa do not have a fully technology-neutral licensing framework. 26 of 54 countries in Africa do not have a unified licensing framework.
Spectrum roadmap	The ATU recommends predictable and timely spectrum licensing to encourage long-term network investment. This includes a spectrum roadmap to provide a schedule for forthcoming spectrum releases to meet the government's broadband plan as well as the requirements driven by changing technology and demand. Only 9 of 54 in Africa countries have published a spectrum roadmap.
Licence duration	The ATU recommends that licence durations should be at least 20 years to incentivise network investment. Only 9 of 54 countries in Africa have licence terms of 20 years or more across all active licences.

20 ATU-R Recommendation relating to Spectrum Licensing for Mobile/Broadband Systems (2021)

3.1 Technology and service neutrality

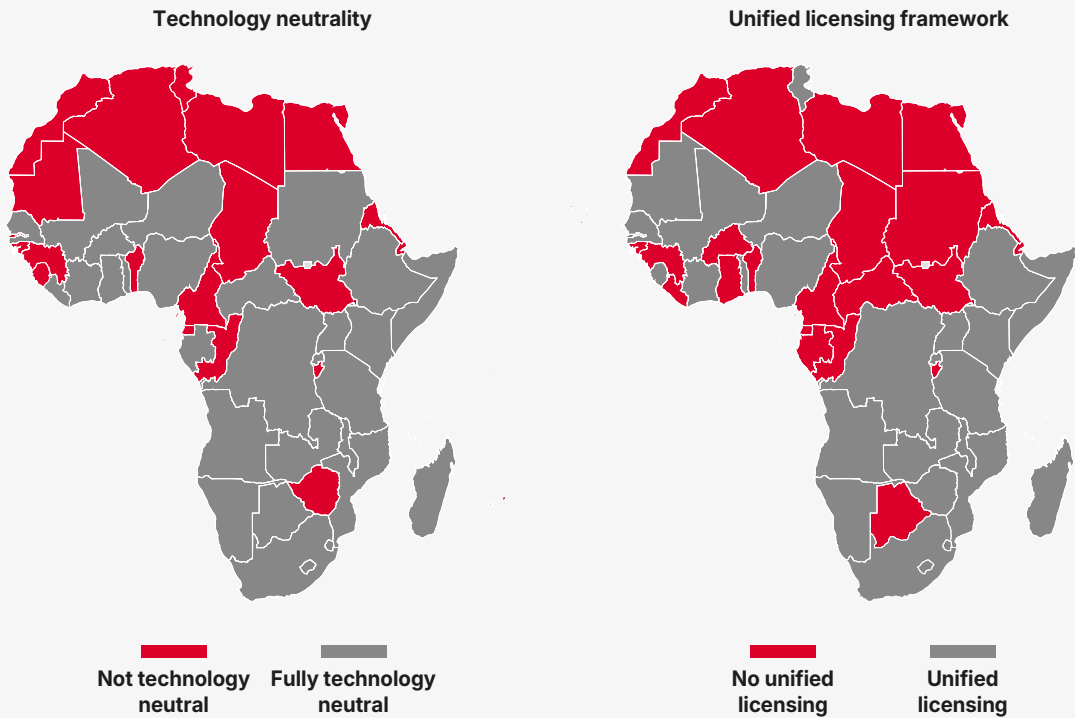
Technology-neutral licensing allows operators to reform spectrum bands historically used for 2G and 3G (900, 1800 and 2100 MHz) to 4G and 5G without additional regulatory cost or delay. Even in countries that technically permit technology-neutral licensing, in practice it is often retrospective only, rather than forward-looking. This means that regulators anchor the definition of neutrality to the technology stack in place at the time of award, meaning operators can face additional regulatory costs or authorisation requirements each time a new technology is introduced, even where they could otherwise reform existing spectrum to deploy them.

Technology neutrality is closely linked to service neutrality, which allows operators to offer whichever services best match the technology and spectrum they hold, including services such as fixed wireless access (FWA).²¹ Licensing spectrum differently based on whether it is used for mobile or fixed services is an outdated distinction, as a single network has been able to provide both since the arrival of 4G. Limiting a licence to one service does not reduce

network costs and it can instead reduce the revenue the operator earns from the same investment, with this cost ultimately passed on to consumers. This is another way these reforms can act as enablers of network expansion by providing operators with greater flexibility in how they use spectrum and deploy technologies.

The relevance of technology neutrality extends beyond regulatory simplification. In a region where operators must expand coverage, improve QoS and support growing demand with limited financial resources, restrictions on the use of assigned spectrum can impose unnecessary costs and reduce investment efficiency. Technology-neutral licensing frameworks allow operators to adapt networks to evolving market needs and technological developments, helping ensure that spectrum resources deliver the greatest possible connectivity and economic benefits. This makes technology neutrality a key component of a broader spectrum policy framework aimed at supporting investment, affordability and digital inclusion across Africa.²²

Figure 20
Technology neutrality and unified licensing framework status by country



Source: GSMA Intelligence

21 [Technology-Neutral Spectrum and Legacy Network Sunsets](#), GSMA, 2023

22 [Mobile technology Neutrality: Public Policy Paper](#), GSMA, 2026

Case study

Rwanda’s transition to a technology – and service-neutral spectrum framework

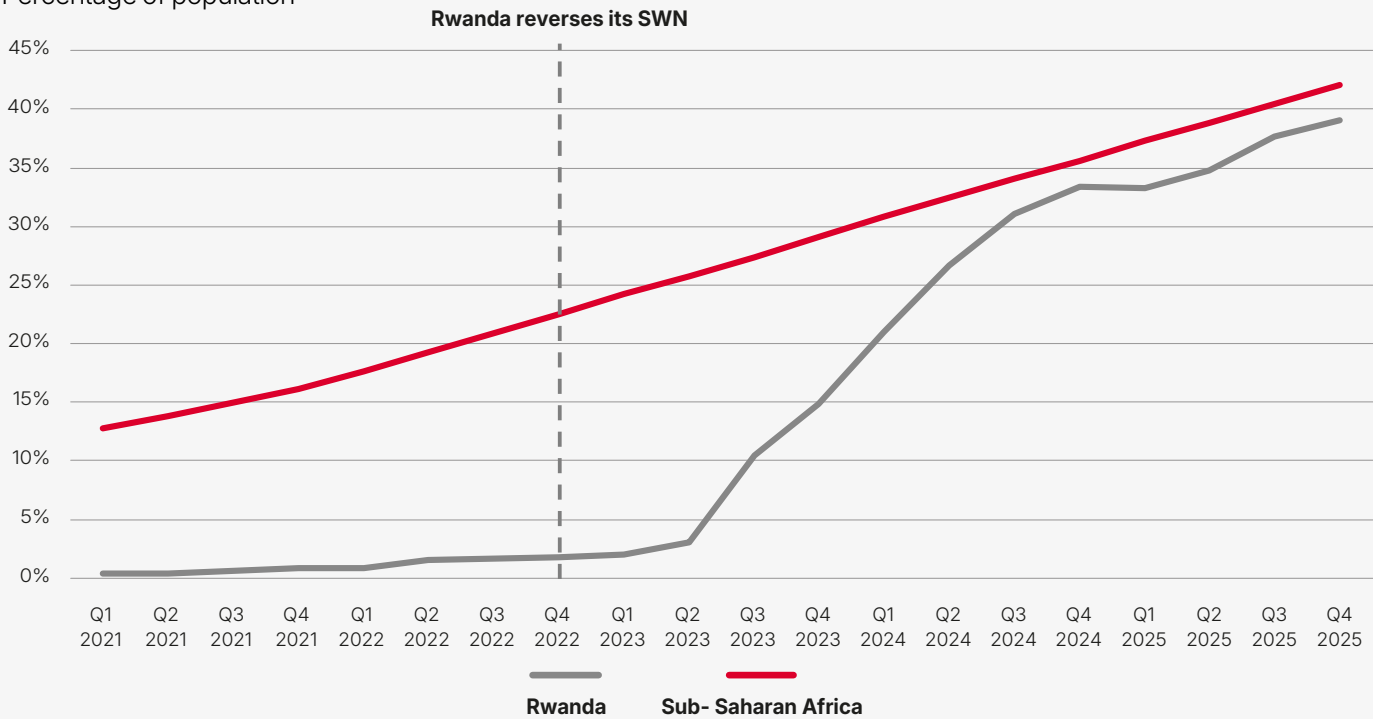


Rwanda provides a relevant example of how spectrum policy reforms can accelerate digital adoption. Between 2013 and 2022, spectrum in the 800 MHz and 2.6 GHz bands was assigned exclusively to a single wholesale network (SWN) operator under a 25-year licence designed to expand 4G coverage.²³

In 2022, Rwanda shifted towards a more open, technology- and service-neutral framework, allowing mobile operators to refarm spectrum and deploy multiple technologies, including 4G and 5G, within the same bands. By increasing flexibility in how spectrum could be used and reintroducing infrastructure-based competition, the reform enabled operators to respond more effectively to consumer demand and make more efficient use of existing spectrum assets.

Within two years, 4G penetration increased from around 2% to over 30% of the population, despite coverage already being largely in place before the policy change. The experience highlights how technology-neutral spectrum frameworks can help translate spectrum availability and network coverage into greater service adoption and consumer uptake.²⁴

Figure 21
Average 4G market penetration in Rwanda and Sub-Saharan Africa²⁵
Percentage of population



Source: GSMA Intelligence

23 "Rwanda reverses decision to depend on a Single Wholesale Network", GSMA, November 2022
24 "Abandoning its single wholesale network unlocks significant connectivity growth for Rwanda", GSMA, December 2024
25 Penetration refers to 4G adoption and not unique subscribers



3.2 Spectrum roadmaps and future spectrum assignments

While the approach to pricing and licensing of existing spectrum bands will be critical for operators, it is equally important for regulators in Africa to ensure that additional spectrum is made available to meet future demand and that it is licensed and priced efficiently. The GSMA's report on spectrum needs in 2035–2040²⁶ shows that in order to meet demand for current and new use cases, a total of 1.6–2.4 GHz of mid-band spectrum will be needed in Africa in high-density urban areas in high-demand countries.

Building on recent spectrum identifications at the World Radiocommunication Conference 2023 (WRC-23), and also looking ahead to WRC-27 discussion items, the primary mid-bands currently under consideration for additional mobile spectrum are from within the:

- upper 6 GHz band between 6.425–7.125 GHz (identified at WRC-23), which should be the primary band for the launch of 6G, providing 700 MHz bandwidth
- 3.8–4.2 GHz range (extending the assignment that countries have made in 3.4–3.8 GHz), which could provide up to an additional 400 MHz of mid-band spectrum for high-power macro deployments
- 4.4–4.99 GHz, which could provide up to 600 MHz
- 7.125–8.4 GHz range, which could provide an additional 600–1,275 MHz.

There is a clear pathway to ensure that the minimum requirement of 1.6 GHz of mid-band spectrum is available in Africa by assigning the full upper 6 GHz band. Should mid-band spectrum requirements reach 2.4 GHz, meaning that an additional 800 MHz would be needed (on top of the 700 MHz from the upper 6 GHz band), regulators can consider options in the 3.8–4.2 GHz range and the 4.5 and 7–8 GHz bands, which offer solutions to the longer-term requirements that could materialise in the 2030s.

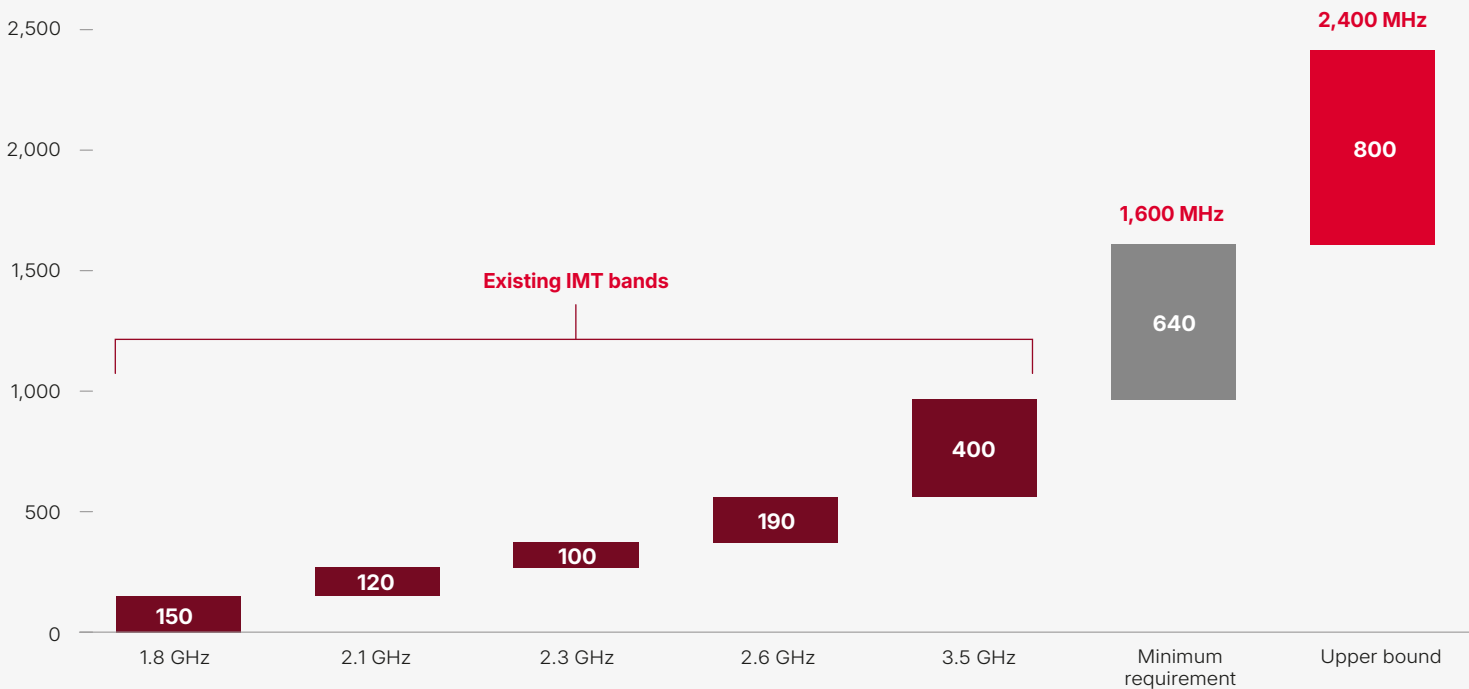
A key consideration in many African countries is that upper 6 GHz and 7 and 8 GHz are heavily used as fixed service (FS) links for mobile backhaul. Repurposing upper 6 GHz for IMT will therefore place greater demand on the remaining 7 and 8 GHz bands. Regulators should assess their own country's use of these bands and design individualised migration paths for existing FS, enabling 5G FWA and 6G without disrupting mobile backhaul.

In addition to mid-bands, assigning the 600 MHz band will also be critical to enhance low-band coverage and capacity, particularly for rural and underserved areas. For a typical country in Africa, the benefits from assigning 80 MHz of this band to mobile would be more than 10× greater than the costs.²⁷

²⁶ [Vision 2040: Spectrum needs for the future of mobile connectivity](#), GSMA, 2026

²⁷ [Socio-Economic Benefits of Low Band Spectrum](#), GSMA, 2023

Figure 22
Existing IMT mid-bands and future spectrum requirements in high-mobile-demand African countries
MHz



Source: GSMA Intelligence

Of course, almost all countries in Africa still have existing IMT spectrum to assign to operators, particularly in the 3.5 GHz range. This should be the priority in the short term. Given both the short-term and long-term spectrum requirements, a published spectrum roadmap is important to give operators and the broader mobile ecosystem visibility over future assignments, letting them plan network investment years in advance rather than reacting to individual award announcements. Uncertainty over when and how future bands will be released is itself a cost: when operators cannot

see beyond the next assignment, they discount the value of committing capital now, hold back on rolling out beyond near-term demand and delay decisions on densification, backhaul and other spectrum-dependent investments.

A published timeline also lets the wider device and equipment ecosystem develop around the bands that a country actually intends to release, which lowers the cost of the handsets and network equipment that operators need once that spectrum is finally assigned.

Unfortunately, as of Q2 2026, only nine countries in Africa have fully developed and published spectrum roadmaps. It is therefore important that regulators begin to develop these, particularly as WRC-27 approaches. GSMA guidance on roadmaps for Africa, together with more recent lessons from harmonisation efforts in Asia, points to a consistent set of recommendations for regulators:

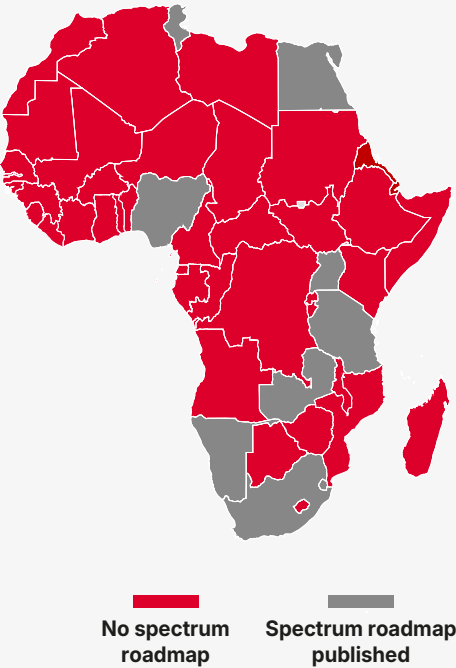
- They should publish a multi-year timeline for upcoming bands rather than announcing awards individually.
- They should align band plans with regional and global harmonisation decisions so that domestic markets benefit from the same device and equipment economies of scale available elsewhere.
- They should consult operators before finalising award terms.

On the harmonisation recommendation, duplex arrangements are a practical illustration of why a common regional approach matters. Spectrum bands can be assigned as paired (frequency division duplex (FDD)) or unpaired (time division duplex (TDD)). Globally, the trend has moved towards TDD, which is better suited to the traffic patterns of modern 4G and 5G networks and benefits from wider channels and a large device ecosystem. The 2.6 GHz band is a good example:

international frameworks allow it to be configured either way, and while many markets originally adopted an FDD or hybrid plan, most recent assignments worldwide have moved to the TDD arrangement.²⁸ These choices deliver most value when they are consistent across neighbouring markets, since different arrangements on either side of a border require additional coordination to manage interference and can constrain how fully the spectrum is used. As countries in Africa assign or renew mid-bands such as 2.6 GHz, licence expiry and renewal windows provide a natural opportunity to consider the approach best aligned with neighbouring markets and the wider global trend.

Taken together, these recommendations share a common goal of making spectrum available in a way that is predictable, harmonised and aligned with market needs. In practice, the detailed steps involved – such as identifying suitable spectrum, clearing it of incumbent use, defining the technical conditions, valuing it and designing the award – are broadly the same for every country, but the specific choices within each step depend on local market conditions, which is precisely why early, structured consultation improves outcomes rather than simply adding process.²⁹

Figure 23
Spectrum roadmap publication status by country



Source: GSMA Intelligence

28 [IMT Spectrum Harmonisation in ASEAN](#), GSMA, 2026 and ITU-R Recommendation M.1036-7 (12/2023)
29 [Roadmaps for 5G Spectrum: Sub-Saharan Africa](#), GSMA, 2021 and [IMT Spectrum Harmonisation in ASEAN](#), GSMA, 2026

Case study

Nigeria's 2026–2030 spectrum roadmap



Nigeria published the Spectrum Roadmap for the Communications Sector (2026–2030) in early 2026, setting out planned spectrum releases and assignment, including the 600 MHz band in the short term, alongside a five-year timeline intended to give operators clarity and predictability ahead of individual assignments.³⁰

The roadmap goes beyond a simple release schedule. It sets out plans for future assignments across the 600 MHz, 1.4 GHz, upper 6 GHz and mmWave bands while also identifying opportunities to optimise and potentially reassign underutilised spectrum through spectrum audits and refarming activities. In addition, it provides visibility on broader regulatory priorities, including reviews of spectrum pricing frameworks, licensing processes and new spectrum management capabilities, helping ensure that spectrum policy evolves alongside changing market and technology requirements.

Publishing this level of detail in advance improves the allocation of the assignments that follow. Operators considering the acquisition of existing IMT bands or planning capital expenditure for the upper 6 GHz band no longer need to price in the risk that the timeline itself might shift, which should in turn support more competitive bidding and pricing that better reflects the underlying value of the spectrum, rather than a premium for regulatory uncertainty. It also gives operators several years' notice to plan the vendor contracts, tower upgrades and backhaul investment that a new band requires, as opposed to compressing that planning into the months between an award announcement and the deadline for rollout obligations.

Nigeria's roadmap illustrates the kind of forward guidance that only nine of Africa's 54 markets currently provide. This report's evidence on spectrum cost pressure suggests it will become increasingly important as more countries approach their own assignments: a published timeline does not by itself guarantee that the spectrum released against it will be priced sustainably, but it removes one source of cost, regulatory uncertainty, that pricing reform on its own cannot address.



30 Spectrum Roadmap for the Communications Sector (2026–2030), NCC, 2026

3.3 Licence duration

Licence terms of 20 years or more give operators enough certainty to plan long-term network investment against the spectrum they hold. This is widely recognised in international best practice as a minimum benchmark, alongside clearly defined renewal expectations set out at the point of award rather than negotiated next to the expiry.

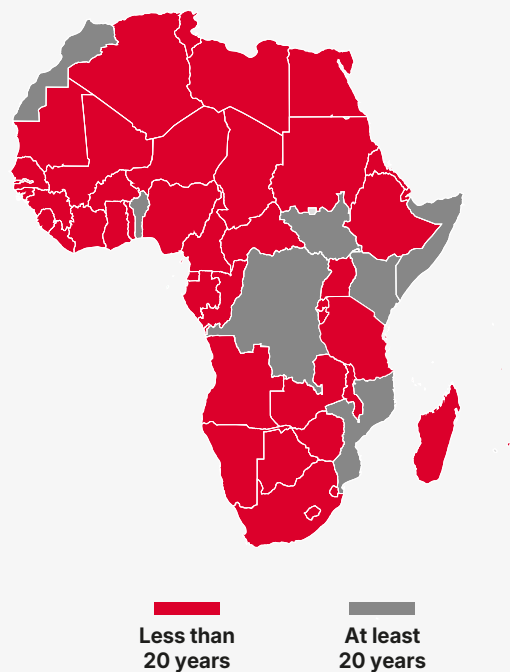
Mobile networks are capital intensive, and operators need enough certainty over the licence term to expect a full return before it expires. Fixed-term licences that run short, or where renewal terms are unclear, discourage investment in the years approaching expiry, precisely when a network might otherwise be upgraded or extended. International reviews of licensing practice have found that a presumption of renewal and licensing that is predictable and timely are consistently associated with stronger long-term network investment. Several markets have moved in recent years towards even longer, and in some cases indefinite, licence durations for exactly this reason: removing the fixed expiry

date removes the recurring investment hesitation that comes with an approaching renewal decision and gives operators more confidence in the expected return on new network spending.

With only nine of 54 African countries currently meeting the 20-year benchmark, this is one of the more straightforward gaps for regulators to close, since it requires no change to pricing, only to the terms attached to future awards and renewals.³¹

This pattern sits within a broader relationship between policy and digital development in Africa: countries with more enabling telecoms and digital policy frameworks show markedly higher digital adoption by consumers, businesses and governments. But only a small number of African countries currently combine strong policy scores with strong digital outcomes.³²

Figure 24
Spectrum licence duration by country



Source: GSMA Intelligence

31 For example, see ATU-R Spectrum Recommendation. The spectrum recommendations call for harmonised, predictable licensing frameworks across member states, a principle directly aligned with the case for longer, more consistent licence terms made in this report.

32 The GSMA Digital Africa Index, GSMA Digital Nations and Society Index and GSMA Digital Policy and Regulatory Index

3.4 Licence renewals

Two forward-looking processes will play a decisive role in shaping Africa's future spectrum cost burden: the renewal of existing licences and the assignment of spectrum that many countries have yet to release. Both represent critical policy decisions and will influence whether spectrum becomes more affordable and investment incentives improve over time.

In terms of renewals, a GSMA global study of spectrum licence renewals highlights their relevance. By 2035, more than 1,500 mobile licences representing 68% of all active licences globally will reach renewal, covering licences with a historical acquisition cost of \$437 billion.³³ In Africa, based on the data currently available, more than 200 mobile licences will reach renewal by 2035 with a value of more than \$10 billion.³⁴

Table 4
Summary of estimated impacts of spectrum licence renewal approaches³⁵

Renewal approach	Effect on spectrum cost	Estimated global benefit
Renewal pricing aligned with declines in revenue per megahertz	Reduces spectrum costs as a proportion of operator revenue by almost 30%	Up to 10% higher network speeds and up to \$1.3 trillion in additional economic output
Automatic renewal	Reduces spectrum costs as a proportion of operator revenue by more than 50%	Up to 20% higher network speeds and up to \$2.4 trillion in additional economic output

Source: GSMA Intelligence

The implications for Africa are clear. As shown throughout this report, operators across the region generate substantially less revenue per megahertz than in the past, while mobile broadband adoption, usage and spectrum assignment levels remain well below those observed in most other regions. At the same time, only nine African countries currently offer licence durations of at least 20 years, meaning that a large share of the continent's spectrum portfolio will be subject to renewal decisions within the coming decade.

This makes renewal policy particularly important. Setting renewal fees with reference to current market conditions and the economic value of spectrum today, rather than to prices established decades earlier, can help sustain incentives for network investment while preserving the public benefits generated by mobile connectivity. The global evidence suggests that renewal frameworks which recognise the long-term decline in revenue generation per megahertz and reflect that trend in spectrum renewal costs can produce substantial gains in network performance and economic output.

Ideally, as recognised in the ATU Recommendation, a presumption of renewal will minimise the risk of investments being delayed because of uncertainty over

future rights. Regulators may also consider renewing licences with an indefinite duration. An indefinite duration provides regulatory certainty for operators to invest in network expansion and modernisation on existing bands, removing the risk that their spectrum holdings will significantly change, and allows them to amortise spectrum-related investments over a longer time period when the life of the asset is longer than the life of the licence. Allowing operators to retain spectrum beyond the initial term for a further period, in exchange for an investment commitment rather than a high renewal fee, should therefore become standard practice. This supports investor confidence and allows operators to plan further ahead as they move towards digital maturity.

To ensure that spectrum is assigned to the most efficient users over time, regulators can enable spectrum trading and leasing, which would be incentivised by the implementation of indefinite licences. Few countries in Africa have seen significant progress on spectrum trading and leasing, with Nigeria being a notable exception. Allowing spectrum to move from an operator that cannot fully or efficiently utilise a band to one facing growing capacity constraints and willing to invest more is one of the most direct ways for regulators to maximise the value that citizens derive from a scarce national asset.

33 Rethinking Spectrum Renewals, GSMA, 2026
34 As we do not have data on all active licences in the continent, these numbers represent an underestimate.
35 Rethinking Spectrum Renewals, GSMA, 2026

3.5 Satellite connectivity and direct to device

There has been much attention given to the potential role of satellite technology to close the connectivity gap in remote areas, both in Africa and in other regions, particularly with the latest generation of low Earth orbit (LEO) satellites. Satellite connectivity can help close the coverage gap in three ways:

- **Providing fixed satellite broadband connectivity to consumers:** The growth in fixed satellite broadband has been significant due to the expansion of Starlink, but the service is primarily targeted at households in high-income countries that live in areas with limited fixed-broadband alternatives (particularly a lack of fibre broadband access), along with higher-income households in low- and middle-income countries. This is evident from the cost of access, which ranges from \$20 to \$220 for the monthly residential subscription price and from \$190 to \$700 for the hardware. Analysis shows that in low- and middle-income countries, the cost of a Starlink service package is six times higher than the ITU affordability target for entry-level broadband (2% of monthly GNI per capita) and more than 10× higher than the cost of a mobile data service. Meanwhile, the upfront cost of a device and necessary Starlink equipment is around five times higher than the affordability threshold considered to represent an affordable device and seven times higher than the cost of an entry-level mobile device. Given that the main barrier to mobile internet adoption in Africa is affordability, followed by digital skills and literacy, fixed satellite broadband is unlikely to address the continent's usage gap.
- **Supporting mobile connectivity with satellite backhaul solutions:** The cost of mobile backhaul in rural sites can be more than double the cost in urban areas. Most backhaul in rural areas uses microwave links due to the lack of fibre. However, in many locations, there is no viable microwave backhaul link due to, for example, there being no line of sight to a nearby site or network node. In such cases, the only viable backhaul solution is through satellite. However, the cost of backhaul using geosynchronous orbit (GSO) satellites has been prohibitive to date, at up to 10× higher than microwave, while limited bandwidth has meant that connected sites could only provide a very constrained 4G user experience, alongside high-latency delays. In contrast, LEO constellations operate closer to Earth, delivering significantly lower latency, much higher bandwidth and a lower overall cost than GSO satellite systems. This could go some way in helping to close the coverage gap. However, other site costs are often prohibitive in remote areas and need to be addressed, particularly base station and energy costs. This is especially important in remote sites with not many users, as potential revenues are more limited.

- **Offering direct-to-device connectivity:** The technology that has arguably garnered most interest in recent years is direct to device (D2D). Connectivity to a mobile device is provided directly from a satellite, without the need for a terrestrial base station or a dish or large receiving equipment. While the technology is not new, the integration of non-terrestrial networks (NTNs) into 3GPP has been critical, as standard mobile devices will be able to connect seamlessly with both traditional base stations and satellite systems when out of range of terrestrial connectivity. Recent advances in technologies such as beamforming and phased-array antennas also allow satellites to focus signals more directly to individual devices. D2D operations can use two spectrum categories: frequency bands identified for IMT and allocated to the mobile service, and bands already allocated to the mobile satellite service (MSS).

At the end of Q1 2026, 23 operators worldwide had a D2D service. Many are currently limited to text messages, but some recent services also incorporate data capabilities. Due to the distances and the size of the satellite beams, D2D connectivity cannot provide a service comparable to terrestrial networks outside of uninhabited locations and areas with extremely low population densities. For example, GSMA Intelligence analysis shows that a constellation with 42,000 D2D satellites using all IMT spectrum would support a 4G-like service to less than 2% of the global population.³⁶ The relatively low data rates and limited concurrent network capacity that D2D can support are driven by the large distance between the satellite and device, which means that compared to terrestrial networks there is much greater free-space path loss and much larger satellite beams (or cells), so a limited amount of spectrum is shared across a vast area.

In practice, the majority of mobile users in Africa will not actively need D2D on a regular basis, as they will be served by terrestrial networks that already cover 95% of the continent's population (based on any technology). Furthermore, in indoor situations, where the majority of mobile usage occurs, D2D signals will be severely attenuated or completely blocked due to building entry losses, leaving link budgets with insufficient margin to close the connection. Consequently, direct satellite connectivity is predominantly an outdoor, line-of-sight solution rather than an indoor service. This means that D2D can provide connectivity in remote and unserved locations where there is no terrestrial coverage (e.g. transit corridors, remote tourist locations, offshore maritime areas and sparsely populated rural environments).

36 [The Limits of D2D: Modelling the extent of D2D connectivity](#), GSMA, 2026

GSMA Intelligence analysis shows that with a 15,000-satellite constellation that is able to utilise all MSS bands, there is sufficient capacity to support an adoption rate of more than 10% for a 2 Mbps (3G-like) service in areas with a population density below 40 people per square kilometre. This increases to more than 20% at population densities below 20 people per square kilometre.³⁷ These are the low-density locations where many countries in Africa lack coverage, as it is too expensive to deploy terrestrial networks. The cost of infrastructure increases exponentially for the final 1–3% of population coverage, and it is generally not financially viable for either an operator or government to subsidise it. This is precisely where D2D can supplement existing coverage, as it can provide sufficient capacity for a small number of users at very low incremental costs.

Table 5 shows the share of population in a selection of countries that are unlikely to be able to receive network coverage from a terrestrial service. This is due to the exponentially increasing cost of deploying mobile networks to the most remote and sparsely populated settlements. It shows that in all markets analysed, D2D has a potential role to extend coverage to the final 1–3% of the population (in the Democratic Republic of the Congo (DRC), it is slightly higher at 5% due to the larger proportion of people living in very remote areas).

Table 5

Share of population unlikely to have terrestrial mobile broadband network coverage in selected markets

Country	Share of population unlikely to have terrestrial network coverage
Benin	1%
Republic of the Congo	3%
DRC	5%
Gabon	2%
Madagascar	3%
Malawi	1%
Nigeria	2%
Senegal	1%
Tanzania	1%
Uganda	1%

Source: GSMA Intelligence³⁸

Given the supplementary role of D2D, which is to extend coverage in remote and uninhabited locations but ultimately not addressing the majority of connectivity demand, it is important to ensure the following principles are applied by regulators in Africa:

- D2D using mobile (IMT) spectrum should be provided through mobile operator licences.
- When using IMT spectrum, D2D must protect IMT networks in accordance with the Radio Regulations.
- Agreement with mobile operators must be in place to use their licensed spectrum in the licensed area.
- Ahead of WRC-27, interference needs to be addressed through domestic regulations.
- Any new MSS allocations at WRC-27 must protect IMT networks from harmful interference.

37 [The Limits of D2D: Modelling the extent of D2D connectivity](#) GSMA, 2026

38 For further details, see [GSMA Country Digitalisation reports](#)

4. Policy analysis and recommendations



Africa faces some of the largest connectivity deficits in the world, with persistent gaps in mobile internet adoption, coverage and network quality. In parallel, operators are under increasing financial pressure, with declining revenues generated per megahertz of assigned spectrum. Spectrum policy sits at the intersection of these challenges. Additional spectrum is needed to support growing traffic demand, improve network performance and expand connectivity. However, the benefits of additional spectrum depend on a framework that preserves operators' ability and incentive to invest.

The evidence presented in this report shows that spectrum costs in many African markets are significantly higher than global benchmarks, particularly when spectrum assignments and licence obligations are taken into consideration. This is important in a region that requires substantial investment to improve coverage, adoption and network quality. This means that regulators in Africa should accelerate progress on the following policy and regulatory reforms, all of which are aligned with the ATU Recommendations.

With regard to spectrum pricing, regulators should take into account the following:

- The primary objective of assigning spectrum should be to assign it to the users that will deliver the greatest social and economic benefits to society, rather than maximising public revenues.
- Regulators should not anchor spectrum costs to historical prices and outdated benchmarks. The costs should instead reflect the forward-looking value that licence holders are likely to realise from having the spectrum.
- Where regulators use auctions, reserve prices should be set at low levels to allow room for price discovery and minimise the risk of unsold spectrum. Furthermore, ongoing charges (e.g. annual fees) should not be imposed if operators have already paid for spectrum in an auction.

- Should regulators decide to impose obligations on licence holders, the cost of meeting those obligations should be paired with discounts in spectrum costs that preserve commercial viability. Furthermore, any obligations should be designed in a manner that their costs do not exceed their incremental social benefits, and regulators should engage in a dialogue with licence holders to arrive at practical and sustainable solutions.
- For existing and active spectrum licences, there should be a presumption of licence renewal, ideally automatically renewals with indefinite licences. To ensure that spectrum is assigned to the most efficient users over time, regulators should enable spectrum trading and leasing.

It is also recommended that regulators take the following actions:

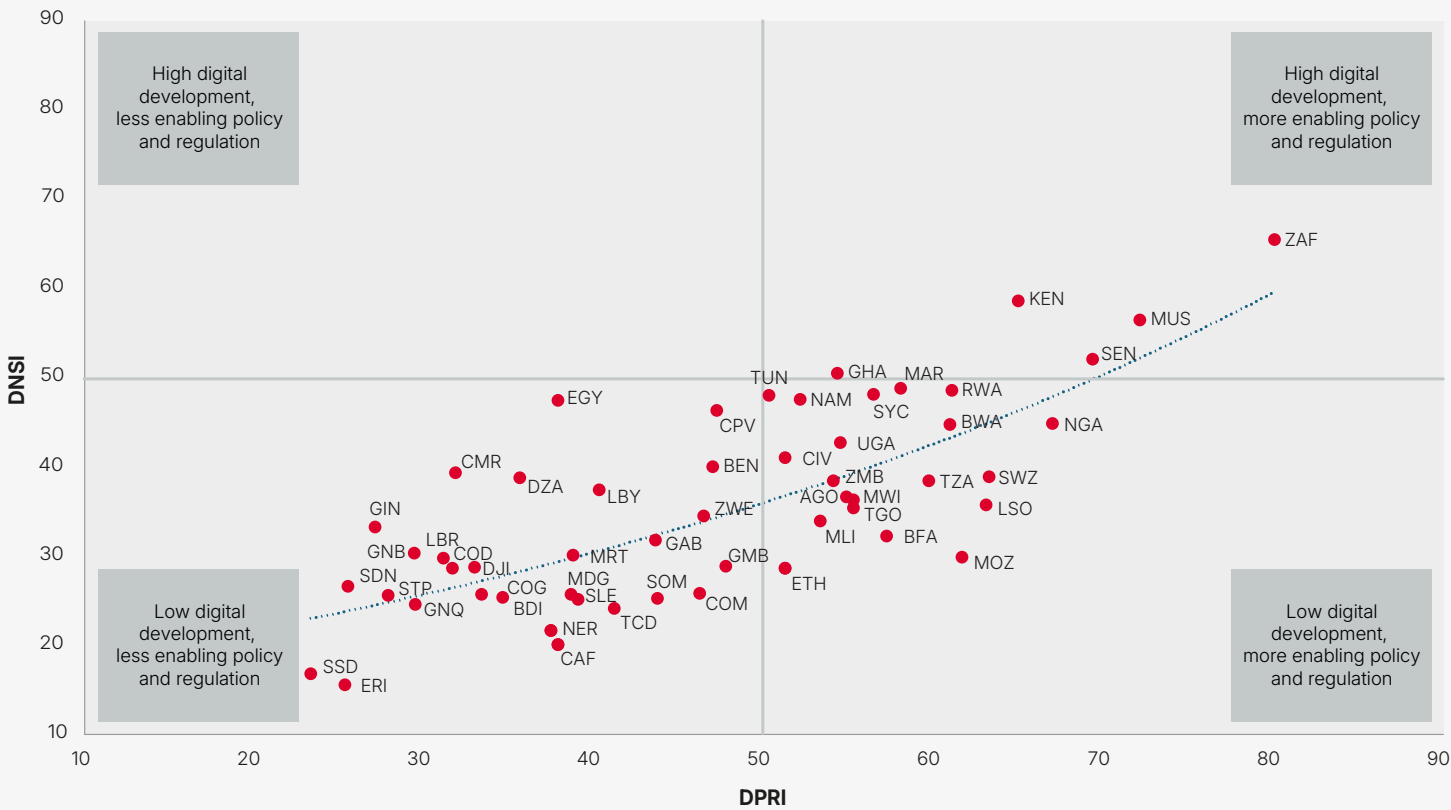
- They should make all spectrum allocated to mobile services (IMT) available to operators, to ensure there is no artificial scarcity and to support better coverage and network quality for consumers.
- They should adopt technology- and service-neutral spectrum licensing, under a unified licensing framework.
- They should set licence durations of at least 20 years to incentivise network investment.
- They should publish long-term spectrum roadmaps that set out forward-looking plans on future spectrum allocations to allow operators the maximum time to plan their investments.
- Looking ahead to the next 10-15 years, governments should allocate the full upper 6 GHz band for mobile use to ensure they meet the minimum requirement for mid-band spectrum needs in high-density urban areas in high-demand countries. To ensure sufficient coverage and capacity in rural areas for new technologies, the 600 MHz band should be allocated for mobile use.

Adopting these policies will lead to substantial benefits for consumers, businesses and the wider economy. Figure 25 simulates the impact of spectrum and licensing reforms using the GSMA Digital Africa Index, with Figure 25a showing the current scores for the Digital Nations and Society Index (DNSI) and Digital Policy and Regulatory Index (DPRI).³⁹ Within the DPRI, the Licensing and Spectrum pillar tracks progress on each of the policy topics above. Implementing them would enable all countries to achieve the maximum scores for this pillar. Figure 25b shows the resulting increases in DPRI scores, and the potential knock-on effect on the DNSI.

The key impacts are as follows:

- The average DPRI score in Africa would increase by 10 points, from 46 to 56 (out of 100)
- The average DNSI scores would increase by 6 points, from 36 to 42 (out of 100). This means greater digitalisation in countries, including among consumers, businesses and governments.
- The number of countries achieving scores above 50 in both indices (i.e. having high digital development as well as more enabling policy and regulation) would increase from five to 14.

Figure 25a
Africa: DNSI and DPRI scores, 2025

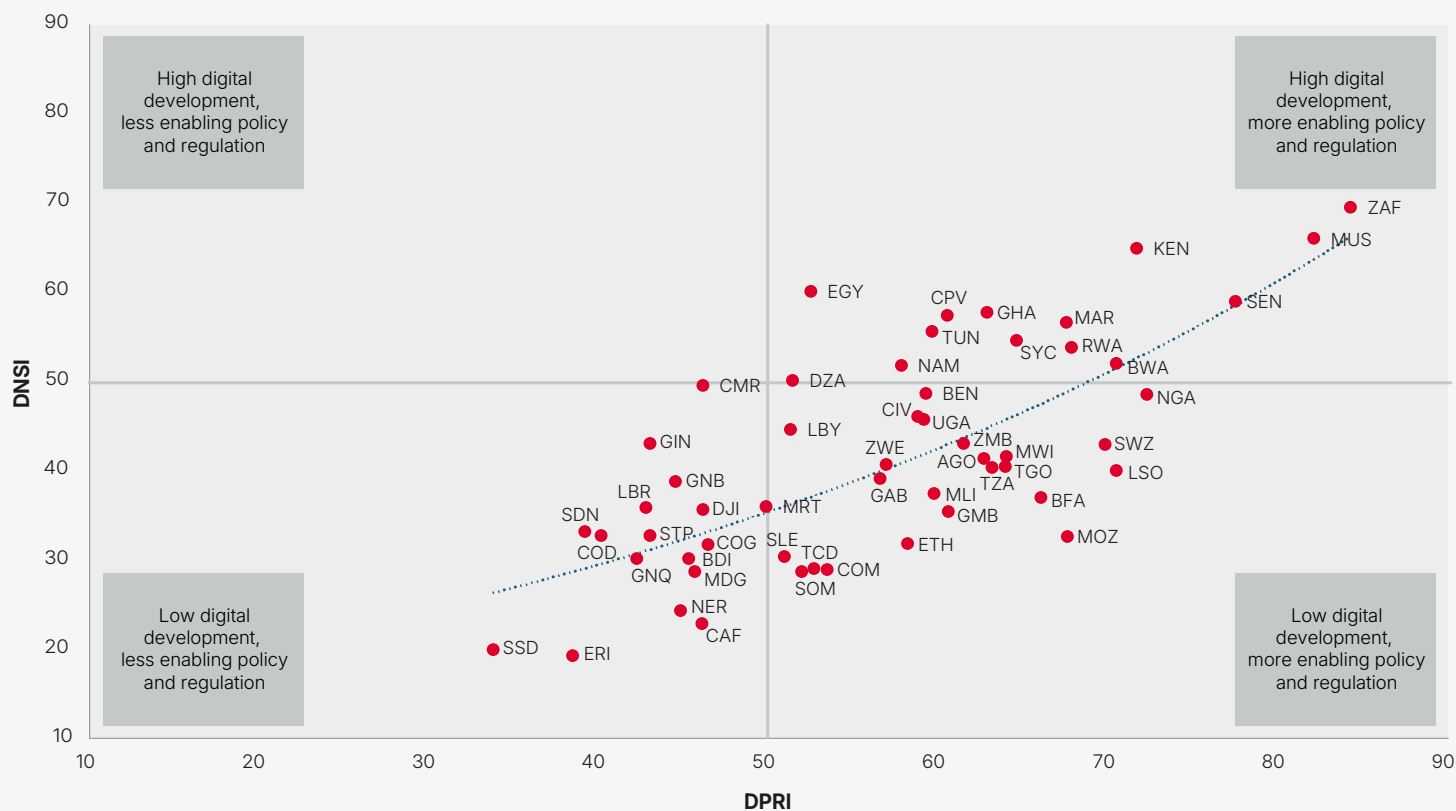


Source: GSMA Intelligence

39 See www.gsma.com/digital-africa-index

Figure 25b

Africa: simulated DNSI and DPRI scores if all spectrum and licensing policy recommendations are implemented



Source: GSMA Intelligence

In terms of more direct impacts, it is estimated that if all countries in Africa adopted the above policy reforms, the potential benefits would include:⁴⁰

- an additional 50 million people covered by 4G networks (increasing 4G population coverage by 3pp)
- an additional 170 million people covered by 5G networks (increasing 5G population coverage by 11 pp)
- an increase in average download speeds increase by 30–50%
- a cumulative increase in GDP across Africa by more than \$120 billion (in 2024 prices) between 2026 and 2035 (by 2035, the reforms could increase the continent's GDP by up to 0.5%).

Although additional spectrum will remain essential, for many African countries the challenge is not simply to release more spectrum. It is equally important to ensure that spectrum pricing, licence conditions, obligations and renewal frameworks support sustainable investment and efficient spectrum use. Getting this balance right can help expand coverage, improve QoS, support growing traffic demand and accelerate digital adoption while ensuring that operators have the capacity to continue investing in the networks needed to improve Africa's digital development.

⁴⁰ The impact of the policy reforms on network coverage and speeds is based on their causal link with spectrum holdings and costs. For further details, see Spectrum licence renewals and obligations, GSMA, 2026, and The Dynamics of Spectrum Cost in the Era of 4G and 5G and Its Impact on Mobile Network Development, Zagdanski, Bahia and Castells, 2025, in Proceedings of the TPRC 53: The 53rd Research Conference on Communication, Information and Internet Policy 2025. The impact on GDP is modelled based on the approach set out in Spectrum licence renewals and obligations, GSMA, 2026 and Spectrum and the Economic Benefits of 6G, GSMA, 2026.





